

Reasons for Not Vaccinating Adolescents: National Immunization Survey of Teens, 2008–2010

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KEY WORDS

adolescent, preventive health services, vaccination, immunization, adolescent health services, preventive health services, vaccines, meningococcal vaccines, papillomavirus vaccines, tetanus vaccine, diphtheria-tetanus vaccine, attitude to health, patient acceptance of health care, treatment refusal

ABBREVIATIONS

CI—confidence interval
HPV—human papillomavirus vaccine
MCV4—quadrivalent meningococcal conjugate vaccine
NIS-Teen—National Immunization Survey of Teens
Not-UTD—not up to date
OR—odds ratios
Td—tetanus toxoid and reduced diphtheria toxoid vaccine
Tdap—tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine

Dr Darden conceptualized and designed the study, participated in the analyses, drafted the initial manuscript, and approved the final manuscript as submitted. Dr Thompson helped with the design of the study, designed the analytic plan, oversaw the analyses, reviewed and revised the manuscript, and approved the final manuscript as submitted. Mrs Hale carried out the analyses, interpreted results, reviewed and revised the manuscript, and approved the final manuscript as submitted. Dr Roberts helped with the design of the study, interpreted results, reviewed and revised the manuscript, and approved the final manuscript as submitted. Dr Naifeh interpreted results, reviewed and revised the manuscript, and approved the final manuscript as submitted. Dr Pope helped with the design of the study, interpreted results, reviewed and revised the manuscript, and approved the final manuscript as submitted. Dr Jacobson helped with the design of the study, interpreted results, reviewed and revised the manuscript, and approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: The reasons why teens are not immunized are related to parental lack of knowledge and the need for provider recommendations.



WHAT THIS STUDY ADDS: The reasons for vaccine refusal for human papillomavirus vaccine differ from other teen vaccines, and concerns about its safety are increasing over time.

abstract

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OBJECTIVE: To determine the reasons adolescents are not vaccinated for specific vaccines and how these reasons have changed over time.

METHODS: We analyzed the 2008–2010 National Immunization Survey of Teens examining reasons parents do not have their teens immunized. Parents whose teens were not up to date (Not-UTD) for Tdap/Td and MCV4 were asked the main reason they were not vaccinated. Parents of female teens Not-UTD for human papillomavirus vaccine (HPV) were asked their intent to give HPV, and those unlikely to get HPV were asked the main reason why not.

RESULTS: The most frequent reasons for not vaccinating were the same for Tdap/Td and MCV4, including “Not recommended” and “Not needed or not necessary.” For HPV, the most frequent reasons included those for the other vaccines as well as 4 others, including “Not sexually active” and “Safety concerns/Side effects.” “Safety concerns/Side effects” increased from 4.5% in 2008 to 7.7% in 2009 to 16.4% in 2010 and, in 2010, approaching the most common reason “Not Needed or Not Necessary” at 17.4% (95% CI: 15.7–19.1). Although parents report that health care professionals increasingly recommend all vaccines, including HPV, the intent to not vaccinate for HPV increased from 39.8% in 2008 to 43.9% in 2010 (OR for trend 1.08, 95% CI: 1.04–1.13).

CONCLUSIONS: Despite doctors increasingly recommending adolescent vaccines, parents increasingly intend not to vaccinate female teens with HPV. The concern about safety of HPV grew with each year. Addressing specific and growing parental concerns about HPV will require different considerations than those for the other vaccines. *Pediatrics* 2013;131:645–651

Since 2005, 3 new vaccines have been licensed and recommended for adolescents: tetanus toxoid, diphtheria toxoid, and acellular pertussis vaccine (Tdap), quadrivalent meningococcal conjugate vaccine (MCV4), and human papillomavirus vaccine (HPV).^{1–3} These new vaccine recommendations add to the current recommendations for clinical preventive services⁴ and have the potential to improve the health of the entire population.^{5–7}

