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RESEARCH ARTICLE



Mothers' perceptions and attitudes about HPV vaccination initiation among 9- and 10-year-olds

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ABSTRACT

HPV vaccination has potential to prevent 90% of HPV-associated cancers. The Advisory Committee on Immunization Practices recommends HPV vaccination for 11- and 12-year-olds, but vaccine initiation can start at age 9. The purpose of this study was to explore perceptions about starting HPV vaccination at a younger age to inform future interventions that promote initiation at ages 9 and 10 years. This was part of a larger study about vaccine hesitancy among racially/ethnically diverse parents of adolescents in the Greater Newark Area of New Jersey. We thematically analyzed transcripts from 16 interviews with English- and Spanish-speaking mothers who had at least one child ≤ 10 years. Analyses focused on perceptions of HPV-related disease risk, attitudes toward HPV vaccination need, and vaccine confidence specifically for 9- and 10-year-olds. Few parents with young adolescents reported receiving vaccination recommendations, and only one reported series initiation before age 11. Mothers' hesitation about younger HPV vaccination initiation revolved around: 1) low perceived necessity among English-speaking mothers due to young adolescents not being sexually active, 2) concerns about potential side effects associated with vaccinating prepubescent adolescents, and 3) a desire for adolescents to be old enough to provide assent. Participants were not opposed to younger initiation but wanted and relied on pediatricians to inform them about vaccination for younger adolescents. These findings suggest mothers are willing to vaccinate at younger ages after clear provider recommendations. Equipping providers with evidence about vaccine safety and cancer prevention communication strategies may promote initiation and timely completion at younger ages.

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Introduction

The HPV vaccine can prevent 90% of HPV-associated cancers (i.e., oropharyngeal, cervical, anal, penile, vaginal, vulvar),^{1–4} as well as other diseases (e.g., genital warts) caused by HPV.^{5,6} The Advisory Committee on Immunization Practices (ACIP) recommends two doses of the HPV vaccine at 11 or 12 years-old, but vaccination can start as early as 9 years of age.⁷ For teens who initiate at age 15 or older, ACIP recommends three doses of the vaccine. Health care providers are encouraged to clearly recommend the HPV vaccine to parents of adolescents by announcing the child is due and “sandwiching” the HPV vaccine between the other adolescent vaccines (Tdap and Meningococcal) to increase uptake.^{8–10} Despite over a decade of implementation, HPV vaccination remains much lower than other adolescent vaccines.^{11–13} For example, 2022 NIS-Teen data indicate roughly 89% of adolescents aged 13–17 years received ≥ 1 doses of both Tdap and MenACWY, while only 76% received ≥ 1 dose of the HPV vaccine.¹³ However, HPV vaccination rates may be lower as some insurance claims and surveys suggest for certain adolescent populations^{14,15} and among young adults.^{16,17} More importantly, race/ethnicity, gender, and age differences in HPV vaccination must be addressed to eliminate disparities in HPV-associated cancers.¹⁸

The American Cancer Society and American Academy of Pediatrics endorse the younger starting age,^{19,20} rather than bundling HPV vaccination with other adolescent vaccines.²¹ Removing barriers to provider recommendations, such as disconnecting their communication about the HPV vaccine from discussions of sexual activity,²² vaccinating prior to sexual debut,²³ and reducing the number of vaccines received during a single appointment are notable potential benefits to younger initiation.²⁴ Vaccination at ages 9–10 years is associated with timely series completion.^{25–27} An analysis of NIS-Teen data found prevalence of being up-to-date was 27% higher for younger initiators (ages 9–10 years) compared to older initiators (age ≥ 11 years).²⁸ In fact, HPV vaccine initiation at a younger age may reduce sex differences and insurance barriers.²⁸ Multiple interventions have been proposed and are currently being tested using the earlier initiation age for HPV vaccination.^{27,29–31} However, historically uptake has been very low for 9-year-olds, and more recently in 2020, still only 4% of US adolescents initiated the vaccine series before age 11 years.³²

Therefore, the purpose of this study was to examine qualitative interview data from a larger study on adolescent vaccination and vaccine hesitancy among a racially/ethnically diverse sample of parents of adolescents 9–13 years. This report focuses on perceptions and attitudes toward younger

HPV vaccination among parents with children ≤ 10 years of age to inform the development of interventions to promote younger series initiation.

