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Perceived barriers and facilitators to HPV vaccination: Insights from focus groups with unvaccinated mid-adults in a U.S. medically underserved area

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ABSTRACT

Shared clinical decision-making (SCDM) about HPV vaccination has been recommended for U.S. mid-adults aged 27–45 since 2019. To explore barriers and facilitators to HPV vaccination in this population, we conducted 14 virtual focus groups with 86 unvaccinated mid-adults (34 men and 52 women) in California's medically underserved Inland Empire between September 2020 and January 2021. We systematically analyzed the focus group data using the rigorous and accelerated data reduction (RADaR) technique to identify key themes. Identified barriers included: lack of awareness, vaccine hesitancy, and perceived unaffordability (cited in 14 groups); lack of healthcare provider communication and insufficient time (13 groups); fear of moral judgment (12 groups); lack of motivation and information needs (10 groups); and lack of reliable transportation and foregone care during the COVID-19 pandemic (3 groups). Proposed facilitators included: tailored HPV vaccine information for mid-adults, cost mitigation, and improved vaccine accessibility (12 groups); healthcare provider-initiated conversations (6 groups); and vaccine reminders (4 groups). These findings highlight challenges to HPV vaccination among U.S. mid-adults eligible for SCDM and point to actionable strategies for improvement. Specifically, tailored educational interventions, decision-making tools for pharmacists, and integrating HPV vaccination into other healthcare encounters may enhance vaccination efforts in areas with limited primary care resources.

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Adults; human papillomavirus; HPV vaccine; shared clinical decision-making; vaccination; United States

Introduction

In 2018, an estimated 42.5 million people in the United States were living with one or more types of human papillomavirus (HPV), a common pathogen and sexually transmitted infection.[1] Many individuals are unaware they have HPV because it is not a nationally notifiable condition, and most cases resolve without symptoms.[2] However, certain HPV types can cause anogenital and oropharyngeal cancers – diagnosed in approximately 37,800 people in the United States each year – as well as warts.[3] Fortunately, the 9-valent HPV vaccine can prevent over 90% of these HPV-attributable cancers and warts.[4] The U.S. Advisory Committee on Immunization Practices (ACIP) has recommended routine HPV vaccination for 11–12-year-old girls since 2006 and boys since 2011, along with catch-up HPV vaccination for individuals through age 26.[5] Despite these recommendations, fewer than half of U.S. adults aged 18–26 reported ever receiving the HPV vaccine in 2022.[6]

Recognizing an "opportunity to help prevent HPV-related diseases and cancers in a broader age range," the U.S. Food and Drug Administration (FDA) expanded the approval of the 9-valent HPV vaccine in 2018 to include mid-adults aged 27–45 years.[7] This decision was based on clinical trials demonstrating that a three-dose HPV vaccine schedule elicits an immune response in this age group and prevents persistent HPV infection and precancerous lesions in mid-adult women.[8–10] Following this approval, in 2019 ACIP recommended "shared clinical decision-making" (SCDM) for mid-adults aged 27–45 "who are not adequately vaccinated" and "might be at risk for new HPV infection and might benefit from vaccination."[5] However, the recommendation lacks guidance on how to identify these individuals.[11]

SCDM involves collaborative discussions between healthcare providers and patients about infection risks and vaccination benefits, enabling personalized decisions that address individual needs.[12] Under the Affordable Care Act (ACA), health insurers are also generally required to cover the costs of vaccines recommended for SCDM,[13] thereby improving access. Despite these advancements, knowledge gaps among U.S. healthcare providers regarding HPV vaccine recommendations, safety, and insurance coverage could hinder effective SCDM discussions that are essential for facilitating vaccination.[14–16] For example, a 2019 survey found that only 58% of U.S. primary care physicians were aware of HPV vaccine SCDM recommendations for mid-adults, and 57% were uncertain about what to emphasize in these discussions, undermining their ability to engage effectively.[14] Additionally, another 2019 survey revealed that some U.S. obstetricians and gynecologists lacked an understanding of HPV vaccine safety and insurance coverage, creating potential barriers to accurate SCDM conversations.[15] Furthermore, a 2021 survey revealed that only half of U.S. healthcare providers correctly answered an objective knowledge question about HPV SCDM recommendations, which could contribute to inequities in discussions with patients.[16]