Data from the National Immunization Survey of Teens (NIS-Teen) suggest that immunization rates are improving but are still below the Healthy People 2020 goal of 90%.⁸ Among 13- to 17-year-olds, Tdap/tetanus toxoid and reduced diphtheria toxoid vaccine (Td) immunization rates improved from 72.2% in 2008 to 76.2% in 2009 to 81.2% in 2010. MCV4 immunization rates increased over the same 3 years from 41.8% to 53.6% to 62.7%. The percentage of females fully immunized with 3 doses of HPV was substantially lower than for the other vaccines but increased from 17.9% to 26.7% to 32.0%.^{9–11} Although specific early age cohorts (11–12 years) and differences in immunization rates by financial status have been studied, the reasons parents give for not immunizing adolescents and how these reasons change remain to be examined.^{12–14}

Parents' attitudes and beliefs affect the likelihood that their children will receive vaccines.^{15,16} A recent study in infants indicated that parents who delayed or refused vaccines were more likely to have vaccine safety concerns and to perceive fewer benefits associated with vaccines.¹⁶ In a survey of parents and adolescents in Monroe County, New York, Rand et al found that refusal of HPV was associated with viewing vaccines in general as unsafe. Parents' primary responses to open-ended questions were that the vaccine had not been sufficiently studied, that the teen was not

at risk, and that the parent or teen wanted more information.¹⁷ In the same study, parents who perceived vaccines as very safe were more likely to accept Tdap and MCV4. Perception of vaccine safety was not a significant predictor for HPV vaccination.¹⁸ However, in a survey of Texas physicians, the barrier to HPV immunization most commonly cited by parents was concern about HPV safety.¹⁹

Several studies have found that clinician recommendation increases parental vaccine acceptance. In a survey of nurses about their own daughters, clinician recommendation of HPV was associated with increased intent to receive HPV.²⁰ Additionally, in a national survey, women who received HPV were more likely to report that their clinician discussed HPV.²¹ Finally, analysis of the NIS-teen data from 2008 and 2009 shows association between clinician recommendation of HPV and improved immunization rates.²²

The objective for this project was to determine the reasons parents choose not to vaccinate their adolescents with specific vaccines and how these reasons have changed over time.

METHODS

We analyzed the public-use files of the NIS-Teen from 2008 through 2010. The NIS-Teen is implemented annually by the National Center for Immunization and Respiratory Diseases and the National Center for Health Statistics of the Centers for Disease Control and Prevention. The surveys, the methods of which have been published elsewhere,^{23,24} are validated, stratified, random-digit-dialing telephone surveys of households with adolescents 13 to 17 years of age. The survey is conducted in 2 phases. In the first phase, the household survey is collected through computer-assisted telephone-interview techniques. Then, immunization providers, who were identified

through the household survey, are surveyed in the second phase. Adjustments to weighting variables are made to account for biases resulting from nonresponse and nontelephone households. The Centers for Disease Control and Prevention assigns separate weights to respondents in the household and provider surveys to represent the total number of adolescents in the population.²⁴ This project derived population estimates on the basis of a weighted analysis of the household surveys.

We included teens in these analyses if the respondent (typically a parent) completed the household survey. Because data for the US Virgin Islands were not present in all years, they were not included in the analyses. The household survey asked parents about vaccines using the terms tetanus booster, Tdap, and Td; meningitis vaccine, brand names, MCV4 and MPSV4; and for HPV, HPV shot.

Parents were asked whether a doctor or other health care professional (clinician) had ever recommended that the teen receive Tdap/Td, MCV4, or HPV. Parents were asked separate questions about recommendations for each vaccine. These questions about clinician recommendation were different items from the response some parents gave to the main reason for not immunizing when some parents reported "Not recommended."

Our main outcome was the parents' stated reason their teen did not receive Tdap/Td, MCV4, or HPV. The analyses included parents who reported that their teen was not up to date (Not-UTD) for these vaccines and were subsequently asked the main reason. Not-UTD by parent report for Tdap/Td and MCV4 were variables in the NIS-Teen data set. To define Not-UTD for HPV, we used the parent report variables. For Tdap/Td, teens were considered Not-UTD if their parents reported no

Tdap/Td booster. For MCV4, teens were considered Not-UTD if their parents reported the child had not received any MCV4. For HPV, female teens were considered Not-UTD if the parents reported <3 HPV doses.