Materials and methods

This analysis is part of a larger study investigating HPV vaccine hesitancy in the Greater Newark Area of Northern New Jersey (NJ), containing two of the most racially/ethnically diverse cities (i.e., Jersey City and Newark) in the state.^{33,34} We recruited parents from two counties (Essex and Hudson) purposefully targeting geographic areas with low vaccination rates, low-income, and high proportions of Black and/or Hispanic residents. We recruited through community partners at food pantries, public libraries, schools, health fairs, and family events in the study counties.

Parents (i.e., mothers and fathers) with adolescents aged 9 to 13 years, who made health care decisions for their adolescent(s), resided in the study counties, and spoke English or Spanish were eligible to participate. We distributed study information online, via flyers, and had in-person conversations with potential participants. After confirming eligibility, potential participants consented and were then enrolled in the study before scheduling their interviews. Because the interviews were conducted via Zoom, we gave participants the option of consenting to an audio-only or video-recorded interview. Female social scientists (KC, RW) trained in anthropology and health psychology conducted interviews in the participants' preferred language from May 2021 to February 2022 until we reached data saturation (i.e., when we stopped hearing new ideas or themes during the interviews).

Data collection and analysis were informed by the WHO Vaccine Hesitancy Determinants Matrix³⁵ and the Increasing Vaccination Model,³⁶ which outline the contextual and psychosocial factors that influence vaccine hesitancy and vaccination behaviors. We previously described³⁷ our conceptual model and semi-structured interview guide, but briefly, we included questions about vaccination information sources, knowledge, beliefs, and vaccination behaviors. We specifically probed on HPV risk perceptions, HPV vaccination benefits, harms, the influence of child age and gender on perceptions of vaccination, and vaccination conversations with providers. Two bilingual and bicultural study team members (KC, JV) translated materials separately, compared translations, and discussed discrepancies to confirm the cultural appropriateness of the interview guide for the Spanish-speaking population in our target communities. Recordings were professionally transcribed, de-identified, and organized in NVivo 2020 for coding and analysis.

All transcripts were read, summarized, and double coded by study staff trained in anthropology, health psychology, and public health (KC, RW, JV). We created an initial codebook organized according to the main concepts of the conceptual frameworks and independently applied it to two transcripts to compare how codes were applied. Additional codes were created as themes emerged from the data. We held weekly meetings to merge and compare coding and discuss discrepancies. Spanish transcripts were coded by bilingual study staff (KC, JV) and analyzed as a subgroup, then compared and combined

with English transcripts. Key quotes from Spanish transcripts were translated and back translated for accuracy; translations were included in English for publication. The multidisciplinary analytic team (REK, KC, RW, JV) met weekly to review and discuss interview summaries and analytic memos that detailed emerging themes and interpretations. Following an immersion-crystallization approach,^{38,39} multiple rounds of analysis occurred for reflexivity, corroboration, and synthesis.

Although we recruited 22 participants until saturation for the larger study, this manuscript only includes analysis of 16 interviews with parents who had at least one child ≤ 10 years to focus on perceptions about vaccination of younger adolescents. Upon comparing responses from these mothers of children ≤ 10 with those of only older adolescents (aged ≥ 11 years), we observed few differences in their responses aside from parents of younger children using stronger language when discussing HPV vaccine necessity in relation to age compared to parents of older adolescents. Therefore, the following results only include themes emerging from interviews with mothers of younger children as their comments may be more relevant for informing future interventions for younger vaccination initiation.^{40,41}

