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HPV Vaccine Acceptability in a Rural Southern Area

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ABSTRACT

Background: **Although cervical cancer rates in the United States are highest in Southern and rural areas, research on human papillomavirus (HPV) vaccine acceptability has focused on other geographic areas.**

Methods: **To address this gap, we surveyed women from a rural area in North Carolina with elevated rates of cervical cancer to identify predictors of HPV vaccine acceptability for themselves and their daughters.**

Results: **One hundred forty-six women completed questionnaires about HPV infection, cervical cancer, and HPV vaccination. The majority (62%) of respondents were African American. Most respondents intended to vaccinate an adolescent daughter against HPV. Older and African American women reported lower vaccination intentions. Higher intentions to vaccinate an adolescent daughter against HPV were associated with knowing more about HPV, believing that HPV infection and cervical cancer are both likely and have negative consequences, and believing that the HPV vaccine is effective against cervical cancer. Women reported higher intentions to get the HPV vaccine for an adolescent daughter than for themselves.**

Conclusions: **HPV vaccine acceptability for an adolescent daughter was associated with women's beliefs about their own healthcare needs. These findings on the HPV vaccination decisions of women in North Carolina offer insights that can inform future health communication activities intended to increase vaccination uptake in other high-risk populations of rural Southern women.**

INTRODUCTION

Of the estimated 11,150 women in the United States who developed cervical cancer in 2007, a third will die from the disease.[1] Although invasive cervical cancer rates in the United States continue to decline, substantial disparities remain.[2] African American women continue to get cervical cancer twice as often as white women.[2,3] Cervical cancer mortality and incidence rates are consistently higher among rural- than urban-dwelling women and are higher in the South than elsewhere in the United States.[2,4–6] For women living in rural areas of the South, economic disadvantages and medical infrastructures may present barriers to healthcare, resulting in inadequate Pap smear coverage, inadequate treatment, and continued health disparities.[4,6]

A new prophylactic vaccine that prevents infection with two carcinogenic strains of human papillomavirus (HPV, types 16 and 18) was recently recommended for females aged 11–26, and

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a second HPV vaccine will soon be approved. These vaccines may prevent up to 70% of invasive cervical cancer cases,[7] offering an extraordinary opportunity to reduce long-standing cervical cancer disparities.[8]

Although rural Southern women are at elevated risk for cervical cancer, it is unknown whether or not they will choose to get vaccinated. Research on acceptability of HPV vaccines among these women is needed to understand who is likely to get vaccinated and how to increase vaccination uptake.[9] To date, five HPV vaccine acceptability studies conducted in the South have been published,[10–14] and the three studies that included rural and urban dwellers did not present findings separately for rural participants.[12,14,15] No published data on HPV vaccine acceptability characterize the beliefs of rural Southern women.

Many of the attitudes and beliefs that motivate influenza and other vaccination behaviors[16,17] are codified in the health belief model.[18] Interventions guided by the health belief model have been shown to increase vaccination rates.[19,20] The model suggests that key predictors for acceptability of any vaccine include perceived disease likelihood and severity, perceived vaccine benefits and barriers, and cues to action. In the context of HPV vaccination, perceived likelihood is the belief that HPV infection and cervical cancer are likely outcomes. Perceived severity is the belief that HPV infection and cervical cancer would have serious negative health consequences. Perceived vaccine effectiveness (i.e., perceived benefit) is the belief that the HPV vaccine will reduce the risk of HPV infection or cervical cancer. Perceived barriers can be any perceived impediments to vaccination, such as cost. Cues to action are situational and social factors that prompt one to get vaccinated.

Women view cervical cancer as a health problem with severe consequences,[21–23] yet, to date, HPV vaccine acceptability studies have focused on beliefs about HPV while largely ignoring beliefs about cervical cancer.[9] Beliefs about cervical cancer and their role in prompting HPV vaccination seem especially important given the increased marketing of the vaccine as a cervical cancer vaccine rather than an HPV vaccine.[24] Parents will play a key role in HPV vaccination,[8] in part because universal vaccination of 11–12-year-old girls is now recommended.[25] Furthermore, because people often infer others' needs from their own needs and beliefs, we hypothesized that women would infer their daughters' need for HPV vaccination based on their perceived needs for themselves.[26]

To address the dearth of literature on HPV vaccine acceptability among rural Southern women, we conducted a cross-sectional study in an area with especially high cervical cancer rates. HPV vaccine acceptability was conceptualized as willingness to pay for the vaccine and intentions to vaccinate if it were free. We examined beliefs (including health belief model constructs) about HPV, cervical cancer, and HPV vaccines. We also examined the extent to which women's beliefs about their own need for the HPV vaccine influenced their beliefs about vaccinating their adolescent daughters.