For Tdap/Td and MCV4, when the child was Not-UTD by parent report, the parent was asked an open-ended question concerning the main reason the teen was not vaccinated.²⁵ In contrast, for HPV, respondents reporting <3 HPV doses were then asked an “intent to vaccinate” question.²⁵ Those who did not respond to this question or who responded “Not too likely” and “Not likely at all” were then asked the main reason the child will not receive the HPV in the next 12 months.²⁵ For all open-ended main reason questions, there were no response prompts, and multiple responses were accepted.

Responses to the intent question were not present in the public-use data sets. Accordingly, we assumed that all parents whose adolescents were Not-UTD for HPV and who were asked for a main reason had expressed the intent

to not vaccinate their child for HPV in the next 12 months.²³

The analyses of Tdap/Td and MCV4 included all respondents. Because male teens were queried about HPV only in 2010, only female teens were included in analyses related to HPV. Analyses that compared the 3 vaccines with respect to clinician recommendations were also restricted to females teens.

To assess trends over the 3 years in Not-UTD by vaccine, clinician recommendation for a specific vaccine, and intent to vaccinate with HPV, we created logistic regression models that treated year as a continuous variable. These models estimate odds ratios (ORs; and 95% confidence intervals [CIs]) that are interpretable as, for example, the odds of being Not-UTD for a specific vaccination in 2009 or 2010 compared with the odds of being Not-UTD in the preceding year.

Each year's NIS data set included weights and other design elements that permit calculation of appropriate population estimates for children 13 to 17 years of age in that year in the United

States. We used the final weights appropriate to those completing the household survey (not including the US Virgin Islands).²³ Following the strategy recommended in the 2010 NIS-Teen Users Guide, we combined 3 years of data in a single database (number of observations; 98 086 with the weighted $N = 62\,625\,326$), generated year-specific estimates, and made between-year comparisons without adjusting household weights.

We used SAS version 9.2 (Cary, NC) and Stata version 10.1 (College Station, TX) to calculate accurate population estimates of odds and proportions. Estimated parameters were considered significant if their associated P values were $\leq .05$ or if the 95% CI did not include one.

All data were deidentified and freely available on the Internet. The University of Oklahoma Health Sciences Center Institutional Review Board for Human Research does not consider analyses of this type of data to qualify as human subjects research and therefore exempted this research from review.²⁶

TABLE 1 Percentage of Teens Who Are Not-UTD, Received a Recommendation for Vaccine, and Asked Main Reason (by Vaccine and by Year)^a

	2008% (CI)	2009% (CI)	2010% (CI)	OR (CI) ^b
Tdap/Td				
Not-UTD by parent report ^c	22.4 (21.3–23.5)	20.4 (19.5–21.2)	21.0 (20.2–22.0)	0.96 (0.92–1.00) ^d
Clinician recommendation for vaccine	46.9 (45.8–48.0)	49.2 (48.2–50.1)	50.0 (49.0–51.0)	1.06 (1.03–1.10) ^d
Asked main reason for not vaccinating ^e	21.3 (20.2–22.3)	19.3 (18.5–20.1)	20.3 (19.5–21.2)	0.97 (0.93–1.01) ^d
MCV4				
Not-UTD by parent report ^c	68.8 (67.7–69.9)	63.7 (62.7–64.7)	62.6 (61.5–63.6)	0.87 (0.84–0.90) ^d
Clinician recommendation for vaccine	28.6 (27.7–29.6)	33.7 (32.8–34.6)	35.8 (34.9–36.8)	1.18 (1.14–1.21) ^d
Asked main reason for not vaccinating ^e	67.6 (66.5–68.8)	62.6 (61.6–63.6)	61.8 (60.7–62.8)	0.88 (0.85–0.91) ^d
HPV (female)				
Not-UTD by parent report ^c	83.8 (82.7–84.8)	76.2 (75.2–77.3)	75.2 (74.0–76.3)	0.77 (0.74–0.81) ^d
Clinician recommendation for vaccine	46.8 (45.3–48.3)	54.5 (53.1–55.7)	52.4 (51.0–53.8)	1.12 (1.07–1.17) ^d
Asked main reason will not vaccinate/no intent to vaccinate ^{e,f}	39.8 (38.4–41.3)	41.1 (39.8–42.4)	43.9 (42.5–45.3)	1.08 (1.04–1.13) ^d