The study protocol was reviewed and approved by the authors' institutional IRB. The Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist guided data analysis procedures and reporting of the findings.⁴²

Results

We identified parents' knowledge gaps regarding HPV vaccination recommendations generally and the younger starting ages specifically. We also identified the following key concerns regarding HPV vaccination before age 11 from the interview data: 1) low perceived necessity of vaccination among non-Spanish-speaking mothers due to young adolescents not being sexually active, 2) potential side effects associated with vaccinating prepubescent adolescents, and 3) a desire for adolescents to assent to vaccination. Participants also described topics they desired more information about through health care provider counseling as well as educational workshops. Below we describe each of these themes in detail with exemplar quotes.

Sample characteristics

We analyzed transcripts of interviews with 16 mothers (Table 1) who had at least one child ≤ 10 years in English ($n = 12$) and Spanish ($n = 4$). We were unable to recruit any fathers to participate in our study. Most mothers (87%) had multiple children. Three mothers had 9-year-olds and five mothers had 10-year-olds. Thirteen of the mothers had children younger than 9 years who would be eligible for vaccination in the future. Eleven mothers had at least one child aged 11 or older (i.e., should have received a recommendation for the HPV vaccine). All participants were female and over two-thirds were born outside of the US. Mothers were Hispanic (44%), Non-Hispanic (NH)-Black (38%), NH-Asian (12%) and NH-White (6%). Just over two thirds of our sample graduated college while the

Table 1. Sample characteristics of mothers of adolescents from Greater Newark Area of New Jersey.

Characteristics	N (%)
Female	16 (100)
Ethno-racial identity	
Non-Hispanic Black	6 (38)
Hispanic	7 (44)
Non-Hispanic Asian	2 (12)
Non-Hispanic White	1 (6)
Education	
Less than high school	4 (25)
High School graduate	1 (6)
College graduate	11 (69)
Employment status	
Formally employed full/part time	10 (62)
Stay at home mom	3 (19)
Unemployed/Out of work	3 (19)
Language of interview	
English	12 (75)
Spanish	4 (25)
Non-US-born	11 (69)
Aware of HPV vaccine	14 (87)
Mother received HPV vaccine	3 (19)
Adolescent ≥11 years vaccinated	5 (45)*

*out of 11 adolescents ≥11 years.

Table 2. Characteristics of adolescents among mothers interviewed.

Ages of all children ≤13 in household	Ethno-racial identity	Insurance
6, 8, 12	Hispanic*	Medicaid
8, 10, 12	Hispanic*	Medicaid
5, 12	Hispanic*	Medicaid
1, 11	Hispanic*	Medicaid
8, 11	Hispanic	Private
6, 10	Hispanic	Medicaid
10	Hispanic	Private
2, 5, 9, 12	NH Black	Uninsured
2, 4, 10	NH Black	Private
9, 11	NH Black	Private
4, 11	NH Black	Medicaid
6, 9	NH Black	Uninsured
10	NH Black	Medicaid
6, 12	NH White	CHIP
3, 11	NH Asian	CHIP
6, 13	NH Asian	Medicaid

NH, Non-Hispanic; CHIP, Children's Health Insurance Program.

*indicates a participant interviewed in Spanish.

remaining 31% completed high school or less. Most (87%) were aware of the HPV vaccine. Despite three mothers recalling that they received the HPV vaccine as teens or young adults, none of their adolescents were vaccinated yet.

Three quarters of adolescents were insured through Medicaid or Children's Health Insurance Program (CHIP) or were uninsured (Table 2). Five of the adolescents were vaccinated. Four of the vaccinated adolescents in our sample initiated at age 11; one adolescent initiated at age 10. All vaccinated adolescents were either insured through Medicaid/CHIP or were uninsured and received vaccination through NJ's Vaccine for Children (VFC) program.

Few mothers were aware of the recommended ages, especially the youngest starting age 9

Mothers were unfamiliar with the starting age for routine HPV vaccination. Mothers tended to associate HPV vaccination with older adolescents (i.e., teenagers) and young adults.

