

Disparities in Healthcare Providers' Recommendation of HPV Vaccination for U.S. Adolescents: A Systematic Review



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ABSTRACT

Infrequent provider recommendations continue to be a key barrier to human papillomavirus (HPV) vaccination, including among adolescents at higher risk for future HPV cancers. To inform future interventions, we sought to characterize disparities in health care providers' HPV vaccine recommendation for U.S. adolescents. We systematically reviewed studies published in 2012–2019 that assessed provider HPV vaccine recommendations for adolescents aged 9–17. Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, we identified 52 eligible studies and used a standardized abstraction form to assess recommendation prevalence by adolescent demographic characteristics. Studies consistently found that fewer parents of boys than girls

reported receiving HPV vaccine recommendations (14 studies, range of difference: –11 to –35 percentage points). Studies also found fewer recommendations for adolescents who were younger (2 studies, –3% to –12% points), non-White (3 studies, –5% to –7% points, females only), lower income (3 studies, –1% to –8% points), or uninsured (1 study, –21% points, males only). Studies identified geographic disparities in southern and rural areas. In conclusion, findings from this systematic review identify disparities in HPV vaccine recommendation that may contribute to suboptimal vaccine uptake. Efforts to improve providers' HPV vaccine communication should focus on increasing recommendation consistency, especially for lower-income, non-White, and rural adolescents.

Introduction

Widespread human papillomavirus (HPV) vaccination could prevent an estimated 32,000 of the 34,800 HPV-associated cancers currently diagnosed in the United States each year (1). However, HPV vaccination coverage continues to fall far short of national goals (2). Although completion of the two-dose series is recommended for adolescents ages 11–12, less than half of adolescents (45%) were fully vaccinated by age 13 in 2019 (2). Furthermore, coverage was even lower for certain subpopulations, including among adolescents in Southern (3) and rural areas (2) where HPV cancers are more common (4, 5). These gaps in vaccination coverage could exacerbate future HPV cancer disparities and suggest an urgent need to target HPV vaccination promotion efforts where they are needed most.

Healthcare providers play a critical role in increasing HPV vaccination coverage. Receiving a provider's recommendation is a strong and consistent predictor of vaccine uptake, with adolescents who receive a recommendation having about 10 times higher odds of

starting the HPV vaccine series (6). Despite strong evidence of the impact of provider recommendation on vaccination, a large body of research suggests that providers often recommend HPV vaccination inconsistently, behind schedule, or not at all (7). However, the extent to which provider recommendation differs systematically by adolescent demographics remains unclear. To address this gap, we sought to review current evidence to characterize disparities in provider recommendation to better target future interventions to improve provider communication, increase HPV vaccine uptake and equity, and reduce the burden of HPV cancers.

Methods

We systematically reviewed studies of health care providers' HPV vaccine recommendation for U.S. adolescents in clinical settings. We defined providers broadly as members of the primary care team, including physicians, nurse practitioners, physician assistants, and nurses. We defined recommendation as verbal communication indicating explicitly or implicitly that the adolescent should receive HPV vaccine; we included "offering" the vaccine but excluded more general measures of HPV vaccine-related "discussion" or "counseling." *Adolescents* were patients ages 9–17 living in the United States. Clinical settings were private practices, health departments, and school-based health centers or vaccination clinics where HPV vaccine may be administered. Our review included studies reporting quantitative data collected in 2012–2019; we focused on these years as males were not included in guidelines for routine HPV vaccination until October 2011. We excluded non-peer-reviewed articles, commentaries, conference abstracts and proceedings, and other reviews.

One investigator (R. Carlson) developed search strategies for five databases: PubMed via NLM, PsycINFO and CINAHL Plus via EBSCO, as well as Embase and Scopus via Elsevier. Search terms were optimized for each database but all used a combination of subject headings and keywords for variants of the terms HPV, vaccination, communication, and recommendation (see Supplementary Materials

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Note: Supplementary data for this article are available at Cancer Epidemiology, Biomarkers & Prevention Online (<http://cebp.aacrjournals.org/>).

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and Methods). We conducted the search on January 14, 2020, using database filters to specify the study period and exclude nonhuman studies and conference abstracts. We removed duplicate entries using EndNote (Clarivate, Philadelphia, PA).