MATERIALS AND METHODS

Participants and procedure

The study was conducted in Person County, North Carolina, a rural area with 90 persons per square mile.[27] The estimated 10-year cervical cancer mortality rate of 5.8 deaths annually per 100,000 women between 1993 and 2002[28] is twice the state average and well above the *Healthy People 2010* goal for cervical cancer mortality.[29]

Of four clinics offering women's health services in Person County identified by the county's health department, two agreed to participate. Participants were recruited from the waiting rooms of a public clinic and a hospital-based, private obstetrics/gynecology office, located less than a mile from one another, from April to May 2006 (prior to federal approval of the HPV vaccine) and were paid $20 for completing a self-administered questionnaire. Eligibility criteria included being female, at least 18 years of age, and able to read English. The study was approved by the University of North Carolina institutional review board.

Measures

Awareness and knowledge. The questionnaire assessed awareness of HPV by asking: "The next questions are about human papillomavirus, also known as HPV. Have you ever heard of HPV (human papillomavirus)?" We assessed HPV knowledge using an existing scale,[30] the scoring of which was adapted slightly to reflect the current understanding of the natural history of HPV in-

fection. The scale included 13 items, of which 10 were single items and 3 were composite questions about symptoms of HPV, consequences of untreated HPV, and risk for HPV infection.

Awareness of HPV vaccines was assessed by asking: "In case you have not heard of HPV, it is a sexually transmitted infection. Some common types of HPV lead to cervical cancer. There is a new vaccine that prevents HPV infection with two cancer-causing types of HPV. 7 out of 10 cervical cancer cases can be prevented if people use this vaccine. Have you ever heard of the HPV vaccine before today?"

Vaccine acceptability. We assessed HPV vaccine acceptability by examining intentions to vaccinate if the vaccine were free and willingness to pay for the vaccine for adolescent daughters and themselves. These different measures allowed us to separate interest in vaccination from the influence of cost on HPV vaccine acceptability. Three items, accompanied by 5-point response scales, assessed intentions to vaccinate if the vaccine were free (Cronbach's alphas = 0.89, for daughters and themselves). Another aspect of vaccine acceptability, willingness to pay for HPV vaccination out-of-pocket, was measured by an 8-point response scale: "Nothing," "$1–19," "$20–49," "$50–99," "$100–199," "$200–299," "$300–399," and "$400 or more." Women who did not have an adolescent (i.e., aged 11–16) daughter were asked to answer these and other questions about daughters as if they did.

Attitudes. Four items assessed women's perceived likelihood of HPV infection, perceived likelihood of cervical cancer, perceived severity of HPV infection, and perceived severity of cervical cancer. Similarly, four items assessed these beliefs for their daughters. Two items, not specific to either daughter or self, measured perceived effectiveness of the vaccine in preventing HPV infection and cervical cancer. Five items assessed the effect of potential cues to action, such as a doctor's recommendation and receiving a reminder such as a postcard or phone call, and the absence of perceived barriers (i.e., an HPV vaccine free or paid by insurance, low cost of the vaccine, and ease of getting to a provider) on women's intentions to vaccinate their daughters. Items were combined to create separate scales for cues to action (Cronbach's alpha = 0.57) and perceived barriers (Cronbach's alpha = 0.79). Single items assessed beliefs that the HPV vaccine is safe and that it may have serious side effects.

A slightly modified version of the Brief Illness Perception Questionnaire (IPQ) assessed beliefs about cervical cancer after asking respondents to imagine that they had been diagnosed with the disease.[31] Many of the items that were highly correlated were combined into scales: cervical cancer has negative consequences (Brief IPQ questions 1, 2, 5, 6, and 8; Cronbach's alpha = 0.78) and is treatable (Brief IPQ questions 3 and 4, Cronbach's alpha = 0.55). One item (Brief IPQ question 9) that was uncorrelated with the others measured how well cervical cancer was understood. An open-ended question assessed beliefs about the cause of cervical cancer. Two investigators independently coded women's responses (kappas = 0.80–1.00) and resolved any disagreements in coding.