Learning that HPV vaccination could begin at age 9 was described as "something new." For most participants it was "the first time I was hearing about it [HPV vaccination] with such young people." Although many realized the vaccine is recommended for both girls and boys, a few worried about gendered differences in provider recommendations:

I do take them [my sons] for a regular checkup every year. But she [pediatrician] has never mentioned [the HPV vaccine] at all. And I'm thinking because they're boys versus if I had a girl, she would've mentioned it already by now. I'm thinking that's the reason she hasn't brought it up yet.

— Hispanic mother of 10- and 6-year-old males

Many mothers relied on pediatricians to bring up the HPV vaccine and inform them of when it was due. Importantly, mothers who accepted recommendations for their 11-year-old adolescent were more open to vaccination generally (i.e., less vaccine hesitant) and more willing to accept vaccination for their younger child beginning at age 9 or 10. Even though they "didn't get too many details" from their providers, these mothers indicated they follow routine vaccination recommendations:

We have taken all the vaccines they are supposed to take. So we are good to go now [...] When the doctor says, "This is the vaccine he has to take." He [my son] is going to.

— NH-Black mother of 12- and 9-year-old males

Few mothers received recommendations from pediatricians before their child was 11

Four mothers reported speaking to their pediatricians about HPV vaccination before age 11. Of these, two requested the vaccine, one was primed to expect an HPV vaccine recommendation at the next wellness visit, and one had an optional/conversational recommendation. None of these parents' descriptions of discussions with pediatricians included strong, clear recommendations for initiation at 9- or 10- years old.^{8,43}

Only one adolescent from our sample was vaccinated at age 10 – a proactive Spanish-speaking mother who requested vaccination – however, the other mothers intended to accept when their child became 11 or older.

Although two Spanish-speaking mothers requested the vaccine for their 9- or 10-year-old, only one indicated that their child received the vaccine. The other mother explained that she was dissuaded by the pediatrician who suggested the HPV vaccine is "given to girls in case they are going to have sex early" and did not believe it was not necessary yet for her 9-year-old daughter.

Yes, I had already done my research. Like, why it should be given and that there are two doses. Like, I was looking at it as [just another shot] on the immunization card. The immunization card says 'nine,' and she's nine, so it's time for this vaccine. I mean, I'm going to go [get her vaccinated] because it's time. . . But when she [the pediatrician] told me, 'No,' I was really, really, really surprised. She said, 'No, I don't think she's going to need it [...] Let's talk about this when she's older, like 16. Maybe then we could talk about this?' and I said, 'Okay, it's alright.' But I went in very conscious. . . But I went in very conscientious that it was already time to give the vaccination. Just like I bring my son in for the

pneumonia vaccine at 15 months, I was bringing my 9-year-old daughter in, because it was time for the HPV vaccination.

— **Hispanic mother of an 11-year-old female and 1-year-old male**

In the priming conversation, the pediatrician “didn’t offer it right away, they just mentioned” the HPV vaccine at the 8-year-old wellness visit and that she would be eligible soon. Although this mother intended to vaccinate her daughter after “looking into the side effects,” she missed the 9-year-old visit “because of the pandemic.” Still, she planned to vaccinate her daughter at the next routine appointment (at 10 years old).

The more conversational (as opposed to a clear and presumptive/announcement) recommendation^{9,44} for younger HPV vaccination initiation, was still viewed positively by the participant. The mother explained that she valued the pediatrician offering support in her vaccine decision making process:

They [the pediatrician] pretty much asked us if we’ve heard about it [the HPV vaccine]. We were then provided information and then asked us if we were considering it. They were very supportive. They seemed very neutral, which was great. They didn’t have like a “you should do it” versus “you shouldn’t” [approach]. It was more like, “Do you have the information that you need if you are interested?” [...] So she made me feel very comfortable with whatever decision that we were going to go with, so that was great. It was a good experience.