We identified eligible studies in two steps using Covidence software (Veritas Health Innovation, Melbourne, Australia). In the first step, a team of reviewers (A.-L. McRee, G. Bustamante, G.K. Rodgers, I.K. Pallotto, W.Y. Kong) screened article titles and abstracts against our predetermined eligibility criteria. For each record, two members of the team conducted the review independently. In the second step, six reviewers (A.-L. McRee, G. Bustamante, I.K. Pallotto, M.B. Gilkey, M.A. Margolis, W.Y. Kong) independently conducted full-text reviews to confirm eligibility. We also contacted some authors to retrieve further study details and to determine eligibility. In both steps, reviewers resolved disagreements in coding via discussion with the research team.

For included studies, two reviewers independently abstracted information using a standardized form. For each study, we abstracted the proportion of parents who reported receiving or providers who reported delivering recommendation for key subgroups of adolescents. We focused on the demographic characteristics of sex, age, race/ethnicity, household income, health insurance status, and locale. We adapted Sirriyeh and colleagues' quality assessment tool (8) to score the quality of each abstracted

study. Our study protocol (ID# 160869) was prospectively registered with The International Prospective Register of Systematic Reviews on April 28, 2020, and with Carolina Digital Repository on February 7, 2020 (9).

Results

Database searches yielded a total of 7,768 citations. Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (10), we removed 4,610 duplicates, leaving 3,158 unique citations. We screened 252 full-text articles for eligibility and retained a final sample of 52 cross-sectional studies for abstraction (Fig. 1). Of these, 33 were studies of parental reports (Table 1) and 19 were studies of provider reports (Table 2). The mean quality score was 23 of 42 (SD: 4.5). Among studies of parents, the proportion who reported receiving a provider recommendation for HPV vaccination ranged from 24% to 88% (11, 12). Thirteen of the 52 included studies reported single estimates of recommendation prevalence without comparison across adolescent populations or settings (11–23), and the other 39 studies reported findings stratified by the adolescent demographic characteristics prioritized in this review. For these 39 studies, we present findings from parental and provider reports separately by each of the examined demographic characteristics in the following sections.

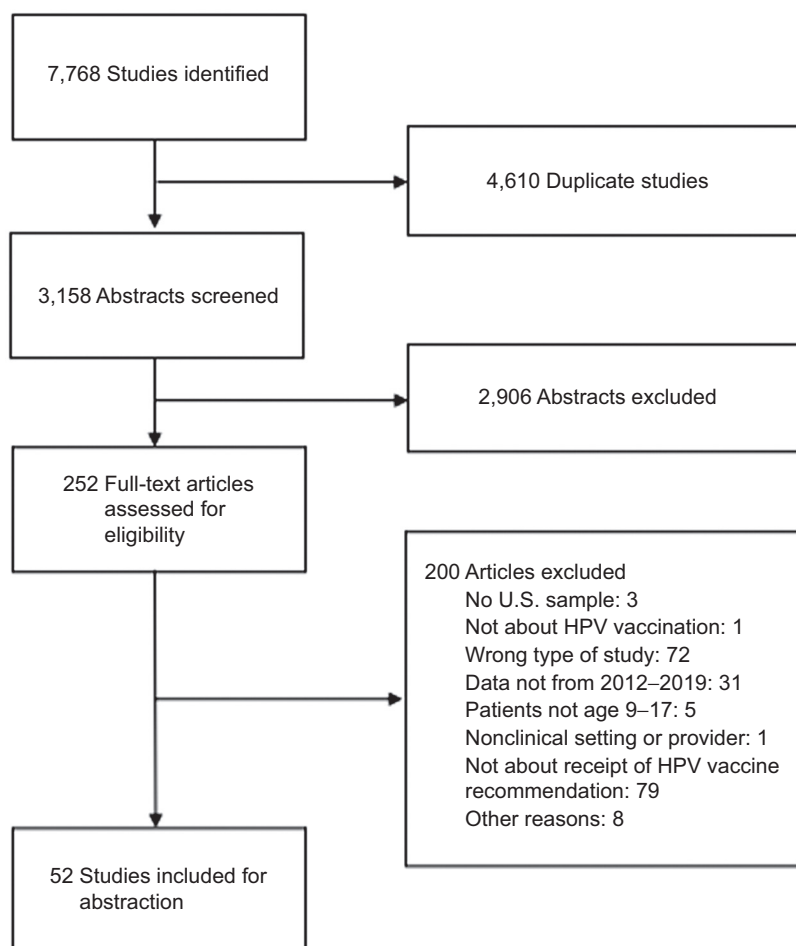


Fig. 1. PRISMA flow diagram of included and excluded studies.

Table 1. Summary of parent studies of HPV vaccine recommendation receipt (*n* = 33).

