Recommending Human Papillomavirus Vaccination at Age 9: A National Survey of Primary Care Professionals

Wei Yi Kong, MA; Qian Huang, PhD; Peyton Thompson, MD, MSCR; Brigid K. Grabert, PhD, JD, MPH; Noel T. Brewer, PhD; Melissa B. Gilkey, PhD

From the Department of Health Behavior, Gillings School of Global Public Health (WY Kong, Q Huang, BK Grabert, NT Brewer, MB Gilkey), University of North Carolina, Chapel Hill, NC; Division of Infectious Diseases, Department of Pediatrics (P Thompson), University of North Carolina, Chapel Hill, NC; and Lineberger Comprehensive Cancer Center (BK Grabert, NT Brewer, MB Gilkey), University of North Carolina, Chapel Hill, NC

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Address correspondence to Melissa B. Gilkey, PhD, Associate Professor of Health Behavior, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Campus Box 7440; Chapel Hill, NC 27516 (e-mail: gilkey@email.unc.edu).

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Abstract

Objective: Several US health organizations, including the American Academy of Pediatrics, now encourage primary care professionals to recommend human papillomavirus (HPV) vaccination before the traditionally targeted ages of 11 to 12 years as a strategy to increase vaccination timeliness. To understand the feasibility of this approach, we sought to evaluate primary care professionals' current recommendation timing and willingness to recommend HPV vaccination at age 9.

Methods: A national sample of 1047 primary care professionals completed our online survey in 2021. Respondents were physicians (71%), advanced practitioners (17%), and nurses (12%).

Results: About one-fifth (21%) of primary care professionals reported that they already routinely recommend HPV vaccination at ages 9 to 10. Among the remaining 822 respondents, over half (61%) reported being somewhat or more willing to start recommending at age 9. Willingness was higher among those working in family medicine versus pediatrics (adjusted odds ratio [aOR]: 1.40, 95% confidence interval [CI] 1.03, 1.92), but lower among those with ≥20 years of practice experience versus ≤9 years (aOR: 0.65, 95% CI 0.44, 0.96). Many primary care professionals believed age 9 recommendations would have the advantage of protecting adolescents before HPV exposure (67%) or increasing vaccination timeliness (55%). The most commonly perceived disadvantage was that parents are not ready to talk about HPV vaccination at age 9 (73%).

Conclusion: Over two-thirds of primary care professionals in our national sample reported they recommend HPV vaccination at ages 9 to 10 or are somewhat or more willing to do so. Training may be needed to help primary care professionals address perceived parental hesitancy toward age 9 recommendations.

Keywords: health communication; HPV vaccine; pediatric health; provider recommendation

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WHAT'S NEW

About one-fifth (21%) of primary care professionals reported recommending human papillomavirus vaccination early (ages 9−10), with others recommending at ages 11 to 12 (59%) or late/never (20%). Among those not recommending early, many (61%) were somewhat or more willing to start doing so.

Increasing the proportion of adolescents who complete the human papillomavirus (HPV) vaccine series before age 13 is a cancer prevention priority in the United States (US), but leading health organizations differ in their guidance about the age at which primary care professionals should begin routinely recommending the vaccine. The Advisory Committee on Immunization Practices, which develops the adolescent immunization schedule endorsed by the Centers for Disease Control and Prevention, targets ages 11 to 12 for routine HPV vaccination, while noting that the vaccine can be administered as early as age 9.[1] Advisory Committee on Immunization Practices's rationale for prioritizing ages 11 to 12 included strong immune response to the vaccine at these ages, the goal of protecting adolescents before sexual debut, and the opportunity to co-administer HPV vaccine with other vaccines routinely recommended at ages 11 to 12.[2,3] In recent years, other health organizations, including the American Academy of Pediatrics and the American Cancer Society, have begun encouraging primary care professionals to routinely recommend HPV vaccination as early as possible, starting at age 9.[4,5] This strategy is intended to increase vaccination timeliness, given that by

