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Commentary

COVID-19 Vaccination in Children: Lessons Learned From Human Papillomavirus Vaccination

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As of February 2022, nearly 11.4 million children have tested positive for COVID-19 since the pandemic began [1]. As Omicron variant cases explode nationwide, this raises future questions for schools managing the ever evolving COVID-19 landscape. Vaccination can mitigate potential long-term effects of COVID-19 among infected children [2]. However, as of February 2022 only 55% of children aged 12–17 years are fully vaccinated [2]. Adolescent vaccines, such as human papillomavirus (HPV) vaccine, provide lessons learned for COVID-19 vaccination in children. This article describes similarities and differences between HPV and COVID-19 vaccines and discusses implications of successful strategies that increased adolescent HPV vaccination for ongoing efforts to promote COVID-19 vaccination in children (Table 1).

HPV Vaccines and COVID-19 Vaccines

In 2006, Gardasil and Cervarix were the first vaccines to prevent HPV-associated cervical cancers and genital warts in girls and young women. In 2009, vaccination was expanded to boys and young men to prevent HPV-associated genital warts and cancers. By 2014, Gardasil 9 was in widespread use across the United States for boys and girls [3]. Over the years, HPV vaccine ingredients (e.g., additional proteins of HPV strains) and its dose administration changed [3], causing confusion among some parents and providers about the dosing and timing for vaccination [4]. These changes provide a parallel structure for the Pfizer-BioNTech COVID-19 vaccine, the only authorized vaccine approved for use in children. Confusion about COVID-19 vaccines

surfaced as new information continues to emerge about the SARS-CoV-2 virus. For example, children were once perceived as unaffected by COVID-19, but now make up nearly 23% of weekly COVID-19 cases [1], causing public confusion in the need to vaccinate children.

Misinformation in The Lay Media

The initial enthusiasm for finding vaccines for HPV and COVID-19 quickly rebounded to public skepticism owing to misinformation in major media outlets. Mass media became a source to spread misinformation about both vaccines, raising parents' skepticism to vaccinate children. The initial enthusiasm for HPV vaccine was rapidly countered by negative public messaging that the vaccine increased promiscuity [3], causing controversy among religious leaders about parent decision-making for HPV vaccination and the encouragement of premarital sex among adolescents [5]. This claim has since been counteracted, noting HPV vaccination does not increase promiscuity [3]. In addition, emphasis was placed on harmful side effects (e.g., Guillain-Barre syndrome) from a “new” vaccine which raised concerns about the safety of HPV vaccine. Messaging for HPV vaccine later evolved from sexually transmitted infection prevention to cancer prevention in efforts to increase vaccine uptake [3]. However, the initial emphasis on HPV vaccination as “the cervical cancer prevention vaccine” led to misunderstanding about the benefits of vaccinating boys. Over time, HPV vaccine messaging became more gender-inclusive [3].

Although COVID-19 vaccination in children has not been sexualized as the HPV vaccine was, concerns about the mRNA technology used in vaccine development have raised questions about its safety and efficacy, which became evident as reports of cases of myocarditis among young men were amplified in the media. As with HPV vaccine, the media played an important role in fueling misinformation about the COVID-19 vaccination [6]. Importantly, sources of misinformation have multiplied (e.g., Facebook, TikTok, television, and newspaper websites), and the

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Table 1
Comparisons of HPV and COVID-19 vaccines and implications for COVID-19 vaccination