First author, year	Full study period	Eligible study period	Data source	Study population	Analytic N	Main study result	Recommendation by adolescent characteristics									
							Sex	Age	Race	Income	Insurance	Locale	None			
Burdette et al., 2017 (24)	2008-2013	2013	Phone survey, NIS-Teen	Parents of adolescents aged 13-17 in a national sample	134,201 (pooled)	About 70% and 43% of parents received recommendation for females and males, respectively	●	●	●	●	●	●	●	●	●	
Cheruvu et al., 2017 (16)	2008-2012	2012	Phone survey, NIS-Teen	Parents of unvaccinated female adolescents aged 13-17 in a national sample	3,504	44% of parents received recommendation	●									●
Choi et al., 2016 (25)	2012-2013	2012-2013	Phone survey, NIS-Teen	Parents of adolescents aged 13-17 in a national sample	38,705 (pooled)	63% and 35% of parents received recommendation for females and males, respectively	●									●
Clark et al., 2016 (17)	2012	2012	Online survey	Parents of female adolescents aged 11-17 in a national sample	791	58% of parents received recommendation or strong recommendation	●									●
Colon-Lopez et al., 2015 (18)	2013	2013	In-person survey	Dominican parents of male adolescents aged 9-17 at a Federal Qualified Health Clinic in San Juan, Puerto Rico	60	33% of parents received recommendation	●									●
Colon-Lopez et al., 2016 (19)	2013	2013	In-person survey	Parents of male adolescents aged 9-17 at a Federal Qualified Health Clinic in San Juan, Puerto Rico	200	34% of parents received recommendation	●									●
Dempsey et al., 2016 (11)	2014	2014	Mail survey	Parents of adolescents aged 9-14 at 16 primary care practices in metropolitan Denver	356	88% of parents received very strong recommendation	●									●
Donahue et al., 2015 (31)	2014	2014	Online survey	Mothers of adolescents aged 9-13 in a national sample	2,185	45% of mothers received recommendation or strong recommendation	●									●
Eun et al., 2019 (20)	2015-2018	2015-2018	Transcripts of audio recordings	Parents who intended to vaccinate their adolescents aged ≥11 at 8 urban and suburban family medicine or pediatric practices in the Northeast region	56 dyads with 39 providers	66% of parents received recommendation for HPV vaccine as 'indicated'	●									●
Fontenot et al., 2018 (21)	2016	2016	Online survey	Parents of adolescents aged 11-17 in a national sample who had discussed HPV vaccination with providers	795	76% of parents received recommendation	●									●
Gilkey et al., 2016 (32)	2014-2015	2014-2015	Online survey panel	Parents of adolescents aged 11-17 in a national sample	1,495	52% of parents received recommendation	●									●

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Table 1. Summary of parent studies of HPV vaccine recommendation receipt (n = 33). (Cont'd)

First author, year	Full study period	Eligible study period	Data source	Study population	Analytic N	Main study result	Recommendation by adolescent characteristics							
							Sex	Age	Race	Income	Insurance	Locale	None	
Jacobson et al., 2015 (33)	2008–2013	2013	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	18,264	70% and 44% of parents received recommendation for females and males, respectively	●							●
Johnson et al., 2017 (34)	2013	2013	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	18,264	64% and 42% of parents received recommendation for females and males, respectively	●							
Kornides et al., 2018 (13)	2016	2016	Online survey	Parents of adolescents aged 11–17 in a national sample who initially declined HPV vaccination	494	78% of parents received recommendation prior to their declination								●
Krakow et al., 2017 (35)	2014	2014	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	12,742	About 67% of parents received recommendation	●							
Landis et al., 2018 (57)	2014	2014	Phone survey, NIS-Teen	Parents of male adolescents aged 13–17 in a national sample	10,743	54% of parents received recommendation					●			●
Lindley et al., 2016 (36)	2013	2013	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	18,264	53% of parents received recommendation	●							
Lu et al., 2019 (50)	2011–2016	2016	Phone survey, NIS-Teen	Parents of male adolescents aged 13–17 in a national sample	9,712	66% of parents received recommendation	●				●			●
Mohammed et al., 2016 (37)	2014	2014	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	34,478	73% and 52% of parents received recommendation for females and males, respectively	●				●			●
Mohammed et al., 2017 (38)	2014	2014	Phone survey, NIS-Teen	Parents of unvaccinated adolescents aged 13–17 in a national sample	10,354	53% and 31% of parents received recommendation for females and males, respectively	●							
Naifeh et al., 2014 (26)	2010–2012	2012	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	19,199	65% and 31% of parents received recommendation for females and males, respectively	●							●
Odoh et al., 2018 (27)	2014	2014	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	16,439	76% and 54% of parents received recommendation for females and males, respectively	●							
Perkins et al., 2015 (58)	2008–2012	2012	Phone survey, NIS-Teen	Parents of female adolescents aged 13–17 in a national sample	9,320	61% of parents received recommendation								●
Pierre-Victor et al., 2017 (59)	2008–2012	2012	Phone survey, NIS-Teen	Parents of female adolescents aged 13–17 in Virginia, South Carolina, and Tennessee	3,203 (pooled)	65% of parents in VA, 51% in SC, and 67% in TN received recommendation								●