2019 only about two-thirds (67%) of 13-year-old adolescents had received at least 1 HPV vaccine dose and less than half (45%) had completed the 2-dose series.[6] This low level of on-time series completion leaves adolescents unnecessarily vulnerable to future HPV cancers, which are estimated to total over 34,000 cases in the US each year.[7]

Preliminary data lend support for recommending HPV vaccination at ages 9 to 10 as a way to increase timely uptake, although research in this area remains very limited at present.[8−11] For example, a recent multi-component intervention study that included promotion of age 9 recommendations raised coverage for on-time HPV series completion by 15 percentage points among 11- to 12-year-old adolescents who presented at 1 of 5 primary care clinics during the study period.[11] Although the study was not designed to isolate the impact of recommendation timing specifically, participating providers cited advantages to delivering HPV vaccine recommendations at ages 9 to 10, including greater parental acceptance, higher chances of timely vaccine series completion, and fewer logistical challenges.[8] Other studies, including a quality improvement evaluation in 14 primary care clinics and an observational study among adolescents in a single mid-western county, also suggest that recommending and starting the HPV vaccine series at ages 9 to 10 may increase the timeliness of series completion.[9,10] Although these early regional studies indicate promise for age 9 recommendations, questions remain about the effectiveness and feasibility of this practice, including the extent to which primary care professionals have adopted—or are willing to adopt—it nationally.

To address this gap, we conducted a national survey to evaluate the timing of primary care professionals' HPV vaccine recommendations, as well as their willingness to recommend HPV vaccine at age 9. This cross-sectional study is designed to provide early insights into the feasibility of using age 9 recommendations as part of efforts to promote on-time HPV vaccination.

METHODS

PARTICIPANTS AND PROCEDURES

We engaged a survey company, Sermo, to administer our online survey to a standing national panel of primary care professionals from February to March 2021. Panel members were recruited through digital advertisements, marketing emails, online registration, and referrals. Physicians' identities were verified with their licensure information during recruitment. Panel members eligible to participate in this study were physicians, advanced practitioners (nurse practitioners or physician assistants), and nurses who prescribed or administered vaccinations for adolescents ages 11 to 17 in the US. We excluded residents of Vermont due to state policies prohibiting primary care professionals' participation in the survey panel.

Prior to fielding, we pretested our survey with a sample of 30 eligible primary care professionals in the Sermo panel. Next, the survey company invited eligible panel members to participate via email, sending up to 2 reminders. A total of 1,055 panel members provided informed consent and completed the survey, yielding response rates of 61% among physicians and 41% among advanced practitioners and nurses (based on American Association for Public Opinion Research response rate 4).[12] We subsequently excluded 6 physicians and 2 advanced practitioners who reported not seeing any adolescent patients (defined in the survey as ages 11−17) in a typical week, resulting in a final analytic sample of 1,047 primary care professionals. Participants received a single payment of $15 to $80, depending on their location and profession. The University of North Carolina Institutional Review Board approved our study protocol.

MEASURES

Our survey assessed 2 outcomes regarding HPV vaccine recommendations: current recommendation timing and willingness to recommend at age 9. We assessed recommendation timing with a closed-ended question about when primary care professionals routinely recommend HPV vaccine: "Do you routinely recommend HPV vaccine starting at…." We re-categorized the 5 response options as early ("age 9−10"), on-time ("age 11−12"), late ("age 13−17," "an older age,"), or never ("don't routinely recommend HPV vaccine").

Among respondents who reported on-time or late/never recommendations, a closed-ended question with a 5-point response scale assessed their willingness to recommend HPV vaccination specifically at age 9: "How willing are you to start routinely recommending HPV vaccine to children at age 9?" We categorized responses as somewhat or more willing ("somewhat," "very," "extremely") versus less so ("a little," "not at all"). We categorized willingness in this way given our interest in assessing the feasibility of age 9 recommendations, assuming that a moderate or higher level of willingness is likely needed to support adoption of the practice.