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Emerging research also indicates that U.S. mid-adults' face significant challenges related to knowledge, attitudes, and beliefs about HPV vaccination, which further complicate SCDM.[11,17–21] For example, surveys from 2020 revealed that only 38% of U.S. mid-adults were aware that the HPV vaccine was approved for their age group,[17] while 80% expressed a need for more information on topics such as vaccine safety, effectiveness, personal benefits, provider recommendations, side effects, and risks.[11] Additionally, a 2018 survey highlighted disparities in HPV vaccine-related knowledge, favoring women and mid-adults with higher education levels.[18] Qualitative studies conducted with mid-adults in the Inland Empire, California, following updated ACIP guidance further identified concerns about embarrassment and stigma as barriers to HPV vaccination.[19,20] Moreover, multiple studies suggest that being in a monogamous relationship can diminish mid-adults' motivation to get vaccinated, despite the fact that relationship status may not accurately reflect HPV risk.[19–21]

In contrast, research on broader barriers and facilitators to HPV vaccination has primarily focused on younger populations.[22–28] Systematic reviews of U.S. and global studies published before 2020 identify several key factors influencing HPV vaccination among adolescents and young adults, including recommendations from healthcare providers, knowledge about HPV and the vaccine, financial considerations, perceived risk of HPV infection, perceived necessity of vaccination, concerns about safety and efficacy, social norms, and trust in vaccination programs and healthcare providers.[22–25] A review of qualitative studies involving U.S. girls and women aged 9 and up from 2013 to 2023 emphasized the need for healthcare teams to impart knowledge and skills on patients to shift norms away from HPV vaccine hesitancy and improve uptake.[26] Global studies focusing on Indigenous populations from 2008 to 2020 have identified unique barriers to HPV vaccination, such as colonial systems and inadequate culturally appropriate awareness campaigns, and emphasized the need for community-oriented education and equity-oriented practices to enhance vaccine uptake.[27] Additional studies examining specific U.S. populations, such as migrant farmworkers in Florida and rural residents in Georgia from 2015 to 2022, have uncovered practical challenges affecting HPV vaccination among young adults and adolescents, including lack of transportation, time constraints, and employer inflexibility.[28,29]

Widespread implementation of SCDM for mid-adults could advance efforts to eliminate HPV-associated diseases.[30] Evidence indicates that barriers and facilitators to HPV vaccination vary by age, location, and other sociodemographic factors,[21,31,32] making it crucial to study diverse samples of mid-adults to inform effective SCDM interventions. This qualitative study utilizes focus groups with a diverse sample of unvaccinated mid-adults from a U.S. medically underserved area to explore these barriers and facilitators. Medically underserved areas, as defined by the U.S. Health Resources and Services Administration, face a significant shortage of primary care services,[33] which can limit opportunities for both SCDM and vaccination. Consequently, this study aims to both enhance understanding of the unique challenges mid-adults face regarding HPV vaccination and provide valuable insights into inform interventions in areas with limited primary care resources.

Methods

The University of California, Riverside Socio-Behavioral Institutional Review Board approved the study (#HS19-288), which was conducted in accordance with the principles outlined in the Belmont Report. We used a cross-sectional observational design, collecting qualitative data through focus groups. This data collection was part of a broader investigation of mid-adults' (a) knowledge, attitudes, and beliefs about HPV vaccination (findings published elsewhere)[19,20] and (b) perceived barriers and facilitators to HPV vaccination (the focus of the current study). To ensure transparency, we followed the Standards for Reporting Qualitative Research (SRQR) checklist.[34] The research team was well-equipped to conduct the study, with both authors holding Master of Public Health degrees; the senior author also completed doctoral-level training in qualitative research methods and has a track record of published research on HPV vaccination.

Study site

We selected the Inland Empire as our study site – a vast 27,000-square-mile region of Southern California with a population exceeding 4.5 million.[35] Comprising Riverside and San Bernardino Counties, the region consists of both urban centers and sparsely populated rural areas.[35] The region is designated as a medically underserved area due to significant healthcare provider shortages, with only 42 primary care physicians per 100,000 people, compared to the California state average of 60 and the recommended supply of 60–80.[35,36] The expansive geography intensifies healthcare access challenges for some residents who must travel long distances to receive essential medical care.[35] Approximately 13.7% of Inland Empire residents live below the federal poverty line, 34.9% have a college degree, and 9.4% lack health insurance.[35] The population is racially and ethnically diverse, with approximately 51.6% identifying as Hispanic, 31.5% as non-Hispanic White, 7.1% as Black, and 6.8% as Asian.[35]