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Table 1. Summary of parent studies of HPV vaccine recommendation receipt (*n* = 33). (Cont'd)

First author, year	Full study period	Eligible study period	Data source	Study population	Analytic <i>N</i>	Main study result	Recommendation by adolescent characteristics							
							Sex	Age	Race	Income	Insurance	Locale	None	
Pierre-Victor et al., 2017 (60)	2008–2012	2012	Phone survey, NIS-Teen	Parents of female adolescents aged 13–17 in Louisiana, Alabama, and Mississippi	LA-AL paired sample: 2,162 LA-MS paired sample: 2,275 (pooled)	60% of parents in LA, 53% in AL, and 41% in MS received recommendation						•		
Rahman et al., 2015 (14)	2012	2012	Phone survey, NIS-Teen	Parents of female adolescents aged 13–17 who initiated HPV vaccination in a national sample	4,548	77% of parents received recommendation							•	
Reiter et al., 2014 (12)	2010–2012	2012	Phone survey, NIS-Teen	Parents of Hispanic male adolescents aged 13–17 in a national sample	1,321	24% of parents received recommendation							•	
Roberts et al., 2015 (28)	2010–2013	2012–2013	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	37,463 (pooled)	In 2012, 65% and 31% of parents received recommendation for females and males, respectively In 2013, 70% and 46% of parents received recommendation for females and males, respectively		•					•	
Stokley et al., 2014 (29)	2007–2013	2012–2013	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	37,463 (pooled)	In 2012, 61% and 28% of parents received recommendation for females and males, respectively In 2013, 64% and 42% of parents received recommendation for females and males, respectively		•					•	
Sturm et al., 2017 (15)	2013	2013	Audio recordings of medical encounters	Parents of adolescents aged 11–12 at private practices located across the US	75 patient visits across 19 pediatricians	67% of parents received recommendation								•
Victory et al., 2019 (30)	2017	2017	In-person survey	Parents of adolescents aged 9–17 in the Rio Grande city school district	622	44% of parents received recommendation								•
Walker et al., 2019 (61)	2018	2018	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	17,252	78% of parents received recommendation								•
Williams et al., 2020 (62) ^a	2016–2017	2016–2017	Phone survey, NIS-Teen	Parents of adolescents aged 13–17 in a national sample	41,424 (pooled)	73% of parents received recommendation								•

^aAvailable online in 2019.

Table 2. Summary of provider studies of HPV vaccine recommendation delivery ($n = 19$).

First author, year	Full study period	Eligible study period	Data source	Study population	Analytic N	Main study result	Recommendation by adolescent characteristics							
							Sex	Age	Race	Income	Insurance	Locale	None	
Alcala et al., 2018 (39)	2017	2017	Online survey	Nurses, physicians, and physician assistants in family medicine or gynecology, or pediatric practices in northern Virginia	42	50% and 45% of providers recommended to females (74% of the time) and males (67% of the time) aged 11–12, respectively	●	●						
Allison et al., 2016 (40)	2013–2014	2013–2014	Mail and online survey	Providers who were members of the American Academy of Pediatrics or the American Academy of Family Physicians in a national sample	582	60% pediatricians and 59% family physicians strongly recommended to females aged 11–12, and 52% pediatricians and 41% family physicians strongly recommended to males aged 11–12	●	●						
Berkowitz et al., 2015 (54)	2012	2012	Online survey, DocStyles survey	General practitioners, gynecologists, internists, nurse practitioners, and pediatricians	1,753	55% of providers recommended to females aged 11–12	●							
Bonville et al., 2017 (55)	2016	2016	Mail survey	Nurse practitioners, physicians, and physician assistants in family medicine practice in New York State	226	74% of providers “always” recommended to adolescents aged 11–12	●							
Dempsey et al., 2016b (42)	2014	2014	In-person survey	Doctors of osteopathy or medical doctors, nurse practitioners, and physician assistants in family medicine and pediatric practices in metropolitan Denver	149	60% and 55% of providers strongly recommended to females and males aged 11–12, respectively	●	●						
Deupree et al., 2017 (43)	2017	2017	Online survey	Nurse practitioners at retail health clinics in a Southeastern state	67	49% and 40% of providers recommended to females and males aged 11–12, respectively	●	●						
Finney Ruffen et al., 2017 (44)	2015–2016	2015–2016	Mail and online survey	Primary care physicians in southeast Minnesota	227	79% and 62% of providers “always” or “usually” recommended to females and males aged 11–12, respectively	●	●						
Gilkey et al., 2015 (45)	2014	2014	Online survey	Family medicine physicians and pediatricians in a national sample	776	74% and 61% of providers recommended to females and males aged 11–12, respectively	●	●						

