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Understanding the Implications of HPV Infection: Does Parental Education Impact HPV Vaccination Completion Rates?

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Abstract

Background*:* Up to 80% of United States (U.S.) citizens will contract the human papillomavirus (HPV) at some point in their lives. HPV has the ability to cause multiple types of cancer, including cervical, vulvar, vaginal, penile, anal, and oropharyngeal. The most recent HPV vaccine is effective against nine strains of the virus, which account for most cases of cancer and genital warts caused by HPV. Parents are a key component in reaching Healthy People 2030's goal to have 80% of all adolescents in the U.S. completely vaccinated against HPV. ***Objective****:* The purpose of this systematic review was to determine if parental education regarding the implications associated with contracting an HPV infection and the development of cancer and knowledge of the impact of the HPV vaccine on HPV infection rates (and thus cancer prevention) could increase adolescent vaccination initiation and completion rates in the U.S. ***Results****:* Research does not strongly support education as a sole intervention to achieve Healthy People 2030's goal. ***Findings****:* Multiple interventions are likely necessary to impact HPV infection and vaccination rates in adolescents, including parental education, policy change, public health campaigns, and public health interventions such as school-based vaccination clinics.

Keywords: Vaccine hesitancy, vaccine refusal, vaccine compliance, vaccine uptake, HPV vaccine, HPV vaccination, human papilloma virus vaccine, papillomavirus, education, teaching, instruction, parents, caregivers, mother, father, parent, United States of America, America, US, USA, teen, adolescent, preteen

Parental Education on Implications of HPV Infection in Their Adolescent Children: Can This Increase HPV Vaccination Initiation and Completion Rates?

Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States (U.S.), with up to 80% of citizens contracting this infection during their lifetime (Niccolai & Hansen, 2015). Up to 50% of infected individuals contracted HPV during their first sexual encounter (Niccolai & Hansen, 2015). More than 32% of female adolescents age 14 to 19 years old have contracted HPV (Dorell et al., 2014). This infection is well known to cause multiple types of cancer, including cancer of the cervix, vulva, vagina, anus, penis, and oropharynx (Brewer et al., 2020; Lee et al., 2016; Lu et al., 2015; Schnaith et al., 2018; Thomas et al., 2012). Seventy percent of the world's cervical cancer cases are caused by HPV strains 16 and 18, both of which are vaccine preventable (Lee et al., 2016). Brewer et al. (2020) assert there are 42,000 new cases of cancer diagnosed annually in the U.S. per year that can be attributed to HPV. Oropharyngeal squamous cell carcinoma is now the leading HPV associated cancer in the U.S. (Schnaith et al., 2018). HPV can also cause non-cancerous diseases, such as genital warts (Moss et al., 2016a). HPV can also be asymptomatic, allowing individuals to unknowingly spread this infection (Lu et al., 2015; Niccolai & Hansen, 2015).

The HPV vaccine became available in the United States in 2006, with initial recommendations solely for girls. Recommendations for boys were added in 2010 (Thomas et al., 2012). The nine-valent HPV vaccine (Gardasil 9) is the most recent HPV vaccine, approved for use in 2014 (Lee et al., 2016). This vaccine protects the individual from strains of HPV that cause 95% of genital warts and 90 to 95% of anogenital cancers (Brewer et al., 2020). Current guidelines recommend vaccinating against HPV at 11 to 12 years of age, as the vaccine is most beneficial if used before sexual debut (Dela Cruz et al., 2016; Litton et al., 2011; Moss et al.,

2016a; Victory et al., 2019). If greater than 80% of U.S. adolescents become fully vaccinated against HPV, it is estimated that 56 to 86% of abnormal Papanicolaou tests, cervical cancer, and anal cancer could be prevented and genital warts would become nearly eradicated (Brewer et al., 2020).

Despite the prevalence of HPV-related cancers in the United States, HPV vaccination rates have failed to meet Healthy People 2020's goal of 80% of adolescents completing the vaccine series (Healthy People, 2020; Kornides et al., 2018). Only 49.5% of female and 37.5% of male adolescents age 13 to 17-years-old have completed the HPV vaccine series (Schnaith et al., 2018; Victory et al., 2019). Looking at HPV vaccination rates from a global perspective, developed countries like Australia, England and Denmark report that more than 70% of their adolescent populations have completed the HPV vaccine series (Niccolai & Hansen, 2015). If the U.S. could meet the goal of fully vaccinating 80% of adolescents against HPV, an estimated 53,000 cases of lifetime cervical cancer diagnoses could be prevented (Victory et al., 2019).

Background

Phenomenon of Interest

The focus of this paper is to identify how parental education regarding the long-term health outcomes surrounding contracting an HPV infection impact adolescent vaccine uptake. Current efforts have failed to meet Healthy People 2020's goal for 80% of adolescent males and females to complete the HPV vaccination series (Healthy People, 2020). Healthy People 2030 is repeating this goal since the United States fell short of achieving the 2020 HPV vaccination goals (Healthy People 2030, n.d.). Patients under the age of 18 in the U.S. must have parental consent to get vaccinated. Thus, gaining parental support of the HPV vaccine is a key step in reaching Healthy People 2030's goal.

Clinical Question

In light of the U.S. public health goal of increasing HPV vaccination rates in the U.S., the following clinical question was developed. *Does focused parental education regarding HPV and its role in cancer development impact HPV vaccine uptake in adolescents (age 9 to 18 years of age)?*

Significance for Advanced Practice

Nurses have historically been among the most trusted professions in the United States (Moss et al., 2016a). Nurse practitioners are in a position to impact parental decision making regarding the HPV vaccine and their adolescent children. Patient education is a fundamental aspect of nursing. Many studies in this literature review identify lack of education as a barrier to the HPV vaccine uptake. Other studies also found that parental education increases acceptance of the vaccine (Niccolai & Hansen, 2015; Thomas et al., 2012; Victory et al., 2019). Nurse practitioners have an opportunity to initiate conversation about HPV and the vaccine, which gives parents a chance to ask questions and nurse practitioners a chance to clarify misperceptions about the vaccine. Understanding the role parental knowledge plays in initiating and completing the HPV vaccine series is critical for advanced practice providers.

Nurse practitioners as a profession have expanded access to healthcare in the U.S., especially for individuals in rural and underserved communities. Rural communities historically have had low rates of HPV vaccination in both male and female adolescents (Thomas et al., 2012). Underserved communities in the U.S. have higher rates of HPV associated cancers than the general population. For example, Southeast Asian American females have the highest rate of cervical cancer of all ethnic groups (Lee et al., 2016). Geographic disparities in HPV vaccine uptake also exist across the country, with the South and rural communities having lower rates of

HPV vaccination (Moss et al., 2016a). As an example, the Rio Grande Valley in Texas is geographically rural, with its residents more likely to be of Hispanic descent and to experience economic disadvantages, low health literacy, less education, and less access to medical care (Victory et al., 2019). Nurse practitioners have the ability to increase access and encourage HPV vaccination in all adolescents, promoting health within their communities and the nation as a whole (Fenton et al., 2017).

Methods

Search Strategies and Data Abstraction

A thorough systematic literature review was conducted between the dates of 11/13/2020 and 1/21/2021 using CINAHL, PubMed, and Cochrane Database. Information covered in these databases included nursing and allied health, healthcare, evidence-based medicine, nursing, dentistry, veterinary medicine, health care systems, and preclinical sciences. Table 1 (see Appendix) reviews restrictions added to the literature search. Keyword combinations were used to further narrow research articles pertaining to the area of interest. Key words used for this process included vaccine hesitancy, vaccine refusal, vaccine compliance, vaccine uptake, HPV vaccine, HPV vaccination, human papilloma virus vaccine, papillomavirus, education, teaching, instruction, parents, caregivers, mother, father, parent, United States of America, America, US, USA, teen, adolescent, and preteen. Table 2 (see Appendix) further addresses keyword combinations used for this review. Number of articles matching keywords and keyword combinations were also included in Table 2 (see Appendix). Searches that retrieved 100 or fewer articles triggered a review of article titles and abstracts. Complete studies were read if titles and abstracts pertained to the research question. Ninety studies were reviewed, and 33 articles met all inclusion criteria.

Inclusion and Exclusion Criteria

Articles utilized in this review included parents of U.S. adolescents ages 9 through 18 years of age; parental education on HPV, HPV's role in cancer development, and the HPV vaccine; full text articles written in the English language; peer reviewed; recommendations on how providers should approach vaccine hesitancy; and recommendations for parental education. Studies that included a discussion surrounding state vaccination policies and HPV vaccination rates were also included for review. Studies were excluded if education was only directed towards adolescents; parents of children over age 18 years of age; or included participants from countries outside of the U.S. Table 3 addresses further inclusion and exclusion criteria (see Appendix).

Literature Review

The literature review process revealed multiple types of research studies to include in this paper. This section will discuss findings from the studies included for analysis after completion of the systematic review.

Study Characteristics

Types of research

Research designs included in this study are clinical reports, cohort studies, cross sectional studies, qualitative studies, systematic reviews (including randomized and non-randomized designs), quasi-experimental studies, expert opinions, randomized trials, and non-randomized control trials. Levels of evidence from these studies ranged from level I through level VII. Table 4 (see Appendix) addresses further insights into research articles included in this systematic review.

Populations studied

Populations studied included mothers, fathers, caregivers and guardians of adolescents ranging from nine to 18 years of age; individuals belonging to the Caucasian, Hispanic, multicultural Hawaiian, African American, Cambodian American, and Native American (Hopi) races; along with healthcare workers and medical students.

Interventions

Multiple methods of communication were utilized to provide education on HPV, the HPV vaccine, and health outcomes associated with HPV infection. Written educational information was disseminated via handouts (ex. Bright Futures), flyers, posters, postcards, pamphlets, fact sheets, booklets, and vaccine information available in the clinic. Public communications, including radio and billboard advertisements, spread information to communities. Digital education resources included educational images posted on public social media accounts, website advertising, informational web pages, and DVD's. Verbal educational interventions included physician-led presentations to parents, adolescents, school staff, school nurses, family and pediatric primary providers, medical school students, and mother/daughter dyads. In one study, health professionals provided educational information to parents of adolescents over the telephone. Some studies addressed education on HPV for multidisciplinary clinic employees.

Some studies included multiple interventions, aside from parental education, aimed at increasing HPV vaccination rates in adolescents. Such interventions included motivational interviewing, patient prompts (ex. reminder magnets, text messages, or phone calls for next dose), role playing simulations with a vaccine-hesitant parent, provider prompts (ex. EMR reminder message), schools as an alternative vaccination site, school vaccine requirements,

parental interviews, questionnaires, surveys, provider vaccine recommendation, and education for providers on best practices for recommending the vaccine.

Research Synthesis

Education

Healthcare provider role

Patient education is a core component of a health care provider's role. Research supports the notion that parents prefer to receive education about HPV and their child's health directly from their provider, rather than alternate sources (Dela Cruz et al., 2016; Litton et al., 2011). Education should highlight the vaccine's ability to prevent certain types of cancers, as well as dispelling common myths such as encouraging premarital and unprotected sex (Brewer et al., 2020; Suryadevara et al., 2019).

Public health campaigns

Brewer et al. (2020) utilized a "Boot Camp Translation" to create messages for the local public in Mesa County and the Denver metro area, aiming to increase adolescent uptake of the HPV vaccine. HPV messaging was dispersed among the communities with social media messages, posters, and educational materials provided in pediatric primary care clinics (Brewer et al., 2020). Educational messages and materials were tailored to the specific community the researchers targeted, such as individuals with low health literacy in the Denver metro area. Brewer et al.'s (2020) study was published very recently, so researchers are continuing to monitor the campaign's outcome on HPV vaccination rates. However, researchers identified that different communities preferred campaign messages that emphasized different aspects of the vaccine (ex. cancer prevention vs. misconceptions) (Brewer et al., 2020). This may be useful information for future research studies on public health campaigns.

Educational motivators for adolescents and parents

Studies found in the literature review indicated that parents who were educated about the HPV vaccine by their healthcare provider were more likely to vaccinate their adolescent daughters than if they did not receive this information (Litton et al., 2011). Highlighting the vaccine's ability to prevent certain types of cancers has also shown modest improvement in adolescent HPV vaccination rates (Suryadevara et al., 2019). Suryadevara et al. (2019) studied the impact of educating healthcare providers and staff, parents, and adolescents on cancer prevention associated with the HPV vaccine. The study included multiple clinic sites, which yielded a 12-20% increase in series completion rate in pre-teens (11 to 12 years old), and an increase of 7-23% in teens (13 to 18 years old) (Suryadevara et al., 2019).

Despite the many educational intervention studies that exist, only one study was found that met the Healthy People 2020 goal (80% HPV vaccination completion rate post-intervention) using a parental educational intervention (Winer et al., 2016). The Winer et al. (2016) research team studied effects of a Hopi Native American mother-daughter educational intervention. Mother-daughter dyads were invited to a dinner featuring an educational presentation, with the intervention group's focusing on HPV. Winer et al. (2016) found that Hopi mothers who learned about HPV were significantly more likely to initiate and complete the HPV vaccine series for their daughters than mothers whose educational presentation was on juvenile diabetes (the study's control group). While only 20% of the intervention group's females age 11 to 12 years had completed the vaccine series, 80% of 13 to 17-year-old females had completed the HPV vaccine series upon recheck.

Fu et al. (2014) completed a systematic review of educational interventions aiming to increase acceptance of the HPV vaccine. Most studies did not find a dramatic increase in

adolescent HPV vaccination rates (Fu et al., 2014). Additionally, Fu et al. (2014) found that interventional literature does not accurately represent the United States' population. Most studies only included literate individuals who had attained a level of higher education. Thus, it is difficult to attain an accurate understanding of how educational interventions work across more diverse populations based off existing literature.

Factors Implicated in Parental Acceptance of the HPV Vaccine

Provider recommendation plays a large role in parental HPV vaccine acceptance, regardless of the family's sociodemographic group or race (Dela Cruz et al., 2016; Litton et al., 2011; Sanderson et al., 2017; Schnaith et al., 2019; Victory et al., 2019). Other associated factors include parental trust in the provider, positive parental attitude and intention to vaccinate, use of preventive healthcare, patient's mother (not both parents) decides on vaccination, insurance coverage of the HPV vaccine, increased parental knowledge of HPV and the vaccine, parental history of HPV risk, geographic region (rural vs. urban), age of the child, and parent gender (fathers are less likely to vaccinate daughters) (Fu et al., 2014; Victory et al., 2019).

Factors Implicated in Parental Delay or Refusal of the HPV Vaccine

Parents play a large role in their children's immunizations, including the HPV vaccine. Up to 36% of parents refuse this vaccine for their children (Kornides et al., 2018). Research indicates there are a multitude of factors that cause parents to delay or refuse vaccinating their adolescents against HPV infection. Factors identified in this literature review included low parental knowledge about the vaccine, concerns about the vaccine's safety and efficacy, belief that the vaccine encourages premarital sex, view the vaccine is unnecessary, believe their child is not sexually active, lack of or low provider recommendation, negative media coverage, and

barriers to accessing the vaccine (ex. cost, inconvenience) (Brueggmann et al., 2015; Dorell et al., 2014; Kinder, 2016; Kirchhoff et al., 2019; Schnaith et al., 2018; Victory et al., 2019).