— **NH-Black mother of a 10-year-old**

Another participant described needing more time to decide about vaccination after she asked her gynecologist for advice about HPV vaccination for her child. Similarly, she was “pretty satisfied” with the information she received, but she was still not ready and felt she was still in the process of making a decision about when to vaccinate her 10-year-old.

Notably, all of the parents who had early vaccination discussions with health care providers acknowledged that adolescents in general were engaging in sexual activity at younger ages and viewed the HPV vaccine as an “extra barrier of protection” for them against HPV.

Mothers viewed the need for HPV vaccination at younger ages differently

Although mothers mostly viewed the HPV vaccine positively as cancer prevention, the benefits were not enough to overcome some mothers’ hesitancy based on necessity. However, English- and Spanish-speakers had different ideas about *when* their children might be at risk for HPV infection mainly because of sexual debut and puberty. All of the Spanish-speakers believed that the HPV vaccine was “extremely necessary” regardless of recommended age to “protect” their children and “prevent” infection or diseases later in life.

Spanish-speakers acknowledged the possibility of early exposure to HPV more than English-speakers. In fact, Spanish-speaking mothers were aware of the high prevalence of HPV, threat to women, and the existence of the HPV vaccine, primarily from Spanish-language television news. They accepted the inevitability of their adolescents’ sexual activity and their limited control over it. These mothers had

a greater perceived need for the vaccine given the “liberalization” of sexuality, which they framed as a global historical change over time, not as a cultural difference or “acculturation” between communities of origin and their new communities in NJ.

For me, really, it’s very necessary, very necessary, primarily because nowadays I’ve seen a lot, in my experience, I’ve seen that children start having sex at a young age. So, it’s important to always be preventing, I think, right? We have to always be one step ahead [of things].

— **Hispanic mother of 12- and 8-year-old males**

In contrast, English-speaking mothers questioned the necessity of the HPV vaccine more frequently, particularly at a younger age. Their concerns were rooted in perceptions of sex and age-specific risk of HPV; they wanted “to wait a little bit longer” because their 9- and 10-year-olds were not sexually active. From their perspective, adolescents were at risk for HPV-related cancers only after becoming sexually active. Two mothers with unvaccinated children emphasized that they did not oppose younger HPV vaccination – they recognized that the vaccine was safe for 9- and 10-year-olds – however, they did not find it necessary yet for *their own* adolescents.

Maybe because my daughter’s, you know, playing with dolls and all of that. She acts like she’s younger. So maybe that’s why I’m thinking she’s even a little too young, but I definitely – I’m open to it when I go to the doctor next month and will explain to her what it’s for and tell her that it’s important.

— **Hispanic mother of an 11-year-old female and 8-year-old male**

Some preferred to wait due to concerns about side effects on pubescent bodies

Most mothers expressed some level of concern about vaccinating too early and potentially hindering their adolescents’ development. Instead, they preferred to vaccinate after puberty as they thought it might reduce any potential side effects on their children’s “developing little bodies.” Several mothers emphasized the need for evidence from long-term follow-up data demonstrating the vaccine’s safety among young initiators and at different developmental stages. These mothers planned to discuss these information gaps with their pediatrician before allowing their children to receive the vaccine.

I wouldn’t say I would not give it to him, but I think 9 is a little bit too young. I think that children’s bodies are still developing and growing, and I think by 11, 12 that their body is a little bit more mature and maybe ready for the vaccine, such as HPV.

— **NH-Black mother of a 10-year-old male**

Some preferred to wait because adolescent assent to HPV vaccination was valued, which required discussions about sex

A few mothers thought that their adolescents should be allowed to develop some autonomy and “make decisions for their body”

and therefore be involved in the decision-making about HPV vaccination. For them, assent would entail their adolescent having the capacity to broadly understand sex and the risk of sexually transmitted infections given the context of HPV-related cancers. These mothers wanted their adolescents to “understand what [the HPV vaccine] is and what it’s supposed to prevent.” In addition to wanting her adolescent to consent to vaccination, one mother emphasized wanting her adolescent to be familiar with their own medical history. Still, all of these mothers believed that 9- and 10-year-old children are “too young to understand” to provide this level of assent for the vaccination. Instead, they wanted to wait until puberty, suggesting that older adolescents would be more mature and have the capacity to understand the purpose of HPV vaccination and the ability to agree that “yeah, I definitely want this. I need it.”