The questionnaire assessed beliefs that vaccines (in general) are beneficial (4 items, Cronbach's alpha = 0.83) and unnecessary (7 items, Cronbach's alpha = 0.75). Additional questions assessed beliefs that the HPV vaccines are beneficial (4 items, Cronbach's alpha = 0.78) and appropriate for adolescents (2 items, Cronbach's alpha = 0.94).

Items on HPV vaccine information and services assessed women's preferences for the location of vaccine delivery for an adolescent daughter, preferences for information about the HPV vaccine (using an item from the Health Information National Trends Survey[32]), intentions to follow the HPV vaccines' recommended three-dose regimen, and the best age for HPV vaccination.

Participants' characteristics. The questionnaire assessed respondents' age, race, education level, marital status, age and sex of children, work status, health insurance status, financial status, and history of an HPV-related cervical abnormality (i.e., HPV infection, cancer-causing HPV infection, genital warts, and cervical cancer). Financial status was assessed using an item previously shown to minimize nonresponse that assessed participants' ability to pay their bills.[33]

Statistical analysis

Analyses using multiple linear regressions examined predictors of intentions to obtain the HPV vaccine and willingness to pay for adolescent daughters and themselves (i.e., one regression for

each of the four outcome measures). To identify potential covariates, bivariate correlations were examined between the outcome measures and the participant characteristics in Table 1. This analysis identified four covariates that were subsequently included in the linear regression analyses: African American race, age, history of an HPV-related cervical abnormality, and location of recruitment. Logistic regressions were also used to examine dichotomized versions of the intention to vaccinate variables because they were somewhat skewed toward higher intentions. The logistic and linear regression analyses yielded essentially identical patterns of findings. Therefore, only the linear regression results for intentions are presented in order to simplify comparisons with the willingness to pay results.

Bivariate correlations examined whether beliefs about the HPV vaccine for oneself predicted beliefs about an adolescent daughter. We also examined whether HPV vaccine acceptability for oneself was less strongly endorsed than for one's daughter. A 2 × 2 within-subjects repeated measures analysis of variance (ANOVA) examined the influence of role (mother or daughter) and health threat (HPV infection or cervical cancer) on perceived likelihood. Significant interactions were probed using *post hoc*, paired-samples *t* tests. Analyses were conducted using two-tailed test with a critical alpha of 0.05. Data were analyzed using SPSS 14.0 (Chicago, IL).

Table 1. Participating Women from Person County, NC (n = 146)

	n (%)	*Mean (SD)*[a]
Age, years		42 (15)
Race[b]		
African American	91 (62)	
White	47 (32)	
American Indian	3 (2)	
Not stated	5 (3)	
Education		
High school diploma	83 (57)	
Completed some college or a technical degree	63 (43)	
Married	60 (41)	
Had children	124 (85)	
Employed	64 (44)	
Insured	109 (75)	
Sufficient finances	78 (53)	
History of HPV-related cervical abnormality	20 (14)	
Had HPV infection	8 (5)	
Had cancer-causing HPV infection	10 (7)	
Had genital warts	11 (8)	
Had cervical cancer	6 (4)	
Recruited at public clinic	118 (81)	

[a]SD, standard deviation.
[b]Total does not add up to 100% because of rounding.

RESULTS

Seventy-seven percent of the 190 women we approached agreed to participate (n = 149). Of these, 3 subjects did not complete the questionnaire, leaving 146 for statistical analyses. Table 1 reports participants' characteristics. Sixty-two percent (n = 91) of respondents were African American women, and 32% (n = 47) were white. Respondents' mean age was 42 years, and the majority of women reported having children (85%, n = 124). Most women were recruited from the public clinic (88%, n = 118).

Few respondents had heard of HPV (36%, n = 53), and fewer still had heard of the HPV vaccine (19%, n = 28). Knowledge about HPV was low, with women answering most knowledge questions incorrectly (32% correct, on average). Table 2 provides the percent correct for each knowledge item. Given a choice of several options of sources for information on the HPV vaccine, the majority of women preferred healthcare providers (61%, n = 89) or the internet (27%, n = 39).

Participant characteristics

With respect to predictors of vaccine acceptability (Table 3), younger respondents had higher intentions to vaccinate ($p < 0.001$) than older women. African American women reported lower intentions to vaccinate against HPV than women from other racial groups ($p = 0.020$). Women recruited from the public clinic reported higher intentions to vaccinate themselves against HPV ($p = 0.005$) and were willing to pay more for the vaccine for themselves ($p = 0.003$) and their daughter ($p = 0.032$) than women recruited at the private obstetrics/gynecology office.