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Table 2. Summary of provider studies of HPV vaccine recommendation delivery (n = 19). (Cont'd)

First author, year	Full study period	Eligible study period	Data source	Study population	Analytic N	Main study result	Recommendation by adolescent characteristics										
							Sex	Age	Race	Income	Insurance	Locale	None				
Gilkey et al., 2015 (22)	2014	2014	Online survey	Family medicine physicians and pediatricians in a national sample	776	73% of providers "strongly endorsed" for adolescents aged 11-12											
Hofstetter et al., 2017 (23)	2013	2013	Online survey	Physicians in pediatric endocrinology, hematology, oncology, pulmonology, or rheumatology practice in a national sample	418	50% of providers "always" or "sometimes" recommended to adolescents with chronic medical conditions aged 11-17											
Javadi et al., 2017 (56)	2015	2015	Online survey	Nurses, nurse practitioners, and medical doctors in gynecology, family medicine, or pediatric practices in Texas	618	94% of providers recommended to adolescents aged 9-12											
Kempe et al., 2019 (46)	2018	2018	Mail and online survey	Pediatricians and family medicine physicians who were members of the American Academy of Pediatrics or the American Academy of Family Physicians	530	99% and 99% of pediatricians "strongly recommended" or "recommended" to females and males aged 11-12, respectively 96% and 94% of family physicians "strongly recommended" or "recommended" to females and males aged 11-12, respectively											
Malo et al., 2016 (51)	2014	2014	Mail survey	Family medicine physicians and pediatricians in Florida	355	30% of providers recommended to males aged 11-12 as 'routine'											
McRee et al., 2014 (47)	2013	2013	Online survey	Family medicine physicians, nurse practitioners, and pediatricians in Minnesota	575	76% and 46% of providers recommended to females and males aged 11-12, respectively											
Mehta et al., 2017 (52)	2016	2016	Online and mail survey	Providers in Louisiana who were members of the American Academy of Pediatrics	116	95% of providers routinely recommended to adolescents aged 11-18											
Reno et al., 2019 (48)	2014, 2016	2014	Intervention, online and in-person survey	Doctors of osteopathy, nurse practitioners, medical doctors, and physician assistants from the Colorado Children's Outcomes Network	74 in intervention group, 75 in control group	At baseline (intervention group): 61% and 57% of providers strongly recommended to females and males aged 11-12, respectively At baseline (control group): 59% and 53% of providers strongly recommended to females and males aged 11-12, respectively											

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Table 2. Summary of provider studies of HPV vaccine recommendation delivery (*n* = 19). (Cont'd)

First author, year	Full study period	Eligible study period	Data source	Study population	Analytic <i>N</i>	Main study result	Recommendation by adolescent characteristics							
							Sex	Age	Race	Income	Insurance	Locale	None	
Soon et al., 2015 (49)	2012	2012	Online survey	Family medicine physicians and pediatricians and in Hawaii	73	71% and 57% of providers strongly recommended to females and males aged 11–12, respectively	●	●						
Vadapa-rampil et al., 2016 (53)	2014	2014	Mail survey	Family medicine physicians and pediatricians in Florida	355	31% of providers consistently and strongly recommended to males aged 11–12	●							
Walling et al., 2019 (41)	2015	2015	Online survey	Pediatricians from networks with Washington University and University of Pittsburgh	100	91% and 90% of providers recommended to females and males aged 11–12, respectively	●							