^a The denominator for every column under Tdap/Td and MCV is all respondents in that year. For HPV the denominator is all parent respondents of female teens.

^b The OR associated with year and a model where year predicted the row variable for the vaccine in the heading.

^c Not-UTD by parent report or parent held vaccination record is Tdap/Td = 0, MCV4 = 0, and HPV <3.

^d $P < .05$.

^e The parent of teens who were Not-UTD were asked an open-ended question about the main reason the child was not vaccinated (Tdap/Td and MCV4) or would not be vaccinated (HPV).

^f For HPV only, to be asked the main reason for not vaccinating the respondent must have reported the teen was Not-UTD and indicated no intent to vaccinate in the next 12 months.

RESULTS

Table 1 summarizes the percentage of teens who were Not-UTD, by parent report, for each vaccine and in each year. The percentage of teens who were Not-UTD for Tdap/Td showed no trend over the years studied (OR 0.96; 95% CI: 0.92–1.0) and was 22.4% in 2008 and 21.0% in 2010. MCV4 Not-UTD decreased from 68.8% in 2008 to 62.6% in 2010 (OR 0.87, 0.84–0.90). For females, the odds of Not-UTD for HPV decreased yearly (OR 0.77, 0.74–0.81), with the proportion Not-UTD beginning at 83.8% in 2008 decreasing to 75.2% in 2010.

At the same time that the parent-reported percentage of teens who were Not-UTD were stable or decreasing (indicating stable or increasing immunization coverage), parents reported increasing clinician recommendations for each of the 3 vaccines. Parents reporting that their clinician recommended each vaccine were highest for HPV (in female teens) and lowest for the MCV4 (Table 1). For Tdap/Td, reports of clinician recommendation increased over the years (OR 1.06; 95% CI: 1.03–1.10) from 46.9% (45.8%–48.0%) in 2008 to 50.0% (49.0%–51.0%) in 2010. For MCV4, clinician recommendation increased from 28.6% (27.7–29.6) in 2008 to 35.8% (34.9–36.8) in 2010 (OR 1.18, 95% CI: 1.14–1.21). In female teens, clinician recommendation for HPV increased from 46.8% (45.3%–48.3%) in 2008 to 52.4% (51.0%–53.8%) in 2010 (OR 1.12, 95% CI: 1.07–1.17).

The percentages of parents who were asked the main reason for not vaccinating their teen for Tdap/Td and MCV4 differed by ~1 percentage point, in each year, from the percentages of those who reported their teens were Not-UTD for those 2 vaccines (Table 1). Similar to the proportion Not-UTD, the proportion of parents asked the main reason over the 3 years was stable for Tdap/Td vaccine and decreasing for MCV4.

TABLE 2 The Most Frequent Parental “Main Reasons” for Not Vaccinating Teens (by Vaccine and by Year)^a

