

Human Papillomavirus Vaccination: Barriers, Disparities, and Potential Solutions
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Abstract

The Human Papillomavirus (HPV) is a sexually transmitted disease that has infected over 10% of the American population, negatively impacting the population's morbidity by increasing patients' risk for developing cervical, oropharyngeal, and anal cancer. In 2006 the Food and Drug Administration (FDA) approved a triple-dose HPV vaccine regime for use in adolescent females, and in 2009 the FDA approved the same regimen for use in adolescent males. However, as of 2022, less than 65% of young Americans have been reported to have finished the vaccine series. Vaccine uptake this low will not lead to herd immunity within the population, resulting in the continuation of HPV infection and its implications. This review will provide insight into key barriers and disparities in vaccine uptake by analyzing trends in data and patient/physician testimonies over the past decade. Next, this review will conclude with some promising interventions to promote vaccination uptake and completion based on their ability to remove barriers to HPV vaccine uptake, and their credibility based on recent data. The goal of this article review is to draw attention to the role that health care, public health, and the patient play in regard to increasing HPV vaccine uptake, and to bring awareness to the complexity of HPV vaccine hesitancy.

Background Information

The Human Papillomavirus (HPV) is a common sexually transmitted virus infecting human hosts. Due to its minimal symptoms, HPV infections can become latent and trigger the development of cancer in oropharyngeal, cervical, and anal epithelial cells. Many case-control studies and population surveys have concluded that HPV is the central cause of cervical cancers worldwide (Muñoz 2000). A concern to epidemiologists in the United States (U.S.) is that this carcinogenic virus has a sizable prevalence in the population. According to the Center for Disease Control and Prevention (CDC), more than 13% of the United States population, aged fifteen and older, are infected with a strain of HPV that can cause cancer (Weinstock et. al 2021). This is most likely due to the easy transmission of the virus and lack of screening for HPV infection. To combat growing infection rates of HPV, vaccines have been created in hopes that herd immunity could be reached and that HPV infection and HPV-related cancer rates could dramatically decrease.

In 2006, an HPV vaccine program consisting of three doses was approved by the Food and Drug Administration (FDA) for clinical use in adolescent females and later approved for clinical use in adolescent males in 2009. These vaccine programs are meant to be given proactively, meaning they would be administered to adolescents at an age before they would be at risk for HPV infection via sexual transmission. This is critical as studies have provided evidence that the prevalence of HPV decreases as the vaccine program of a population is more complete (Markowitz et. al 2019). With the HPV vaccine series being one of the few that is confirmed to decrease a person's risk of developing cancer, many might believe that vaccination rates for HPV would be high in a country with prominent public health and medical fields like the U.S. However, as of 2022, the CDC has reported that only an estimated 62.6% of adolescents in the U.S. have fully completed the HPV vaccine series (Pingali et. al 2023). This vaccine rate is not high enough for the U.S. to reach herd immunity and eradicate HPV infections and HPV-related cancers. Because of the tremendous impact HPV-related cancers have on a person's morbidity and mortality, Americans should be concerned that HPV has not been

eradicated. It is reported that the U.S. spends over \$2.9 billion a year treating HPV-related pathologies, the incidence of oropharyngeal cancer is increasing, and cervical cancer is still the 14th leading cause of cancer death in American women (Hirth 2018). The devastating impact of HPV and HPV-related cancers on the U.S. population could be reduced or even eliminated by increased completion of the HPV vaccine program in the adolescent population. Thus, HPV and HPV-related cancers are a substantial contributor to mortality and morbidity in the U.S., and examining the barriers to promoting vaccine program uptake is of substantial public health importance. Once the barriers of this issue are identified, their solutions must be also explored to one day achieve the eradication of HPV in the U.S. population.

Moral Belief Barriers

Humans do not all reach physical and emotional sexual maturity at the same rates, which is why a vaccine against sexually transmitted viruses should be administered proactively. This means that the HPV vaccine program should be given during a person's early adolescent years before they are sexually active. However, proactive sexual health care can be viewed as controversial due to certain moral beliefs. Because the vaccine program is typically administered to adolescents, the moral belief barriers of their parents predominantly influence the likelihood of vaccination of the adolescent occurring.

