

Original article

Human Papillomavirus Vaccine Initiation in an Area with Elevated Rates of Cervical Cancer

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Abstract

Purpose: We assessed human papillomavirus (HPV) vaccination of adolescent girls living in communities with elevated cervical cancer rates.

Methods: During July to October 2007, we conducted interviews with a probability sample of parents (or guardians) of 10- to 18-year-old girls in five North Carolina counties with cervical cancer rates substantially higher than the national average. Estimates are weighted.

Results: We interviewed 889 (73%) of 1220 eligible parents; 38% were black. Overall, 10.3% (95% confidence interval [CI] 7.7%–13.5%) of daughters had received at least 1 dose of HPV vaccine. Only 6.4% of 10- to 12-year-olds had initiated vaccination, versus 17.5% of 16- to 18-year-olds (odds ratio [OR] 3.1, 95% CI 1.4–6.9). Older age of daughters and doctor's recommendation were the only factors independently associated with vaccine initiation. Main reasons reported for not initiating HPV vaccine were: needing more information (22%) or never having heard of the vaccine (14%), believing daughter is too young (16%) or not yet sexually active (13%), and not having gone to the doctor yet (13%). Only 0.5% of parents cited concern about HPV vaccine making a teenage girl more likely to have sex as a main reason for not vaccinating. Of 780 parents with unvaccinated daughters, 62% reported their daughters "probably" or "definitely" will, and 10% reported their daughters "definitely won't" get HPV vaccine in the next year.

Conclusions: Approximately 1 year after its introduction, HPV vaccine had been initiated by only 10% of adolescent girls in an area with elevated cervical cancer rates; however, most parents intended for their daughters to be vaccinated. Additional efforts are needed to ensure that parents' intentions to vaccinate are realized. Published by Elsevier Inc. on behalf of Society for Adolescent Medicine.

Keywords: Human papillomavirus; HPV vaccines; Immunization; Adolescent

The quadrivalent human papillomavirus (HPV) vaccine was licensed by the U.S. Food and Drug Administration in June 2006. Soon thereafter, the Advisory Committee on Immunization Practices (ACIP) recommended routine HPV vaccination for 11- and 12-year-old girls and "catch-up" vaccination for 13- through 26-year-olds who have not previously received it [1,2]. HPV vaccine holds great promise for reducing the burden

of cervical cancer and other HPV-related disease where its uptake is high. This will be especially important in communities with the highest cervical cancer rates, which often include large racial and ethnic minority populations [3,4].

Little is known about HPV vaccine uptake in communities with elevated cervical cancer rates. Because these communities are often medically underserved, there is concern that adolescents with the greatest need for HPV vaccine may be least likely to receive it. The objective of this study was to assess HPV vaccine uptake by adolescent girls, their parents' intentions for them to be vaccinated, and potential barriers to their vaccination in an area with elevated cervical cancer rates.

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Methods

We conducted a telephone survey of caregivers (parents or guardians) of 10- to 18- year-old girls in five North Carolina counties. To select these counties, we identified 11 North Carolina counties that met predefined inclusion criteria of: (a) annual cervical cancer incidence rates greater than 10 cases/100,000 women, 1993 to 2003, and mortality rates greater than 4 deaths/100,000 women, 1994 to 2004; (b) at least 20% African American residents; and (c) at least 1500 girls in the targeted age range. We further narrowed the list to nine eligible counties geographically clustered in southeastern North Carolina. We included the only urban county in the region: Cumberland (population 302,963), and randomly selected four rural counties: Duplin, Harnett, Sampson, and Wayne (combined population 336,481). Annual cervical cancer incidence rates in these counties ranged from 10.2 to 13.9 cases/100,000 women and mortality rates ranged from 4.2 to 6.5 deaths/100,000 women (personal communication, North Carolina State Center for Health Statistics, 2006), substantially higher than annual U.S. rates in a similar time frame (incidence, 8.6 cases/100,000; mortality, 2.9 deaths/100,000) [5].