Reasons	Tdap/Td			MCV4			HPV (female) ^{b,c}		
	2008% (CI)	2009% (CI)	2010% (CI)	2008% (CI)	2009% (CI)	2010% (CI)	2008% (CI)	2009% (CI)	2010% (CI)
Not recommended	23.0 ^f (20.8–25.2)	24.5 ^{fg} (22.5–26.6)	23.6 ^f (21.6–25.6)	35.3 ^{fg} (34–36.7)	35.5 ^{fg} (34.3–36.7)	34.8 ^{fg} (33.5–36.1)	10.8 ^f (9.4–12.2)	8.5 ^f (7.4–9.6)	9.0 ^f (7.7–10.3)
Not needed/not necessary	15.4 ^f (13.6–17.2)	15.9 ^f (14.2–17.7)	16.8 ^f (15.0–18.5)	11.7 ^f (10.8–12.5)	13.2 ^f (12.3–14)	14.3 ^f (13.3–15.2)	14.4 ^f (12.7–16.1)	15.5 ^f (14.1–16.9)	17.4 ^{fg} (15.7–19.1)
Lack of knowledge	13.8 ^f (11.9–15.7)	14.1 ^f (12.5–15.7)	11.5 ^f (10–13)	12.4 (11.4–13.3)	11.4 ^f (10.6–12.2)	10.3 ^f (9.4–11.2)	15.8 ^{fg} (14–17.6)	15.7 ^{fg} (13.9–17.5)	10.2 ^f (8.8–11.6)
Not appropriate age	3.0 (1.9–4.1)	3.2 (2.4–3.9)	2.1 (1.5–2.7)	4.0 (3.5–4.5)	4.2 (3.7–4.6)	3.9 (3.3–4.4)	5.8 ^f (4.9–6.8)	4.4 ^f (3.6–5.2)	4.4 ^f (3.6–5.2)
Safety concern/side effects	0.4 (0.2–0.6)	0.3 (0.1–0.4)	0.6 (0.2–0.9)	0.5 (0.3–0.6)	0.4 (0.3–0.6)	0.9 (0.6–1.2)	4.5 ^f (3.6–5.4)	7.7 ^f (6.7–8.7)	16.4 ^f (14.6–18.1)
Don't know ^d	28.5 ^{fg} (25.7–31.3)	23.9 ^f (21.9–25.8)	25.7 ^{fg} (23.6–27.8)	22.4 ^f (21–23.7)	19.6 ^f (18.6–20.7)	20.2 ^f (19–21.3)	7.4 ^f (6.1–8.6)	4.8 ^f (4–5.6)	5.0 ^f (3.9–6.2)
Not sexually active	—	—	—	—	—	—	14.1 ^f (12.4–15.7)	12.3 ^f (11.0–13.6)	11.1 ^f (9.9–12.3)
Multiple reasons	2.2 (1.7–2.7)	2.9 (2.1–3.8)	3.1 (2.0–4.2)	3.2 (2.7–3.6)	3.7 (3.2–4.2)	3.6 (3.0–4.2)	7.2 ^f (6.0–8.4)	7.2 ^f (6.2–8.1)	9.2 ^f (8.0–10.3)
All other reasons ^e	13.7	15.2	16.6	10.6	12	12.1	20	24	17.2

A dash (—) denotes main reasons that were not given in this year and vaccine.

^a The percentages for the reasons shown are those parents gave when asked “What is the main reason your teen did not receive this vaccine?” (Tdap/Td and MCV4) or “What is the main reason your teen will not receive this vaccine?” (HPV). See Methods for details.

^b For HPV only, to be asked the main reason for not vaccinating the respondent must have indicated no intent to vaccinate in the next 12 months. See Methods for details.

^c The columns under HPV represent results for female teens only in that year; all other vaccines are for both male and female teens.

^d The reason “Don't know” was considered a valid response. This response never occurred with any other main reason.

^e The percentages shown are a sum of all reasons not shown in the table. Reasons not shown in the table are “No doctor or doctor's visit not scheduled,” “Not a school requirement,” “Other reason,” “Costs,” “Effectiveness concern,” “Child fearful,” “Child should make decision,” “College shot,” “Don't believe in vaccinations,” “Family/parental decision,” “Handicapped/special needs/illness,” “Religion/orthodox,” “Time,” “More info/new vaccine,” “Already up to date,” and “Not available.” Reasons not shown that were only given for HPV are “Increased sexual activity concern,” “No ob/gyn,” “Already sexually active,” and “Child is male” (only in 2010).