Adolescents' sex

Parental reports

Studies based on parental reports of HPV vaccine recommendation by sex consistently found that recommendations for male adolescents was less common than recommendations for female adolescents (24–38). We identified 14 national studies (24–29, 31–38), including 12 studies that used NIS-Teen data (24–29, 33–38), which examined recommendation prevalence by sex. These national studies found recommendation prevalence among males to be 11 to 35 percentage points lower than among females (Fig. 2; refs. 26, 28, 36). Of these, 11 studies performed statistical tests to evaluate differences and reported either a *P* value or estimates with confidence intervals; all found recommendation receipt to be less common among males (25–29, 31–33, 36–38). We also identified 4 regional or local studies (26, 28, 30, 33), which reported sex differences in recommendation prevalence ranging from 6 to 35 percentage points (28, 30). Of these, 4 studies statistically tested the difference, with 3 reporting recommendation to be less common for males (26, 28, 33), and 1 finding no difference (30).

Provider reports

Most studies based on provider reports also found HPV vaccine recommendation to be less common for male versus female adolescents, including for adolescents aged 11–12 who are the target for routine HPV vaccination (39–49). Among 3 national studies (40, 45, 46), the percentage of providers routinely delivering recommendation at ages 11–12 was 1 to 13 points lower for males than for females (45, 46), and 2 of these studies conducted tests to assess and report statistically significant differences (40, 46). Among an additional 8 regional studies (39, 41–44, 47–49), 7 reported sex differences in the percentage of providers delivering recommendation, which ranged from 1 to 30 points lower for males than females (41, 47). Of these regional studies, 3 tested and reported the difference as significant (42, 44, 47), while the other 4 did not formally test the differences (41, 43, 48, 49).

Age

Parental reports

We identified 2 national studies that compared recommendation prevalence for adolescents aged 11–12 versus aged 13 and older; one study reported that provider recommendation was 12 percentage points significantly lower for younger adolescents, while the other reported a nonsignificant 3 percentage point difference (32, 36). Although not as pertinent to this review, we identified an additional 4 studies that reported age-stratified recommendation prevalence among adolescents aged 11 or younger (30, 31) or among older adolescents aged 13 and above (37, 50).

Provider reports

Most provider studies also reported a lower prevalence of HPV vaccine recommendation for younger compared to older adolescents (39–43, 46, 49, 51–56). One study reported a -13 percentage points difference in recommendation receipt among younger adolescents aged 11–12, as compared to older adolescents, but did not conduct significance test (55). We identified 7 studies that stratified recommendation prevalence by adolescents' sex and/or provider specialty (39–43, 46, 49), of which 2 studies tested and reported that providers made significantly fewer strong recommendation for younger adolescents (40, 42). Four additional studies assessed recommendation prevalence among adolescents aged 11 or younger (56), or