The survey was conducted July to October 2007, approximately 1 year after HPV vaccine was licensed and first recommended [1], 5 months after final ACIP recommendations were published [2], and 6 months after HPV vaccine became available through the Universal Children's Vaccine Distribution Program (UCVDP). UCVDP is North Carolina's program to distribute vaccines through the federally funded Vaccines for Children (VFC) program, which provides vaccines at no cost primarily to uninsured and Medicaid-eligible children and adolescents [6]. Although North Carolina also uses state funds to supplement the VFC entitlement to provide vaccines for all underinsured, non-VFC-eligible children, state funds were not available for HPV vaccine in 2007.

Trained interviewers contacted a stratified probability sample of county households with telephone access, using a dual-frame approach. Five percent of the sample was selected using a list-assisted random digit dialing frame, and 95% was chosen from a nonoverlapping targeted-list frame consisting of directory-listed residential telephone numbers with available recent demographic information. Samples were stratified at the telephone exchange level by concentration of African American residents and rural versus urban status (based on U.S. Census 2000 block-level classification) [7]. We oversampled households likely to include a 10- to 18-year-old girl and those in predominantly African American and rural areas. To be eligible for the study, telephone numbers needed to reach study county residential households that included a female child aged 10 to 18 years. If a household had more than one female child aged 10 to 18, we randomly selected one index child for questions. We attempted to interview the child's female caregiver but interviewed the male caregiver if she was not available. For the sake of simplicity, hereafter we refer to caregivers as

"parents" and index children as "daughters." All respondents gave verbal consent for the study. The institutional review board at the University of North Carolina approved the study protocol.

Interviews contained questions on HPV vaccine uptake, main reasons for not vaccinating, and intentions to vaccinate daughters (survey instrument available on request). Vaccine initiation was determined by the question: "Has [daughter] had any shots of the HPV vaccine?" If a daughter had not been vaccinated, the interviewer asked the open-ended question, "What is the *main* reason she has not gotten any HPV shots?" Respondents were encouraged to give just one reason, but all reasons were recorded. Parents were also asked: "How likely are you to get [daughter] the HPV vaccine in the next year?" Response options were "definitely won't," "probably won't," "probably will," and "definitely will." We collected additional information including demographics, healthcare provider recommendations, where HPV vaccine was received and costs of vaccination. Race/ethnicity was defined as white (non-Hispanic), black or African American (non-Hispanic), Hispanic, or "other." Hispanics and "other" race/ethnicities were evaluated separately for HPV vaccine initiation, but were combined to evaluate the multilevel variable for intentions to vaccinate, because of small numbers.

All prevalence estimates were weighted to incorporate the sampling design of the survey. Confidence intervals (CIs) for prevalence estimates were calculated using a logit transformation, and variance estimates were calculated using a Taylor series linearization. Summary *p*-values for bivariate associations were calculated using a Wald *F* test for independence. Odds ratios (ORs) with 95% CIs were calculated by logistic regression.

A multivariate logistic regression model was developed to examine independent associations with HPV vaccine initiation, using a backward elimination process. Variables associated with vaccine initiation with a *p*-value less than or equal to 0.20 in bivariate analysis were considered for the initial model. At each step, the variable with the largest Wald *F* *p*-value was removed from the model. Possible confounding was assessed by confirming that no beta coefficients of statistically significant variables in the previous step changed by more than 25%. This process was repeated until all remaining variables had a Wald *F* *p*-value less than or equal to 0.05. Last, all pairwise interactions were explored among remaining variables. Statistical analyses were performed using SAS-callable SUDAAN (Research Triangle Institute, Research Triangle Park, NC).

Results

Among 3259 households contacted, 89% were screened for eligibility [8]. We identified 1220 eligible parents, and 73% (889) agreed to participate and completed the interview. This sample represented parents with a mean age of 41 years (interquartile range [IQR] 36–45 years); 38% reported their

race/ethnicity as black or African American, and 5% as Hispanic (Table 1). Just over half of the parents reported an annual household income equal to or more than \$50,000, and 72% had some college education. Most (78%) parents had heard of HPV vaccine before the survey.

The mean age of daughters was 14 years (IQR 12–17 years). Most (76%) daughters had some form of private health insurance, and only 4% had no insurance. Per parents' reports, 92% of daughters had seen a healthcare provider and

83% had had a preventive care visit such as a physical or check-up in the last year. A healthcare provider had recommended the HPV vaccine for 21% of the daughters in the last year.