Participants and recruitment

Recruitment details are published elsewhere.[19,20] Briefly, we used advertisements in community health clinics, local health organization listservs, and targeted social media posts to recruit a purposive sample of mid-adults eligible for SCDM about HPV vaccination who were diverse in terms of gender and race/ethnicity. Potential participants completed an online consent form and demographic survey in Qualtrics (version September 2020, Qualtrics, Provo, UT), chose a pseudonym to link their demographic information to focus group data, and provided contact details for scheduling. To ensure the validity of the survey questions, we used standard items from surveys administered by the U.S. Census Bureau and U.S. Centers for Disease Control and Prevention.[37]

Registrants were eligible to participate in the study if they had indicated on the demographic survey that they were

27–45 years old, had never received any HPV vaccinations, could read and write in English, lived in Riverside or San Bernardino counties, had access to an internet-enabled device (computer, tablet, or smartphone), and self-identified as Asian, Black, Hispanic, and/or White (the most predominant racial/ethnic groups in the region). Non-eligible registrants were screened out. To promote the collection of valid, quality focus group data, we carefully reviewed registrants' survey and IP-based geolocation data (i.e., the latitude and longitude associated with the IP address of the device used to complete the survey) prior to inviting them to a focus group. We excluded likely fraudulent registrants, such as those who made multiple attempts to screen into the study or registered from outside California. One hundred and twenty-four registrants were invited to participate in the study and 86 attended focus groups and received $30 gift cards as incentives.

Focus groups

We conducted text-based online focus groups using Adobe Connect (version 11, Adobe Systems, San Jose, CA) to accommodate the COVID-19 pandemic and ensure participation was possible for individuals with low-bandwidth internet.[38] Although we could not compare data obtained from our online focus groups to data that would have been collected in person, evidence suggests these modalities generate remarkably similar qualitative themes and conclusions and that text-based focus groups elicit a more candid discussion of sensitive topics.[39–42] Online focus groups have additionally been shown to facilitate the inclusion of population subgroups that face logistical barriers (e.g., time, transportation) to in-person participation, who are geographically dispersed, or are otherwise unwilling to participate in face-to-face groups.[42,43]

From September 2020 to January 2021 the senior author, experienced in focus group facilitation, and a research assistant (see acknowledgments) co-facilitated 14 gender-stratified focus groups (6 with men, 8 with women) with 4–11 participants in each group. Participants were unknown to the facilitators before joining the study and used pseudonyms to ensure anonymity from one another, creating an environment that encouraged candid responses.[44] We employed a semi-structured focus group discussion guide, allowing the flexibility to ask follow-up questions when needed, and focused on the questions detailed in Table 1 for the present study. The focus group discussion guide was reviewed by a senior public health researcher with expertise in HPV vaccination and focus groups (see acknowledgments), and performed well during an initial pilot focus group, allowing us to include data from the pilot group in our analyses. No baseline educational material was given to focus group participants, however the facilitators shared basic information from the U.S. Centers for Disease Control and Prevention in response to participants' unsolicited questions about HPV and vaccination that they could not resolve among themselves (e.g., "Is the vaccine administered to both genders?"). The full focus group discussion guide and summaries of questions posed by participants are published elsewhere.[19,20]

Data analysis

The senior author, trained in statistical analysis, exported the demographic data from the Qualtrics survey into Stata (version 16, Stata-Corp, College Station, TX) and generated summary statistics, including frequencies, medians, ranges, and interquartile ranges. The senior author also exported the focus group chat logs from Adobe Connect into a single table in Microsoft Excel for Microsoft 365 (version 2211, Microsoft Corporation, Redmond, WA) and deidentified the data. We then analyzed the focus group data using the "rigorous and accelerated data reduction" (RADaR) technique, which involved creating and refining comprehensive data tables through multiple revisions to produce focused themes.[45]

The RADaR analysis involved multiple steps. First, the first author reviewed all focus group data in relation to the question: "What are mid-adults' perceived barriers and facilitators to HPV vaccination?" Text unrelated to this question was deleted. Next, the first author independently analyzed the remaining data using an open-coding process to identify preliminary codes, which they then refined and organized into broader concepts and themes.[46] For example, codes capturing "fear of needles;" concerns about "vaccine safety," "allergies to vaccine ingredients," and "non-specific vaccine side-effects;" along with worries that HPV vaccination could lead to "infertility," "paralysis," "gene mutations," and "death" were grouped into two broader concepts: "concerns about possible vaccine-related side-effects" and "worries rooted in misinformation." These categories were ultimately combined into the overarching theme of "vaccine hesitancy." This inductive approach, which borrows coding techniques from grounded theory, ensured that findings emerged directly from the data without the influence of preconceived theories, categories, or codes, allowing for the discovery of unanticipated patterns and themes.[46]

Table 1. Relevant questions from the semi-structured focus group discussion guide.