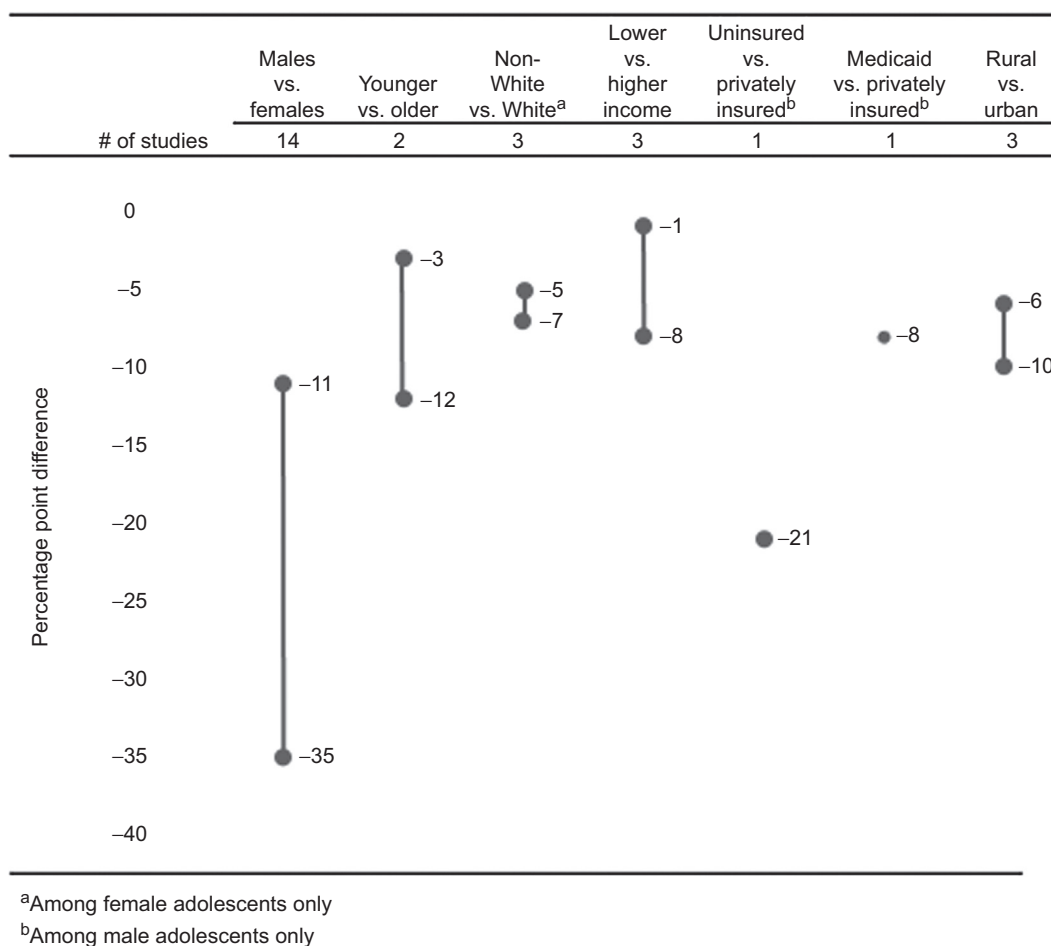


Figure 2. Percentage point differences in parental reports of provider HPV vaccine recommendations in national studies.

examined age differences within samples of either female (54) or male adolescents (51, 53).

Race/ethnicity

Parental reports

Studies found that parental report of HPV vaccine recommendation differed across race/ethnicity among female adolescents, but not male adolescents (24, 32, 37, 50, 57, 58). We identified 6 national studies that examined variations by race/ethnicity (24, 32, 37, 50, 57, 58), which included 5 studies that used NIS-Teen data (24, 37, 50, 57, 58). One national study reported that recommendation receipt ranged by -1 to +4 percentage points among Black, Hispanic, and “other” racial/ethnic adolescents overall, relative to Whites, but this difference was not statistically significant (32). Among the 5 NIS-Teen studies, 3 studies measured recommendation receipt among female adolescents (24, 37, 58). The prevalence of provider recommendation was 5 to 7 percentage points lower among Black, Hispanic, and “other” racial/ethnic groups, as compared to Whites (24, 37). Two of these 3 studies statistically tested differences and found significantly fewer reports of vaccine recommendation among non-White females (37, 58). In contrast, four NIS-Teen studies assessed provider recommendation among male adolescents (24, 37, 50, 57);

three studies found that non-White racial/ethnic groups differed by -8 to +4 percentage points from their White counterparts (24, 37, 50). Of these 4 studies, 3 studies tested and reported nonsignificant differences among male adolescents (37, 50, 57).

Household income

Parental reports

Several studies found provider recommendation to be less common for lower-income versus higher-income adolescents (32, 37, 50). We identified 3 national studies that examined parental reports of provider recommendation by household income (32, 37, 50), of which 2 analyzed NIS-Teen data (37, 50). These national studies reported a difference of -1 to -8 percentage points in recommendation receipt for lower-income adolescents (32, 50). All 3 studies conducted significance tests, with 2 finding a significant difference between adolescents in the lower versus higher household income bracket (37, 50), and 1 reporting no significant difference (32).

Health Insurance Status

Parental reports

One national study observed that HPV vaccine recommendation among male adolescents varied by health insurance type, with

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recommendation being less common for uninsured and Medicaid-insured adolescents (50). Using NIS-Teen data, this study found that relative to privately insured adolescents, recommendation receipt was 21 percentage points lower among those uninsured, and 8 percentage points lower among those enrolled in Medicaid. These differences were statistically significant.

Locale

Parental reports

We identified 10 national studies that examined geographical variations in HPV vaccine recommendation using NIS-Teen data (26, 28, 33, 37, 50, 57, 59–62). Of these studies, 2 studies found that receipt of provider recommendation was lowest in the South and highest in Northeast region of the US (37, 57). Another 2 studies reported the lowest state-level prevalence of vaccine recommendation in Mississippi and Wyoming and highest prevalence in the Northeast (Maine and Massachusetts) (50, 61). In 3 other studies, recommendation receipt in rural areas was 6 to 10 percentage points significantly lower than in urban areas (50, 61, 62). In contrast, these studies reported recommendation receipt as –2 to +2 percentage points for suburban versus urban areas (50, 61, 62); two of these studies conducted statistical tests and reported nonsignificant findings (61, 62). Five studies reported recommendation receipt of specific states, further supporting that geographic differences in vaccine recommendation exist across the US (26, 28, 33, 59, 60).