Religious Beliefs

In the United States, moral beliefs are largely influenced by religiosity, and thus, religious beliefs play a substantial role in the likelihood of HPV vaccination. A study analyzing data from a survey given by the National Immunization Survey to U.S teens aged 13-17 years old in 2016, found a correlation between U.S states with a large population of highly religious adults and significantly lower rates of HPV vaccine completion (Franco et. al 2019). While correlation does not mean causation, an online survey asking questions about religious practices and opinions on vaccinating female adolescents against HPV that was given to a nationally representative panel of parents with daughters between the ages of 9-17 years old established a correlation between religiosity and a negative view of the vaccine series. When statistically analyzed, the authors determined that parents who reported that they frequently attend religious services were 3.05 times more likely to also report being against HPV vaccination (Shelton et. al 2011). Parents who attend religious services more frequently are usually more likely to follow and believe in said religious beliefs. Therefore, the correlation shown in this study may indicate that parents' religious beliefs could impact their decision to vaccinate their children against HPV.

Appropriateness for Adolescents

Many moral beliefs, such as abstinence from sexual intercourse until marriage, are informed by religious beliefs, and although vaccination against HPV does not necessarily imply someone is partaking in sexual behavior, some parents feel that it is not appropriate for young adolescents to receive the HPV vaccine series due to the implication of sexual behavior. When 349 pediatricians and 331 family physicians from the American Academies of Pediatrics and Family Physicians were surveyed in a study on HPV vaccination practices, 39% of pediatricians and 43% of family physicians somewhat agreed that the parents of their adolescent patients were concerned that vaccination against HPV would encourage earlier or riskier sexual behavior

(M. Daly et. al 2010). The majority of parents feel it is their moral duty to decrease their child's risk of partaking in sexual activity before they reach adulthood. However, there is no scientific data supporting a correlation between HPV vaccination and risky sexual behavior. A survey given to 13 to 23-year-old female patients at a U.S Midwestern hospital indicated that unvaccinated young women and vaccinated women showed no significant differences in risky sexual behavior (Rysavy et. al 2014). Despite evidence that HPV vaccination does not result in increased sexual behavior, if parents believe administering the HPV vaccine program will increase their child's risk for sexual activity as the data from the survey of healthcare professionals from the American Academies of Pediatrics and Family Physicians suggests, then they most likely will not vaccinate their child.

Safety Concerns

In addition to keeping their children from engaging in sexual activity, parents may also believe they have a moral duty to keep them safe from physical harm. The anti-vaccine movement is characterized by a group of attitudes and beliefs held by people who do not want themselves or their children to receive vaccinations, due to concern of such vaccinations conferring physically harmful side effects. Even though Vaccine Safety Datalink analysis reports no significant safety concerns against the current HPV vaccination programs used, the increase in social media use amongst Americans has helped spread both misinformation and anti-vaccine movement beliefs about the negative side effects of HPV vaccination (Donahue 2019). This increased misinformation has likely contributed to the 79% increase in parents of U.S. adolescents (aged 13-17) who refused HPV vaccination for their children due to safety concerns in a National Immunization Survey from 2015 to 2018 (Sonawane et. al 2021). It is logical that parents would prevent their children from receiving a vaccination that they felt was unsafe because parents typically feel the need to protect their children from harm. Thus, despite data suggesting that there are no significant safety risks, parents may feel compelled to protect their children from harm if they believe the HPV vaccine is unsafe.

Accessibility Barriers

Unlike those with moral barriers, those with accessibility barriers may want themselves or their child vaccinated, however, they are unable to do so because of external factors. Because this vaccine series requires administration by a licensed professional, successful completion of the HPV vaccine series requires patients and their family be given adequate information about the vaccine from their healthcare providers, be able to afford the cost of administration, and be able to visit the clinic for each dose. These factors, as well as many others, illustrate the fact that the patient and family having a positive attitude towards the vaccine is not the only factor determining whether an individual undergoes successful uptakes of the vaccine. The patients and their families must also be able to overcome possible accessibility barriers that can prevent or pause the vaccination series from being completed.