Initiation of HPV vaccination

Overall, 10.3% (95% CI 7.7%–13.5%) of parents reported that their daughters had received at least one dose of HPV vaccine (Table 2). However, initiation of HPV vaccine varied by daughters' age group. According to parents' reports, only 6.4% of 10- to 12-year-old daughters had received a dose of HPV vaccine, whereas 17.5% of 16- to 18-year-old daughters had received it, a significant threefold difference in the odds of vaccine initiation (OR 3.1, 95% CI 1.4–6.9). Limiting to 13- to 17-year-old daughters, the age group evaluated by the National Immunization Survey—Teen (NIS—Teen) [9], we found that 9.8% had initiated HPV vaccine. Vaccine initiation did not differ significantly between whites (10.3%) and blacks (12.5%, $p = .54$). Although the numbers of Hispanic parents were relatively small, very few reported their daughters had been vaccinated, a significantly lower proportion than non-Hispanic whites ($p = .01$). Reported receipt of at least 1 dose of HPV vaccine was 16.1% among daughters with only public health insurance, that is, Medicaid or the state Children's Health Insurance Program, and 9.1% among those with any private insurance ($p = .20$). We found no significant interaction between race and insurance status ($p = .10$). Recommendation of HPV vaccine by a healthcare provider was strongly associated with HPV vaccine initiation (OR 11.7, 95% CI 5.3–25.9). However, it is notable that 66.0% of those who had been recommended HPV vaccine by a healthcare provider had not received it.

In a multivariate model, only two factors were independently associated with HPV vaccine initiation: age group of daughter and recommendation of HPV vaccine by a healthcare provider. Daughters aged 13 to 15 were no more likely than those aged 10 to 12 to have initiated HPV vaccine (adjusted OR [aOR] 0.9, 95% CI 0.4–2.2); however, those aged 16 to 18 were significantly more likely to have initiated HPV vaccine (aOR 3.1, 95% CI 1.3–7.5). Those who had received a healthcare provider's recommendation had over a 12-fold increase in the odds of having initiated HPV vaccine (aOR 12.6, 95% CI 6.0–26.5). There was no significant interaction between daughter's age group and healthcare provider's recommendation ($p = .30$).

Location and costs of HPV vaccination

Of the 106 daughters who had received at least one dose of HPV vaccine, 40% received it from a pediatrician, 23% from a family practitioner, and 19% from an obstetrician–gynecologist. Another 10% of parents stated only that their daughter got HPV vaccine at a “public clinic” and 8% at a military facility. The vast majority (92%) of parents reported that their daughters' health insurance covered HPV vaccine, 6% did

Table 1
Demographic and other characteristics of parents (n = 889) and their daughters

	n	Weighted %
Parents		
Sex		
Male	54	7
Female	835	93
Age group, years		
≤ 39	245	50
40–49	495	39
≥ 50	139	11
Race/ethnicity		
White ^a	624	52
Black ^a	206	38
Hispanic	28	5
Other	28	5
Annual household income		
≥\$50,000	560	56
<\$50,000	272	44
Education level		
Some college or greater	697	72
High school or less	190	28
Rural/urban status		
Urban	452	53
Rural	437	47
Had heard of HPV vaccine before survey		
Yes	726	78
No	160	22
Daughters		
Age group, years		
10–12	249	35
13–15	290	33
16–18	342	33
Health insurance status		
Private	735	76
Public only	109	20
None	42	4
Had seen a healthcare provider in last year		
Yes	825	92
No	62	8
Had had a preventive care visit in last year		
Yes	728	83
No	159	17
Had been recommended HPV vaccine by healthcare provider in last year		
No	684	79
Yes	193	21

HPV = human papillomavirus.

^a Non-Hispanic.