^f The most frequent reasons summing to at least 75% of the main reasons in that year for that vaccine.

^g The most frequently cited main reason for that vaccine in that year.

For HPV, the parents whose female adolescent were Not-UTD were asked about their intent to vaccinate in the next 12 months. Those who expressed intent not to vaccinate were asked the main reason why not. The percentages of parents who did not intend to vaccinate female teens with HPV were 39.8% (38.4%–41.3%) in 2008, 41.1% (39.8%–42.4%) in 2009, increasing to 43.9% (42.5%–45.3%) in 2010 (OR 1.08, 95% CI: 1.04–1.13; Table 1).

Table 2 summarizes the main reasons that account for 75% of those that parents offer for failing to immunize (MCV4 and Tdap/Td) or not planning to immunize (HPV). The 4 main reasons are the same for Tdap/Td and MCV4: (1) Not recommended, (2) Not needed or not necessary, (3) Lack of knowledge, and (4) Don't know. "Not recommended" was the most frequent reason in 2009 for Tdap/Td and in all years for the MCV4. "Don't know" was the second most common reason for not vaccinating for all years for MCV4 and in 2009 for Tdap/Td and the most frequent reason in 2008 and 2010 for Tdap/Td.

For HPV, when parents gave the main reason for not seeking a vaccination in the next 12 months, 8 reasons accounted for 75% of responses in all years. These most frequently reported reasons included the same 4 as those for MCV4 and Tdap/Td. However, for all years, parents gave 4 additional main reasons "Not sexually active," "Not appropriate age," "Safety concern/side effect," and multiple reasons. The most frequent main reason for lack of intent to seek HPV varied by year. "Lack of knowledge" was the most frequent main reason in 2008 and 2009, comprising 15.8% and 15.7%, respectively. In 2010, this main reason had decreased to 10.2%. In 2010, the most frequent main reason cited by parents was "Not needed or not necessary" at 17.4% (15.7%–19.1%). A close second

most frequent main reason in 2010 was "Safety concerns/side effects" at 16.4% (14.6%–18.1%). The percentage of parents who planned not to seek HPV vaccination because of "Safety concerns/side effects" increased dramatically, from 4.5% in 2008% to 7.7% in 2009% to 16.4% in 2010.

To examine the effect of clinician recommendation on teen vaccination, we calculated the proportion of teens who were Not-UTD but whose clinician had recommended the vaccine. This analysis included only females to permit comparisons among the 3 vaccines. Among adolescent females who were Not-UTD for Tdap/Td, parents reported that a clinician had recommended the vaccine in 11.1% (8.6%–13.5%) in 2008 to 12.0% (9.7%–14.2%) in 2009 and increasing to 16.1% (13.1%–19.0%) in 2010 (OR 1.25, 95% CI: 1.05–1.48). For MCV4, the proportions of clinician recommendation in those Not-UTD were 8.5% (7.1%–9.9%) in 2008 and 9.7 (8.4%–11.0%) in 2010 (OR 1.07, 95% CI: 0.96–1.21). Clinician recommendation for HPV to the parents of female teens who were Not-UTD was more common than for other vaccines. The proportion who reported that a clinician recommended HPV was 40.0% (38.3%–41.7%) in 2008, increasing to 44.6% (43.1%–46.2%) in 2009 and then to 43.7 (42.0%–45.3%) in 2010 (OR 1.08, 95% CI: 1.03–1.13).

DISCUSSION

The main reasons that parents offer for not vaccinating their teenage children were similar and consistent over the years for Tdap/Td and MCV4. In contrast, the main reasons parents gave for not seeking the HPV differed from the other vaccines, were more diverse, and changed dramatically over the years examined.