Discussion

Provider recommendations are critical for HPV vaccine uptake, yet findings from our systematic review of over 50 studies evidenced disparities in recommendations for US adolescents. Specifically, studies found that recommendation was less common for adolescents who were male, younger in age, lower-income, and residents of Southern or rural areas. Provider recommendation was also less common for non-White females and for males who were Medicaid-eligible or uninsured versus privately insured. Based on providers' own reports of their communication practices, it is likely that recommendation disparities for males and younger adolescents are due to providers not prioritizing these groups for guideline-consistent recommendation (63). Such suboptimal recommendation practices may be due to providers' discomfort with the prospect of discussing HPV as a sexually transmitted disease (64) and concern about resistance from parents (63). Reasons for recommendation disparities for lower-income, rural, Southern, non-White, and uninsured adolescents are less clear, but could be related to access to care (65, 66), as these groups may be less likely to access well-child visits, and, thus, could have fewer opportunities to receive a provider recommendation. Whatever the reason, disparities in HPV vaccine recommendation likely limit HPV vaccine uptake, including in non-White, lower-income, and rural populations who are more likely to experience future HPV cancers (5, 67).

The disparities in providers' HPV vaccine recommendation observed in this study signal the need for continued efforts to increase recommendation consistency and timeliness. Existing research highlights several opportunities in this regard. First, training providers to improve their recommendation practices can be accomplished with evidence-based communication interventions (68, 69). Second, health systems factors, such as provider prompts and standing orders, are likely also needed. For example, electronic health record prompts that offer providers a script for

HPV vaccine recommendation have been shown to increase uptake (70). At the same time, reminder/recall and other patient navigation efforts may hold promise for overcoming access barriers. Third, a growing body of research points to the value of combined, multilevel intervention approaches to maximize impact (71). Finally and most importantly, these interventions should be targeted in the South and in rural areas where disparities in provider recommendation were noted in this review.

Our findings also suggest several opportunities to strengthen and extend the existing literature on providers' HPV vaccine recommendation. First, most parental studies in this review (22 of 33 studies) analyzed data collected through the NIS-Teen survey of households with adolescents aged 13–17. Although the NIS-Teen is considered the “gold standard” of adolescent vaccine surveillance, the survey's focus on older adolescents limits insights into “on-time” recommendation. Future research should focus on guideline-consistent recommendation to adolescents aged 12 and younger. Second, most measures of HPV vaccine recommendation did not specify a timeframe, but instead assessed whether parents had ever received a recommendation. Greater specificity would meaningfully extend the limited available literature on recommendation timeliness (e.g., “in the past 12 months”). Finally, the vast majority of included studies relied on parent or provider report of HPV vaccine recommendation; more objective and varied data collection methods, including the recording of medical encounters, is warranted.

The findings of this systematic review should be interpreted in light of its weaknesses. Our findings on disparities in provider recommendation were limited to adolescent characteristics measured in reviewed studies. For example, differences in provider recommendation by adolescents' sex were restricted to male-versus-female comparisons; possible disparities across gender diverse adolescents are thus not presented in this review. Similarly, other demographic characteristics, such as sexual orientation, are lacking in the current literature. Future studies should also consider provider characteristics as potential correlates of HPV vaccine recommendation practices, including specialty, years in practice, and race/ethnicity. As previously noted, studies in this review primarily used self-reported data to assess differences in providers' recommendation of HPV vaccination. However, our study was strengthened by the inclusion of both parent and provider reports, allowing for some triangulation of perceived HPV vaccine recommendation receipt and delivery. Finally, we note that studies in our sample received only middling quality scores on average, but we chose to include all studies regardless of quality for the sake of completeness. As the literature on HPV vaccine recommendation grows, future studies may have the opportunity to use meta-analytic techniques to quantitatively synthesize findings on recommendation disparities.

Conclusion

Our systematic review of 52 studies finds disparities in providers' HPV vaccine recommendation for US adolescents. Parent and provider reports suggest that recommendation is less common for adolescents who are male, younger in age, lower-income, or reside in Southern or rural areas. Differences were also observed by race/ethnicity and insurance status of female and male adolescents, respectively. Increased and targeted efforts to promote consistent provider recommendation are needed to reduce disparities in HPV vaccine recommendation, increase uptake, and maximize adolescents' protection against future cancers.

Authors' Disclosures

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