Table 2
Initiation of HPV vaccination by daughters (n = 886),^a according to demographic characteristics and healthcare provider recommendation

	N	Weighted % with vaccinated daughter, 95% CI	Unadjusted OR (95% CI)	p-Value ^b
Total	886	10.3 (7.7–13.5)		
Sex of parent				.63
Male	54	7.9 (1.9–26.9)	1.0 ^c	
Female	832	10.4 (7.8–13.9)	1.4 (0.3–6.3)	
Age group of parent, years				.04
≤ 39	245	6.7 (3.5–12.3)	1.0 ^c	
40–49	492	15.3 (11.0–20.9)	2.5 (1.2–5.5)	
≥ 50	139	9.7 (4.7–18.8)	1.5 (0.6–3.8)	
Race/ethnicity of parent				.02
White ^d	622	10.3 (7.9–13.3)	1.0 ^c	
Black ^d	205	12.5 (7.3–20.7)	1.2 (0.6–2.4)	
Hispanic	28	1.0 (0.1–7.5)	0.1 (0.01–0.7)	
Other	28	2.6 (0.4–17.0)	0.2 (0.03–1.8)	
Household income				.61
≥\$50,000	559	9.9 (7.2–13.5)	1.0 ^c	
<\$50,000	270	11.6 (7.0–18.4)	1.2 (0.6–2.3)	
Education level of parent				.13
Some college or greater	694	11.6 (8.5–15.7)	1.0 ^c	
High school or less	190	6.8 (3.3–13.7)	0.6 (0.2–1.3)	
Rural/urban status				.30
Urban	449	11.6 (7.8–17.1)	1.0 ^c	
Rural	437	8.7 (6.1–12.4)	0.7 (0.4–1.3)	
Age of daughter, years				.02
10–12	249	6.4 (3.6–11.1)	1.0 ^c	
13–15	290	7.5 (4.7–11.7)	1.2 (0.5–2.6)	
16–18	339	17.5 (11.6–25.6)	3.1 (1.4–6.9)	
Health insurance status of daughter				.17
Private	733	9.1 (6.9–12.0)	1.0 ^c	
Public only	108	16.1 (8.1–29.3)	1.9 (0.8–4.4)	
None	42	4.3 (1.2–14.5)	0.5 (0.1–1.8)	
Healthcare provider recommended HPV vaccine				<.001
No	684	4.2 (2.2–7.8)	1.0 ^c	
Yes	193	34.0 (24.9–44.0)	11.7 (5.3–25.9)	

HPV = human papillomavirus; OR = odds ratio; CI = confidence interval.

^a Data are missing for three parents who did not know whether their daughters had received HPV vaccine.

^b Wald *F* test for independence.

^c Referent.

^d Non-Hispanic.

not know, and only 2% stated it did not. Fifty-five percent of parents stated that they did not have any out of pocket costs when their daughter got the first dose of vaccine, 32% paid less than \$100, only 4% paid close to the \$120 wholesale cost per dose, and 9% did not know how much it had cost. The vast majority of parents reported that it was “not hard at all” to find a provider or clinic that had HPV vaccine available (94%), that was easy to get to (97%), where they could afford the vaccine (94%), and where they did not have to wait long to get an appointment (94%).

Main reasons reported for daughters not having initiated HPV vaccination

Among parents of unvaccinated daughters (n = 780), the main reasons reported for daughters not having received vaccine are shown in Table 3. The most commonly cited

reason was needing more information about the vaccine, reported by 22% of parents. An additional 15% reported that they had never heard of HPV vaccine or were not aware their daughter could get it. Another commonly cited reason for not vaccinating was feeling the daughter was too young for HPV vaccine, reported by 16% of parents. This figure varied by daughter’s age: 3% of parents of 16- to 18-year-olds, 12% of parents of 13- to 15-year-olds, and 32% of parents of 10- to 12-year-olds cited this as a reason (*p* < .001). Limiting the youngest age group to 11- to 12-year-olds did not change this finding substantially; 27% of parents of 11- to 12-year-olds reported that the main reason for not vaccinating was that the daughters were too young for HPV vaccine. An additional 13% of parents reported that they had not vaccinated because their daughter is not having sex yet. Not having been to the doctor or gotten around to it yet was reported by 13% of parents. Few parents reported