I don’t think my 10, almost 11-year-old, will pay attention or understand the full details why he’s getting this vaccination [...] I think I will want him to understand a little bit why he’s getting a shot. And he will probably want to know too. ‘Why are you giving me this? And why do I have to take two shots?’

— Hispanic mother of 10- and 6-year-old males

Parents wanted more counseling and workshops from pediatric providers to address HPV vaccination concerns

Although some mothers wanted to wait until after their children are 11 or 12, most of them indicated that they intended to vaccinate after raising their concerns with their pediatricians. School-based seminars and community workshops between health care providers, parents, and adolescents were suggested. Mothers wanted HPV vaccination information from school nurses and interactive sessions with providers explaining the relationship between HPV and cancer.

Our PTA has hosted a pediatrician twice to talk to parents at our PTA meeting about COVID and children and the importance of

vaccinating them [...] And we have a large turnout. People have lots of questions and are really interested in getting information. So I think that that could be really helpful [for the HPV vaccine]. I would sign up.

— NH-White mother of a 12-year-old female and 6-year-old male

Another mother suggested a workshop to refresh parents’ knowledge because they may not recall their own vaccination or be aware of the safety and effectiveness details from their youth:

There’s some people that probably just don’t know anything about [the HPV vaccine] at all. But some of them probably need to be reminded that they did have it, that they were vaccinated. Because parents at my age, I was vaccinated when I was in high school, so they may not remember having been vaccinated.

— NH-Black mother of 11 and 9 year-old males

Discussion

This study explored experiences and perceptions of HPV vaccination before age 11 among a racially/ethnically diverse sample of mothers from NJ. We identified one adolescent from our sample who initiated the vaccine series at age 10 at the mother’s request. A few other mothers reported having vaccination discussions with their providers when their child was age 9 or 10 years and intended to vaccinate when their child was closer to age 11. We observed more hesitancy and concerns expressed by English-speaking mothers compared to more proactive attitudes and behaviors among Spanish-speaking, immigrant mothers in our sample. Primary concerns about younger HPV vaccination centered around mothers’ perceptions of young adolescents’ low need for vaccination and low risk of HPV due to lack of sexual activity as well as potential side effects on adolescents who have not yet reached puberty (Table 3). A few mothers valued adolescent assent for vaccination and therefore were less accepting of younger initiation.

Table 3. Exemplary quotes of factors affecting younger HPV vaccine initiation.

Theme	Exemplary quotation
Mothers were not aware of younger starting age	Actually, I should call his doctor and ask about it [...] my son just turned 11, and this is the first – yeah, this is the first time I learned about it, unfortunately. —NH Black mother of 11- and 4-year-old males
Optional recommendations from providers	It was the summer before she was turning 12. And [the pediatrician] mentioned [the HPV vaccine], and I said, ‘okay, but we’re not ready for it right yet.’ And she said, ‘okay, no problem, you’re just at the very beginning of whatever the timeframe [is] for her.’ But I said we would talk about it the next time when I came. [At] her 12-year checkup, I guess. —NH White mother of a 12-year-old female and 6-year-old male
Low perceived need for vaccination at younger ages	I’m not really sure why the HPV vaccine has been going lower in age. I’m not really sure. I mean, I don’t think we really need it to be done any younger than the sixth grade [...] But if it was to become a choice for parents to be able to do it at the age of 9, if the manufacturer is saying that it’s safe to do it at the age of 9, I guess it would be good to give the parents a choice to have a range between 9 and 12. —NH Black mother of 11- and 9-year-old males
Concerns about side effects for prepubescent adolescents	So just considering the side effects or the not so great effects of it, and just worrying about how it’s going to affect my kid as they grow. What does that mean for their body and how they react to it? So those are the things that makes me want to wait a little longer, just so that they’re older so that their body’s a little more developed. But that’s the only thing that makes me a little hesitant. —NH-Black mother of a 10-year-old
Delay due to valuing adolescent assent	It should be discussed with the parent and I think the child, too. So that if the child has questions or comments or concerns, they can ask right then and there, too, with the professional [...] I think it should be something that is discussed between everyone. It shouldn’t just be the doctor and the parents. The child should be involved. —NH Black mother of a 10-year-old-male and 4-year-old
High demand for pediatric counseling and school-based information	And if they go to the doctor regularly – the pediatrician for the kids – they’re going to listen to them when they’re there. But other than that ... the school. — NH Black mother of a 10-year-old female