Males and the HPV Vaccine

Even though HPV vaccination rates in adolescent males has significantly increased since the vaccine became available to boys, adolescent male HPV vaccination rates remain low (Lu et al., 2015). Lu et al. (2015) found the most common reason that parents did not vaccinate their male child was because they felt their provider did not recommend it. Other reasons for not vaccinating sons included parental lack of knowledge on the HPV vaccine, concern for safety, personal belief that it was not necessary, and that their son was not yet sexually active (Lu et al., 2015). This study also found that white non-Hispanic males were significantly less likely to be vaccinated than Hispanic or non-Hispanic black male adolescents (Lu et al., 2015).

Mayer et al. (2013) studied parental and son beliefs about the HPV vaccine and sexual disinhibition. Both parents and sons felt that the adolescent male and his girlfriend would feel safer taking risks after vaccination (Mayer et al., 2013). Parental characteristics that were associated with increased likelihood to vaccinate their child included having a daughter who was vaccinated against HPV, parents that did not have a daughter, not having a strong belief that the vaccine would cause sexual disinhibition, and having liberal political views (Mayer et al., 2015). Parents with conservative political views were more likely to believe the HPV vaccine would cause sexual disinhibition, and potentially deter the parent from vaccinating their child (Mayer et al., 2015). Boys in this study who thought their peers approved of the vaccine were more likely to believe the vaccine would produce sexual disinhibition and did not view this negatively (Mayer et al., 2015).

Provider Persistence and Communication with Parents

How healthcare providers communicate education on the HPV vaccine is just as important as the education itself. Kornides et al. (2018) found that parents who reported they were highly satisfied or moderately satisfied with provider communication were more likely to vaccinate their adolescents against HPV than parents who reported low levels of satisfaction with provider communication. Parents were more satisfied with their provider's communication if discussions were easy to understand, there was a clear recommendation to vaccinate against HPV, they were told the number of doses required for the adolescent, and allowed parents to ask questions (Kornides et al., 2018).

Additionally, providers should not immediately acquiesce if parents seem hesitant to vaccinate their adolescent. Many parents who are not sure if they want to vaccinate their child against HPV may initially respond with hesitancy, such as a question (Shay et al., 2018). However, Shay et al. (2018) found that when the provider persisted, such as providing an explanation on benefits of the vaccine or consequences of not vaccinating, parents who were initially hesitant ended up vaccinating their child at the same appointment. Shay et al. (2018) also found that when providers did not persist against initial parental hesitation, no adolescents received the HPV vaccine that day. To further support persistence rather than acquiescence, a persistent response took less than 4 minutes to discuss while acquiescent responses took greater than 5 minutes (Shay et al., 2018). With busy provider schedules, a persistent response to vaccine hesitant parents would save the provider valuable time for other health promoting opportunities. Clear recommendations, open lines of communication, and persistence should be used as communication tactics to increase the likelihood of vaccinating the adolescent patient against HPV.

Cultural Competence and Underserved Populations

Racial minority communities in the U.S. are disproportionately more likely to have poorer health outcomes related to HPV infection (Sanderson et al., 2017). Females that have a low income, are an ethnic minority, or an immigrant have higher cervical cancer rates compared to the general female population in the U.S. (Dela Cruz et al., 2016). African Americans are a cultural group that suffers from high rates of cancers caused by HPV (Fu et al., 2018). Due to barriers to healthcare, even if the African American community achieved high rates of HPV vaccination, it is estimated that they would continue to have the highest risk of morbidity from cancers caused by HPV (Fu et al., 2018). Hispanic American women are also more likely to be diagnosed with and die from cervical cancer than non-Hispanic white females (Brueggmann et al., 2015; Kaul et al., 2019). This disparity is thought to be related to the Hispanic female population experiencing high rates of HPV infection, lack of knowledge that HPV can cause cancer, lower health literacy levels, decreased healthcare access, and low rates of screenings and follow-ups (Brueggmann et al., 2015; Kaul et al., 2019).

In order to improve HPV vaccination uptake in all racial and ethnic communities that are present in the U.S., parental and patient culture must be included. Fu et al. (2018) found that common concerns in the African American community, such as fear of medical experimentation or close social contacts with this concern, were powerful enough to cause parents to not vaccinate their adolescents against HPV. Educational interventions should consider social influences unique to the parent's culture (Fu et al., 2018).

Providing educational materials that are culturally diverse and represent the racial and ethnic populations of a clinic's patient base is also an important aspect of improving HPV vaccination rates among all races and ethnicities (Brueggmann et al., 2015; Dela Cruz et al., 2016). Educational material that a culture considers relevant may have a positive influence on a

parent's decision to vaccinate their adolescent. Relevance would mean incorporating testimonials and pictures of individuals from the same race or ethnicity, reflective of the local community's population, as well as presenting information in languages besides English (Brueggmann et al., 2015; Dela Cruz et al., 2016).

Childhood Cancer Survivors

Individuals who have cancer during their childhood are at increased risk for developing another form of cancer later in life (Kirchhoff et al., 2019). Specifically, female childhood cancer survivors are 40% more likely to develop cancer from an HPV infection and males are 150% more likely than non-childhood cancer survivors (Kirchhoff et al., 2019). However, parents of childhood cancer survivors are less likely than the general population to vaccinate their adolescent against HPV (Kirchhoff et al., 2019). Parents who spoke with their child's oncologist about vaccines and possible side effects were more likely to vaccinate their adolescent against HPV (Kirchhoff et al., 2019).

Gaps in Literature

This author noted a significant gap in literature regarding educational interventions aiming to increase adolescent male HPV vaccine series initiation and completion rates. Adolescent males have significantly lower rates for initiating and completing the HPV vaccine series. HPV can be spread from males to females and other males, so increasing vaccination rates in this population could theoretically slow the spread of HPV among the U.S. population. In addition, many interventional studies focused mainly on non-Hispanic white females. Expanding studies to focus on parental educational interventions of a culturally and gender diverse population may shed light on how to reduce health disparities that currently exist in some racial and ethnic populations. To promote the health of all Americans, efforts to increase HPV vaccine

initiation and completion rates must include parents of males and females, as well as individuals from a variety of races and ethnicities.

Discussion

Mixed Results and Clinical Practice

There were conflicting findings with regards to the efficacy of education as a sole intervention to increase the U.S. adolescent HPV vaccination rates in this literature review. Only one study among all the studies evaluated regarding parental education impacting vaccination completion rates met Health People's 2020 goal (Winer et al., 2016). This is a promising intervention that deserves more research, both within the Native American population and the general U.S. population. Until further research using this type of intervention is replicated, it is difficult to say if the results from this study can be applied to other cultural groups within the U.S. Overall, educational interventions may have a positive impact on vaccination rates, but the impact is modest and likely not enough to attain Healthy People's goal. Reaching the 80% vaccination goal will likely only be met with a multifaceted approach, with possible policy intervention.

However, a modest improvement is better than no improvement at all, and healthcare providers must not underestimate the important role they play in educating their patients and parents. Providers should always provide education on HPV infection, health implications, and the vaccine. Vaccinating youth against HPV has the ability to prevent multiple types of cancer, as well as genital warts, amongst this patient population.

Improving the Adolescent Male Vaccination Rate

A large portion of available literature focuses on adolescent females, or both adolescent females and males. There are not enough studies available that have focused on interventions

aimed specifically at increasing adolescent male HPV vaccination completion rates. Only 37.5% of male adolescents age 13 to 17-years-old have completed the vaccine series, far below Healthy People's goal of 80% (Schnaith et al., 2018; Victory et al., 2019). HPV can cause cancer in both males and females, and infected males are able to transfer this infection to their sexual partners. Further efforts must be made to increase the adolescent male HPV vaccination rate, which has the potential to decrease cancer risk among both males and females.

More research is needed to determine what, if any, parental educational interventions can increase male HPV vaccination rates. However, providers can incorporate findings from existing literature to identify possible teaching points. For example, reassuring parents that the vaccine does not cause sexual disinhibition may persuade hesitant parents to vaccinate their son. Providers should also reinforce the need to use barrier protection with sexual activity to protect against other forms of sexually transmitted infections.

Unique Adolescent Populations

Certain adolescent populations may benefit from a specialty healthcare provider's recommendation supporting the HPV vaccine. Kirchoff et al. (2019) found that parents of childhood cancer survivors were more likely to vaccinate their adolescent against HPV if their oncologist recommended it. Though primary care providers should recommend the vaccine, utilizing the patient's multidisciplinary care could provide parents with more specific information on the HPV vaccine and childhood cancer survivors. This could be a worthwhile effort to increasing adolescent HPV vaccination rates.

Reducing Health Disparities

Unfortunately, health disparities still exist in the U.S. As previously discussed, culture, race, socioeconomic status, lack of health insurance and other factors are associated with

increased morbidity and mortality from cancers caused by HPV. While preventing disease should be a goal for the entire U.S. population, efforts must be especially focused to prevent disease in populations that are most likely to experience adverse outcomes related to HPV infections. Strategies to reduce barriers, such as parental education, cost, time, and transportation, may be effective ways to increase adolescent HPV vaccination rates in populations most at risk for adverse outcomes. This may require broad public health efforts to vaccinate the greatest number of adolescents. An example could be increasing access to vaccinations in public schools. Unfortunately, time, finances, and available health care staff may exist as barriers to such efforts. Increasing public awareness on the importance of the HPV vaccine, and gaining the public's support, may be necessary to advance such public health efforts.

Implications for Future Practice

Recommendations for Clinical Practice

How the HPV vaccine is offered to families can make a significant difference in parental acceptance rates. Nurse practitioners should "bundle" the HPV vaccine with other scheduled vaccines for 11 to 12-year-old patients, like meningococcal and Tdap vaccines (Kinder, 2016; Victory et al., 2019). Even though most schools do not require the vaccine for entry, providers should strongly and clearly recommend it and emphasize its ability to prevent certain types of cancers (Bernstein & Bocchini, 2017; Kinder, 2016; Kornides et al., 2018). The vaccine should be offered in the same way to both males and females (Victory et al., 2019). Each visit to the clinic should be viewed as an opportunity to vaccinate against HPV (Bernstein & Bocchini, 2017).

Having clinic staff hand out educational information may not be enough. Dela Cruz et al. (2016) found that parents preferred their child's healthcare provider review the educational hand out with them. This would be a simple way to guide discussion on the HPV vaccine and provide pauses for parents to have a chance to ask about any questions or concerns they may have.

How providers communicate information about the HPV vaccine to parents can also impact a parent's decision to vaccinate or not vaccinate (Kornides et al., 2018). Providers should reflect on how they currently present information on the HPV vaccine. Do they clearly give a strong recommendation to vaccinate male and female adolescents? Do they provide information that is easy to understand, no matter the parents' education level? Do they provide enough time for parents to express concerns and ask questions? If not, the provider must aim to include these points into their HPV vaccine discussion.

Recommendations for Research

After reviewing the literature, a few themes were identified as areas requiring further research. It is not clear if parental education alone is enough to provide a significant impact on adolescent HPV vaccination rates. Some of the literature reviewed found, or hypothesized, that the sole intervention of parental education increased adolescent HPV vaccination rates (Brewer et al., 2020; Brueggmann et al., 2016; Ferris et al., 2010; Hansen et al., 2016; Shay et al., 2018; Suryadevara et al., 2019; Victory et al., 2019; Winer et al., 2016). Other research studies suggest that multiple interventions are necessary for parents to initiate and complete their adolescent's HPV vaccine series (Bernstein & Bocchini Jr., 2017; Dela Cruz et al., 2017; Dorell et al., 2014; Fu et al., 2014; Kaul et al., 2019; Lee et al., 2016; Moss et al., 2016a; Pasket et al., 2016; Roberts et al., 2018; Sanderson et al., 2019; Walling et al., 2016). Further research should be completed to determine if multiple interventions produce a more significant increase in HPV vaccine series

initiation and completion. Further research is also needed to determine which educational interventions can increase HPV vaccination rates among culturally diverse populations and support culturally competent care (Fu et al., 2014).

Winer et al. (2016) achieved an 80% HPV vaccine series completion rate in female participants age 13 to 17-years-old. This was the only study retrieved from the literature review that produced results that met Healthy People 2020's goal. Further research is warranted to explore if a parent/child dinner with an educational presentation on HPV would produce similar results with fathers, sons, and individuals from communities outside the Hopi Native American reservation.

Future research should also focus on the role that provider education plays in adolescent HPV vaccination rates. Schnaith et al. (2018) utilized education on HPV, health outcomes associated with infection, and how to communicate with vaccine hesitant parents in a group of University of Minnesota medical students. Students then utilized this knowledge in simulations with vaccine hesitant parent scenarios. This study found that the education increased the students' confidence in discussing and recommending the HPV vaccine to hesitant parents. Future research should focus on how providers' confidence actually impacts adolescent HPV vaccination rates, and if more programs like this should be integrated into provider education. Other studies included in this literature review focused on provider education on cancer prevention, and its impact on vaccination rates (Ferris et al., 2010; Suryadevara et al., 2019). Further research should be conducted to discover which educational topics and methods of education delivery have a significant impact on increasing HPV vaccination rates in adolescents.

One article included in this review focused on the adolescent mother's healthcare status and its relation to adolescent HPV vaccination rates. Rahman et al. (2013) found there was no

difference in the intent to vaccinate their adolescent between mothers with a well-woman exam within the last two years compared to women without a recent exam. However, these researchers felt a mother's well-woman exam could be an additional opportunity for providers to advocate for adolescent HPV immunizations and recommend this as an area for further research.

When caring for patients who have survived childhood cancer, the provider's education must include the increased likelihood of cancer development from an HPV infection compared to a child who has never had cancer. However, there is a lack of research surrounding what educational information should be included for parents after their child has completed treatment. Further research is necessary to determine how to best address parents of childhood cancer survivors (Kirchhoff et al., 2019).

Further research studies are needed to determine the impact large scale public health messages have on adolescent HPV vaccination series initiation and completion rates (Brewer et al., 2020). Several studies were underway at the time of publication, yet additional research should be conducted to evaluate the impact of large scale messaging across the nation. Studies included in this systematic literature review suggested that education tailored to each parent and patient, along with including cultural implications, was more effective than a generalized approach (Fenton et al., 2018; Fu et al., 2014; Thomas et al., 2012; Tomas et al., 2013). However, further studies on patient-centered and culturally competent care are needed to validate and demonstrate the actual impact on HPV vaccination rates in adolescents. Future research should also focus on the impact of culturally competent public health messages and its impact on adolescent HPV immunization rates.

As previously mentioned, there is a significant gap in the literature investigating how parental education impacts adolescent male HPV vaccine series initiation and completion rates.