Table 3
Main reasons reported for daughters not having initiated HPV vaccination

	All unvaccinated daughters (n = 780) Weighted % ^a	Unvaccinated daughters for whom provider recommended HPV vaccine (n = 115) Weighted % ^a
Need more information about the vaccine	21.7%	14.9%
Daughter too young	16.4%	19.0%
Never heard of the vaccine or not aware daughter could get it	15.1%	0%
Haven't been to the doctor or gotten around to it yet	12.7%	16.2%
Daughter isn't having sex yet	12.6%	5.7%
Doctor did not recommend vaccine or recommended against it	7.3%	1.4% ^b
Vaccine is too new	6.6%	8.3%
Vaccine not necessary or daughter not at risk	4.5%	3.1%
Vaccine is unsafe	3.8%	6.7%
Vaccine not available yet	3.5%	9.3%
Still deciding	1.7%	0.5%
Vaccine costs too much	1.5%	3.9%
Health insurance doesn't cover the vaccine	1.5%	7.8%
Daughter has fear of shots	0.8%	1.6%
Parent did not ask provider about vaccine	0.7%	0%
Vaccine might make daughter have sex	0.5%	0.6%
Other reasons	5.6%	9.6%

HPV = human papillomavirus.

^a Parents could report more than one main reason daughter had not received HPV vaccine, so percentage total is greater than 100%; overall, 14.7% reported more than one main reason.

^b n = 3. Two of these parents reported that a health care provider recommended daughter get HPV vaccine at some point, but discouraged it from being given now, because of factors such as young age.

cost, insurance issues, or vaccine safety concerns as main reasons for not vaccinating. Only 0.5% of parents cited a concern that the HPV vaccine may make a teenage girl more likely to have sex as a main reason for not vaccinating.

Among the subset of 115 parents whose daughters did not receive HPV vaccine despite a healthcare provider's recommendation, the most commonly reported reason for not vaccinating was feeling the daughter was too young (19%). Another 16% reported that a provider had recommended HPV vaccine, but they had not made an appointment or gone to get it yet. Even after a provider's recommendation, 15% of parents felt they still needed additional information about HPV vaccine before deciding whether to get it for their daughters.

Intentions to vaccinate among parents with unvaccinated daughters

Among parents with unvaccinated daughters (n = 780), 26% reported that their daughters "definitely will" and 36% that their daughters "probably will" get HPV vaccine in the next year. Another 6% did not know, and 22% reported that their daughters "probably won't" get the vaccine. Only 10% reported that their daughters "definitely won't" get HPV vaccine in the next year. There were no significant differences in intentions to vaccinate by age group of daughters ($p = .87$), despite notable differences in HPV vaccine initiation, and no significant differences by race/ethnicity ($p = .30$; Figure 1). Sixty-seven percent of blacks and 58% of whites intended to vaccinate their daughters in the next

year. Of note, although few of their daughters had been vaccinated, 66% of Hispanics and others had intentions to vaccinate.

Most parents of unvaccinated daughters reported that it would be "not hard at all" to find a provider or clinic that had HPV vaccine available (69%), that was easy to get to (87%), where they could afford the vaccine (61%), and where they did not have to wait long to get an appointment (53%). Forty-one percent reported that if HPV vaccine were available at their daughter's school, they would want her to get it there. When asked whether their daughters' insurance covers HPV vaccine, 59% did not know, 27% stated it did, 12% stated it might, and 3% stated it did not.

Discussion

In an area with elevated cervical cancer rates, only 10% of parents reported their 10- to 18-year-old daughters had initiated HPV vaccination, approximately 1 year after HPV vaccine was licensed and 6 months after publicly funded HPV vaccine became available in North Carolina. HPV vaccine initiation varied by age group of the daughter, with older daughters much more likely to have initiated vaccine than younger daughters. In fact, we found that older age of the daughter and a healthcare provider's recommendation were the only two factors independently associated with having initiated HPV vaccine. We observed no black–white racial disparities in HPV vaccine uptake in this population. Despite the relatively low level of HPV vaccine initiation