Topic	Sample Questions
Barriers to HPV Vaccination	What might prevent you from being vaccinated against HPV? *Probes*: • What might make it difficult for you to access the HPV vaccine? • What might make it difficult for others in your community to access the HPV vaccine? • What might make it difficult for you to be vaccinated against HPV? • What might make it difficult for others in your community to be vaccinated against HPV?
Facilitators to HPV Vaccination	What might help you to get vaccinated against HPV? *Probes*: • What might make it easy for you to access the HPV vaccine? • What might make it easy for others in your community to access the HPV vaccine? • What might make it easy for you to be vaccinated against HPV? • What might make it easy for others in your community to be vaccinated against HPV?

To enhance trustworthiness of the analysis, the senior author reviewed all of the coded data tables to confirm interpretations, resolving any discrepancies through discussion. Finally, for each theme, we collaboratively created final data tables that included relevant quotes linked to participants' gender and race/ethnicity, using their chosen pseudonyms. Research demonstrates that 90% of themes are discoverable within three to six focus groups.[47] Analysis of our eleventh focus group showed no new codes, suggesting we reached thematic saturation.

Results

Table 2 summarizes the demographic characteristics of the sample. Participants ($N = 86$) ranged in age from 27 to 45 years (median = 31 years) and had household incomes ranging from $0 to more than $150,000 (median = $55,000). Sixty-nine percent ($n = 59$) had a bachelor's degree or higher education level and 84% ($n = 72$) had health insurance. Reflecting the ethnic and racial diversity of the region, 42% identified as Hispanic ($n = 36$), and a further 27% ($n = 23$) identified as non-Hispanic Black, Asian, or multiracial. Twenty-one percent ($n = 18$) identified as gay, lesbian, or bisexual, and 51% ($n = 44$) were married or in a domestic partnership.

Qualitative analyses revealed ten barriers and five facilitators to HPV vaccination, which are summarized in Table 3 and discussed in order of frequency below.

Perceived barriers to HPV vaccination

Lack of awareness regarding HPV vaccine eligibility and access was mentioned as a barrier in all 14 focus groups. Men and women reported believing they were ineligible for HPV vaccination due to age or being past sexual debut, and some men also cited being ineligible due to gender. Participants also underscored a general lack of awareness about where to access HPV vaccination within the community. "Robert," a Hispanic man, pointed out, "not so many people are knowledgeable about it [HPV vaccination] and probably where to access the vaccine."

Vaccine hesitancy emerged across all 14 focus groups, with participants expressing concerns that would deter them from seeking HPV vaccination. These concerns included fear of needles, injection-site pain, allergies to vaccine ingredients, and nonspecific side-effects. "Sunni," a White woman, articulated, "I've turned it [HPV vaccination] down as I have a fear of needles as well as worried about side effects." In nine focus groups, participants also mentioned specific worries related to infertility, paralysis, gene mutations, death, or beliefs that the vaccine's safety profile was unknown, that were rooted in misinformation. For example, "Ricky," a Black man, expressed "I think it can cause death and some mutation changes."

Perceived unaffordability emerged as a theme in all 14 focus groups. Some participants expressed that HPV vaccination would be prohibitively expensive, while many others were uncertain about whether their insurance plans covered HPV vaccination. "Samantha," an Asian woman, emphasized, "If I am not required to get it, I wouldn't be able to make room in my budget to afford it." Additionally, some mothers reported that while they would prioritize their resources to cover any out-of-pocket costs associated with HPV vaccination for their children, they would not do so for themselves.

Lack of healthcare provider communication was emphasized in 13 focus groups. Several participants, including those

Table 2. Demographic characteristics of the sample ($N = 86$ participants).