Adequate Education and Awareness

One of the first barriers that a patient or their parents must overcome when thinking about receiving the HPV vaccine series is access to proper education about HPV, HPV-related cancers, and the vaccine series itself. However, many Americans are not properly educated on

such topics, and according to a cross-sectional study, only 65% of U.S. adults in 2020 knew of HPV and its vaccine, and less than 25% knew that it could cause cancers other than solely cervical cancer (Stephens et. al 2023). Patients and parents who are uneducated on HPV and the vaccine may be less likely to get the vaccine simply because they are unaware it exists or of its benefits, illustrating why access to education on HPV and HPV vaccination is important. An accessible source of information on HPV and its vaccine is a patient's provider. A patient's provider can educate them about the importance of the HPV vaccine by giving them a highly informative recommendation to start the series. Yet, according to a national online survey of parents of adolescents, 11-17 years old, 64% of parents reported receiving either a low-quality recommendation or no recommendation from their provider to have their child receive the HPV vaccine (Gilkey et. al 2016). This study demonstrates that a reason why so many Americans may be uneducated about HPV and its vaccine and why vaccine uptake is low is that patients and their parents are not given access to quality information and education via their providers. Accessibility of information about the vaccine through providers is important because when patients are able to receive education on the vaccine, they can make a more informed choice regarding their or their child's healthcare. This is evident in a case study of a clinic in Texas that held cervical cancer prevention education sessions and was able to subsequently increase their HPV vaccine uptake by 12.7% in girls aged 9-18 after their education sessions (Obulaney et. al 2016). This case study supports the claim that education on cervical cancer and the HPV vaccine can increase an individual's or their parent's willingness to receive the vaccine, which supports how a lack of education can inadvertently prevent patients from even thinking about receiving the vaccine.

Out-of-Pocket expenses

The cost of the vaccine series is a common barrier for those who are open to the vaccine series, but are not able to access it due to socioeconomic barriers. A single dose of the Gardasil-9 HPV vaccine is about \$285, and while most private insurance and government healthcare plans will reimburse patients for this expense, some patients may still have to pay a significant sum out of pocket (Merck & Co., Inc. 2024). According to research on HPV vaccine administration costs, a single dose's cost can increase 17-28% above its base price due to additional fees associated with storing and supplying the vaccine, which many insurance providers do not reimburse patients for (Middleman 2007). This means that patients and their families will have to pay around \$150-\$240 out of pocket for an entire vaccination series, even with their insurance's full coverage. This high out-of-pocket cost was one of the many cost-related barriers identified in a study examining accessibility barriers of 71 clinics in low-income areas of the American Southeast. According to the study, inadequate reimbursement from insurance for the cost of the vaccine was the highest cost-related concern reported by the clinics (Keating et. al 2008). If people view the cost of the vaccine as higher than what they are willing or able to pay for it, they will most likely not choose to undergo the vaccine series. This will ironically further damage the U.S. economy by impacting negatively the availability of able-bodied contributors from HPV-related morbidity and mortality.

Location and Transportation

Another common barrier is a lack of adequate health care providers in the area and transportation to them. Health infrastructure includes the collection of individuals and buildings available to provide healthcare services for persons in an area. The HPV vaccine series requires a substantial amount of health infrastructure to be present in an individual's community in order for them to receive the vaccine series. According to a study done analyzing data from a National Immunization Survey given to U.S teens in 2017, one reason states with mostly rural populations had a lower completion rate of the vaccine series compared to states with mostly urban populations is that rural populations typically lack nearby health care providers and reliable transportation to clinics (Peterson et. al 2020). This is because if a patient is limited to the healthcare resources in their area and their area has poor healthcare infrastructure regarding the HPV vaccine series, there is little the patient can do besides travel to an area with better healthcare resources. Although transportation to another area to receive healthcare may not sound difficult in theory, it can pose a serious threat to the completion of the vaccine series. In a qualitative analysis of responses given by U.S young adults and parents of adolescents regarding social determinants in relation to vaccine completion, lack of transportation was the biggest risk factor for low completion of the vaccine series (Mansfield et. al 2022). Lack of transportation can cause many issues such as not being able to schedule appointments, being late to appointments, and missing appointments altogether. As the HPV vaccination series requires patients to travel to the clinic at least two times, if patients experience transportation issues they may not be able or willing to receive both doses, resulting in incomplete vaccination.

Disparity Barriers

In most public health matters, disparities among populations occur. Unlike moral or accessibility beliefs, disparity barriers can rarely be eliminated due to their nuanced origins. A health disparity is when the preventable burdens of diseases, poor quality healthcare, and poor health outcomes unequally affect different populations. Health disparities typically affect populations based on race, sex, sexuality, or other characteristics and may illustrate how society, public health, and healthcare have in the past and present restricted their access to education, prevention, and treatment. Disparity populations may have a harder time accessing the HPV vaccine and completing the series unless specific programs are implemented for them as they may lack the proper resources to get vaccinated, in addition to other barriers they may experience. As vaccines rely on significant uptake and herd immunity in order to eradicate the disease, the disparities faced by large subgroups of the US population threaten the success of HPV vaccine programs. Thus, it is important that disparities between populations regarding HPV vaccination are minimized, because it could increase HPV vaccine uptake for an entire portion of the population that is currently underserved.