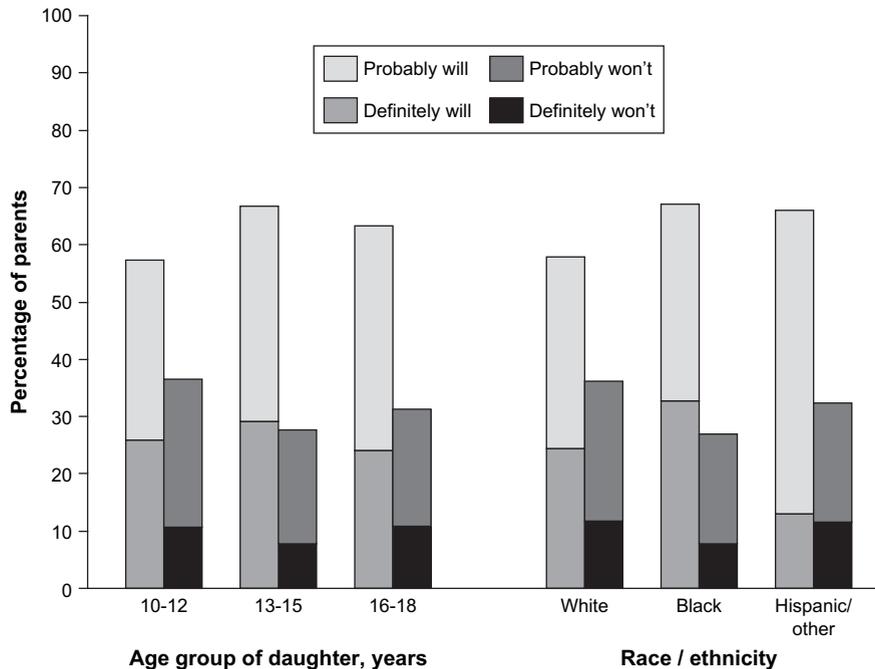


Figure 1. Parents' intentions to have daughters vaccinated against HPV. "Don't know/not sure" responses are not shown but are included in the denominator. There were no significant differences in intention to vaccinate by age group of daughters ($p = .87$) nor by race/ethnicity ($p = .30$).

in this population, the majority of parents with unvaccinated daughters intended for them to be vaccinated in the next year.

Few 10- to 12-year-olds in this population had initiated HPV vaccination, but vaccine initiation was over 17% among 16- to 18-year-olds. Differential HPV vaccine uptake by age group may reflect a desire to provide catch-up vaccination for older teens who had not yet been vaccinated, because these girls are closest to the risk of HPV infection and are still within the age range covered by the VFC program [6]. On the other hand, it may reflect a perception that the vaccine is not yet needed in younger teens. This latter perception appears to be playing at least a contributory role, because over one-quarter of parents of 11- to 12-year-olds, the age group recommended for routine HPV vaccination by the ACIP [2], reported that the main reason they had not vaccinated their daughters was because the daughters were too young. Further, a substantial number of parents stated their daughters had not been vaccinated because they were not yet sexually active. HPV vaccination is encouraged well before sexual initiation because HPV vaccine is most efficacious in women who have never acquired HPV infection [10,11], and HPV infection is acquired rapidly following sexual debut [12,13]. Parents typically underestimate whether their adolescent has ever had sex, and fail to predict the timing of their daughters' sexual initiation [14,15]. Thus, it is critical that parents of adolescent girls and their healthcare providers are educated about the need to follow ACIP guidelines to maximize the health benefits of HPV vaccination, especially in communities at greatest risk for cervical cancer.

The lack of racial disparities in HPV vaccine initiation between non-Hispanic blacks and whites was encouraging,

given existing black–white racial disparities in cervical cancer incidence and mortality, with black women more than twice as likely to die of cervical cancer than non-Hispanic white women in the United States [4]. However, Hispanic women in the United States have even higher cervical cancer incidence rates [3,4]. Very few Hispanic parents in our survey reported that their daughters had been vaccinated, although small numbers limited interpretation. Nonetheless, we found substantial room for improvement in HPV vaccine uptake across all racial/ethnic groups. Consistent with a large number of acceptability studies primarily conducted before HPV vaccine licensure [16,17], the majority of parents in all groups reported intentions to vaccinate their daughters. Additional efforts are needed in communities with elevated cervical cancer rates to ensure intentions to vaccinate translate into HPV vaccination, so that HPV vaccine can help close racial and ethnic gaps in cervical cancer morbidity and mortality [3].