	N or Median	% or Range (IQR)
Age, years	31	27–45 (8)
Gender[a]		
Man	34	39.53
Woman	52	60.47
Household income in 2019, USD[b]	55,000	0–150,000+ (70,000)
Highest Educational Degree Completed		
High School Diploma or GED	17	19.77
Associate Degree	10	11.63
Bachelor's Degree	32	37.21
Graduate or Professional Degree	27	31.40
Marital Status		
Married/domestic partnership	44	51.16
Single/divorced/separated	42	48.84
Race/Ethnicity		
Hispanic	36	41.86
Asian, non-Hispanic	5	5.81
Black, non-Hispanic	14	16.28
White, non-Hispanic	27	31.40
Multiracial	4	4.65
Sexual Orientation		
Heterosexual	68	79.07
Bisexual	4	4.65
Gay or lesbian	14	16.28
Health Insurance		
Insured	72	83.72
Uninsured	14	16.28

Notes: [a]Includes both cisgender ($n = 84$) and transgender ($n = 2$) men and women.
[b]Highest income value is suppressed to protect participant confidentiality.

Table 3. Perceived barriers and facilitators to HPV vaccination and illustrative quotes ($N = 86$ participants across 14 groups).

	Illustrative Quote	# Groups
Perceived Barriers		
Lack of awareness	"I feel like a lot of those who could benefit [from HPV vaccination] have no idea." ("Biggie," White woman)	14
Vaccine hesitancy	"I feel like it's too soon [to get the HPV vaccine] and data doesn't exist yet." ("Greenleaf," Hispanic woman)	14
Perceived unaffordability	"I don't have a medical insurance cover[age], so I feel that [HPV vaccination] would be costly for me." ("Sandy," Black woman)	14
Lack of healthcare provider communication	" . . . none of my doctors, primary or ob/gyn, have asked me to take one [an HPV vaccine]." ("Kay," Asian woman)	13
Insufficient time	"We work when clinics are open, so it's difficult." ("Sprouts," Black woman)	13
Fear of moral judgment	"We have a large population of Latino and working-class folks. . . While I didn't feel a social stigma to get the vaccine, I think others in conservative/Catholic communities might." ("Quenti," Hispanic woman)	12
Lack of motivation	"Most people are exposed to HPV anyway and most don't progress to cancer." ("Panchy," Asian woman)	10
Information needs	"I think in the community the biggest issue to these [HPV] vaccines is the lack of information. Especially for those who don't regularly visit doctors." ("Olympia," Hispanic woman)	10
Foregone care during the COVID-19 pandemic	"I have postponed my yearly physical for the past 12 months due to COVID!" ("Herb," White man)	3
Lack of reliable transportation	"I think that transportation is also a huge issue." ("Cali," White woman)	3
Perceived Facilitators		
Tailored information	"There needs to be more education about it and visibility, especially bilingual (English/Spanish) for the IE [Inland Empire]." ("Quenti," Hispanic woman)	12
Cost mitigation	"For the first shot to be given for free, while the rest should be affordable for everyone. Say like $20-$30." ("Cristina," Hispanic woman)	12
Enhanced accessibility	"Kind of like the flu shot it's available everywhere any time so that is helpful. For example I never get the flu shot but this year I did and the minute I decided I just went and got it. I dread making appointments. Especially doctor ones." ("Olympia," Hispanic woman)	12
Provider-initiated conversations	"Making it the standard of care to include. . . HPV vaccine education during every adult physical across the board. Create uniformity so that folks don't fall through the cracks depending on where they live or what type of coverage (or lack there of) they have." ("Ali," Hispanic man)	6
Reminders	"Also, a reminder to get it, either in the mail or at the visit." ("Olivia," White woman)	4

previously eligible for HPV vaccination before age 27, cited lack of healthcare provider communication as the primary reason for not having already been vaccinated against HPV. Some reasoned that the shortage of healthcare providers in the Inland Empire contributes to a lack of care continuity, diminishing opportunities for provider-initiated communication about vaccines. For instance, "Sprouts," a Black woman, highlighted, "I don't have a regular primary care physician because physician density is low . . . there is no one with a long-term knowledge of my health history."

Insufficient time to schedule and attend three separate HPV vaccine appointments arose in 13 focus groups. Some participants also stressed their inability to take time off work for vaccination appointments. "Sully," a multiracial man, shared: "Time off from work to go to the doctor – if it's three vaccines on three different dates, that's an inconvenience since it'll have to be during a typical 8–5 workday."

Fear of moral judgement emerged as a barrier in 12 focus groups. Participants expressed concerns about negative reactions from healthcare providers, friends, family, or sexual partners should they decide to seek HPV vaccination, given the sexually transmitted nature of HPV. "Agnes," a White woman, recounted her experience with such judgment during a previous healthcare encounter: "Earlier this year is when the nurse told me that my age was fine, I could still get the [HPV] vaccine, but she basically told me it's only good if I sleep around a lot and I felt very uncomfortable with her saying that. I felt judged, I guess, for even considering it."