Sex Assigned at Birth

Although HPV is the most common STI for both men and women, a significant health disparity is seen between HPV vaccine rates in males and females. In 2022, a National Center for Health Statistics data brief reported that of children in the U.S aged 9-17 years old, 42% of girls received or completed the vaccine series whereas only 34.6% of boys received or completed the vaccine series (Villarroel et. al 2024). This data supports the hypothesis that

there is an unequal distribution of HPV risk between adolescent males and females in the U.S. who are less likely to contract HPV due to them being vaccinated. This disparity can be attributed to the systematic “feminization”, or concentration on females, of the vaccine series. In a survey randomly sent to physicians from the American Academies of Pediatrics and Family Physicians, physicians replied that they were more likely to strongly recommend the vaccine to their female patients over their male patients, even though 74% of physicians responded that they believed HPV infection is common enough to justify vaccinating males (Allison et. al 2013). This survey data is an example of a disconnect between physician’s beliefs about male’s need to receive the vaccine and their actions to not recommend it to them. This results in a barrier for males to receive the vaccine based on their perceived need and risk. The stereotype that the male population is in less need of the HPV vaccine stems from societal and healthcare norms regarding reproductive healthcare. In an article exploring the “feminization” of the HPV vaccine, it was stated that the most likely cause of this trend is that the responsibility of reproductive healthcare, such as contraception, is usually placed on females (E. Daley et. al 2017). This statement illustrates that the disparity in male and female HPV vaccine uptake is attributable to another broader disparity in the burden of reproductive care. Although reproductive healthcare has historically targeted women because of its focus on birth control rather than STI prevention, the HPV vaccine has created an opportunity for reproductive healthcare to have a gender-neutral focus because both males and females will benefit from the vaccine and, ultimately, the vaccine will not be effective if only half the eligible population completes the series.

Sexuality

When discussing health disparities, it is important to not disregard intersectionality, which is the way that a person or population’s multiple identities can further increase the risk of them facing barriers against preferable health outcomes. The barriers to successful HPV vaccination attributable to the intersecting identities of male sex and sexual orientation experienced by queer men can lead to even lower HPV vaccine uptake in their population compared to heterosexual men. In a National HIV Behavioral Surveillance of queer U.S men conducted in 2017, only 17.2% of queer men aged 18-26 reported starting the vaccine series, compared to the national estimate of 48.7% of heterosexual men aged 19-26 completing the vaccine series (McClung et. al 2020). This apparent difference between queer and heterosexual male HPV vaccine uptake displays how significant the disparity between these two populations is. As an issue of intersectionality, the even lower rates of vaccine uptake in queer men to heterosexual men may be due to the additional effects the queer identity has on already existing barriers to male vaccination. As noted in the documented sex-based disparities in HPV vaccination rates, a reason why vaccination rates in males are lower than in females is that the vaccine’s benefits for men’s health are commonly undervalued. According to responses from a 2018 interview of queer men in New York City, queer men are unsure of the value of HPV vaccination for them due to their own belief that HPV and its related pathologies mostly impact women, with whom they do not have sexual intercourse (Jaiswal et. al 2020). These interviews further show that like many men, queer men do not believe the HPV vaccine is intended directly for the male benefit, and they also extrapolate on this belief to conclude that they also would not indirectly benefit from the vaccine in any way because they are not exposed to health risks predominantly

associated with heterosexual contact. Thus, queer men are commonly less likely to be vaccinated against the HPV vaccine due to additional stereotypes and attitudes they have about the vaccine based on gender and sexuality. This exemplifies how the intersectionality of a queer man's identity can add additional barriers to those they already experience as men, which can further exacerbate disparities in HPV vaccination rates.