All participants indicated perceived advantages and disadvantages of recommending HPV vaccine at age 9 by endorsing response options from pre-specified lists. We developed these lists based on providers' perceptions about HPV vaccination reported in previous studies, and we included perceptions that were and were not evidence-based, as both may inform recommendations.[8,13−17] For example, prior research indicates that some providers prioritize recommendation practices that they perceive as ensuring protection before exposure,[13] accommodating parental concerns about giving too many vaccines at one time,[14] minimizing discussions of sexual activity,[14] or inducing better immune response.[8] Conversely, other studies suggest that some providers avoid recommendation practices that they perceive as raising the topic of HPV vaccination before parents are ready to talk about it,[8,15] leading to uncomfortable discussions of sexual activity,[16] or inducing an immune response that may not last long enough to protect the child at later, higher-risk

Table 1. Sample Characteristics (N = 1047)

	n (%)
Primary care professional characteristics	
Gender	
Woman	515 (49)
Man	492 (47)
Other*	40 (4)
Race	
White	717 (68)
Asian	170 (16)
Black	41 (4)
Other†	119 (11)
Training	
Physician	747 (71)
Advanced practitioner	177 (17)
Nurse	123 (12)
Years in practice	
0–9 years	252 (24)
10–19 years	395 (38)
20+ years	400 (38)
Adolescent patients seen per week	
≤9 adolescents	283 (27)
10–24 adolescents	431 (41)
≥25 adolescents	333 (32)
Clinical characteristics	
Specialty	
Family medicine	748 (71)
Pediatrics	299 (29)
Practice type	
Solo practice	127 (12)
Group practice	569 (54)
Hospital or academic institution	254 (24)
Other‡	97 (9)
Part of health care system or network	
Yes	590 (56)
No	457 (44)
US region	
South	333 (32)
Northeast	265 (25)
Midwest	247 (24)
West	202 (19)
Urbanicity of area served	
Urban	363 (35)
Suburban	525 (50)
Rural	159 (15)

*Includes response options "neither woman nor man," "prefer to self-describe," and "prefer not to say."

†Includes American Indian, Alaska Native, Native Hawaiian, Pacific Islander, "other," and "prefer not to say."

‡Includes federally qualified or community health center, state or local health department, and nonprofit organization.

ages.[17] Our survey also collected data on participants' demographic and clinical characteristics (Table 1).

Statistical Analysis

First, we used descriptive statistics to analyze primary care professionals' current HPV vaccination recommendation timing. We next used bivariate logistic regression to assess the association between current recommendation timing and respondents' demographic and clinical characteristics. We modeled the outcome as early recommendation (1) versus otherwise (0). We then entered statistically significant correlates into a multivariable model.

Second, among those who did not report using early recommendations, we used bivariate logistic regression to assess the association between willingness to recommend at age 9 and respondents' demographic and clinical characteristics. We modeled the outcome as somewhat or more willing to recommend at age 9 (1) versus less so (0). We then entered significant correlates into a multivariable model.

Finally, we used chi-square tests to assess variation in perceived advantages and disadvantages of recommending HPV vaccination at age 9, comparing primary care professionals who did versus did not report using age 9-10 recommendations. Statistical tests were 2-tailed with a critical alpha of .05 and conducted using Stata version 15.1 (College Station, Tex).

Results

Sample Characteristics

Our sample consisted of 71% physicians, 17% advanced practitioners, and 12% nurses (Table 1). About three-quarters (73%) of primary care professionals reported seeing 10 or more adolescent patients per week. Most worked in family medicine clinics (71%) and served urban (35%) or suburban areas (50%).

Recommendation Timing

About one-fifth (21%) of primary care professionals reported routinely recommending HPV vaccination early at ages 9 to 10, with others recommending on-time at ages 11 to 12 (59%), late (17%), or never (3%). In multivariate analyses, primary care professionals who self-identified as Asian versus white were more likely to recommend HPV vaccination at ages 9 to 10 versus otherwise (adjusted odds ratio [aOR]: 1.51, 95% CI 1.02, 2.25, Table 2). Those whose clinics are located in suburban versus urban areas were less likely to recommend at ages 9 to 10 (aOR: 0.65, 95% CI 0.47, 0.91). Training and years of practice experience were statistically significant correlates in bivariate analyses, but did not retain significance in the multivariable model.