Vaccine acceptability for adolescent daughters

Most women (84%, n = 122) reported being likely to vaccinate their adolescent daughters against HPV if the vaccine were free. Of these women, 88% (107 of 122), said they would ensure their adolescent daughter received the full three-shot regimen of the vaccine. Interest in vaccinat-

Table 2. Knowledge of HPV Infection

Statement[a]	*Responded with correct answer n (%)*
HPV is the virus that causes herpes (F)	23 (16)
Genital warts are caused by some types of HPV (T)	52 (36)
HPV is the virus that causes cervical cancer (T)	49 (34)
Pap smears prevent disease caused by HPV (T)	86 (59)
If a woman's Pap smear is normal, she doesn't have HPV (F)	38 (26)
Changes in a Pap smear may indicate that a woman has HPV (T)	50 (34)
Genital warts are caused by the herpesvirus (F)	20 (14)
HPV can cause cancer (T)	53 (36)
Pap smears will almost always detect HPV (F)	24 (16)
HPV can be passed from the mother to baby during childbirth (T)	51 (35)
Symptoms of HPV[b]	46 (32)
Consequences of untreated HPV[c]	44 (30)
Risk for HPV infection[d]	67 (46)

[a]T, true; F, false.
[b]Correct if respondent marked two of three correct responses (warts that sometimes itch or bleed, warty growths, or no symptoms).
[c]Correct if respondent marked three of five correct responses (cancer, precancer [dysplasia], warts, no consequences, or death).
[d]Correct if respondent marked two of three correct responses (sex before age 16, many sexual partners, or partner with many sexual partners).

ing adolescent girls and boys did not differ. The average amount they would pay out-of-pocket (not covered by insurance) to vaccinate their adolescent daughters was $178 (95% CI $155-$207). Forty-three percent of the total sample ($n = 62$) believed the best age for HPV vaccination was 17–25 years old, whereas 38% ($n = 55$) believed the best age was younger, 11–16 years old. Most respondents (80%, $n = 116$) preferred to have their daughters vaccinated at private doctors' offices, 14% ($n = 21$) preferred public clinics, and <1% ($n = 1$) preferred school-based provision. Women scoring higher on the HPV knowledge scale reported higher intentions to vaccinate an adolescent daughter ($p = 0.043$).

Beliefs about HPV and cervical cancer risk were associated with women's intentions to vaccinate their daughters. Women with higher perceived likelihood of HPV infection ($p = 0.006$), higher perceived severity of HPV infection ($p < 0.001$), higher perceived likelihood of cervical cancer ($p = 0.055$), and higher perceived severity of cervical cancer ($p = 0.018$) for an adolescent daughter reported higher intentions to vaccinate her. Respondents who reported higher perceived likelihood of HPV infection ($p = 0.034$) or cervical cancer ($p = 0.035$) for an adolescent daughter were also willing to pay more for the vaccine for her.

Women who believed that cervical cancer had more negative consequences expressed higher intentions to vaccinate their daughters ($p = 0.036$) and were willing to pay more for the vaccine for them ($p < 0.001$). The three most common causes of cervical cancer reported by women were poor health behaviors (e.g., not getting a Pap test regularly), heredity, and sexual behavior (e.g., having many sexual partners), and none of these beliefs predicted HPV vaccine acceptability.

Women who believed the vaccine was more effective for cervical cancer prevention reported higher intentions to vaccinate their daughters ($p < 0.001$) and higher willingness to pay for an HPV vaccine for a daughter ($p = 0.003$). Those who reported that cues to action ($p = 0.002$) and the absence of perceived barriers ($p < 0.001$) would encourage HPV vaccination reported higher intentions to vaccinate an adolescent daughter.