In addition to barriers created by intersectionality, queer men also are affected by barriers unique to their population. In interviews of queer Florida men in 2014, queer men reported that they were more likely to receive a recommendation for the HPV vaccine if they disclosed their sexuality to their provider, but some queer men reported that they do not feel comfortable discussing their sexuality with their provider due to fears of homophobia or hypersexualization (Wheldon et. al 2016). As the statements from the interviewees state, queer men are hesitant to disclose their sexuality to their healthcare providers because they fear stereotypical negative responses to doing so. However, healthcare providers are more likely to recommend the HPV vaccine to patients that they are aware of belonging to the queer male populations in order to combat unequal burdens of low vaccine rates. The queer male population's identity is unique from other disparity populations in that the only way for healthcare providers to know of a patient's sexuality is for the patient to inform them. Therefore, queer men are less likely to receive a much-needed recommendation for the HPV vaccine and are subsequently less likely to get vaccinated due to barriers affecting their provider's knowledge of them being in a population that experiences the burden of low HPV vaccine uptake.

Race

Beyond sexuality and sex assigned at birth, an individual's race is yet another factor that should be considered as a potential factor contributing to health disparities under an intersectional lens. Due to America's diverse population and complicated history of racial inequality, many health disparities exist amongst various racial groups in the U.S. This is apparent according to data analyzed from National Immunization Surveys of Teens between 2016 and 2020, wherein it was reported that Hispanic American and African American adolescents had lower odds of HPV vaccine completion than white adolescents (Hirth et. al 2020). Some of this inequality can be attributed to a lack of awareness of the vaccine amongst these populations. Data from the Health Information National Trends Survey in 2014 stated that African Americans were 44% less likely to have heard of the HPV vaccine compared to White Americans, and Hispanic Americans were 53% less likely to have heard of the HPV vaccine compared to White Americans (Adijei Boakye et. al 2017). If African and Hispanic Americans are not as aware of the HPV vaccine, whether through their own healthcare providers or other entities, they correspondingly would experience lower rates of vaccination, because patients are only able to make choices about their healthcare based on their prior knowledge of preventive measures and treatments. Often racial minorities are unaware of the HPV vaccine due to external barriers. A systematic review of articles published from 2010 to 2021 about disadvantaged and minority populations identified some barriers to receiving information about the HPV vaccine U.S minorities experienced are a lack of access to physicians with more availability to talk to patients due to overcrowded clinics, and limited translated and culturally appropriate resources (Essa-Hadad et. al 2024). If minorities are less likely to spend a substantial amount of time talking to their healthcare provider during visits, they will not be able

to receive additional education from them and cannot build a relationship with them to the point that they feel comfortable asking them questions about their health. Additionally, if minorities are not provided educational resources in their language or adapted to their culture, it cannot be expected for them to be properly informed about the HPV vaccine and its benefits. Therefore, these barriers related to racial minorities in the U.S. contribute to disproportionate HPV vaccine series completion due to their institutionally influenced lack of awareness.

Possible Solutions to Barriers to HPV Vaccine Uptake

The outlook on HPV vaccine uptake may seem bleak due to the multitude of barriers that can reduce patients' awareness of the vaccine, willingness to initiate the vaccine series, and completion of the vaccine series. However, since the introduction of the vaccine, researchers have been dedicating their focus to what practices can best reduce barriers to optimize vaccination rates. Together, researchers, health care providers, and public health professionals can utilize both existing and novel solutions to preventing and overcoming challenges to increasing the HPV vaccination rate such that the United States might ultimately reach herd immunity. The best solution would be the easiest for patients to access, overcome the most barriers, and be the most efficient for public health professionals and health care providers to carry out.

Government Mandated School-Based Programs

Many patients fail to get the HPV vaccine due to its inaccessibility, cost, or lack of awareness. A possible solution that would solve these issues would be mandated, government-funded HPV vaccine programs at public schools. This would improve vaccine rates in young children, which would hopefully minimize the incidence of new HPV cases in the future and allow the population to reach herd immunity. This solution has already been implemented in Australia, with one study in 2014 reporting that since the program's start in 2007, over 70% of children aged 12-13 years old have completed the vaccine series, which has resulted in a 77% decrease in the prevalence of HPV related pathologies (Garland 2014). The success of government-funded HPV vaccine programs in Australia provides support that this solution could be beneficial to increasing the HPV vaccine rate in the United States because it will guarantee that patients will receive the vaccine hopefully before they are exposed to HPV and without relying on a physician's recommendations which may be impacted due to disparity barriers. But, this solution can only be successful with the support of parents because the school cannot administer the vaccine without a parent's approval. Luckily, 61% of parents of adolescents aged 11-17 years old interviewed in 2016 were in favor of school-based HPV programs due to their convenience and removal of location barriers (Kempe et. al 2018). If U.S. parents' beliefs are truly reflective of this study, the government could carry out an HPV vaccine program through public schools because they would likely not face substantial pushback from the student's parents. This would ensure children in the ideal age range for vaccination have access to the vaccine without barriers. This solution could also be an opportunity for the government to successfully invest funds into reducing the loss of economic productivity attributed to early deaths and the treatment of HPV-related cancers.