Willingness to Recommend at Age 9

Among the 822 primary care professionals not currently using early recommendations, willingness to start recommending HPV vaccination at age 9 ranged from extremely willing (5%, n = 44), very willing (16%, n = 135), somewhat willing (39%, n = 319), a little willing (25%, n = 205), to not at all willing (14%, n = 119). Thus, over half (61%, n = 498) of this subset (or 48% of the total sample) was somewhat or more willing to adopt age 9 recommendations. Primary care professionals working in family medicine versus pediatric clinics had higher odds of reporting somewhat or more willingness to adopt age 9 recommendations (aOR: 1.40, 95% CI 1.03, 1.92, Table 3), as did those practicing in the Midwest (aOR: 2.00, 95% CI 1.32, 3.03) or the West (aOR: 1.69, 95% CI 1.09, 2.62) versus the Northeast. Primary care

Table 2. Correlates of Routinely Recommending HPV Vaccination at Ages 9 to 10 (N = 1047)

	Primary Care Professionals Currently Recommending at Ages 9–10/ Total Primary Care Professionals in Category *n* (%)	Bivariate OR (95% CI)	Multivariable aOR (95% CI)
Primary care professional characteristics			
Gender			
Woman	116/515 (23)	1	
Man	102/492 (21)	0.90 (0.67, 1.21)	—
Other†	7/40 (18)	0.73 (0.31, 1.69)	—
Race			
White	140/717 (20)	1	
Asian	49/170 (29)	1.67 (1.14, 2.44)*	1.51 (1.02, 2.25)*
Black	13/41 (32)	1.91 (0.97, 3.79)	1.68 (0.84, 3.38)
Other‡	23/119 (19)	0.99 (0.60, 1.61)	0.86 (0.52, 1.43)
Training			
Physician	175/747 (23)	1	1
Advanced practitioner	29/177 (16)	0.64 (0.42, 0.99)*	0.68 (0.43, 1.06)
Nurse	21/123 (17)	0.67 (0.41, 1.11)	0.75 (0.45, 1.26)
Years in practice			
0–9 years	67/252 (27)	1	1
10–19 years	79/395 (20)	0.69 (0.48, 1.00)	0.74 (0.50, 1.08)
20+ years	79/400 (20)	0.68 (0.47, 0.99)*	0.73 (0.50, 1.07)
Adolescent patients seen per week			
≤9 adolescents	60/283 (21)	1	
10–24 adolescents	94/431 (22)	1.04 (0.72, 1.49)	—
≥25 adolescents	71/333 (21)	1.01 (0.68, 1.48)	—
Clinical characteristics			
Specialty			
Family medicine	163/748 (22)	1.07 (0.77, 1.48)	—
Pediatrics	62/299 (21)	1	
Practice type			
Solo practice	26/127 (20)	1	
Group practice	103/569 (18)	0.86 (0.53, 1.39)	—
Hospital/academic institution	65/254 (26)	1.34 (0.80, 2.24)	—
Other§	31/97 (32)	1.82 (0.99, 3.35)	—
Part of health care system or network			
Yes	137/590 (23)	1.27 (0.94, 1.71)	—
No	88/457 (19)	1	
US region			
South	70/333 (21)	1.04 (0.70, 1.55)	—
Northeast	54/265 (20)	1	
Midwest	55/247 (22)	1.12 (0.73, 1.71)	—
West	46/202 (23)	1.15 (0.74, 1.80)	—
Urbanicity of area served			
Urban	95/363 (26)	1	1
Suburban	96/525 (18)	0.63 (0.46, 0.87)*	0.65 (0.47, 0.91)*
Rural	34/159 (21)	0.77 (0.49, 1.20)	0.88 (0.56, 1.39)