Vaccine acceptability for adult women

Sixty-six percent ($n = 96$) of respondents reported being likely to get the HPV vaccine for themselves if it were free. The average amount they would pay out of pocket was $134 (95% CI $106-$156). Few beliefs predicted vaccine acceptability for the women themselves, unlike HPV

Table 3. Predictors of Acceptability of HPV Vaccination[a]

	Adolescent girls		*Adult women*	
	Intention to vaccinate against HPV β	*Willing to pay for HPV vaccine* β	*Intention to vaccinate against HPV* β	*Willing to pay for HPV vaccine* β
Awareness/knowledge				
Heard of HPV	0.04	0.11	−0.13	0.14
Heard of HPV vaccine	0.15	0.17*	0.11	0.15†
Knowledge of HPV	0.17*	0.15†	0.07	0.18*
HPV and cervical cancer beliefs				
Perceived likelihood of HPV infection[b]	0.23**	0.18*	0.17*	−0.06
Perceived severity of HPV infection[b]	0.31**	0.11	0.09	0.09
Perceived likelihood of cervical cancer[b]	0.16*	0.17*	0.04	−0.14
Perceived severity of cervical cancer[b]	0.20*	0.11	0.11	0.07
Cervical cancer has negative consequences	0.18*	0.277**	0.04	0.20*
Cervical cancer is treatable	0.03	0.00	0.03	−0.05
Cervical cancer is well understood	0.12	0.29**	0.07	0.23**
Cervical cancer is caused by poor health behaviors	0.06	−0.05	0.05	−0.12
Cervical cancer is caused by heredity	0.04	−0.09	0.10	0.04
Cervical cancer is caused by sexual activity	0.03	0.01	−0.07	0.05
Vaccine beliefs				
Vaccines are beneficial	0.07	−0.05	0.09	0.02
Vaccines are unnecessary	−0.03	0.01	−0.05	0.05
HPV vaccines are beneficial	0.02	0.09	0.02	0.03
HPV vaccines are appropriate for adolescents	0.28**	0.20*	0.25**	0.15†
Perceived effectiveness of HPV vaccines against HPV	0.09	0.08	0.08	−0.01
Perceived effectiveness of HPV vaccines against cervical cancer	0.28**	0.24**	0.42**	0.16†
High HPV vaccine safety	0.01	0.13	−0.03	0.09
Low HPV vaccine side effects[c]	−0.09	−0.08	−0.08	0.01
Cues to action to vaccinate daughter	0.25**	0.16†	0.23**	0.19*
Low perceived barriers to vaccinating daughter	0.32**	0.14†	0.24**	0.17*
Participant characteristics				
Older age	−0.25**	−0.11	−0.41**	−0.07
African American	−0.20*	−0.02	−0.19	−0.04
Higher educational attainment	0.12	−0.03	0.11	−0.04
Had children	0.01	0.01	−0.07	0.01
Employed	−0.01	−0.13	0.01	−0.06
Insured	−0.09	−0.14†	−0.08	−0.16†
Sufficient finances	0.03	0.04	0.08	0.07
History of HPV-related cervical abnormality	0.14†	0.26**	0.15†	0.26**
Recruited at public clinic	0.11	0.25**	0.23**	0.18*

[a]All analyses, except those reported in the participant characteristics section, controlled for African American race, age of respondent, history of HPV-related cervical abnormality, and location of recruitment.

**$p \leq 0.01$; *$p \leq 0.05$; †$p \leq 0.10$.

[b]These constructs were assessed using separate items for adolescent daughters and adult women.

[c]Wording reflects reverse coding of participant responses.

vaccine acceptability for an adolescent daughter (Table 3). Women with higher knowledge of HPV infection reported greater willingness to pay for the HPV vaccine ($p = 0.036$). Higher perceived likelihood of an HPV infection (but not cervical cancer) was related to higher intentions to vaccinate ($p = 0.026$). Respondents' beliefs that the HPV vaccine is effective in preventing cervical cancer also predicted higher intentions to get the vaccine ($p < 0.001$). Those encouraged by poten-

tial cues to action and the absence of perceived barriers reported higher intentions to vaccinate themselves ($p = 0.003$ and $p = 0.002$, respectively) and willingness to pay more for the vaccine ($p = 0.021$ and $p = 0.037$, respectively).

Comparing adults and adolescents

Women expressed higher intentions and higher willingness to pay for vaccinating an adolescent daughter than for vaccinating themselves (4.31 vs. 3.80, $t = -5.56$, $p < 0.001$; \$179 vs. \$134, $t = -4.83$, $p < 0.001$, respectively). The willingness to pay measures were highly correlated ($r = 0.75$, $p < 0.001$) as were the intentions measures ($r = 0.61$, $p < 0.001$), suggesting reliable measurement. However, willingness to pay and intention measures were moderately correlated for daughter ($r = 0.27$, $p < 0.001$) and weakly for self ($r = 0.14$, $p = 0.09$), suggesting that these are distinct constructs.