	HPV vaccine	COVID-19 vaccine (pfizer)
Misinformation in the lay media	<ul style="list-style-type: none"> • Sexualization of vaccine increasing promiscuity • Opposition from church leaders promoting abstinence • New vaccine with harmful side effects (e.g., Guillain-Barre syndrome) • Social media and mass media fueled vaccine misinformation 	<ul style="list-style-type: none"> • Rapid vaccine development and concerns about safety • New vaccine developed with “new” mRNA technology unlike traditional vaccine development • Harmful side effects (e.g., myocarditis) • Social media and mass media fueled vaccine misinformation
Politicization of HPV and COVID-19 vaccines	<ul style="list-style-type: none"> • School-entry mandates in four states • Adolescent autonomy for self-consent for vaccination 	<ul style="list-style-type: none"> • Topic of debate during 2020 election
Lessons learned from HPV vaccine campaigns: implications for COVID-19 vaccination	<ul style="list-style-type: none"> • Reframing messaging for vaccination from sexually transmitted infection prevention to cancer prevention with focus on gender inclusivity • Administering HPV vaccine with other adolescent vaccines • Use of reminder systems and HPV education via technology and applications • System-wide changes to improve vaccine access and utilization (e.g., offer HPV vaccine in pharmacies) 	<ul style="list-style-type: none"> • Reframe messaging for vaccination from COVID-19 mortality to safety of vaccination in children and regaining sense of normalcy (e.g., hang out with friends) • Offer and co-administer COVID-19 vaccines with other childhood vaccines. • Use social platforms popular among youth (e.g., TikTok, YouTube, Instagram) to disseminate COVID-19 vaccine information • Offer vaccines in federally qualified health centers, schools, and pharmacies • Using v-safe for COVID-19 vaccine education and vaccine dose reminders

HPV = human papillomavirus; mRNA = messenger RNA.

speed of spreading misinformation has accelerated, all contributing to skepticism among many communities [6] who already expressed concerns about COVID-19 vaccines [7].

Politicization of HPV and COVID-19 Vaccines

The politicization of HPV and COVID-19 vaccines also influenced decision-making for vaccination. Politicians debated mandating HPV vaccination requirements for schools in four states which have enacted this mandate [3]. Such mandates have led to small increases in HPV vaccination rates but caused opposition among parents [8]. California became the first state to announce the requirement of COVID-19 vaccination for school entry and may receive similar backlash observed with HPV vaccination mandates. COVID-19 vaccines also became a source of political debate during the recent election, which may have further increased skepticism in COVID-19 vaccines [6]. Adolescent self-consent for HPV vaccination also sparked political tension where some states allow adolescents to receive HPV vaccine without parental consent [8]. Similar tension may arise for COVID-19 vaccines as children may want to get vaccinated, but parents may disagree.

HPV Vaccine Campaigns: Implications for COVID-19 Vaccination

HPV vaccination rates have steadily increased since 2008 because of successful public health campaigns implementing interventions to improve vaccine access and utilization, such as co-administering HPV vaccine with other adolescent vaccines, implementing reminder systems, and creating system-wide changes across various health care settings (e.g., offer HPV vaccination in pharmacies) [9]. These strategies were augmented by reframing HPV vaccine messaging for health care providers and in the media to focus on cancer prevention and gender inclusivity and

using technology for HPV education [9]. COVID-19 vaccine messaging is evolving more rapidly as the initial focus shifted from individual protection to community protection from COVID-19 and tailored messages were created addressing vaccine concerns in diverse populations [7]. However, there is a much shorter time-frame for health care and public health leaders to develop strategies for COVID-19 vaccination than there was for HPV vaccine.

Lessons learned from HPV vaccination can serve as a blueprint to develop strategies to improve COVID-19 vaccination in children. The key strategies to consider include the following:

- Reframing and tailoring messaging that appeals to teens and parents about COVID-19 vaccines that normalizes vaccination, highlights vaccine efficacy and safety, combats vaccine misinformation, addresses parents' and teens' vaccine concerns, and endorses provider recommendations for COVID-19 vaccination.
- Using social platforms popular among youth (e.g., TikTok, YouTube, Instagram) to disseminate COVID-19 vaccine information.
- Reducing structural barriers to access vaccines such as removing unnecessary sign-up processes and educating parents and teens of convenient places to receive vaccination, such as federally qualified health centers, schools, and pharmacies.
- Routinely offering COVID-19 vaccines with other childhood vaccines, such as strategies implemented with the influenza and HPV vaccine.
- Educating parents about enrolling in v-safe, a free, smartphone-based tool that allows parents to report vaccine side effects and receive reminders about vaccine doses [10].

Conclusion

As COVID-19 variants and cases continue to rise, health care providers are in a unique position to increase acceptance and

uptake of COVID-19 vaccines in children. Lessons learned from HPV vaccine campaigns may serve as a foundation to develop effective strategies for COVID-19 vaccination in children, including reframing vaccine messaging, improving vaccine delivery, and reducing structural barriers to vaccine access.

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