OR indicates odds ratio; aOR, adjusted odds ratio; CI, confidence interval; HPV, human papillomavirus.
*$P < .05$
†Includes response options "neither woman nor man," "prefer to self-describe," and "prefer not to say."
‡Includes American Indian, Alaska Native, Native Hawaiian, Pacific Islander, "other," and "prefer not to say."
§Includes federally qualified or community health center, state or local health department, and nonprofit organization.

professionals who identified their race as "other" versus white had lower odds of reporting somewhat or more willingness (aOR: 0.59, 95% CI 0.38, 0.93), as did those with ≥20 years of practice experience versus ≤9 years (aOR: 0.65, 95% CI 0.44, 0.96).

Perceived Advantages and Disadvantages of Recommending HPV Vaccination at Age 9

Most primary care professionals perceived HPV vaccine recommendation at age 9 as offering multiple advantages (mean = 2.5 of 8 advantages, SE = 0.05). A majority endorsed age 9 recommendations as offering protection before HPV exposure (67%) and increasing the likelihood of on-time vaccine series completion (55%). Less than half agreed that advantages included giving fewer vaccines at the same time (40%), avoiding the topic of sex (24%), making parents more receptive (18%), increasing immune response (17%), decreasing the need for reminder or recall (13%), or shortening discussions (12%). Only a small minority perceived age 9 recommendations as having no advantages (12%). Primary care

Table 3. Correlates of Primary Care Professionals' Willingness to Recommend HPV Vaccine at Age 9 (n = 822)

	Primary Care Professionals Willing to Recommend at Age 9[†]/ Total Primary Care Professionals in Category n (%)	Bivariate OR (95% CI)	Multivariable aOR (95% CI)
Primary care professional characteristics			
Gender			
Woman	244/399 (61)	1	
Man	231/390 (59)	0.92 (0.69, 1.23)	—
Other[‡]	23/33 (70)	1.46 (0.68, 3.15)	—
Race			
White	362/577 (63)	1	1
Asian	68/121 (56)	0.76 (0.51, 1.13)	0.67 (0.44, 1.02)
Black	18/28 (64)	1.07 (0.48, 2.36)	1.11 (0.50, 2.49)
Other[§]	50/96 (52)	0.65 (0.42, 1.00)*	0.59 (0.38, 0.93)*
Training			
Physician	353/572 (62)	1	
Advanced practitioner	89/148 (60)	0.94 (0.65, 1.35)	—
Nurse	56/102 (55)	0.76 (0.49, 1.16)	—
Years in practice			
0–9 years	124/185 (67)	1	1
10–19 years	192/316 (61)	0.76 (0.52, 1.11)	0.80 (0.55, 1.18)
20+ years	182/321 (57)	0.64 (0.44, 0.94)*	0.65 (0.44, 0.96)*
Adolescent patients seen per week			
≤9 adolescents	136/223 (61)	1	
10–24 adolescents	201/337 (60)	0.95 (0.67, 1.34)	—
≥25 adolescents	161/262 (61)	1.02 (0.71, 1.47)	—
Clinical characteristics			
Specialty			
Family medicine	371/585 (63)	1.50 (1.11, 2.04)*	1.40 (1.03, 1.92)*
Pediatrics	127/237 (54)	1	1
Practice type			
Solo practice	62/101 (61)	1	
Group practice	272/466 (58)	0.88 (0.57, 1.37)	—
Hospital/academic institution	124/189 (66)	1.20 (0.73, 1.98)	—
Other[‖]	40/66 (61)	0.97 (0.51, 1.83)	—
Part of health care system or network			
Yes	288/453 (64)	1.32 (1.00, 1.75)	—
No	210/369 (57)	1	
US region			
South	155/263 (59)	1.32 (0.91, 1.90)	1.30 (0.89, 1.89)
Northeast	110/211 (52)	1	1
Midwest	133/192 (69)	2.07 (1.38, 3.11)**	2.00 (1.32, 3.03)*
West	100/156 (64)	1.64 (1.07, 2.51)*	1.69 (1.09, 2.62)*
Urbanicity of area served			
Urban	166/268 (62)	1	
Suburban	253/429 (59)	0.88 (0.65, 1.21)	—
Rural	79/125 (63)	1.06 (0.68, 1.64)	—