Lack of motivation was cited in 10 focus groups. Some participants expressed views that HPV was not serious enough to warrant vaccination. For instance, "Angela," a White woman, remarked, "I was surprised when my oldest child was old enough and they recommended the vaccine. I said 'wait I thought it [HPV] wasn't a big deal.'" Others, including "Sprouts," a Black woman, reported a lack of motivation because HPV infection was unlikely to lead to cancer-related death: "The prevalence of HPV infection is so high, that survival and avoiding cancer may be likely." Other reasons for low motivation included not knowing anyone who had received the vaccine, believing safer sex practices were sufficient for HPV prevention, or not currently being sexually active.

Information needs were identified as a barrier in 10 focus groups. Participants expressed a need for easily accessible and age-specific information about HPV vaccine safety and efficacy to make informed vaccination decisions. "Cookie," a Black woman, emphasized, "I'd like to know first how the vaccine has helped the older people who recently got vaccinated." Some participants also speculated that language barriers exacerbated information-related needs for non-English speakers in the region.

Foregone care during the COVID-19 pandemic was noted as a barrier in three focus groups, with participants recounting decisions to avoid non-urgent healthcare. For example, "Nuna," a White woman, emphasized the pandemic deterred her from attending her first scheduled HPV vaccination appointment, stating: "I actually had an appointment to finally do it [get the HPV vaccine] but then the pandemic hit and [I] did not feel that it was crucial to do it at this moment."

Lack of reliable transportation was identified as a barrier in three of the focus groups conducted with women. "Farrier," a White woman, stressed: "public transportation here is awful."

Perceived facilitators to HPV vaccination

Tailored information about HPV vaccination for adults aged 27–45 was suggested to facilitate HPV vaccination in 12 focus groups. Participants stressed the need for such information to

be accessible across various platforms (e.g., websites, podcasts, television) and in multiple languages. Participants emphasized that tailored messaging should focus on the vaccine's ability to prevent various cancers rather than the sexually transmitted nature of HPV. "Biggie," a White woman, stated, "I think if we discussed its benefits (cancer reduction and showed data to prove this), people would be more willing to get this vaccine." Others emphasized the importance of community outreach workers raising awareness, along with the value of community members sharing their personal success stories about HPV vaccination.

Cost mitigation emerged as a proposed facilitator in 12 focus groups, with participants suggesting strategies such as providing transparency about insurance coverage and introducing low- or no-cost HPV vaccine initiatives. For instance, "Lucius," a Hispanic man, expressed: "Not everyone around here has medical insurance; the cost is too high. If there was a free clinic where you don't have to pay for the Dr appointment."

Enhanced accessibility of HPV vaccines was proposed in 12 focus groups and included suggestions for more diverse vaccine locations (e.g., pharmacies, pop-up clinics, mobile units), extended hours at vaccination sites, and the option to access HPV vaccines during walk-in medical or pharmacy appointments. For example, "Mac," a Hispanic man, recommended, "mobile vaccination units that travel to communities to spread education and offer low cost/free vaccines would be ideal."

Provider-initiated conversations about HPV vaccination was suggested as a facilitator in six focus groups. Some participants highlighted their reliance on health providers for trustworthy vaccination advice and expressed willingness to get vaccinated if recommended. "Quenti," a Hispanic woman, emphasized, "I feel like if my doctor had recommended it to me, I would have taken it a long time ago."

Reminders about vaccine eligibility and vaccine appointments was proposed as a means of facilitating HPV vaccination in four focus groups. This involved suggestions for automated notifications from healthcare providers regarding HPV vaccine eligibility and scheduled appointments. "Quenti," a Hispanic woman, stressed, "frequent reminders would be a must – like automatic emails. Setting up all 3 appointments at once too, but with flexibility to change them if needed as the date approaches."

Discussion

This among the first qualitative studies to explore a broad range of barriers and facilitators to HPV vaccination specific to U.S. mid-adults aged 27–45, following FDA approval for this age group. Since mid-adult HPV vaccination involves assessing individual risk of new HPV infection through SCDM with a healthcare provider, it may not have been suitable for every participant in our study. Nevertheless, our findings point to strategies to enhance SCDM and promote HPV vaccination among mid-adults who could benefit, particularly those in medically underserved areas with limited primary care resources. Below, we outline the key challenges to HPV vaccination identified in our study and propose intervention strategies recommended by our participants and supported by previous research.