The significant difference between female and male HPV vaccination rates deserves further research to identify interventions to meet Healthy People 2030's goal to have 80% of adolescents vaccinated for HPV (Healthy People 2030, n.d.). Increasing the rate of HPV vaccine series completion will work towards meeting Healthy People 2030's goal to reduce the number of HPV infections in 20 to 34-year-olds that could be prevented by the nine-valent vaccine (Healthy People 2030, n.d.).

Recommendations for Continuing Provider Education

To increase parental education about HPV and the HPV vaccine, healthcare providers must be knowledgeable about this topic and comfortable discussing this with parents and adolescents. One study focused on an educational intervention given to a group of medical students at the University of Minnesota (Twin Cities and Duluth locations) (Schnaith et al., 2018). Students took a survey before and after a video, lecture, and simulation focusing on the HPV vaccine and how to address hesitancy with parents. After the intervention, medical school students reported they were more likely to recommend the vaccine overall, more likely to equally recommend the vaccine to males and females, and felt more comfortable to talk about the HPV vaccine with vaccine hesitant parents (Schnaith et al., 2018). This model could be reproduced as a continuing education course for healthcare providers who offer the HPV vaccine in their office. Similar interventions could be added to healthcare providers' education curriculums as well, to increase competency and confidence in discussing HPV and the vaccine even as students.

When recommending the HPV vaccine to parents, the healthcare provider's message must strongly and clearly encourage the parents to vaccinate their adolescent (Kornides et al., 2018; Suryadevara et al., 2019). In addition, the healthcare provider must be educated to allow enough time for parents to ask any questions they may have (Kornides et al., 2018). Continuing

education courses or school curriculums must encourage providers to highlight cancer prevention benefits, include basic information on HPV and its role in cancer development, offering the vaccine at each clinic appointment, bundling vaccines and presenting them as equally important, and cover how to approach vaccine hesitant parents (Suryadevara et al., 2019).

Recommendations for Addressing Policy Changes

Current policies

At this time there are no federal vaccine requirements to enroll in public schools across the U.S. Each state is able to determine its own policies surrounding immunization requirements, with only Washington D.C., Virginia, and Rhode Island requiring the HPV vaccine for school entry (North & Niccolai, 2016). The rate of HPV vaccinations in the U.S. is significantly lower than other school-required vaccines. On average, 63% of girls and 50% of boys had initiated the HPV vaccine series (Roberts et al., 2018). However, vaccination rates vary significantly between states. The percentage of girls who had initiated the HPV vaccine series ranged from 48% to 88%, while boys ranged 35% to 81% (Roberts et al., 2018). Rates of series completion were lower than rates of vaccine series initiation. Roberts et al. (2018) found that states with multiple policy interventions had higher rates of HPV vaccine uptake. Specifically, the combination of five policy interventions were associated with the highest HPV vaccine rates in the country. These interventions included expansion of Medicaid through the Affordable Care Act to decrease financial barriers to vaccination, permitting pharmacists to vaccinate for HPV in local pharmacies, vaccine requirement for school entry, mandating sex education classes in schools, and no state requirements for parental education on HPV (Roberts et al., 2018). Rhode Island, Washington D.C., and Virginia require the HPV vaccine for school entry, but only Rhode Island and Washington D.C. have adopted all five of these policies. Even with school entry

requirements, Virginia has a low HPV vaccine uptake rate. The state also has an expansive vaccine exemption policy, which may have undermined the policy's efforts (Roberts et al., 2018). Rhode Island has the nation's highest HPV vaccination rates, which could also be attributed to their "Vaccinate Before You Graduate" program (Kaul et al., 2019). This program provides the vaccine in schools and a free service (Kaul et al., 2019). However, school-based vaccination efforts have not been able to increase vaccination rates to 80%, suggesting that further research and interventions are necessary to meet Healthy People 2030's goal (Kaul et al., 2019).

Addressing Existing Disparity Rates with Policy Adoption

General school vaccination requirements have increased the equity of vaccine coverage and promoted long term health of children (North & Niccolai, 2016). However, this review suggests that more than a single policy requiring the HPV vaccine for school entry is necessary to achieve acceptable vaccination rates (Roberts et al., 2018). Further research is necessary for a deeper understanding of which policy combinations yield HPV vaccine uptake rates that meet the Healthy People 2020 goals of 80% of the adolescent population (age 13 to 17 years of age) completing the series, and how to implement such policies (Roberts et al., 2018). While not an easy task, this is critical to the public health of young Americans. Disparities currently exist in vaccination rates between races and ethnicities, as well as geographic locations, which may be due to a lack of policy surrounding the HPV vaccine series. Hispanic individuals have 66.3% of females and 54.2% of males vaccinated. African American females have a slightly higher female vaccination rate at 66.4%, but African American males have a significantly lower vaccination rate than Hispanic males, at 54.2%. Non-Hispanic white adolescents have consistently lower vaccination rates, with 56.1% of females vaccinated and only 36.4% of males vaccinated (North

& Niccolai, 2016). Adolescents living in rural communities are 11% less likely to initiate the HPV vaccine series (Kaul et al., 2019).

Recommendations for Non-Policy Public Health Interventions

If policies surrounding the HPV vaccine cannot be approved by government officials, there are non-policy public health interventions that are associated with increased HPV vaccine uptake found in the literature. The following reviews several key strategies to consider.

Universal School Vaccine Programs

Universal school vaccine programs have been implemented in other high-income countries with success (North & Niccolai, 2016). Australia is an example of a successful universal school vaccine program. From 2006 to 2011, the country saw an 89.9% decrease in anogenital warts in girls age 12 to 17 years old (North & Niccolai, 2016). Australia also saw a decrease in cervical cancer precursors in vaccinated girls compared to non-vaccinated girls. Even though not all children were vaccinated, there still appears to be possible benefit to the population as a whole. Unvaccinated Australian females experienced a 38% decrease in anogenital warts during this same time period (North & Niccolai, 2016). Other high-income countries that implemented universal school vaccine programs achieved 70% or greater HPV vaccine rates, without having school entry vaccine requirements (North & Niccolai, 2016).

School vaccination programs have been trialed in the United States. Kaul et al. (2019) studied the effect of school based parental education and HPV vaccinations on adolescent vaccination rates in the rural, largely Hispanic, economically disadvantaged and medically underserved Rio Grande Valley area of Texas. School staff, healthcare staff, and parents reported the education on HPV and the vaccine increased their knowledge on this topic. Findings from this study indicated that school-based education on HPV and the vaccine, as well as providing

the vaccine in school, can significantly increase vaccine series initiation and completion rates in rural, underserved communities. Researchers found that schools that provided both education and the vaccine doubled the initiation and completion rates for the HPV vaccine, compared to schools who provided education as the only intervention (Kaul et al., 2019). Implementing education and school-based vaccines could be a more effective way to increase HPV vaccine series initiation and completion rates in the United States.

Chicago's Department of Public Health HPV Campaign

Another non-policy public health intervention that yielded increased adolescent HPV vaccine uptake rates is Chicago's 2013 to 2014 campaign. The city utilized an $800,000 federal grant to create a public health campaign, provide reminders, and train 200 clinicians with an aim to increase HPV vaccine uptake in adolescents (North & Niccolai, 2016). By the end of the campaign, rates of HPV vaccines increased to 78.1% of females and 64.9% of males (North & Niccolai, 2016). Based upon current U.S. HPV vaccination rates, it is clear that some sort of intervention is necessary to improve adolescent HPV vaccine series initiation and completion rates.

Future Research

Multiple factors interact to impact U.S. adolescent HPV vaccination uptake rates. More research is needed to determine the role of public policy in adolescent HPV vaccination rates (North & Niccolai, 2016). Currently it is up to individual states to determine school vaccine requirements. What policy interventions would be most effective at increasing adolescent HPV vaccination series initiation and completion? Roberts et al. (2018) recommends further research exploring the effect of multiple policies on HPV vaccine uptake, rather than implementation of a single policy. Determining an effective policy combination, and likely combining policy with

effective public health interventions, must be completed to meet Healthy People 2030's goal to achieve 80% of adolescents completing the HPV vaccination series. The health of adolescents and young adults in the United States depends on this.

Conclusion

A large percentage of the U.S. will contract HPV at some point in their lives. HPV has the ability to cause multiple types of cancer. The most current HPV vaccine is effective against nine strains of the virus, which account for most cases of cancer and genital warts that are caused by HPV. Parents are a key component in reaching Healthy People 2030's goal to have 80% of all adolescents completely vaccinated against HPV. However, education as a sole intervention may not be enough to achieve this goal. Utilizing school-based vaccination programs, public health campaigns, and public policy may be necessary to meet this goal.

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Schnaith, A. M., Evans, E. M., Vogt, C., Tinsay, A. M., Schmidt, T. E., Tessier, K. M., & Erickson, B. K. (2018). An innovative medical school curriculum to address human papillomavirus vaccine hesitancy. *Vaccine, 36*(26), 3830-3835.

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Thomas, T. L., Strickland, O. L., DiClemente, R., Higgins, M., & Haber, M. (2012). Rural African American parents' knowledge and decisions about human papillomavirus vaccination. *Journal of Nursing Scholarship, 44*(4), 358-367.

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Appendix

Table 1
Database Search Description

Database/ Search Engine	Restrictions Added to Search	Dates Included in Database	General Subjects Covered by Database
CINAHL	Full text; English Language; Peer Reviewed; USA	2010-2020	Nursing and allied health
Cochrane Database	Full text; English Language	2010-2020	Healthcare, evidence-based medicine
PubMed	Full text; Free full text; English Language; Child 6-12 years; Adolescent 13-18 years; Humans; MEDLINE; Nursing Journals	2010-2020	Medicine, nursing, dentistry, veterinary medicine, health care system, preclinical sciences

Table 2
Data Abstraction Process

Date of Search	Key Words	Results in CINAHL	Results in PubMed	Results in Cochrane Database
11/13/2020	"Vaccine hesitancy" OR "vaccine refusal" OR "vaccine compliance" OR "vaccine uptake"	385	1,005	2
	"Vaccine hesitancy" OR "vaccine refusal" OR "vaccine compliance" OR "vaccine uptake" AND "hpv vaccine" OR "hpv vaccination" OR "human papilloma virus vaccine" OR "papillomavirus"	93	477	2
	"Vaccine hesitancy" OR "vaccine refusal" OR "vaccine compliance" OR "vaccine uptake" AND "hpv vaccine" OR "hpv vaccination" OR "human	35	138	2

	papilloma virus vaccine" OR "papillomavirus" AND "Education" OR "Teaching" OR "Instruction"			
	"Vaccine hesitancy" OR "vaccine refusal" OR "vaccine compliance" OR "vaccine uptake" AND "hpv vaccine" OR "hpv vaccination" OR "human papilloma virus vaccine" OR "papillomavirus" AND "Education" OR "Teaching" OR "Instruction" AND "parents" OR "caregivers" OR "mother" OR "father" OR "parent"	19	74	2
	"Vaccine hesitancy" OR "vaccine refusal" OR "vaccine compliance" OR "vaccine uptake" AND "hpv vaccine" OR "hpv vaccination" OR "human papilloma virus vaccine" OR "papillomavirus" AND "Education" OR "Teaching" OR "Instruction" AND "parents" OR "caregivers" OR "mother" OR "father" OR "parent" AND "	n/a	35	n/a
1/21/2021	"Vaccine hesitancy" OR "vaccine refusal" OR "vaccine compliance" OR "vaccine uptake" AND "hpv vaccine" OR "hpv vaccination" OR "human papilloma virus vaccine" OR "papillomavirus" AND "Education" OR "Teaching" OR "Instruction" AND	n/a	93	n/a

	"parents" OR "caregivers" OR "mother" OR "father" OR "parent" AND "United States of America" OR "America" OR "US" OR "USA"			
1/21/2021	"Vaccine hesitancy" OR "vaccine refusal" OR "vaccine compliance" OR "vaccine uptake" AND "hpv vaccine" OR "hpv vaccination" OR "human papilloma virus vaccine" OR "papillomavirus" AND "Education" OR "Teaching" OR "Instruction" AND "parents" OR "caregivers" OR "mother" OR "father" OR "parent" AND "United States of America" OR "America" OR "US" OR "USA" AND "teen" OR "adolescent" OR "preteen"	n/a	90	n/a

Table 3

Characteristics of Literature Included and Excluded

Reference	Included/Excluded and Document	Rationale
Abdullahi, L. H., Kagina, B. M., Ndze, V. N., Hussey, G. D., Wiysonge, C. S., & Abdullahi, L. H. (2020). Improving vaccination uptake among adolescents. *Cochrane Database of Systematic Reviews, 1*.	Excluded	This review included studies from countries outside of the USA.
Bendik, M. K., Mayo, R. M., & Parker, V. G. (2011). Knowledge, perceptions, and motivations related to HPV vaccination among college women. *Journal of Cancer Education, 26*(3), 459-464.	Excluded	This study included college aged women (18-24 years), not pediatrics and adolescents.