OR indicates odds ratio; aOR, adjusted odds ratio; CI, confidence interval; HPV, human papillomavirus.
*$P < .05$.
**$P < .001$.
†Defined as somewhat, very, or extremely willing.
‡Includes response options "neither woman nor man," "prefer to self-describe," and "prefer not to say."
§Includes American Indian, Alaska Native, Native Hawaiian, Pacific Islander, "other," and "prefer not to say."
‖Includes federally qualified or community health center, state or local health department, and nonprofit organization.

professionals who were already recommending HPV vaccination early perceived advantages more often than those who were not (Fig. 1).

Most primary care professionals also perceived multiple disadvantages of recommending HPV vaccine at age 9 (mean = 2.1 of 7 disadvantages, SE = 0.04). Respondents most often perceived parents' lack of readiness (73%) and discomfort with talking about sex with parents of young children (48%) as disadvantages. Other perceived disadvantages were that offering HPV vaccination at age 9 is earlier than national recommendations (23%), induces an immune response that might not last long enough (20%), makes it harder to bundle the vaccine with other adolescent vaccines (16%), requires talking about the vaccine at more visits (16%), and does not align with their clinic's protocols (13%). Few respondents perceived age 9 recommendations as having no disadvantages (8%). Primary care professionals who were already recommending HPV vaccination early perceived disadvantages less often than those who were not (Fig. 2).

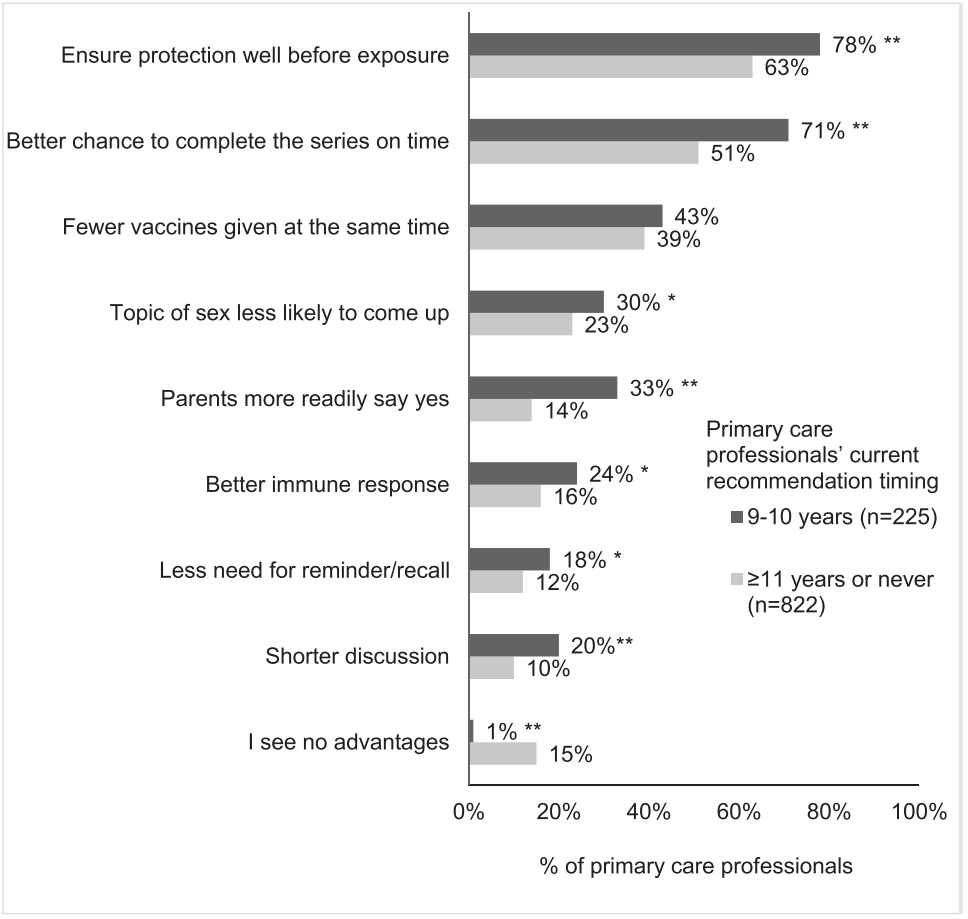

Figure 1. *Perceived advantages of recommending HPV vaccine at age 9. *P < .05, **P < .001. HPV indicates human papillomavirus.*