Not surprisingly, a healthcare provider's recommendation was associated with HPV vaccine initiation. At the time of the survey, only 21% of daughters were reported to have received a provider's recommendation for HPV vaccine, despite the fact that most had had a reported preventive care visit in the past year. Because UCVDP-funded HPV vaccine and final published ACIP recommendations became available only about 5 to 6 months before the survey [2], a substantial portion of these visits may have occurred before providers were routinely stocking HPV vaccine. Thus, it is difficult to assess the extent of potential missed opportunities for vaccinating these adolescents in providers' practices. It was also notable that approximately two-thirds of daughters

who had received a healthcare provider's recommendation had not initiated HPV vaccine. The timing of the survey in relation to final ACIP recommendations and UCVDP vaccine availability may play at least some role in explaining these findings. However, among the group that did not get vaccinated after a provider's recommendation, the main reason reported for not vaccinating was that the daughters were too young. A recent national survey found that although physicians were recommending HPV vaccine to all age groups, they recommended it much less strongly to 11- to 12-year-olds [18]. We had no information about which providers recommended HPV vaccine, their counseling messages, and how that might have impacted vaccine acceptance. We did have data about where girls initiated HPV vaccine. Pediatricians and family practitioners most commonly provided it; however, 19% had received HPV vaccine from an obstetrician–gynecologist. This suggests that obstetrician–gynecologists, who have not traditionally been vaccine providers but have been supportive of HPV vaccination efforts [19], have quickly put systems in place to make HPV vaccine available.

Vaccine coverage with at least one dose of HPV vaccine in this at-risk population was substantially lower than the 25% vaccine coverage found in the U.S. population-based NIS—Teen evaluation [9]. Levels of HPV vaccine initiation similar to those in NIS—Teen have been reported by two other recent studies of vaccine uptake among adolescents, the California Health Interview Survey (26%) [20], and a smaller university clinic-based evaluation (26%) [21]. NIS—Teen collected data in the fourth quarter of 2007, overlapping with our survey only in its first month, and the other two studies had data collection continuing into early 2008. HPV vaccine initiation is likely to be increasing over time. Nonetheless, the differences between our findings and those of other studies, including the nationally representative NIS—Teen sample, are concerning. If we aim to reduce disparities in cervical cancer and have the greatest impact on disease prevention, vaccination rates will need to be optimized in communities with elevated cervical cancer rates. The main reasons for not vaccinating reported by parents in our population, such as needing more information about HPV vaccine and being concerned that their daughters are too young, can be overcome with information and education of parents and healthcare providers in these communities [8]. Factors that might be expected to be barriers in underserved communities, such as cost, insurance coverage, and logistical considerations, did not appear to be major concerns to the parents we interviewed, although these issues may still play a role in limiting HPV vaccine delivery within provider practices serving this population [22].

Because we focused on an area with elevated cervical cancer rates in the Southeastern United States, findings from our study may not be generalizable to other populations. In addition, the parents we interviewed had slightly higher income and education level than might be expected in an underserved area; thus, there may have been some selection

bias in who agreed to participate. Vaccination status was reported by the parent and not confirmed by medical record review, thus there may have been some recall and misclassification errors. Because HPV vaccine is so new, these types of errors were likely to be limited. Finally, as our survey was done relatively soon after the vaccine became available, HPV vaccine initiation in this at-risk community is likely to be evolving; the vaccine coverage we report here may not reflect current coverage. We are conducting a follow-up survey approximately 15 months after the initial interviews to determine uptake of HPV vaccine over time and predictors of uptake, which will provide additional data on HPV vaccine coverage in this community at risk.

In conclusion, approximately 1 year after HPV vaccine was licensed, only 10% of parents in an area with elevated cervical cancer rates reported that their 10- to 18-year-old daughters had initiated HPV vaccination. Vaccine initiation was particularly low in the youngest age group, and a substantial number of parents of 11- to 12-year-olds, the age group recommended for routine HPV vaccination [2], felt their daughters were too young for HPV vaccine. However, most parents with unvaccinated daughters, regardless of age, intended for them to be vaccinated in the next year. To minimize disparities and have the greatest impact on cervical cancer and other HPV-related disease, redoubled efforts are needed in communities with elevated cervical cancer rates to reduce barriers and ensure that intentions to vaccinate translate into HPV vaccination.

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