Women believed their adolescent daughters had a higher chance of getting HPV and cervical cancer than they did, $F(1,145) = 48.8$, $p < 0.001$ (Fig. 1), and this difference was larger for perceived likelihood of HPV infection than for perceived likelihood of cervical cancer, $F(1,145) = 15.3$, $p < 0.001$. Women's perceived likelihood of HPV and cervical cancer was moderately to strongly related to these same beliefs about their adolescent daughters ($r = 0.24 - 0.75$, $p < 0.01$), with one exception (women's perceived likelihood of getting cervical cancer for herself and her daughter were not significantly correlated ($r = 0.11$, n.s.).

DISCUSSION

The large disparities in cervical cancer in the United States call for interventions to increase uptake of the HPV vaccines among adolescents and women at high risk for the disease. In our cross-sectional study of women in rural North Carolina, an understudied and high-risk population, most were willing to vaccinate themselves and their daughters against HPV. As suggested by the health belief model, acceptability of the HPV vaccine was associated primarily with beliefs about cervical cancer, HPV, and the HPV vaccine. In addition, women's vaccination acceptability was associated with vaccine acceptability for their daughters. Similarly, women's beliefs about their daughters' likelihood of getting HPV were associated with their beliefs about their own likelihood of getting HPV.

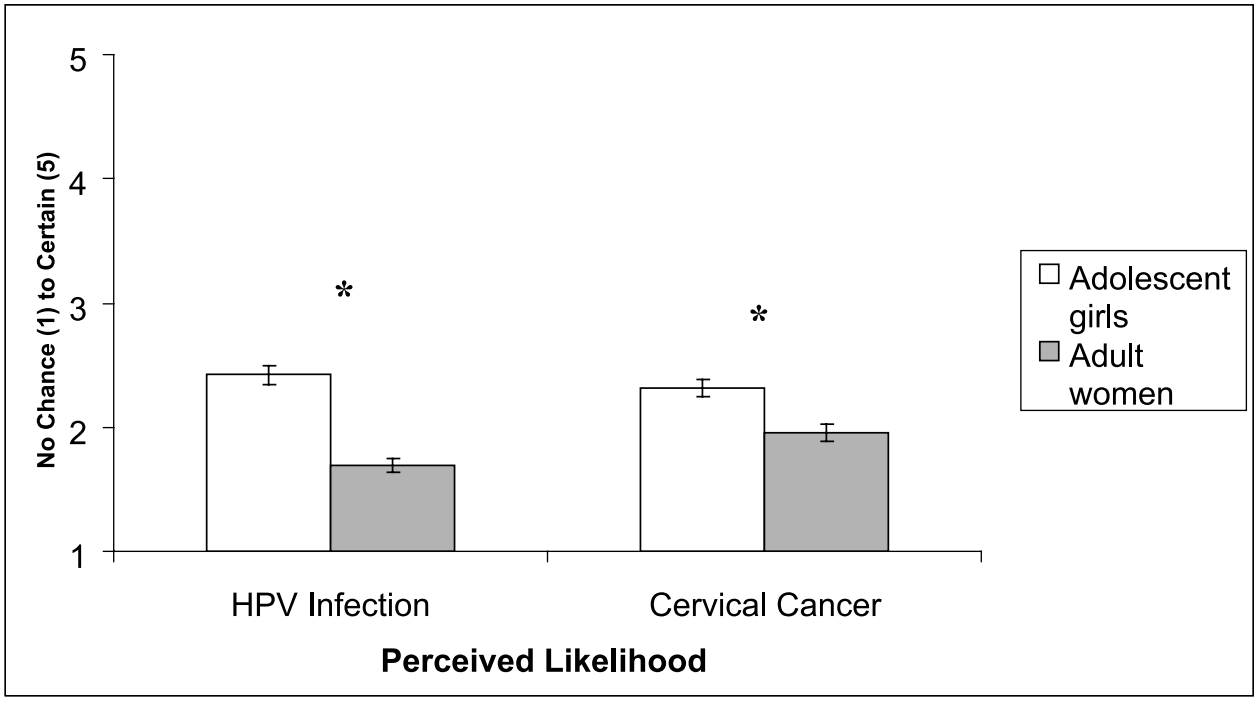

FIG. 1. Perceived likelihood of HPV infection and cervical cancer. *Significant mean difference ($p \leq 0.001$). Error bars depict standard errors.