These findings highlight the important role pediatric health care providers have on HPV vaccine awareness and initiation. However, we observed few experiences with younger HPV vaccination discussions and initiation. This finding is similar to recent NIS-Teen data, which indicated few (4%) vaccinations are initiated among 9- and 10-year-olds.³² Indeed, a couple of the early vaccination discussions were prompted by parents or were described as more conversational, which may not be surprising given that only 20% of primary care professionals in the US reported they routinely recommend the HPV vaccine for 9- and 10-year-olds.⁴⁵ Although recently providers have identified benefits to recommending vaccination at younger ages, including avoiding discussions of sex,^{20,46} our findings suggest mothers may need counseling on the benefits of younger initiation due to low perceived risk of HPV. Importantly, the benefits of initiating at 9- or 10-year-old may need to be emphasized to providers with different specialties or training,⁴⁷ especially to encourage strong recommendations^{8,47,48} at younger ages because multiple studies have shown these strategies increase series completion by age 13.^{25,28,49}

We found that Spanish-speaking mothers had realistic expectations about the possibility of their children's sexual activity and mothers' limited control over when their child may be exposed to HPV. A few were proactive in requesting HPV vaccination and generally more accepting of initiating the series for younger adolescents. Others have documented Hispanic parents are generally less vaccine hesitant⁵⁰ and have higher initiation rates⁵¹ compared to other racial/ethnic groups. Multiple studies have suggested reinforcing Spanish-speaking mothers' positive beliefs about the benefits and protective nature of HPV vaccination to improve uptake in this sub-group,^{52,53} which may also be effective for younger initiation. Otherwise, the concerns of English-speaking mothers were dominated by their perceived lack of need due to their views that young adolescents were not sexually active. Messaging and educational interventions to promote cancer prevention^{29,54} and benefits of early vaccination may help address these concerns.⁵⁵

We also highlight specific safety concerns related to potential side effects of the vaccine on prepubescent children, which made some mothers want to wait for vaccination. Parental concerns about the necessity and safety/side effects of the HPV vaccine are well-documented.^{50,56-59} Although parents have been increasingly delaying or refusing HPV vaccination for their children due to safety concerns,⁵⁹ few adverse events associated with receiving the HPV vaccine have been reported.⁶⁰ Health care providers play an important role in easing parental concerns, decreasing hesitancy, and consequently increasing vaccine confidence.^{59,61} Ensuring that health care providers are equipped with information specifically about 9- and 10-year-olds is critical to promoting younger vaccine initiation.

We also found that some mothers valued adolescents' involvement in decisions about health services, including providing assent to vaccination. According to the American Academy of Pediatrics, patient- and family-centered care, which is rooted in collaboration among (child) patients, family members, and the clinical team, is linked to improved pediatric health

outcomes.⁶² Some argue that pediatric patients' capacity for preferences makes assent important.⁶³ Although some suggest allowing adolescents to consent to HPV vaccination may improve access and coverage,⁶⁴ others have found that adolescents' involvement in HPV vaccine discussions does not influence parents' vaccine decision-making.⁶⁵ However, this study was limited to mothers' perspectives only; we did not include adolescents in the sample to hear their views on this issue.