First, mid-adults in our study identified patient-level barriers to HPV vaccination that reflect those in younger populations,[22–26] including low awareness, vaccine hesitancy, and lack of motivation. They further emphasized a need for information on age-specific safety and efficacy, recommending that tailored messages – especially regarding the vaccine's role in cancer prevention – be shared through various platforms. A 2020 survey similarly found that many U.S. mid-adults require more personalized information about the benefits of HPV vaccination to make informed decisions.[11] This underscores the need for targeted educational interventions, which have been effective in improving HPV vaccine acceptance and uptake among younger populations, particularly when combined with improved access and reminder systems.[48,49] Engaging community members in developing and implementing these interventions, as suggested by our participants, can enhance their cultural sensitivity and ensure messaging resonates with the target audience.[50] Participants also recommended automated reminders about vaccine eligibility and appointments, a suggestion supported by previous studies,[51] which could assist mid-adults in initiating and completing the HPV vaccine series while complementing educational efforts.

Second, our study revealed that both cultural and health system barriers impede SCDM conversations between mid-adult patients and healthcare providers, which are a prerequisite to HPV vaccination. Participants reported concerns about moral judgment as a cultural barrier, which would discourage them from initiating conversations about HPV vaccination with healthcare providers. This issue may be particularly pronounced in medically underserved areas, where inconsistent primary care can undermine the trust and rapport needed for open discussions about sexual health.[52] Additionally, the lack of healthcare provider-initiated communication emphasized by our participants highlights a health system barrier, likely due to insufficient guidance for healthcare providers to identify patients who would benefit most from HPV vaccination.[16] Providers in medically underserved areas often face challenges such as time constraints and incomplete sexual history records,[53,54] complicating their initiation of these discussions. Previous research underscores the need for decision-making tools to help providers efficiently identify mid-adult patients who could benefit from HPV vaccination.[11,16] Given that pharmacists are trusted healthcare professionals authorized to administer HPV vaccines in most states,[55,56] and that pharmacies were noted as a preferred location for vaccine access in our study, equipping pharmacists with decision-making tools could enhance SCDM opportunities for mid-adults with inconsistent primary care.

Third, our study found that perceived unaffordability was a common barrier to HPV vaccination among mid-adults, with many participants reporting concerns about insurance coverage and out-of-pocket costs. The list price for the complete three-dose 9-valent HPV vaccine series is about $860.[57] However, most employer and private insurance plans as well as state Medicaid cover the full cost of HPV vaccination up to age 45.[57,58] Uninsured mid-adults with household incomes below certain thresholds (i.e., ≤$60,240 for individuals, ≤$81,760 for

couples, and ≤$124,800 for a family of four in 2024) can receive free HPV vaccination through the manufacturer's assistance program.[59] Given that 84% of participants in our study had health insurance and the median household income was $55,000, most would have qualified for free vaccination. A 2019 survey of U.S. obstetricians and gynecologists found 30% were unaware that insurers were mandated to cover HPV vaccination under the ACA,[15] hence some healthcare providers may reinforce perceived unaffordability concerns among patients. Addressing perceived unaffordability thus requires increasing awareness of insurance eligibility and patient assistance among both mid-adults and healthcare providers.

Fourth, our study identified perceived access-related barriers to HPV vaccination, including time constraints and transportation issues. Participants anticipated they would need to schedule and attend multiple medical appointments during their typical working hours to acquire HPV vaccines. In medically underserved areas, long wait times at providers' offices are common and can exacerbate time-related obstacles to acquiring vaccines.[60,61] Additionally, unreliable public transportation and the lack of personal vehicles prolongs the travel time required to access vaccines, disproportionately burdening lower socioeconomic status, Black, and Hispanic populations,[62,63] and, as our results suggest, women. Bundling SCDM and HPV vaccination with routine healthcare encounters (e.g., physicals, well-woman exams), other vaccinations (e.g., flu, tetanus, COVID-19), and other healthcare services offered in diverse clinical and community settings (e.g., mobile clinics, STI testing, dental care), could help to enhance HPV vaccine accessibility for mid-adults by reducing the need for repeated vaccine-specific medical appointments.[64–67]

Finally, the COVID-19 pandemic presented an additional barrier to mid-adult HPV vaccination, with some participants recounting experiences of foregone vaccine appointments and other healthcare. This finding complements a recent quantitative study that reported 8.6% of U.S. adults ages 18–45 who had intended to receive the HPV vaccine experienced a pandemic-related disruption in 2021.[68] Although pandemic-related barriers have likely eased since our data was collected in 2020–2021, this barrier may still impact mid-adults with underlying medical conditions that increase their risk of severe COVID-19. Reminder messages about safety measures to prevent disease exposure during vaccine appointments and the availability of vaccines in nontraditional settings (e.g., outdoors, drive-through clinics) have been proposed as promising strategies for preventing missed HPV vaccine opportunities during COVID-19 and future pandemics,[69] and may help to reduce missed opportunities for HPV vaccination among mid-adults.