Single-Dose Regime

Another solution that could impact accessibility, cost, and subsequently completion of the series, would be the development of a single-dose regime. This would allow patients to avoid barriers such as the expense of additional doses, lack of transportation to receive that additional dose, and the reluctance to take additional doses. However, for this solution to be widely available for Americans to use, it requires approval from health agencies and data supporting the effectiveness of a single-dose regime. In December of 2022, the World Health Organization (WHO) updated its recommendations for HPV vaccination to include a single-dose regime as an alternative due to WHO's independent Strategic Advisory Group of Experts determining that a single dose can be as efficient as the standard regime due to cohort studies (World Health Organization 2022). If an established organization like WHO has already approved the use of a single-dose HPV vaccine regime, then it is perhaps likely that a single-dose regime could also be approved in the U.S. by the FDA. Some may argue that this recommendation should only be followed by countries with a vaccine shortage because of concerns that a single-dose regime would be highly inferior. However, a study in which the antibodies of women were checked 10 years after they were either given a single, double, or triple dose of the vaccine, indicated that the single-dose vaccine can provide substantial protection from HPV and this protection is unlikely to wane over many years (Joshi et. al 2023). The outcome of this study disproves claims that a single-dose regime would be ineffective because the single-dose regime showed that it provided protection to patients similarly to multiple-dose regimes. Hopefully with more testing and recommendations from health care agencies, a single-dose regime of the HPV vaccine could be implemented to increase the uptake of the vaccine.

Social Media Campaigns

Compared to in-school programs and alternate regimes, a relatively novel solution to increase HPV vaccine uptake could be social media campaigns. With social media's growing development and popularity and development over the past decade, public health professionals have started to use social media as an avenue to educate the masses. With many patients reporting being in need of awareness or education about the HPV vaccine in order to receive it, social media campaigns could potentially promote vaccine uptake, especially to target specific disparity demographics. A study that tested the receptiveness of young women aged 18-26 to Facebook ads about the HPV vaccine reported that both static posts and videos were valuable in capturing the attention and persuading the young women to want to talk to their physicians about getting vaccinated (Leader et. al 2022). The outcome of this study reiterates the value of social media because a positive correlation was noted between the participants' viewing of HPV vaccine promotional media and positive thoughts on vaccine uptake. This study also displays how social media campaigns can utilize multiple strategies in order to reach as many potential patients as possible. Not only could social media serve to bring awareness about the HPV vaccine, but it could also correct misinformation. A process evaluation of an HPV vaccine social media campaign directed by the South Carolina Cancer Alliance (SCCA) found that their posts provided a platform for peer-to-peer communication which countered misinformation about the vaccine (Sundstrom et. al 2021). This evaluation of the SCCA's social media campaign displays social media could have a dual role in HPV vaccine awareness and advocacy by not only

spreading awareness but also combating misinformation. These two implications of social media campaigns will most likely have a synergistic effect, which will hopefully be able to increase vaccination rates to the point of substantial uptake.

Conclusion

In summary, although HPV is widely prevalent in the United States and vaccine uptake is low, there are possible solutions to promote vaccine uptake thereby reducing future incidence of HPV. In order to implement solutions, it is important to recognize the barriers that hinder patients from receiving and completing the HPV vaccine series. Patient's and parental personal beliefs, inability to access resources to receive the vaccine, and factors specific to one's identity and/or lived experiences can all interfere with a person's ability to be aware of and receive the HPV vaccine series. Without the majority of eligible Americans receiving the HPV vaccine, herd immunity will not be achieved, and the dangers of HPV-related pathologies to patients and the nation's viability will remain prominent. That is why it is crucial that solutions to increase vaccine uptake be explored, such as in-school programs, single-dose regimes, and social media campaigns. It is up to healthcare and public health professionals to continue to work together through research and implementation of initiatives in order to diminish the impact of highly preventable HPV infections. Most importantly, it is in the best interest of all Americans that everyone works collaboratively to become aware, get vaccinated, and eliminate barriers to vaccination to ultimately eradicate the HPV virus.

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