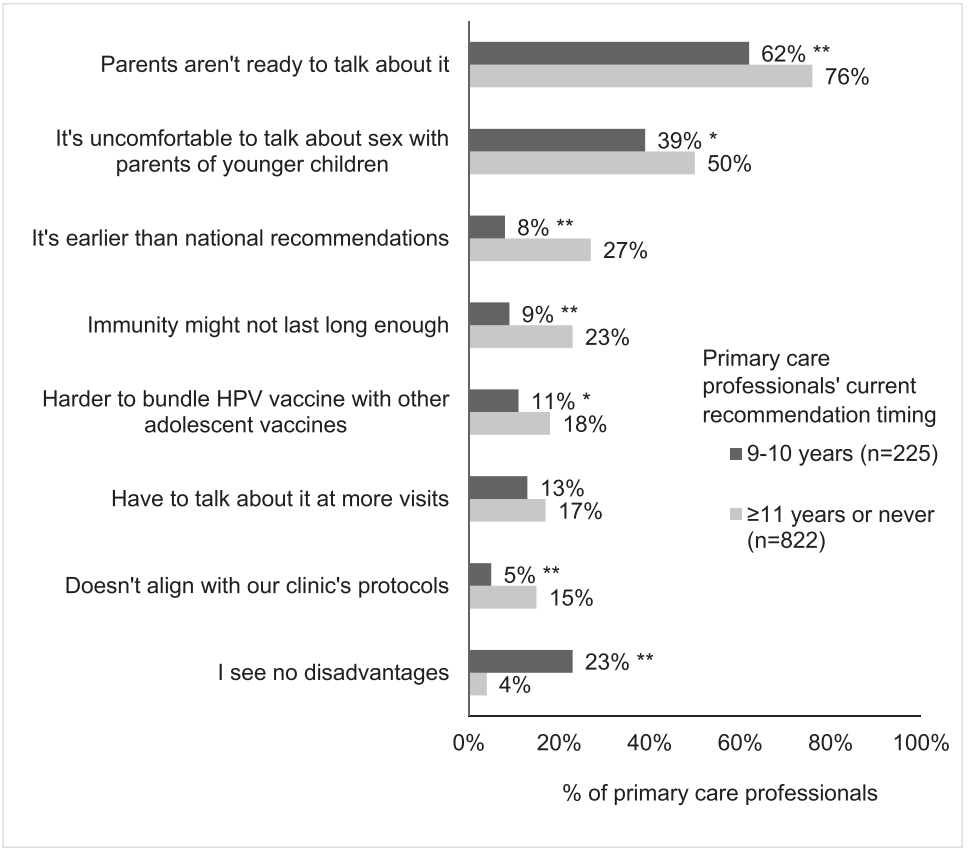

Figure 2. *Perceived disadvantages of recommending HPV vaccine at age 9. *P < .05, **P < .001. HPV indicates human papillomavirus.*

DISCUSSION

This national study provides early evidence to suggest that encouraging primary care professionals to routinely recommend HPV vaccination at age 9 may be feasible. About one-fifth of primary care professionals in our sample of physicians, advanced practitioners, and nurses reported that they already recommend HPV vaccination early at ages 9 to 10. Among the remainder, more than one-third indicated that they were somewhat willing to adopt age 9 recommendations and about one-fifth were very or extremely willing. Most primary care professionals perceived age 9 recommendations as having multiple advantages, which included protecting adolescents prior to HPV exposure and providing better chances for on-time series completion. At the same time, many also perceived age 9 recommendations as having multiple disadvantages, which included parental hesitancy to discuss HPV vaccination at age 9 and discomfort talking about sex. Thus, while many respondents indicated general support for age 9 recommendations, our study also identifies perceived barriers that may inform efforts by the American Academy of Pediatrics, the American Cancer Society, or others to promote this practice.