Bernstein, H. H., & Bocchini Jr, J. A. (2017). Practical approaches to optimize adolescent immunization. *Pediatrics, 139*(3), e1-e14.	**Included**	This report looked at many ways to approach adolescent immunizations, including HPV. It did not necessarily test how education as an intervention impacted uptake rates, but gave recommendations on how to approach vaccine hesitancy and provide education to this population.
Blackman, E., Thurman, N., Halliday, D., Butler, R., Francis, D., Joseph, M., …, & Ragin, C. C. (2013). Multicenter study of human papillomavirus and the human papillomavirus vaccine: Knowledge and attitudes among people of African descent. *Infectious Diseases in Obstetrics and Gynecology, 2013*, 428582.	Excluded	This study included participants from the Bahamas.
Bratic, J. S., Seyferth, E. R., & Bocchini Jr, J. A. (2016). Update on barriers to human papillomavirus vaccination and effective strategies to promote vaccine acceptance. *Current Opinion in Pediatrics, 28*(3), 407-412.	Excluded	Unable to access article.
Brewer, S. E., Nederveld, A., & Simpson, M. (2020). Engaging communities in preventing human papillomavirus-related cancers: Two boot camp translations, Colorado, 2017-2018. *Preventing Chronic Disease, 17*, E02.	**Included**	This study looked at a community health campaign in two different communities to increase HPV vaccine uptake. Interventions included educational messages.
Brouwer, A. F., Delinger, R. L., Eisenberg, M. C., Campredon, L. P., Walline, H. M., Carey, T. E., & Meza, R. (2019). HPV vaccination has not increased sexual activity or accelerated sexual debut in a college-aged cohort of men and women. *BMC Public Health, 19*(1), 821.	Excluded	This study included subjects older than age 18.
Brueggmann, D., Opper, N., Felix, J., Groneberg, D., Mishell, D., & Jaque, J. (2016). Development of a cost-effective educational tool to promote acceptance of the HPV vaccination by Hispanic mothers. *Journal of Community Health, 41*(3), 468-475.	**Included**	Evaluated an educational tool that aimed to increase HPV vaccine uptake among parents.
Calo, W. A., Gilkey, M. B., Shah, P., Marciniak, M. W., & Brewer, N. T. (2017). Parents' willingness to get human papillomavirus vaccination for their adolescent children at a pharmacy. *Preventive Medicine, 99*, 251-256.	Excluded	This study focused on parents' willingness to have their adolescent children receive the HPV vaccine in the pharmacy setting. It did not focus on education as an intervention to increase vaccine uptake.
Carhart, M. Y., Schminkey, D. L., Mitchell, E. M., & Keim-Malpass, J. (2018). Barriers and facilitators to improving Virginia's HPV vaccination rate: A	Excluded	This study had a very small sample size (n=30) and was based on stakeholders' opinions on barriers for the HPV vaccine. No educational intervention was completed.

stakeholder analysis with implications for pediatric nurses. *Journal of Pediatric Nursing, 42*, 1-8.		
Carpiano, R. M., Polonijo, A. N., Gilbert, N., Cantin, L., & Dube, E. (2019). Socioeconomic status differences in parental immunization attitudes and child immunization in Canada: Findings from the 2013 Childhood National Immunization Coverage Survey (CNICS). *Preventive Medicine, 123*, 278-287.	Excluded	This was a survey and only included Canadian citizens.
Cartmell, K. B., Mzik, C. R., Sundstrom, B. L., Luque, J. S., White, A., & Young-Pierce, J. (2019). HPV vaccination communication messages, messengers, and messaging strategies. *Journal of Cancer Education, 34*, 1014-1023.	Excluded	This study focused on identifying the best communication, messengers, and messaging strategies to increase awareness of the vaccine and its purpose. It did not focus on how a healthcare provider's education on the vaccine impacts vaccine uptake.
Cates, J. R., & Coyne-Beasley, T. (2015). Social marketing to promote HPV vaccination in pre-teenage children: Talk about a sexually transmitted infection. *Human Vaccines & Immunotherapeutics, 11*(2), 347-349.	Excluded	This included education as an intervention to increasing HPV vaccine uptake, but only to preteens not parents.
Cates, J. R., Ortiz, R. R., North, S., Martin, A., Smith, R., & Coyne-Beasley, T. (2015). Partnering with middle school students to design text messages about HPV vaccination.	Excluded	This study examined text message reminders and promotions to pre-teens and its effect on HPV vaccination uptake.
Colon-Lopez, V., Fernandez-Espada, N., Velez, C., Gonzalez, V. J., Diaz-Toro, E. C., Calo, W. A., …, & Fernandez, M. E. (2017). Communication about sex and HPV among Puerto Rican mothers and daughters. *Ethnicity & Health, 22*(4), 348-360.	Excluded	Unable to access this article.
De Groot, A. S., Tounkara, K., Rochas, M., Beseme, S., Yekta, S., Diallo, F. S., …, & Koita, O. A. (2017). Knowledge, attitudes, practices and willingness to vaccinate in preparation for the introduction of HPV vaccines in Bamako, Mali. *PLoS One, 12*(2), e0171631.	Excluded	This study focused on participants in Mali, not the United States.
Dela Cruz, M., Tsark, J., Chen, J., Albright, C., & Braun, K. (2017). Human papillomavirus (HPV) vaccination motivators, barriers, and brochure preferences among parents in multicultural Hawai'i: A qualitative study. *Journal of Cancer Education, 32*(3), 613-621.	**Included**	This study investigated what motivates and prevents parents from vaccinating their children. It also includes what parents prefer to see in an educational brochure on this topic.
Dibble, K. E., Maksut, J. L., Siembida, E. J., Hutchinson, M., & Bellizzi, K. M. (2019). A systematic literature review of HPV vaccination barriers among adolescent	Excluded	This systematic review identified the main barriers to the HPV vaccine in adolescent and young adult males. However, researchers included studies with males aged 15-29 years of age.

and young adult males. *Journal of Adolescent and Young Adult Oncology, 8*(5), 495-511.		
DiClemente, R. J., Crittenden Murray, C., Graham, T., & Still, J. (2015). Overcoming barriers to HPV vaccination: A randomized clinical trial of a culturally-tailored, media intervention among African American girls. *Human Vaccines & Immunotherapeutics, 11*(12), 2883-2894.	Excluded	This study examined an educational intervention with adolescents, not parents.
Dilley, S. E., Peral, S., Straughn Jr, J. M., & Scarinci, I. C. (2018). The challenge of HPV vaccination uptake and opportunities for solutions: Lessons learned from Alabama. *Preventive Medicine, 113*, 124-131.	Excluded	This study interviewed parents and health professionals on barriers to HPV vaccine uptake. It did not focus on education as an intervention.
Dorell, C. G., Yankey, D., Santibanez, T. A., & Markowitz, L. E. (2011). Human papillomavirus vaccination series initiation and completion, 2008-2009…[corrected] [published erratum appears in PEDIATRICS 2012; 130(1): 166-8]. *Pediatrics, 128*(5), 830-839.	Excluded	This research article examined vaccination rates, but did not look at any specific interventions and their effects on vaccine uptake.
Dorell, C., Yankey, D., Jeyerajah, J., Stokley, S., Fisher, A., Markowitz, L., & Smith, P. J. (2014). Delay and refusal of human papillomavirus vaccine for girls, national immunization survey-teen, 2010. *Clinical Pediatrics, 53*(3), 261-269.	**Included**	This study used information from the national immunization survey-teen (2010) to examine trends and reasons for delaying and/or refusing the HPV vaccine.
Farias, C. C., Jesus, D. V., Moraes, H. S., Buttenbender, I. F., Martins, I. S., Souto, M. G., …, & Fonseca, A. J. (2016). Factors related to non-compliance to HPV vaccination in Roraima-Brazil: A region with a high incidence of cervical cancer. *BMC Health Services Research, 16*(1), 417.	Excluded	This study's participants were from Brazil.
Fenton, A. T., Elliott, M. N., Schwebel, D. C., Berkowitz, Z., Liddon, N. C., Tortolero, S. R., Cuccaro, P. M., Davies, S. L., & Schuster, M. A. (2018). Unequal interactions: Examining the role of patient-centered care in reducing inequitable diffusion of a medical innovation, the human papillomavirus (HPV) vaccine. *Social Science & Medicine, 200*, 238-248.	**Included**	This longitudinal study examined how patient centered care impacts racial, ethnic, and socioeconomic gaps. Researchers found that parental education alone does not increase HPV vaccination uptake as much as when the provider uses patient-centered care.
Ferris, D., Horn, L., & Waller, J. L. (2010). Parental acceptance of a mandatory human papillomavirus (HPV) vaccination program. *Journal of the American Board of Family Medicine, 23*(2), 220-229.	**Included**	This study aimed to find factors that influence parents' approval of mandatory HPV vaccines. Findings could help to plan public health policies.

Fisher, H., Trotter, C. L., Audrey, S., MacDonald-Wallis, K., & Hickman, M. (2013). Inequalities in the uptake of human papillomavirus vaccination: A systematic review and meta-analysis. *International Journal of Epidemiology, 42*(3), 896-908.	Excluded	This review included studies from many different countries, not just the United States.
Fregnani, J. H. T. G., Carvalho, A. L., Eluf-Neto, J., Ribeiro, K. C. B., Kuil, L. M., da Silva, T. A., …, & Villa, L. L. (2013). A school-based human papillomavirus vaccination program in Barretos, Brazil: Final results of a demonstrative study. *Public Library of Science One, 8*(4), e62647.	Excluded	This study included participants from Brazil, not the US.
Fu, L. Y., Bonhomme, L. A., Cooper, S. C., Joseph, J. G., & Zimet, G. D. (2014). Educational interventions to increase HPV vaccination acceptance: A systematic review. *Vaccine, 17*(7), 1901-1920.	**Included**	This study includes educational interventions with parents and examines the effect on HPV vaccine uptake.
Fu, L. Y., Zimet, G. D., Latkin, C. A., & Joseph, J. G. (2019). Social networks for human papillomavirus vaccine advice among African American parents. *Journal of Adolescent Health, 65*(1), 124-129.	**Included**	This study examined social factors that impact the African American community's decision to vaccinate against HPV. Researchers provided suggestions on ways to provide education to increase HPV vaccine uptake in this community.
Galagan, S. R., Paul, P., Menezes, L., & LaMontagne, D. S. (2013). Influences on parental acceptance of HPV vaccination in demonstration projects in Uganda and Vietnam. *Vaccine, 31*(30), 3072-3078.	Excluded	This study included participants in Uganda and Vietnam, not USA.
Getrich, C. M., Broidy, L. M., Kleymann, E., Helitzer, D. L., Kong, A. S., Sussman, A. L., & RIOS Net Clinicians. (2014). Different models of HPV vaccine decision-making among adolescent girls, parents, and health-care clinicians in New Mexico. *Ethnicity & Health, 19*(1), 47-63.	Excluded	This study did not include any interventions, only surveyed participants to identify decision making dynamics regarding the HPV vaccine.
Gilkey, M. B., Magnus, B. E., Reiter, P. L., McRee, A. L., Dempsey, A. F., & Brewer, N. T. (2014). The Vaccination Confidence Scale: A brief measure of parents' vaccination beliefs. *Vaccine, 32*(47), 6259, 6265.	Excluded	This study was based on a survey of parents on vaccination beliefs. It created a scale but did not include any interventions.
Hansen, C. E., Credle, M., Shapiro, E. D., & Niccolai, L. M. (2016). "It all depends": A qualitative study of parents' views on human papillomavirus vaccine for their adolescents at ages 11-12 years. *Journal of Cancer Education, 31*(1), 147-152.	**Included**	This study shed light on parents' perceptions surrounding the HPV vaccine and its effect on their children.

Hansen, C. E., Okoloko, E., Ogunbajo, A., North, A., & Niccolai, L. M. (2017). Acceptability of school-based health centers for human papillomavirus vaccination visits: A mixed-methods study. *Journal of School Health, 87*(9), 705-714.	Excluded	This study surveyed parents and adolescents for their opinions on the acceptability of school-based vaccination clinics. This study did not look at education as an intervention.
Hughes, C. C., Jones, A. L., Feemster, K. A., & Fiks, A. G. (2011). HPV vaccine decision making in pediatric primary care: A semi-structured interview study. *BMC Pediatrics, 11*, 74.	Excluded	This study included a very small sample size (n=20), and did not research how education impacted HPV vaccination rates.
Javaid, M., Ashrawi, D., Landgren, R., Stevens, L., Bello, R., Foxhall, L., …, & Ramondetta, L. (2017). Human papillomavirus vaccine uptake in Texas pediatric care settings: A statewide survey of healthcare professionals. *Journal of Community Health, 42*(1), 58-65.	Excluded	This study interviewed healthcare workers on their perceptions of barriers that prevent vaccine uptake. It did not focus on how education regarding HPV impacts vaccine uptake.
Javanbakht, M., Stahlman, S., Walker, S., Gottlieb, S., Markowitz, L., Liddon, N., …, & Guerry, S. (2012). Provider perceptions of barriers and facilitators of HPV vaccination in a high-risk community. *Vaccine, 30*(30), 4511-4516.	Excluded	This study only identified barriers in a Hispanic population in LA, CA. It did not include any interventions, only recommendations for further study.
Kao, C. M., Schneyer, R. J., & Bocchini Jr, J. A. (2014). Child and adolescent immunizations: Selected review of recent US recommendations and literature. *Current Opinion in Pediatrics, 26*(3), 383-395.	Excluded	Unable to access article.
Katz, M. L., & Paskett, E. D. (2015). The process of engaging members from two underserved populations in the development of interventions to promote the uptake of the HPV vaccine. *Health Promotion Practice, 16*(3), 443-453.	Excluded	This article did not focus on educational interventions. It explained the step by step process of implementing a community-engaged research project to determine how to increase the community's HPV vaccine uptake.
Kaufman, J., Ryan, R., Horey, D., Leask, J., Robinson, P., …, & Kaufman, J. (2013). Face to face interventions for informing or educating parents about early childhood vaccination. *Cochrane Database of Systematic Reviews, 5*.	Excluded	This review included studies from countries outside of the USA, and focused on early childhood vaccinations not the HPV vaccine.
Kaul, S., Do, T. Q. N., Hsu, E., Schmeler, K. M., Montealegre, J. R., & Rodriguez, A. M. (2019). School-based human papillomavirus vaccination program for increasing vaccine uptake in an underserved area in Texas. *Papillomavirus Research, 8*.	**Included**	This study examined school-based vaccines with community based education on the HPV vaccine compared to community based education alone on HPV vaccine uptake.

Kinder, F. D. (2016). Parental refusal of the human papillomavirus vaccine. *Journal of Pediatric Healthcare, 30*, 551-557.	**Included**	This article identified reasons parents refuse the HPV vaccine for their adolescents. The author also identified nursing implications from this research.
Kirchoff, A. C., Mann, K., Warner, E. L., Kaddas, H. K., Fair, D., Fluchel, M., …, & Kepka, D. (2019). HPV vaccination knowledge, intentions, and practices among caregivers of childhood cancer survivors. *Human Vaccines and Immunotherapies, 15*(7-8), 1767-1775.	Excluded	This study looked at caregivers of childhood cancer survivors and their knowledge about the HPV vaccine, if their child had received the vaccine, and the caregivers' intentions to vaccinate. Researchers found that lack of knowledge was a common barrier to HPV vaccine uptake, and education on vaccines and possible side effects increased caregiver intention to vaccinate.
Ko, L. K., Taylor, V. M., Mohamed, F. B., Hoai Do, H., Gebeyaw, F. A., Ibrahim, A., …, & Winer, R. L. (2019). "We brought our culture here with us": A qualitative study of perceptions of HPV vaccine and vaccine uptake among East African immigrant mothers. *Papillomavirus Research, 7*, 21-25.	Excluded	This study only explored mothers' perceptions of the vaccine. It did not include any interventions.
Koplas, P. A., Braswell, J., & Smalls, T. S. (2019). Uptake of HPV vaccine in traditional-age undergraduate students: Knowledges, behaviors, and barriers. *Journal of American College Health, 67*(8), 762-771.	Excluded	This study focused on college aged patients, not pediatric and adolescent patients.
Kornides, M. L., Calo, W. A., Heisler-MacKinnon, J. A., & Gilkey, M. B. (2018). U.S. primary care clinics' experiences during introduction of the 9-valent HPV vaccine. *Journal of Community Health, 43*(2), 291-296.	Excluded	This study surveyed clinics on their experience introducing the 9-valent HPV vaccine to patients. It did not focus on educational interventions.
Kornides, M. L., Fontenot, H. B., McRee, A. L., Panozzo, C. A., & Gilkey, M. B. (2018). Associations between parents' satisfaction with provider communication and HPV vaccination behaviors. *Vaccine, 36*(19), 2637-2642.	**Included**	This study examines how parent satisfaction with provider communication about HPV and the HPV vaccine relates to vaccination behavior. The authors also created a short HPV Vaccine Communication Scale to assess parent satisfaction with provider communication regarding the vaccine.
Ladd, I. G., Gogoi, R. P., Bogaczyk, T. L., & Larson, S. L. (2019). Cervical cancer patients' willingness and ability to serve as health care educators to advocate for human papillomavirus vaccine uptake. *Journal of Cancer Education, 34*(3), 608-613.	Excluded	This examined cervical cancer survivors' willingness to act as an educator and advocate for the HPV vaccine. It did not assess how education impacts vaccine uptake.
Lanning, B., Golman, M., & Crosslin, K. (2017). Improving human papillomavirus vaccination uptake in college students: A socioecological perspective. *American Journal of Health Education, 48*(2), 116-128.	Excluded	This study focused on college students, not pediatrics and adolescents.
Lantos, J. D., Jackson, M. A., Opel, D. J., Marcuse, E. K., Myers, A. L., & Connelly, B. L. (2010). Controversies in	Excluded	This article focused on controversy surrounding vaccine mandates. It did not include interventions that aimed to increase HPV vaccine uptake.