The reason most commonly reported for not being UTD for Tdap/Td or MCV4 in most years (ie, "Not recommended")

corresponds with another finding in this study, that only a minority of parents whose child was Not-UTD reported that a clinician had recommended these vaccines. Another common main reason given by parents was "Don't know." "Don't know" might reflect that the parent could not recall the reason for which the vaccine was not given, the possibility that the parent could not recall refusing the vaccine, as well as no specific memory of any discussion of the vaccine. The other commonly given reasons for failing to vaccinate ("Not needed or not necessary" and "Lack of knowledge") reflect parental attitudes that clinicians can address. In fact, the study found evidence, in the increasing reports of clinician recommendation, that physicians are addressing these parental attitudes.

For HPV, the issues appear more fluid and more challenging. The consistent 11% to 14% of parents who gave the main answer "Not sexually active" illustrates that parents mistakenly perceive this vaccine is related to and necessary only if there is current sexual activity. Another consistent response, given by 14% to 17% of parents across the 3 years studied, was that the HPV is "Not needed or not necessary," despite the high prevalence rates of HPV infection and of the infection's dire consequences suffered later in life. Also troubling was the dramatic rise over the 3 years in safety concerns about HPV, which increased from 4.5% to 16.4% of parents over the 3-year period. This increase in safety concerns, which coincided with a decreased prominence of "not recommended" as a reason not to get HPV, may imply decreased parental reliance on clinician recommendations for HPV. The decrease in "Not recommended" as a reason for not vaccinating was not seen with Tdap/Td and MCV4 vaccines, for

which this reason was consistently twice to three times as common for HPV. Some of the differences between the vaccines may be explained by the differences in the populations and in the questions asked for HPV compared with the other vaccines. Parents whose teen was Not-UTD for HPV were asked about their intent to vaccinate, and only those who expressed that future vaccination was not likely were then asked the main reason. This contrasts to MCV4 and Tdap/Td, for which all parents of children who reported their teen were Not-UTD were asked about a past activity, the main reason why the teen had not been vaccinated.

In examining clinician recommendation, we find that for MCV4 and Tdap/Td, those who were Not-UTD infrequently reported that their clinician recommended the vaccine. In comparison, those who were Not-UTD for HPV were more likely to report that their clinician had recommended HPV. Moreover, the proportion recommending the HPV among those Not-UTD increased over the years studied.

Dorell et al also examined the main reasons for HPV underimmunization using the NIS-Teen survey from 2009

(the middle year in our analyses).¹³ Their findings were similar to ours for that 1 year, and they concluded that practice and system improvements, including clinician recommendation and registry participation, would improve HPV-series initiation and completion. Laz et al examined parents' reasons for not vaccinating with the HPV in the 2010 National Health Interview Survey and found, similar to our findings, that concerns about vaccine safety were among parents' top 3 concerns.²⁷

The large and increasing proportion of parents who do not intend to immunize their adolescent daughters with HPV is troubling and should be reflected in vaccination coverage rates. In 2010, HPV vaccination coverage rate increases were less than half that of MCV4 and Tdap.¹⁰ This difference persists despite parents reporting that their health care clinician frequently recommended the vaccine.

There are limitations to this survey and the analyses. This is a cross-sectional survey that compares 3 distinct cohorts across multiple years. We focused our analyses on the parent survey and parental reporting and did not

use the provider survey to verify vaccination status. Although this decision may affect the accuracy of some estimates, it was made to preserve a large sample size. We were most interested in those Not-UTD and teens who are Not-UTD are less likely to have adequate provider data.²³ In any event, recent data indicates that, for HPV, parental report is reasonably accurate (for 1 HPV and 3 HPV doses, κ 0.92 and 0.87 respectively).²⁸

The results of this study suggest physician recommendation may not be sufficient to increase uptake of HPV. Our findings across 3 years show that, even as clinicians are increasingly recommending HPV, increasing numbers of parents, >40% in 2010, do not intend to vaccinate their adolescent female children with this vaccine. Parents intending to refuse are increasingly concerned about vaccine safety and seem less willing to accept clinician recommendations. These trends suggest the need for interventions beyond clinician recommendation. There may be a role for testing state and federally designed social marketing campaigns beyond approaches taken in the past,²⁹ which have been limited in scope.^{30,31}

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