Our study participants needed clarification on HPV vaccination recommended ages and suggested some concerns about potential gender differences in provider recommendations. A review of HPV vaccine hesitancy in the US⁶⁶ identified parents' lack of HPV vaccine knowledge as a main determinant of hesitancy and subsequent vaccine refusal. The authors posited that the early focus on vaccinating girls and only later recommending boys also be vaccinated may have contributed to parents' confusion.⁶⁶ Multiple strategies may effectively address these information gaps for parents and increase vaccination. For example, multi-level strategies that standardize printed educational materials, train providers for strong recommendations at 9- and 10-year well child visits, and offer peer-to-peer coaching can increase HPV vaccination initiation at younger ages.³¹ Provider and parent-directed interventions, including education, reminders, and incentives may also increase initiation at ages 9-10.⁶⁷

An underlying issue across these results points to a critical need for continued education for pediatric providers. For example, only five of the 11 adolescents who should have received vaccination recommendations had initiated the vaccine series. Pediatric provider- and systems-level interventions are essential to reduce missed opportunities for HPV vaccination.⁶⁸⁻⁷⁰ Additionally, few discussions were reported among parents with 9- and 10-year olds. In fact, most of the mothers described non-evidence-based communication with providers, including some being discouraged from vaccinating due to age or gender. Provider education to facilitate recommending the HPV vaccine using clear, evidence-based language has the potential to improve HPV vaccine initiation rates,⁴⁴ though more research is needed to improve recommendations at 9 and 10.⁴⁷

This analysis is limited in that it involved a sub-group of parents from a larger study³⁷ with children of varying ages: under 9 and not yet eligible for HPV vaccination, 9- and 10-year olds currently eligible for HPV vaccination, and ≥ 11 years who should have received a recommendation. Despite this small sample size, we reached data saturation for this topic among this sub-group of mothers, which is consistent with saturated samples from other qualitative studies.^{71,72} Although we compared these responses to mothers with adolescents 11 years or older, we limited this analysis to the target population – those who may initiate HPV vaccination for their child(ren) at ages 9 or 10 years – to enhance the relevance of future interventions for young initiation. Though we attempted to recruit both mothers and fathers, we were unsuccessful at recruiting any male participants. However, many mothers are the primary health care decision makers for their children in the US;⁷³ some mothers share decision-making with their partner/spouse.^{74,75} To address this,

we confirmed each participant's role in vaccination decision-making as part of the eligibility criteria. Despite these limitations, we believe these results build upon others' findings about parental perceptions of initiating HPV vaccination and highlight important areas for future research.

Conclusions

Results from this study suggest that mothers are willing to initiate HPV vaccination at 9- and 10-years-old. The findings also suggest that vaccine confidence and uptake at younger ages may be facilitated by addressing concerns specific to vaccination need and HPV disease risk. Provider recommendations emphasizing the starting age of 9 and cancer prevention benefits may help encourage mothers to vaccinate at a younger age instead of waiting for puberty. Disseminating evidence to health care providers about high completion after early initiation may encourage strong recommendations for 9-year-olds. Provider education remains a critical component to a comprehensive, multilevel approach to improve HPV vaccination.

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Authors' contributions

Conceptualization, REK; Formal Analysis, REK, RW, KC; Data Curation, REK, RW, KC; Writing – Original Draft Preparation, REK, RW; Writing – Editing, KC, RB, KG, LK; Funding Acquisition, REK. All authors reviewed and approved the final version of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Consent for publication

Informed consent to publish these findings was obtained from all participants.

Data availability statement

The datasets used and/or analyzed during the current study may be available from the corresponding author on reasonable request.

Ethics approval and consent to participate

This study was approved by Rutgers Cancer Institute's Scientific Review Board and Rutgers Institutional Review Board. Informed consent was obtained from all participants involved in the study.

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