vaccine mandates. *Current Problems in Pediatric and Adolescent Health Care, 40*(3), 38-58.		
Laz, T. H., Rahman, M., & Berenson, A. B. (2013). Human papillomavirus vaccine uptake among 9-17 year old males in the United States: The National Health Interview Survey, 2010. *Human Vaccines & Immunotherapeutics, 9*(4), 874-878.	Excluded	This was a survey to examine HPV vaccination rates in 9-17 year old males, no interventions were done.
Laz, T. H., Rahman, M., Berenson, A. B. (2012). An update on human papillomavirus vaccine uptake among 11-17 year old girls in the United States: National Health Interview Survey, 2010. *Vaccine, 30*(24) 3534-3540.	Excluded	This study reviewed statistics on adolescent girls that have gotten the HPV vaccine. There is more updated data available today, as this is based off of data and statistics from 2010.
Lee, A., Wong, M. C. S., Chan, T. T., & Chan, P. K. S. (2015). A home-school-doctor model to break the barriers for uptake of human papillomavirus vaccine. *BMC Public Health, 15*, 935.	Excluded	This study was completed in Hong Kong, not the United States.
Lee, H., Kim, M., Kiang, P., Shi, L., Tan, K., Chea, P., Peou, S., & Grigg-Saito, D. C. (2016). Factors associated with HPV vaccination among Cambodian American teenagers. *Public Health Nursing, 33*(6), 493-501.	**Included**	This study looked at HPV vaccination rates in the Cambodian American teenage population, and various factors that influence this. The study supports increasing awareness and education on the HPV vaccine with Cambodian American mothers.
Litton, A. G., Desmond, R. A., Gilliland, J., Huh, W. K., & Franklin, F. A. (2011). Factors associated with intention to vaccinate a daughter against HPV: A statewide survey in Alabama. *Journal of Pediatric and Adolescent Gynecology, 24*(3), 166-171.	**Included**	This telephone survey-based study was conducted to see what factors were associated with a parent's intention to vaccinate their adolescent daughter against HPV. The study found parents who had received information on HPV and the vaccine from their medical provider were more likely to intend to vaccinate their daughter within the next 6 months.
Lu, P. J., Yankey, D., Jeyarajah, J., O'Halloran, A., Elam-Evans, L. D., Smith, P. J., Stokley, S., Singleton, J. A., & Dunne, E. F. (2015). HPV vaccination coverage of male adolescents in the United States. *Pediatrics, 136*(5), 839-849.	**Included**	Authors reviewed the 2013 National Immunization Survey-Teen data to examine male HPV vaccine uptake and completion rates, as well as factors that were associated with increased and decreased likelihood of vaccinating.
Mabeya, H., Menon, S., Weyers, S., Naanyu, V., Mwaliko, E., Kirop, E., …, & Vanden Broeck, D. (2018). Uptake of three doses of HPV vaccine by primary school girls in Eldoret, Kenya; A prospective cohort study in a malaria endemic setting. *BMC Cancer, 18*(1), 557.	Excluded	This study included participants from Kenya, not the United States.
Marchand, E., Glenn, B. A., & Bastani, R. (2012). Low HPV vaccine coverage among female community college students. *Journal of Community Health, 37*(6), 1136-1144.	Excluded	This study included college-age participants, not preteens and adolescents and their parents.

Mayer, M. K., Reiter, P. L., Zucker, R. A., & Brewer, N. T. (2013). Parents' and sons' beliefs in sexual disinhibition after human papillomavirus vaccination. *Sexually Transmitted Diseases, 40*(10), 822-828.	**Included**	This study surveyed parents and sons on their thoughts related to the HPV vaccine and sexual disinhibition. It found that certain parental beliefs (ex. Conservative political beliefs) and sons (ex. Hispanic) may be more likely to believe the HPV vaccination leads to sexual disinhibition.
McLean, H. Q., VanWormer, J. J., Chow, B. D. W., Birchmeier, B., Vickers, E., DeVries, E., …, & Belongia, E. A. (2017). Improving human papillomavirus vaccine use in an integrated health system: Impact of a provider and staff intervention.	Excluded	This study examined how provider education on the HPV vaccine impacted HPV vaccination rates of patients. It did not focus on parental education as the intervention.
Middleman, A. B., Won, T., Auslander, B., Misra, S., & Short, M. (2016). HPV vaccine uptake in a school-located vaccination program. *Human Vaccine Immunotherapeutics, 12*(11), 2872-2874.	Excluded	This study focused on a school based vaccination program, not parental education.
Monnat, S. M., & Wallington, S. F. (2013). Is there an association between maternal pap test use and adolescent human papillomavirus vaccination? *Journal of Adolescent Health, 52*(2), 212-218.	Excluded	This study looked at the relationship between a recent maternal pap test and her daughter's HPV vaccination status. This did not look at education as an intervention.
Moss, J. L., Gilkey, M. B., Rimer, B. K., & Brewer, N. T. (2016). Disparities in collaborative patient-provider communication about human papillomavirus (HPV) vaccination. *Human Vaccine Immunotherapeutics, 12*(6), 1476-1483.	**Included**	This study examined how providers communicate may influence disparities in HPV vaccination uptake rates.
Moss, J. L., Reiter, P. L., & Brewer, N. T. (2016). Concomitant adolescent vaccination in the U.S., 2007-2012. *American Journal of Preventive Medicine, 51*(5), 693-705.	Excluded	This research included dates before 2010.
Moss, J. L., Reiter, P. L., Rimer, B. K., & Brewer, N. T. (2016). Collaborative patient-provider communication and uptake of adolescent vaccines. *Social Science & Medicine, 159*, 100-107.	**Included**	Studied how different types of provider communication for recommending vaccination affect HPV vaccine uptake.
Moss, J. L., Reiter, P. L., Rimer, B. K., Ribisl, K. M., & Brewer, N. T. (2016). Summer peaks in uptake of human papillomavirus and other adolescent vaccines in the United States. *Cancer Epidemiology Biomarkers & Prevention, 25*(2), 274-281.	Excluded	This study looked at vaccination rate seasonal patterns. It did not examine education and its impact on HPV vaccine uptake rates.
Mroz, S., Zhang, X., Williams, M., Conlon, A., & LoConte, N. K. (2017). Working to increase vaccination for human papillomavirus: A survey of Wisconsin stakholders, 2015. *Preventing Chronic Disease, 14*, E85.	Excluded	This did not look at educational interventions and its impact on HPV vaccine uptake. It was an environmental scan completed in Wisconsin to look at current interventions within the community.

Niccolai, L. M., & Hansen, C. E. (2015). Practice- and community-based interventions to increase human papillomavirus vaccine coverage: A systematic review. *JAMA Pediatrics, 169*(7), 686-692.	**Included**	This systematic review compared various interventions across multiple studies and their impact on HPV vaccination uptake rates. Education was included and compared to other interventions.
Nodulman, J. A., Starling, R., Kong, A. S., Buller, D. B., Wheeler, C. M., & Woodall, W. G. (2015). Investivating stakeholder attitudes and opinions on school-based human papillomavirus vaccination. *Journal of School Health, 85*(5), 289-298.	Excluded	This study surveyed stakeholders on their thoughts regarding a school-based vaccination program. This did not look at parental education as an intervention.
Nonzee, N. J., Baldwin, S. B., Cui, Y., & Singhal, R. (2018). Disparities in parental human papillomavirus (HPV) vaccine awareness and uptake among adolescents. *Vaccine, 36*(10), 1243-1247.	Excluded	This study did not focus on education's impact on HPV vaccine uptake.
North, A. L., & Niccolai, L. M. (2016). Human papillomavirus vaccination requirements in US schools: Recommendations for moving forward. *American Journal of Public Health, 106*(10), 1765-1770.	**Included**	Provides context for current government policies surrounding the HPV vaccine. Provides recommendations on policies to increase HPV vaccine uptake.
Ogunbajo, A., Hansen, C. E., North, A. L., Okoloko, E., & Niccolai, L. M. (2016). "I think they're all basically the same": Parents' perceptions of human papilloma virus (HPV) vaccine compared with other adolescent vaccines. *Child Care, Health and Development, 42*(4), 582-587.	Excluded	This study did not research how education impacts vaccine uptake.
Painter, J. E., De O Mesquita, S. V., Jimenez, L., Avila, A. A., Sutter, C. J., & Sutter, R. (2019). Vaccine-related attitudes and decision-making among uninsured, Latin American immigrant mothers of adolescent daughters: A qualitative study.	Excluded	This study used a very small sample size and looked at many vaccines, not just the HPV vaccine.
Paskett, E. D., Krok-Schoen, J. L., Pennell, M. L., Tatum, C. M., Reiter, P. L., Peng, J., Bernardo, B. M., Weier, R. C., Richardson, M. S., & Katz, M. L. (2016). Results of a multilevel intervention trial to increase human papillomavirus (HPV) vaccine uptake among adolescent girls. *Cancer Epidemiology, Biomarkers & Prevention, 25*(4), 593-602.	**Included**	Study focused on an educational intervention to increase HPV vaccine reuptake.
Patel, D. A., Zochowski, M., Peterman, S., Dempsey, A. F., Ernst, S., & Dalton, V. K. (2012). Human papillomavirus vaccine intent and uptake among female college students. *Journal of American College Health, 60*(2), 151-161.	Excluded	This study focused on college students age 18-26 years old.

Peterson, C. E., Dykens, J. A., Brewer, N. T., Buscemi, J., Watson, K., Comer-Hagans, D., …, & Fitzgibbon, M. (2016). Society of behavioral medicine supports increasing HPV vaccination uptake: An urgent opportunity for cancer prevention. *Translational Behavioral Medicine, 6*(4), 672-675.	Excluded	This article stated support for the HPV vaccine, but did not examine education about HPV and its relation to vaccine uptake.
Rahman, M., Elam, L. B., Balat, M. I., & Berenson, A. (2013). Well-woman visit of mothers and human papillomavirus vaccine intent and uptake among their 9-17 year old children. *Vaccine, 31*(47), 5544-5548.	**Included**	This study found that HPV vaccination given to a mother of 9-17 year old at her well-woman exam improves the HPV vaccine initiation and completion in their adolescent daughters, but not adolescent sons.
Reiter, P. L., McRee, A. L., Pepper, J. K., Gilkey, M. B., Galbraith, K. V., & Brewer, N. T. (2013). Longitudinal predictors of human papillomavirus vaccination among a national sample of adolescent males. *American Journal of Public Health, 103*(8), 1419-1427.	Excluded	This was a survey, did not focus on any interventions to increase HPV vaccine uptake.
Reiter, P. L., McRee, A. L., Gottlieb, S. L., & Brewer, N. T. (2011). Correlates of receiving recommended adolescent vaccines among adolescent females in North Carolina. *Human Vaccines, 7*(1), 67-73.	Excluded	This study included participants up to age 20 years.
Rickert, V. I., Auslander, B. A., Cox, D. S., Rosenthal, S. L., Rupp, R. E., & Zimet, G. D. (2015). School-based HPV immunization of young adolescents: Effects of two brief health interventions. *Human Vaccine Immunotherapeutics, 11*(2), 315-321.	Excluded	This study did not included education as an intervention to examine impact on HPV vaccine uptake rates.
Roberts, M. C., Murphy, T., Moss, J. L., Wheldon, C. W., & Psek, W. (2018). A qualitative comparative analysis of combined state health policies related to human papillomavirus vaccine uptake in the United States. *American Journal of Public Health, 108*(4), 493-499.	Excluded	This study looked at how state policies impact HPV rates, not education.
Roberts, M. E., Gerrard, M., Reimer, R., & Gibbons, F. X. (2010). Mother-daughter communication and human papillomavirus vaccine uptake by college students. *Pediatrics, 125*(5), 982-989.	Excluded	This article only included college aged women, not pediatrics and adolescents.
Roberts, M. C., Murphy, T., Moss, J. L., Wheldon, C. W., & Psek, W. (2018). A qualitative comparative analysis of combined state health policies related to human papillomavirus vaccine uptake in the United States. *American Journal of Public Health, 108*(4), 493-499.	**Included**	This study examined state health policies in the United States. It found a set of policies that are associated with higher HPV vaccine uptake rates.
Robitz, R., Gottlieb, S. L., De Rosa, C. J., Guerry, S. L., Liddon, N., Zaidi, A., …, & Markowitz, L. E. (2011).	Excluded	This study was completed before 2010.