Interestingly, we observed relatively little variation in current recommendation timing and willingness to adopt age 9 recommendations, with only modest differences by primary care professionals' demographic and clinical characteristics. For example, we found primary care professionals with more years of practice experience or working in pediatrics versus family medicine were less willing to adopt age 9 recommendations. The reasons for these differences are unclear, but it may be that primary care professionals who are more highly experienced in adolescent vaccination are more familiar with—and committed to—the routine immunization schedule's focus on HPV vaccination at ages 11 to 12. Alternatively, ongoing efforts by the American Academy of Pediatrics to promote age 9 recommendations may mean that more of the pediatricians who are willing to adopt the practice have already done so; similar outreach by the American Academy of Family Physicians, which has not published a position statement on age 9 recommendations, might result in more family physicians adopting the practice. Whatever the case, subgroup differences were relatively small in magnitude, which may support the feasibility of encouraging primary care professionals to adopt age 9 recommendations.

Our findings on the perceived advantages and disadvantages of age 9 recommendations can inform the decisions of health care delivery systems, professional organizations, and others about whether and how to promote this practice. For example, our findings on perceived advantages suggest that encouraging primary care professionals to use age 9 recommendations may be facilitated by emphasizing increasing chances of timely protection and vaccine series completion. Perceived disadvantages of age 9 recommendations are also important to consider and are similar to barriers reported in prior studies of barriers to age 11 to 12 recommendations. These barriers include discomfort with discussions about sex or sexually transmitted infections,[13,18–20] increased parental vaccine hesitancy at younger ages,[13,18] and concerns that HPV vaccine immunity may wane over time.[17] Interventionists can leverage data on the durability of HPV vaccine immunity, as well as existing evidence-based provider communication trainings[11,21–24] to build primary care professionals' skills and confidence to address some of these barriers. Future studies including of parental willingness to vaccinate at age 9 and of adapting existing interventions could offer further insights on the effectiveness of age 9 recommendations.

To our knowledge, this study is the first to offer data from a national sample of primary care professionals on age 9 recommendations and thereby extend prior, regional findings.[25,26] Some key limitations should be noted. First, we relied on primary care professionals' self-reports of their recommendation timing and willingness to adopt age 9 recommendations, which may be subject to recall and social desirability biases. Future provider studies on recommendation timing may benefit from triangulating self-reports with observational data to enhance validity. Second, our focus on primary care professionals excludes the perspectives of parents and health care systems in encouraging HPV vaccination at age 9. Future studies should assess parental willingness to vaccinate at age 9, as well as systems changes, such as earlier provider prompts and patient reminder/recall, that may be needed to support this practice. Third, our sample included a higher proportion of primary care professionals in family medicine versus pediatrics. Although we did not note large differences in our findings by specialty, the perspectives of pediatricians are especially salient, due to the high volume of HPV vaccine doses they deliver. Finally, we acknowledge that this study focused on the feasibility of age 9 recommendations; larger-scale intervention studies are needed to evaluate the effectiveness of age 9 recommendations as a strategy to increase rates of on-time HPV vaccination.

CONCLUSION

A high proportion of primary care professionals in our national sample indicated that they are already routinely recommending HPV vaccination early at ages 9 to 10 or are somewhat or more willing to adopt the practice. Along with policy support by the American Academy of Pediatrics and the American Cancer Society, this willingness suggests that interventions to shift primary care professionals' recommendations to earlier ages may be feasible. Our findings further indicate that such interventions should incorporate training to help primary care professionals effectively and efficiently navigate parental hesitancy, which they perceive as a primary disadvantage of age 9 recommendations.

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