Strengths and limitations

The findings of this study are specific to a non-probability sample of unvaccinated mid-adults and cannot be generalized to the entire Inland Empire or beyond. While our qualitative approach helped identify promising strategies for facilitating SCDM and HPV vaccination among mid-adults, rigorous study designs – such as cohort studies and controlled trials – are needed to validate their effectiveness. To ensure sample integrity, we implemented measures to prevent fraudulent participation, including screening of registrants, reviewing IP-based geolocation data, and offering a gift card incentive redeemable only within the United States, however we did not require participants to confirm their identities.

Our sample had a lower median household income ($55,000) compared to the regional average ($65,512) and included a higher percentage of uninsured individuals (16.3%) compared to the regional rate (9.4%), which are factors that may have heightened perceived unaffordability concerns.[35] Although the ACA mandates that most health insurers cover vaccines recommended for SCDM,[12] we were unable to determine the percentage of participants with HPV vaccination coverage because we did not ask if their insurance plans included this benefit. Most participants (68.6%) held a bachelor's degree or higher, which could amplify the informational needs[11] reported in our study and have resulted in an under-reporting of barriers experienced by individuals with lower educational attainment. Recruitment challenges resulted in a higher proportion of women than men in our sample; however, by gender-stratifying our focus groups we discerned that 14 out of the 15 barriers and facilitators (93.3%) identified were relevant to both genders. Due to funding limitations, we were unable to conduct focus groups with Spanish speakers and other non-English speakers, who may experience different perceived barriers and facilitators to vaccination.

While conducting focus groups online excluded individuals without internet access, the text-based format made participation possible for those with low-bandwidth internet and may have also facilitated engagement from groups that face disproportionate logistical barriers to in-person participation, such as individuals with low socioeconomic status or from racial and ethnic minority backgrounds, thus promoting a diverse range of perspectives.[43] Additionally, while face-to-face focus groups are often susceptible to social desirability bias, text-based online focus groups reduce this bias by preserving participant anonymity, thereby enhancing honest participation and encouraging equal contributions.[39,42,44] Although this format typically generates less data (i.e., fewer words) than obtained in face-to-face groups, evidence suggests it yields data of comparable quality and prevents any one participant from dominating the conversation.,[39–44]

Conclusion

This qualitative study provides critical insights into HPV vaccination barriers and facilitators among U.S. mid-adults eligible for SCDM, with implications for vaccination interventions in California's Inland Empire and other medically underserved areas. Our findings highlight how both cultural and health system barriers can hinder SCDM between mid-adults and their healthcare providers, alongside challenges like low awareness, lack of motivation, vaccine hesitancy, perceived unaffordability, and access issues. The study's major contribution is its identification of actionable strategies – such as tailored educational interventions, equipping pharmacists with decision-making tools, and integrating HPV vaccination into other healthcare encounters – that may help facilitate SCDM and HPV vaccination in areas with limited primary care resources. Further

evaluation is needed to determine whether the proposed strategies lead to meaningful outcomes for this population in practice.

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Both authors contributed equally to this manuscript. SK led the analysis and interpretation of the data and the writing of the original manuscript draft. ANP conceived of and designed the study, contributed to the analysis and interpretation of the data, critically revised the manuscript draft for intellectual content and in response to reviewer feedback, and secured the project funding. All authors approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Data availability

Supporting data is not publicly available due to ethical restrictions in place to protect the privacy of research participants, who did not provide consent for their data to be shared publicly. Inquiries related to supporting data availability should be directed to the principal investigator of the study (ANP) at apolonijo@ucmerced.edu

Ethical approval and consent to participate

The study was approved by the Socio-Behavioral Institutional Review Board at the University of California, Riverside (IRB# HS 19–288) and conducted in accordance with the principles outlined in the Belmont Report. All study participants provided informed consent prior to enrollment.

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