Parent attitudes about school requirements for human papillomavirus vaccine in high-risk communities of Los Angeles, California. *Cancer Epidemiology, Biomarkers & Prevention, 20*(7), 1421-1429.		
Rosberger, Z., Krawczyk, A., Stephenson, E., & Lau, S. (2014). HPV vaccine education: Enhancing knowledge and attitudes of community counselors. *Journal of Cancer Education, 29*(3), 473-477.	Excluded	This study examined HPV vaccine education given to community counselors and educators, not parents.
Rose, S. B., Lanumata, T., & Lawton, B. A. (2011). Promoting uptake of the HPV vaccine: The knowledge and views of school staff. *Journal of School Health, 81*(11), 680-687.	Excluded	This study did not examine how education impacts HPV vaccine uptake and it was conducted in New Zealand.
Rutten L. J. F., Breitkopf, C. R., St Sauver, J. L., Croghan, I. T., Jacobson, D. J., Wilson, P. M., …, & Jacobson, R. M. (2018). Evaluating the impact of multilevel evidence-based implementation strategies to enhance provider recommendation on human papillomavirus vaccination rates among an empaneled primary care patient population: A study protocol for a stepped-wedge cluster randomized trial. *Implementation Science, 13*(1), 96.	Excluded	This was a study proposal, and research will by carried out by Mayo Clinic in Minnesota. The study will not be complete until at least 2023.
Sanderson, M., Canedo, J. R., Khabele, D., Fadden, M. K., Harris, C., Beard, K., Burress, M., Pinkerton, H., Jackson, C., Mayo-Gamble, T., Hargreaves, M. K., & Hull, P. C. (2017). Pragmatic trial of an intervention to increase human papillomavirus vaccination in safety-net clinics. *BMC Public Health, 17*(1), 158.	**Included**	This compared educational intervention on the HPV vaccine versus provider recommendation to see which had a stronger influence on vaccine uptake among African American and Hispanic pediatric patients.
Santos, A. C. S., Silva, N. N. T., Carneiro, C. M., Coura-Vital, W., & Lima, A. A. (2020). Knowledge about cervical cancer and HPV immunization dropout rate among Brazilian adolescent girls and their guardians. *BMC Public Health, 20*(1), 301.	Excluded	This study included participants from Brazil, not the United States of America.
Schnaith, A. M., Evans, E. M., Vogt, C., Tinsay, A. M., Schmidt, T. E., Tessier, K. M., & Erickson, B. K. (2018). An innovative medical school curriculum to address human papillomavirus vaccine hesitancy. *Vaccine, 36*(26), 3830-3835.	**Included**	This study provided recommendations for provider training on how to communicate with HPV vaccine hesitant parents.
Shapiro, G. K., Holding, A., Perez, S., Amsel, R., & Rosberger, Z. (2016). Validation of the vaccine	Excluded	This study was completed to validate a scale used to measure vaccine conspiracy beliefs. This did not study how education impacts vaccine uptake.

conspiracy beliefs scale. *Papillomavirus Research, 2*, 167-172.		
Shay, L. A., Baldwin, A. S., Betts, A. C., Marks, E. G., Higashi, R. T., Street Jr, R. L., Persaud, D., & Tiro, J. A.(2018). Parent-provider communication of HPV vaccine hesitancy. *Pediatrics, 141*(6).	**Included**	This study examined specifically how provider recommendation (or lack of) impacts HPV vaccine uptake.
Sheinfeld Gorin, S. N., Glenn, B. A., & Perkins, R. B. (2011). The human papillomavirus (HPV) vaccine and cervical cancer: Uptake and next steps. *Advanced Therapies, 28*(8), 615-639.	Excluded	Unable to access article.
Skinner, S. R., Davies, C., Cooper, S., Stoney, T., Marshall, H., Jones, J., …, & McGeechan, K. (2015). HPV.edu study protocol: A cluster randomized controlled evaluation of education, decisional support and logistical strategies in school-based human papillomavirus (HPV) vaccination of adolescents. *BMC Public Health, 15*, 896.	Excluded	This study included education on the HPV vaccine to adolescents, not parents. This study was completed in Australia, not the United States.
Suryadevara, M., Bonville, C. A., Cibula, D. A., & Domachowske, J. B. (2019). Cancer prevention education for providers, staff, parents, and teens improves adolescent human papillomavirus, immunization rates. *The Journal of Pediatrics, 205*, 145-152.e2.	**Included**	This study included 2 phases with educational interventions. Phase 1 provided HPV vaccine education to healthcare providers. Phase 2 provided HPV vaccine education to adolescents and parents.
Taylor, V., Burke, N., Do, H., Liu, Q., Yasui, Y., Bastani, R., & Taylor, V. M. (2012). HPV vaccination uptake among Cambodian mothers. *Journal of Cancer Education, 27*(1), 145-148.	Excluded	This study did not look at how education on the HPV vaccine impacted vaccination rates.
Thomas, T. L., Caldera, M., & Maurer, J. (2019). A short report: Parents HPV vaccine knowledge in rural South Florida. *Human Vaccines & Immunotherapeutics, 7-8*(15), 1666-1671.	Excluded	This study assessed parents' knowledge regarding the HPV vaccine and beliefs that may prevent them from vaccinating their children. No educational intervention done.
Thomas, T. L., Strickland, O., Diclemente, R., & Higgins, M. (2013). An opportunity for cancer prevention during preadolescence and adolescence: Stopping human papillomavirus (HPV)-related cancer through HPV vaccination. *Journal of Adolescent Health, 52*(5 Suppl), S60-68.	**Included**	This study was conducted in a rural setting. Researchers concluded that education should be provided to parents in a way that is sensitive to the unique culture, economy, and geography of the area they are practicing in.
Thomas, T. L., Strickland, O. L., DiClemente, R., Higgins, M., & Haber, M. (2012). Rural African American parents' knowledge and decisions about human papillomavirus vaccination. *Journal of Nursing Scholarship, 44*(4), 358-367.	**Included**	This study surveyed African American parents of school aged children in a rural area. Researchers examined how different factors influenced the parents' intentions to vaccinate their children, including education.

Van Keulen, H. M., Otten, W., Ruiter, R. A. C., Fekkes, M., van Steenbergen, J., Dusseldorp, E., & Paulussen, T. W. G. M. (2013). Determinants of HPV vaccination intentions among Dutch girls and their mothers: A cross-sectional study. *BMC Public Health, 6*(13), 111.	Excluded	This study included Dutch participants, not American.
VanWormer, J. J., Bendixsen, C. G., Vickers, E. R., Stokley, S., McNeil, M. M., Gee, J., …, & McLean, H. Q. (2017). Association between parent attitudes and receipt of human papillomavirus vaccine in adolescents.	Excluded	This was a survey looking a parent attitudes towards the HPV vaccine and how that impacts vaccine uptake. This did not include an educational intervention.
Victory, M., Do, T. Q. N., Kuo, Y. F., & Rodriguez, A. M. (2019). Parental knowledge gaps and barriers for children receiving human papillomavirus vaccine in the Rio Grande Valley of Texas. *Human Vaccines & Immunotherapeutics, 15*(7-8), 1678-1687.	**Included**	This article explores gaps in parental knowledge on the HPV vaccine and other barriers that prevent adolescent immunization. It also includes suggestions for future research.
Walling, E. B., Benzoni, N., Dornfeld, J., Bhandari, R., Sisk, B. A., Garbutt, J., & Colditz, G. (2016). Interventions to improve HPV vaccine uptake: A systematic review. *Pediatrics, 138*(1), 1-11.	Excluded	This systematic review included participants older than age 18.
Wamai, R., Ayissi, C., Oduwo, G., Perlman, S., Welty, E., Mango, S., & Ogembo, J. (2012). Assessing the effectiveness of a community-based sensitization strategy in creating awareness about HPV, cervical cancer and HPV vaccine among parents in north west Cameroon. *Journal of Community Health, 37*(5), 917-926.	Excluded	This study was published in America, but focused on citizens in Cameroon, Africa.
Wilson, K., White, A., Rosen, B., Chiappone, A., Pulczinski, J., Ory, M., & Smith, M. (2016). Factors associated with college students' intentions to vaccinate their daughters against HPV: Protecting the next generation. *Journal of Community Health, 41*(5), 1078-1089.	Excluded	This study interviewed college students were not parents.
Winer, R., Gonzales, A., Noonan, C., & Buchwald, D. (2016). A cluster-randomized trial to evaluate a mother-daughter dyadic educational intervention for increasing HPV vaccination coverage in American Indian girls. *Journal of Community Health, 41*(2), 274-281.	**Included**	This study looked at how an educational event impacted HPV vaccination rates.
Wisk, L. E., Allchin, A., & Witt, W. P. (2014). Disparities in human papillomavirus vaccine awareness among U.S. parents of preadolescents and adolescents. *Sexually Transmitted Diseases, 41*(2), 117-122.	Excluded	This study only looked at awareness of the vaccine, it did not focus on education as an intervention or give recommendations for education.

Wong, C. A., Berkowitz, Z., Dorell, C. G., Anhang, P. R., Lee, J., Saraiya, M., …, & Saraiya, M. (2011). Human papillomavirus vaccine uptake among 9- to 17-year-old girls: National Health Interview Survey, 2008. *Cancer, 117*(24), 5612-5620.	Excluded	This was a survey, and did not examine how education on the HPV vaccine affected vaccine uptake.
Zimet, G. D., Rosberger, Z., Fisher, W. A., Perez, S., & Stupiansky, N. W. (2013). Beliefs, behaviors and HPV vaccine: Correcting the myths and misinformation. *Preventive Medicine, 57*(5), 414-418.	Excluded	This was a literature review examining HPV vaccine attitudes and uptake. It did not examine interventions.

Table 4

Literature Review of All Studies Included

Citation	Study Purpose	Population (N)/ Sample Size (n)/ Setting(s)	Design/ Level of Evidence	Variables & Instruments	Intervention	Findings	Implications
Bernstein, H. H., & Bocchini Jr, J. A. (2017). Practical approaches to optimize adolescent immunization. *Pediatrics, 139*(3), e1-e14.	To provide recommendations to increase "adherence to the universally recommended vaccines in the annual adolescent immunization schedule…."	Adolescents, parents ("n" not provided). USA.	Clinical report. Level IV.	Instruments used in studies included surveys.	Interventions that can be used to overcome vaccine hesitancy are provided. Motivational interviewing. Patient prompts (ex. Bright Futures hand-outs), provider prompts. Reminder/ recall systems for patients. Schools as alternative vaccination sites, school vaccination requirements.	Provider explanation and recommendation of vaccines are essential to increasing vaccine uptake rates. Adolescents should be included in their care and given the opportunity to make health care choices to prevent disease. Different approaches to different parental attitudes towards vaccines are given. Co-administering the HPV vaccine with other vaccines can	Providers should view every visit as an opportunity to vaccinate. Normalize and advocate for the HPV vaccine, explaining that it prevents cancer, and it is safe. Explain the vaccine schedule to parents, that it requires multiple doses. Do not delay vaccinating until the adolescent becomes sexually active.

						boost HPV vaccine uptake rates.	
Brewer, S. E., Nederveld, A., & Simpson, M. (2020). Engaging communities in preventing human papillomavirus-related cancers: Two boot camp translations, Colorado, 2017-2018. *Preventing Chronic Disease, 17*, E02.	To create messages that appeal to each unique community involved to increase HPV vaccination uptake rates.	Total of 21 participants (11 in Mesa County, 10 in Denver metro). Participants were parents of children (9-11 years in Mesa County, 8-13 years in Denver metro). Researchers excluded parents of young adults as the vaccine is most effective in preteens. Settings included the Denver metro area and Mesa County (semi-rural), Colorado.	Cohort study. Level IV.	Boot Camp Translation (BCT), a research process used to develop messages that relate to the community members, was used to create educational materials and messages and a plan to disperse the information.	Educational information was provided in the form of flyers, images disseminated via social media platforms, website advertisements, postcards, posters, informational websites, and billboards.	Participants in a semi-rural community preferred public health messages to highlight the benefit of protection against cancer, and to minimize or remove statements explaining that HPV is a sexually transmitted disease. Participants in the urban community felt public health campaigns on HPV should focus on correcting misconceptions on the vaccine. The Denver metro cohort also felt long-term benefits of cancer prevention should be included, and parents of elementary school aged children should be targeted with information on increased effectiveness of the vaccine at a younger age. The metro area cohort recommended trusted local community locations should be used to	This research study found that translating BCT to fit HPV vaccination promotion works. Researchers support the notion that public health campaigns should target the specific community they will be placed in. This study was completed on a small scale. At the time of publication, researchers planned to continue studying the communities to learn how these public health messages impact HPV vaccine uptake.

						disperse the information.	
Brueggmann, D., Opper, N., Felix, J., Groneberg, D., Mishell, D., & Jaque, J. (2016). Development of a cost-effective educational tool to promote acceptance of the HPV vaccination by Hispanic mothers. *Journal of Community Health, 41*(3), 468-475.	Develop a cost-effective tool to increase HPV vaccination uptake by Hispanic mothers.	418 Hispanic mothers in waiting area of women's health clinics. Spanish speaking between ages 18-65, with at least one child.	Cross sectional. Level III.	Surveys were used to collect data.	Spanish language educational pamphlet that summarized "the likelihood of HPV contraction, its severe consequences and the benefits of the HPV vaccine in ten simple statements."	Level of education and previous HPV knowledge did not predict vaccine acceptance for children. Women who reported good understanding of information given from a credible professional source had increased levels of vaccine acceptance.	Educational interventions should focus on common misconceptions and gaps in knowledge. Written information should be available in appropriate languages and should be simple and easy to understand.
Dela Cruz, M., Tsark, J., Chen, J., Albright, C., & Braun, K. (2017). Human papillomavirus (HPV) vaccination motivators, barriers, and brochure preferences among parents in multicultural Hawai'i: A qualitative study. *Journal of Cancer Education, 32*(3), 613-621.	"To identify HPV vaccine barriers, motivators, and brochure preferences among parents of teens in multicultural Hawai'i."	20 parents with children between ages 11-18 years. Multicultural Hawaii.	Qualitative. Level III.	Telephone or in-person interviews.	Interviews gathered data on parent gender, race, marital status, age, city of residence, occupation, and age/gender of their children. Further questions asked about knowledge of HPV vaccines in general, knowledge and attitude on the vaccine, physician recommendation of the vaccine, discussions of the vaccine with others, health information sources, and	Major themes found were "physician is critical in the decision to vaccinate", "parental perception of the child's sexual activity guides the timing of their willingness to vaccinate", "HPV health education materials should be provided and discussed by the physician", and "parents would prefer an educational brochure that features local faces and testimonials, includes an immunization chart, and addresses barriers to vaccination."	Educational materials should be inclusive of a variety of ethnicities. Providers should take an active role in recommending the HPV vaccine and should review educational materials that their office provides.

					feedback on 3 HPV educational brochures (which focused on parent education on HPV vaccine).		
Dorell, C., Yankey, D., Jeyerajah, J., Stokley, S., Fisher, A., Markowitz, L., & Smith, P. J. (2014). Delay and refusal of human papillomavirus vaccine for girls, national immunization survey-teen, 2010. *Clinical Pediatrics, 53*(3), 261-269.	Researchers reviewed data given by parents of girls age 13-17 years old to identify prevalence of, associations with, and reasons for refusing or delaying the receipt of the HPV vaccine.	4103 parents of girls age 13-17 years of age. *HPV vaccine was only recommended for girls at time of data collection.	Cross sectional study. Level IV.	Information extracted from the 2010 National Immunization Survey-Teen. The survey used telephone calls (random dialing) with follow-up mail surveys. Providers' reports gave data on vaccination status.	None, this was a review of data.	HPV vaccination rates are lower than other scheduled vaccination rates in the US. Girls with parents of higher household incomes, were non-Hispanic white, and had a mother with a higher education level were more likely to delay or refuse the HPV vaccine. Top concerns with the vaccine included were possible long-term health problems from the vaccine, concerns if the vaccine is effective, and parents' beliefs that their daughters do not need the vaccine.	Educating parents on HPV vaccine safety and benefits can increase vaccination rates. Providers should explore parents' reasons for delaying or refusing the vaccine, listen to concerns, and identify/ help with barriers that may prevent vaccination. Education from multiple sources may be more effective than from the provider alone.
Fenton, A. T., Elliott, M. N., Schwebel, D. C., Berkowitz, Z., Liddon, N. C., Tortolero, S. R., Cuccaro, P. M., Davies, S. L., & Schuster, M. A. (2018). Unequal interactions: Examining the role of patient-centered care in reducing inequitable diffusion of a medical innovation, the human papillomavirus	The purpose of this study was to determine the role that patient centered care has in the role of HPV vaccine uptake.	5,147 adolescents (5^{th}-10^{th} grade) and their parents/ primary caregivers. Settings in the Birmingham (AL), Los Angeles (CA), and Houston (TX) metropolitan areas.	Cohort study. Level IV.	Healthy Passages (longitudinal survey regarding health-related behaviors). Computer and audio-computer assisted interviews in English and Spanish. Dependent variables included provider	Surveys were completed on initial contact, with follow up surveys at 2 and 5 years later (7^{th} and 10^{th} grades). Interviews.	Researchers found that patient centered care contributes to disparity in the diffusion of medical resources, including the HPV vaccine. They found some patient groups are less likely to have the HPV vaccine recommended to	Authors recommend further research on this topic. Researchers advocate for the implementation of patient centered care for all patients, and that all patients/ parents should have the HPV vaccine

(HPV) vaccine. *Social Science & Medicine, 200*, 238-248.				recommendation of the HPV vaccine, vaccine status of the adolescent. Independent variables included patient-centered care, education, and race/ ethnicity.		them than other patients.	recommended to them.
Ferris, D., Horn, L., & Waller, J. L. (2010). Parental acceptance of a mandatory human papillomavirus (HPV) vaccination program. *Journal of the American Board of Family Medicine, 23*(2), 220-229.	The purpose of this study was to identify what influence parents' acceptance of a school-based HPV vaccine program that is required.	325 parents of children 9-17 years old. Georgia and South Carolina.	Cross sectional study. Level IV.	Researchers created a 53-question survey. Variables included household income, education level, personal history of HPV infection, race/ ethnicity, gender (of parent), age (of parent and child), type of/ lack of health insurance, knowledge of HPV, perceived likeliness of child to contract HPV, safety concerns	53 question survey focused on parental opinions of HPV, the vaccine, and a mandatory HPV vaccination program.	Parents who favored requiring the HPV vaccine had a personal history of HPV, fewer financial resources, understood their child's risk for contracting HPV, were interested in getting the vaccine for their child, and understood that the vaccine can prevent cervical cancer. Parents who were most likely to comply with mandatory HPV vaccinations had children 12-14 years old and knew the vaccine would reduce the risk of genital warts and cervical cancer.	Parental and health care provider education on HPV and the vaccine needs to be improved. Researchers stated this "should" increase vaccination uptake rate.
Fu, L. Y., Bonhomme, L. A., Cooper, S. C., Joseph, J. G., & Zimet, G. D. (2014). Educational interventions to increase HPV vaccination acceptance: A systematic review. *Vaccine, 17*(7), 1901-1920.	Review and evaluate literature for evidence of educational intervention to increase HPV vaccine uptake, intention, or attitude.	7 studies tested efficacy of parental educational intervention, 8 with adolescents or young adults, and 18 compared efficacy of different message frames of an	Systematic review. Studies included were randomized and non-randomized designs, quasi-experimental	Various educational interventions designed to increase patient or parental attitude and/or knowledge on the HPV vaccine.	Parental education was provided through written information fact sheets, 1-hour slide presentation, or Spanish-language radio advertisement.	In general, this study did not find strong evidence for any one educational intervention that could be used for wide-spread implementation.	Literature does not support the use of one educational intervention over any others. Recommended further studies to determine efficacy of culturally competent

		educational intervention among adolescents, young adults, and/or parents.	designs. Level III.				educational interventions.
Fu, L. Y., Zimet, G. D., Latkin, C. A., & Joseph, J. G. (2019). Social networks for human papillomavirus vaccine advice among African American parents. *Journal of Adolescent Health, 65*(1), 124-129.	The purpose of this research was to study HPV vaccine refusal in African American patients and any associated social processes.	353 African American parents of 10-12 year old children who have not yet had the HPV vaccine.	Cross-sectional. Level IV.	Survey was given to parents while they waited for child's appointment. Variables included thoughts and perceptions about HPV and the vaccine, social networks/ community that parents took advice from, education level.	Researchers reviewed the study with health care providers, and also educated providers about the best practices on immunization recommendations.	Researchers found that the study's parents' advice networks were small and homogenous.	Some African American parents have few members in their social network that could advise them about the HPV vaccine. However, the few individuals they do count on can be very influential. This should be taken into consideration with future educational interventions.
Hansen, C. E., Credle, M., Shapiro, E. D., & Niccolai, L. M. (2016). "It all depends": A qualitative study of parents' views on human papillomavirus vaccine for their adolescents at ages 11-12 years. *Journal of Cancer Education, 31*(1), 147-152.	The purpose of this study was to identify parental reasoning in accepting or refusing the HPV vaccine for their 11- or 12-year-old child.	45 parents/ guardians of adolescents (male and female) in a primary care practice in an urban hospital-based clinic.	Qualitative study. Level VI.	Semi-structured, face to face interviews were completed. Open-ended questions were used. Variables included parent/ child demographics, parental knowledge on HPV and the vaccine.	Audio-recorded interviews were conducted.	Parents had high levels of support for the HPV vaccine if they understood the benefits of the vaccine (i.e. protection from genital warts and cancer). Researchers found even though parents who said they would follow the recommended vaccination schedule, these parents were hesitant to actually vaccinate that day. Some	Health care providers should help parents understand the advantages of having their child vaccinated according to schedule, not waiting until their child is sexually active.

						parents thought the vaccine was not necessary until their child became sexually active (which they perceived as late adolescence). Researchers found that fathers were most opposed to the vaccination at 11-12 years old. Overall, most parents did want to vaccinate their children.	
Kaul, S., Do, T. Q. N., Hsu, E., Schmeler, K. M., Montealegre, J. R., & Rodriguez, A. M. (2019). School-based human papillomavirus vaccination program for increasing vaccine uptake in an underserved area in Texas. *Papillomavirus Research, 8*.	To compare the efficacy of community-based HPV-related education and on-site school-based vaccination versus community-based education alone in increasing HPV vaccine uptake in a rural medically underserved area.	2307 middle school students in the Rio Grande City Consolidated Independent School District (Texas).	Quasi-experimental. Level II.	Community based education was provided through community (health department community events, regional conferences, and training sessions/ workshops) and school-based (vaccination days, health fairs, back-to-school nights, PTA/school board/ monthly nurse meetings) events. School-based vaccination events were held in the nursing office or conference room during the school year.	On-site school-based vaccination program and physician-led education regarding HPV and HPV vaccines for parents and guardians, school nurses and staff, and pediatric and family providers. CDC's HPV related materials supplemented the education provided.	Prior to the study, intervention schools had lower HPV vaccination initiation and completion rates than comparison schools. After the study's intervention, the intervention schools had higher initiation and completion rates than comparison schools.	Increasing HPV vaccine initiation and completion rates may require more than one type of intervention. Combining community and school efforts could be an effective way to increase HPV vaccine uptake in rural, medically underserved communities.

Kinder, F. D. (2016). Parental refusal of the human papillomavirus vaccine. *Journal of Pediatric Healthcare, 30*, 551-557.	This study identified reasons parents refused the HPV vaccine for their adolescent children.	22 parents of 11-16-year-old adolescents in suburban Philadelphia, PA.	Mixed-methods. Level V.	Well-child visit that included discussion and education on vaccines.	Survey completed after the well-child exam.	Parents gave multiple reasons for refusing the HPV vaccine for their adolescent. Reasons included perceived need for further research, thought the vaccine was too new, side effects, don't believe it works, lack of information, or a father wanted to talk to the adolescent's mother first. No parents reported previous education given by nurse practitioners, instead citing information from family members or physicians.	The HPV vaccine should be offered more than once (i.e. multiple health care visits) to given parents time to learn and think more about the vaccine. Nurse practitioners and physicians are perfectly placed to provide education to parents. Education should focus on safety, especially cancer prevention. Allow parents a chance to ask questions, and for providers to dispel false information (i.e. that vaccine encourages adolescent sexual activity).
Kornides, M. L., Fontenot, H. B., McRee, A. L., Panozzo, C. A., & Gilkey, M. B. (2018). Associations between parents' satisfaction with provider communication and HPV vaccination behaviors. *Vaccine, 36*(19), 2637-2642.	This study was completed to see if there is a link between the healthcare provider's communication about the HPV vaccine and the parent's decision to vaccinate, or not vaccinate, their child.	795 parents of 11-17-year-olds and discussed the HPV vaccine with provider at least one time.	Cross sectional. Level IV.	Researchers created and used the HPV Vaccine Communication Scale (7 questions). Completed online. Variables included demographics, confidence in the vaccine, quality of relationship with healthcare provider,	The HPV Vaccine Communication completed.	Parent satisfaction of the healthcare provider's communication could be an important component in the parent's HPV vaccination decision. They also found that providers were not 100% clear on their	The HPV Vaccine Communication Scale can be used to help providers understand what areas of communication they can improve on. Researchers also recommend clearly stating a recommendation for the HPV

				provider's recommendation quality, parent's refusal or delay to vaccinate, and their child's current vaccination status.		recommendation of the vaccine.	vaccine according to the CDC's vaccination schedule.
Lee, H., Kim, M., Kiang, P., Shi, L., Tan, K., Chea, P., Peou, S., & Grigg-Saito, D. C. (2016). Factors associated with HPV vaccination among Cambodian American teenagers. *Public Health Nursing, 33*(6), 493-501.	Researchers aimed to "determine the HPV vaccine uptakes among CA teenagers and to examine factors influencing HPV vaccine uptakes." *CA= Cambodian American	130 CA mothers of adolescent daughters (ages 12-17 years). Massachusetts.	Cross sectional. Level IV.	Before starting to recruit participants, researchers aimed to "increase awareness and encourage participation" by utilizing commercials on local Khmer radio and TV stations, posters around the community, and word of mouth. "Tell-A-Friend about Data is Power"	Face to face interviews (Khmer or English language).	CA girls had higher HPV vaccination rates than boys (29% vs 16%). CA mothers had low rates of knowledge and awareness of HPV. Data showed that daughters were more likely to be vaccinated if their mother had a higher level of English reading ability, as well as increased knowledge and awareness of HPV.	Improved HPV vaccine education and outreach must be implemented to increase HPV vaccine uptake in the CA community.
Litton, A. G., Desmond, R. A., Gilliland, J., Huh, W. K., & Franklin, F. A. (2011). Factors associated with intention to vaccinate a daughter against HPV: A statewide survey in Alabama. *Journal of Pediatric and Adolescent Gynecology, 24*(3), 166-171.	The purpose of this study was to determine any associations between medical, behavioral, and demographic risk factors for accepting the HPV vaccine of Alabamans.	403 parents of daughters age10-14 years old.	Cross sectional. Level IV.	Telephone survey. Variables included demographics, knowledge, beliefs around sex and HPV, waiting time for appointment	Surveys completed.	This study found that 44.6% of female caregivers were undecided about vaccinating their daughter, and only 16.8% were against the vaccination.	Providers should understand that parents who express hesitancy to the vaccine are not necessarily "anti-HPV vaccine". This is an opportunity to correct misperceptions about the vaccine, discuss benefits, and the safety of the vaccine.

Lu, P. J., Yankey, D., Jeyarajah, J., O'Halloran, A., Elam-Evans, L. D., Smith, P. J., Stokley, S., Singleton, J. A., & Dunne, E. F. (2015). HPV vaccination coverage of male adolescents in the United States. *Pediatrics, 136*(5), 839-849.	Researchers used results from the 2013 National Immunization Survey-Teen data to examine HPV vaccine initiation and completion rates of male adolescents. They also sought to identify any factors that may predict HPV vaccination in this population.	9,554 adolescent males (age 13-17 years). United States.	Cohort study. Level IV.	Telephone survey, participants recruited with random dialing. Collection of provider-reported vaccine records as survey follow-up. Variables included demographics (parent), number of physician visits within the last 12 months, number of vaccination providers, attending 11-12 year well child visit, type of health care facility attended (ex. Public or private, STD clinic, hospital, etc.), and geographic area of the United States.	Survey completion.	HPV vaccination rates for male adolescents increased from the 2010 NIS-T survey but were still low. Male adolescents and their parents had less awareness of the HPV than female adolescents and their parents. This population needs to be targeted with future interventions aimed at increasing the HPV vaccine series uptake and completion. Measures should also be taken to increase vaccine coverage in males that are least likely to be vaccinated. The number one barrier to vaccinating male adolescents was lack of provider recommendation.	Healthcare providers should strongly recommend the HPV vaccine series to all adolescent males and their parents. Providers should also inquire about parental reasons for hesitation and correct misconceptions.
Mayer, M. K., Reiter, P. L., Zucker, R. A., & Brewer, N. T. (2013). Parents' and sons' beliefs in sexual disinhibition after human papillomavirus vaccination. *Sexually Transmitted Diseases, 40*(10), 822-828.	The purpose of this study was to identify adolescent males' and their parents' beliefs about sexual disinhibition in males after	547 parents of adolescent males (age 15-17 yearss) and their sons. United States.	Cross sectional. Level IV.	Online surveys with mult-item scales. Variables included demographics, geographic region of the US (including urban, rural), political ideaology,	Online survey completion.	Most participants did not feel that the HPV vaccine was related with sexual disinhibition in adolescent males. Researchers noted that at the time of the survey the HPV vaccine was not	Providers should understand that certain characteristics, such as conservative political ideology and Hispanic ethnicity, are associated with

	getting the HPV vaccine.			insurance coverage, thoughts on HPV and the vaccine, provider's recommendation.		routinely recommended for males, so participant answers may be different if the study is repeated.	"stronger beliefs about sexual disinhibition". The provider should tailor how they communicate their recommendation to fit the unique parent- adolescent dyad.
Moss, J. L., Gilkey, M. B., Rimer, B. K., & Brewer, N. T. (2016a). Disparities in collaborative patient-provider communication about human papillomavirus (HPV) vaccination. *Human Vaccine Immunotherapeutics, 12*(6), 1476-1483.	Researchers studied the National Immunization Survey- Teen, Parental Attitudes Module 2010, to see if disparities in collaborative communication "mediated the relationship between demographic characteristics and HPV vaccine initiation."	4,124 parents of daughters (ages 13-17 years old). United States.	Cohort study. Level IV.	Telephone survey, participants recruited with random dialing. Collection of provider-reported vaccine records as survey follow-up. Variables included demographics (parent), geographic region of the United States, provider use (or lack of) of collaborative communication.	Survey completion.	Researchers found that 53% of study participants reported collaborative communication with their child's healthcare provider. Patients who were least likely to report this style of communication were "poor, less educated, Spanish-speaking, Southern, and rural" as well as Hispanic parents who did not have private health insurance.	Health care providers should use collaborative communication with all patients and parents as another tool to increase HPV vaccination uptake.
Moss, J. L., Reiter, P. L., Rimer, B. K., & Brewer, N. T. (2016b). Collaborative patient-provider communication and uptake of adolescent vaccines. *Social Science & Medicine, 159*, 100-107.	Determine how patient-driven or provider-driven communication styles impact vaccine uptake. "Patient" included parents in this study.	9,194 parents of adolescents (ages 13-17) who consented provider verification of vaccine history. Data was collected from the 2010 National Immunization	Cohort study. Level IV.	Parents completed the Parental Attitudes Model, which measured parent attitudes, beliefs, and experiences with adolescent vaccines (includes patient-provider communication).	Intervention was provider recommendation of vaccine (provider-driven communication).	Provider recommendation of vaccines increased likelihood of parents vaccinating their adolescents. Provider-driven communication styles were associated with higher rates of HPV vaccine uptake.	Providers should efficiently communicate and recommend HPV vaccination. Authors recommended intervention studies be completed to confirm that efficient

		Survey (NIS)-Teen (conducted by CDC). National survey.					communication increases HPV vaccination in adolescents.
North, A. L., & Niccolai, L. M. (2016). Human papillomavirus vaccination requirements in US schools: Recommendations for moving forward. *American Journal of Public Health, 106*(10), 1765-1770.	The purpose of this article was to summarize current HPV vaccine requirements in the US and to explore pros and cons of such policies.	N/a. This article is not a study; it is a discussion with future recommendations for policies to increase HPV vaccine series uptake and completion rates in the US.	Expert opinion. Level VII.	No tools or instruments used this was not a research study.	No interventions completed this was not a research study.	Rationale for requiring the HPV vaccine for school include vaccine safety and efficacy, possible increased vaccine coverage, possible reduction in health disparities, influence how providers recommend the vaccine, "safety net", achieve herd immunity, improve public health. Rationales against HPV vaccine requirements include low acceptance rates of the vaccine, garnering enough political support to pass such requirements, financial burden (private or public) and increased funding, other interventions may also provide increase in HPV vaccination rates.	Healthcare providers and public health officials can weigh the pros and cons of this discussion. This could spark ideas for policy level interventions to increase HPV vaccine uptake rates.
Paskett, E. D., Krok-Schoen, J. L., Pennell, M. L., Tatum, C. M., Reiter,	"To describe and report the results of a group-	337 parents (daughter ages 9-17) in	Group-randomized	Providers completed surveys to assess HPV	MLI. Clinic-level focused on creating an	The multi-level intervention increased HPV	To improve HPV vaccination rates, multiple levels of

P. L., Peng, J., Bernardo, B. M., Weier, R. C., Richardson, M. S., & Katz, M. L. (2016). Results of a multilevel intervention trial to increase human papillomavirus (HPV) vaccine uptake among adolescent girls. *Cancer Epidemiology, Biomarkers & Prevention, 25*(4), 593-602.	randomized trial (GRT) at the county-level testing of the efficacy of the MLI to improve HPV vaccination among this population."	Appalachian Ohio. 24 clinics, 199 providers from included clinics.	trial. Level II.	vaccine knowledge and attitudes, self-efficacy to discuss with parents and patients about the vaccine. Parents completed a telephone survey and self-administered written survey.	environment which had HPV vaccine information visible and available. Provider-level focused on education sessions on the vaccine and how to discuss the vaccine with parents. Parents were given educational brochures and a DVD about HPV and the vaccine, a magnet reminder to complete the vaccine series, a CDC HPV vaccine information statement, and a telephone call from health educators on the HPV vaccine (comparison group received similar materials and education but on the flu vaccine).	vaccine series initiation among girls ages 9-17. However, overall uptake was low.	influence (ex. Community, policy) and multiple elements (ex. Automated prompts, reminders) within each level should be utilized.
Rahman, M., Elam, L. B., Balat, M. I., & Berenson, A. (2013). Well-woman visit of mothers and human papillomavirus vaccine intent and uptake among their 9-17 year old	Researchers aimed to identify any association between a mother's recent attendance to her well-woman appointment and	1256 female patients of reproductive health clinics.	Cross sectional. Level IV.	Questionnaire with questions on participant demographics, previous well-woman appointments, knowledge of	Self-administered questionnaire.	The majority of participants (78.3%) had a well woman exam within the last 2 years. After adjusting for vaccine awareness, household income	The opportunity to recommend and advocate for adolescent HPV vaccination may not only be at pediatric visits, but the mother's

children. *Vaccine, 31*(47), 5544-5548.	HPV vaccine uptake for their 9-17-year-old children.			HPV, and their intent to vaccinate their adolescent children.		and a personal history of an abnormal Pap smear, there was no difference (between women with a recent well-woman exam and women without a recent exam) in the intent to initiate and complete the vaccine series for their daughters. There was no association between well-woman exams and the intent to start and complete the vaccine series in sons.	annual well exam too. Researchers recommended future research study this intervention and its impact on HPV vaccination uptake rates.
Roberts, M. C., Murphy, T., Moss, J. L., Wheldon, C. W., & Psek, W. (2018). A qualitative comparative analysis of combined state health policies related to human papillomavirus vaccine uptake in the United States. *American Journal of Public Health, 108*(4), 493-499.	"To examine how combinations of state policies, rather than single policies, are related to uptake of human papillomavirus (HPV) vaccine."	50 states, plus Washington DC. United States.	Qualitative comparative analysis. Level V.	Utilized data from National Immunization Survey- Teen and state/ Washington DC policies.	Surveys completed during other research studies.	Researchers found that there was not one single policy that had a great impact on HPV vaccine uptake. Instead, there were sets of policies that consistently increased HPV vaccine uptake rates.	Healthcare and public health professionals can use this study as a reference to influence the creation of state policies surrounding the HPV vaccine series.
Sanderson, M., Canedo, J. R., Khabele, D., Fadden, M. K., Harris, C., Beard, K., Burress, M., Pinkerton, H., Jackson, C., Mayo-Gamble, T., Hargreaves, M. K., & Hull, P. C. (2017). Pragmatic trial of an intervention to increase	To report "on the development and effectiveness of an intervention aimed at increasing HPV vaccine uptake among African American and Hispanic	305 mothers (children ages 9-18 years) and 408 patients (ages 9-18 years). Study completed in 4 safety-net clinics in 3 cities in Tennessee.	Clustered, non-randomized controlled pragmatic trial. Level III.	Parents completed a post-visit questionnaire on staff implementation of key study components or comparable questions in the control group.	Two provider/ staff training sessions, provision of patient education materials (video/ flyer) promoting the HPV vaccine.	Patients in the intervention group were more likely to initiate the HPV vaccine series during the initial visit, though not significantly. Completion of the 3 dose series at 12-	Parent education alone may not be sufficient to increase vaccine uptake. Providers should recommend the vaccine series. Authors recommended future research

human papillomavirus vaccination in safety-net clinics. *BMC Public Health, 17*(1), 158.	pediatric patients in safety-net clinics."			Authors used the Intervention Fidelity Index to create a summed score of post-visit questionnaire answers.		month follow-up was significantly lower than the control group. Providing education materials did not increase likelihood of vaccination at initial visit or completion of series by 12 month follow-up. Provider recommendation during the initial visit were 4x more likely to initiate the vaccine, but not complete the series by the 12-month follow-up.	study more intense provider and staff education, use patient reminders, and compare efficacy of patient education that solely focuses on HPV vaccine instead of all adolescent vaccines.
Schnaith, A. M., Evans, E. M., Vogt, C., Tinsay, A. M., Schmidt, T. E., Tessier, K. M., & Erickson, B. K. (2018). An innovative medical school curriculum to address human papillomavirus vaccine hesitancy. *Vaccine, 36*(26), 3830-3835.	The purpose of this study was to create an educational curriculum for medical students to learn how to communicate with HPV vaccine hesitant patients and parents.	132 medical school students. University of Minnesota- Twin Cities and Duluth campuses.	Quasi-experimental. Level III.	Students surveys before and after the educational intervention. Questions evaluated student comfort level in talking about the HPV vaccine to vaccine hesitant parents and how likely the student was to recommend the vaccine to these parents.	"A presentation on the epidemiology, biology, and disease morbidity associated with HPV." "A video that teaches specific communication strategies." "Role-playing simulations."	Students found the C.A.S.E. method of approaching vaccine hesitant parents to be most helpful.	Provider education on how to best communicate with HPV vaccine hesitant parents may help increase providers' confidence level.
Shay, L. A., Baldwin, A. S., Betts, A. C., Marks, E. G., Higashi, R. T., Street Jr, R. L., Persaud, D., & Tiro, J. A.(2018). Parent-	Explore parent-provider communication of HPV vaccine hesitancy and	43 clinic visits (parent/ adolescent) with unvaccinated	Qualitative. Level VI.	Audio recordings were completed during clinic visits. Recordings were qualitatively coded	Provider interventions with vaccine hesitant parents were coded as only	37 of 43 parents expressed HPV vaccine hesitancy 1+ times (assertive responses, questions,	Providers should not acquiesce to parental vaccine hesitancy immediately.

provider communication of HPV vaccine hesitancy. *Pediatrics, 141*(6).	HPV vaccine uptake.	adolescent. Dallas, Texas.		on how parents verbally expressed vaccine hesitancy.	persistence, a mix of acquiescence and persistence, and only acquiescence.	& concerns). When providers only used persistence to respond to hesitancy, 17/18 adolescents were vaccinated. When providers only acquiesced, no adolescents were vaccinated.	Parents who initially are hesitant to vaccinate their child can be influenced by providers to change their minds.
Suryadevara, M., Bonville, C. A., Cibula, D. A., & Domachowske, J. B. (2019). Cancer prevention education for providers, staff, parents, and teens improves adolescent human papillomavirus, immunization rates. *The Journal of Pediatrics, 205*, 145-152.e2.	"To develop a program to educate providers, office staff, patients, and parents on life-long cancer prevention strategies, including the use of human papillomavirus (HPV) vaccine to improve adolescent HPV vaccination rates."	6 large pediatric offices in upstate New York.	Cohort study. Level IV.	Anonymous survey to assess provider and staff baseline knowledge and beliefs on the vaccine and cancer prevention. Vaccination rates and change in rates were calculated for each clinic. Authors compared data to other New York counties and the state's overall HPV vaccination rate at 6 and 12 months post-intervention. County/state data retrieved using the New York State Immunization Information System.	On-site education for providers and staff. A cancer prevention booklet was given to adolescents and their families.	Adolescent vaccine initiation and series completion rates increased after program implementation.	HPV vaccination rates in adolescents may be modestly improved with cancer prevention education that is given to providers, office staff, patients, and parents.
Thomas, T. L., Strickland, O. L., DiClemente, R., Higgins, M., & Haber, M. (2012). Rural African American parents'	"To identify predictors of human papillomavirus (HPV)	400 African American parents of adolescents (ages 9-13 years). Rural	Cross-sectional. Level IV.	The Health Belief Model (HBM) provided the framework for this study. Surveys	Survey completion.	Researchers identified religious affiliation was associated with parents planning to	Public health education and provider education must take into account rural

knowledge and decisions about human papillomavirus vaccination. *Journal of Nursing Scholarship, 44*(4), 358-367.	vaccination among rural African American families."	counties in southeastern United States.		were anonymously completed.		or have already vaccinated their child against HPV.	African American parents' religious beliefs, knowledge on HPV, and attitudes on HPV and the vaccine.
Thomas, T. L., Strickland, O., Diclemente, R., & Higgins, M. (2013). An opportunity for cancer prevention during preadolescence and adolescence: Stopping human papillomavirus (HPV)-related cancer through HPV vaccination. *Journal of Adolescent Health, 52*(5 Suppl), S60-68.	Researchers aimed to identify correlating factors of parental acceptance and refusal of the HPV vaccine in a rural setting.	519 parents of adolescents (ages 9-13 years). Rural Georgia.	Cross-sectional. Level IV.	The Health Belief Model (HBM) provided the framework for this study. Surveys were anonymously completed.	Survey completion.	Researchers found that parents who were not African American and were not Baptist were two to almost 3 times as likely to vaccinate or intend to vaccinate their adolescent against HPV. Researchers also found that parents who perceived more barriers to getting the vaccine and perceived fewer benefits were more likely to vaccinate or intend to vaccinate their children.	When providing education on the HPV vaccination in rural areas, the healthcare provider should relay information in "context of the patients' cultural values, geographic location, and economic situation." Highlighting the benefits of cancer prevention can also help to increase vaccine uptake.
Victory, M., Do, T. Q. N., Kuo, Y. F., & Rodriguez, A. M. (2019). Parental knowledge gaps and barriers for children receiving human papillomavirus vaccine in the Rio Grande Valley of Texas. *Human Vaccines & Immunotherapeutics, 15*(7-8), 1678-1687.	The goal of this study "was to understand parental knowledge and attitudes about HPV and the HPV vaccine as well as child experience with the HPV vaccine among medically underserved, economically	622 parents (of 4-th-12th graders). Rural Texas.	Cross-sectional. Level IV.	Parental surveys.	Survey completion.	Researchers found that 43.9% of parents reported provider recommendation of the vaccine, and 32.5% of parents had initiated the vaccine and 18.8% fully vaccinated their child at the time the study was completed. 28.2% of parents reported their child initiated getting	Parents and children still have gaps in understanding the HPV vaccine. There are still gaps between male and female vaccination rates, as well as a lack in provider recommendation. Researchers recommend educational

	disadvantaged population."					the vaccine. Parents reported that scheduling conflicts with school or work, as well as no healthcare provider recommendation, were barriers to vaccinating.	interventions (especially for men and minorities) to increase understanding and awareness on HPV related cancers and the vaccine.
Winer, R., Gonzales, A., Noonan, C., & Buchwald, D. (2016). A cluster-randomized trial to evaluate a mother-daughter dyadic educational intervention for increasing HPV vaccination coverage in American Indian girls. *Journal of Community Health, 41*(2), 274-281.	Evaluate if educational presentations on HPV to American Indian mothers impacted HPV vaccination rates in their adolescent daughters.	97 Hopi mothers/ female guardians and daughters (ages 9-12 years). Hopi Reservation.	Cluster-randomized intervention. Level II.	Baseline surveys taken prior to intervention. 11-month follow-up survey to evaluate daughters' HPV vaccine uptake status.	Mother-daughter dinners with educational presentations for mothers on HPV (intervention group) or juvenile diabetes (control).	By the 11-month follow-up survey, intervention and control groups had similar HPV vaccine uptake rates. Those adolescents who had not started the vaccine series prior to the study, girls whose mothers had HPV education were more likely to start the vaccine series themselves than girls whose mothers were in the control group.	Adolescent girls whose mothers receive education on the HPV vaccine may be more likely to initiate the vaccine series than girls whose mothers do not receive education on the HPV vaccine. Providing education on the HPV vaccine to mothers may increase vaccine uptake in daughters, but this study suggests the rate increase is limited.