Although the HPV vaccine has been marketed as a cancer vaccine, little research has examined whether cervical cancer-related beliefs predict acceptability. A novel finding of the present study was that many cervical cancer beliefs were related to HPV vaccine acceptability. Women who associated cervical cancer with negative consequences or reported high perceptions of cervical cancer risk were more accepting of the vaccine. To our knowledge, this is the first study to report that perceived severity of cervical cancer was related to adults' intentions to vaccinate an adolescent daughter. Higher perceived likelihood of getting cervical cancer was also related to higher vaccine acceptability, similar to findings from another cross-sectional study of women.[11]

Women with higher knowledge of HPV were more accepting than their counterparts of the HPV vaccine for their adolescent daughters. This finding is similar to findings from one previous HPV acceptability study,[34] but it differs from others that found knowledge to be unrelated to acceptability.[35,36] Higher perceived likelihood of HPV vaccine infection was also related to higher vaccine acceptability. Given that over three fourths of women are estimated to be infected with HPV in their lifetime,[37] the perceived likelihood of HPV infection for women and their adolescent daughters was relatively low (reported as being between low and moderate, on average). Women's beliefs about the likelihood of HPV were similar to their beliefs about the likelihood of cervical cancer, perhaps reflecting limited understanding of the natural history of HPV and cervical cancer. Low perceived risk meant low acceptability, which suggests low vaccination rates unless interventions are able to change risk beliefs. Further experimental work is needed to determine if increasing HPV and cervical cancer knowledge and perceived risk will increase vaccine acceptance.

Beliefs specific to the HPV vaccine, but not beliefs about vaccines in general, predicted acceptability. Perceived vaccine effectiveness against cervical cancer was related to vaccine acceptability, a novel finding in the HPV vaccine acceptability literature. In contrast, perceived vaccine effectiveness against HPV (not cervical cancer) was not a predictor of acceptability, differing from a previous study that found perceived vaccine effectiveness against HPV to be an important predictor.[11] Another study found that protection offered by the new vaccine (not specifying HPV infection or cervical cancer) influenced acceptability.[35] Overall, these findings suggest the importance of women's beliefs about the vaccine and cervical cancer and provide support for the current practice of marketing of the vaccine as a cervical cancer vaccine rather than as an HPV vaccine.

African American women reported lower intentions than other respondents to get the HPV vaccine for their daughters. Although this difference was also found in a population-based survey of parents in California,[15] six other acceptability studies examining racial differences found none.[10,11,13,34,36,38] The reason for the discrepancy between our findings and those of several previous studies is unclear. We speculate that recruiting in clinics that primarily served low-income women held constant the socioeconomic differences that may coexist with race in nonpopulation-based samples. We examine other potential racial differences in knowledge and beliefs about HPV, cervical cancer, and the HPV vaccines more extensively in a separate paper.[39]

To provide a fuller understanding of the influence of vaccine price on HPV vaccine acceptability, we used two distinct and complementary measures of acceptability, intention to vaccinate if the vaccine were free and willingness to pay for the vaccine. Although there was some notable overlap, participant characteristics related to women's intentions were different from those related to their willingness to pay for the vaccine. For example, race and age of the participant predicted intention to vaccinate but not willingness to pay more for the vaccine, whereas history of HPV-related abnormalities predicted willingness to pay more for the vaccine but did not predict intentions to vaccinate. These differences suggest that acceptability of the HPV vaccine may vary depending on whether or not the vaccine is provided free of charge.

Study limitations include the cross-sectional design and the small convenience sample of community-dwelling women, factors that limit conclusions about causality and generalizability. Women who did not have a daughter at the time of the interview may have had different health beliefs than those who did, although analyses (data not shown) indicated that this was not the case. Although the many statistical relationships examined increase the possibility of a type 1 error, we believe this is reasonable for an exploratory study. Hypothetical measures of acceptability may overstate (or un-

derstate) the frequency of eventual HPV vaccine uptake. Past research, however, has found vaccine intention to be a significant, reliable predictor of future health behavior.[40]

CONCLUSIONS

Most women intended to vaccinate an adolescent daughter against HPV, a finding consistent with other acceptability studies.[41] Women who believed that the vaccine was affordable or would be available for free (low perceived barriers), reported higher vaccine acceptability, and many women were willing to pay far less than the current retail cost of the vaccine ($360 or more). The cost of the vaccine appears to be an influential consideration for women in this study, a traditionally underserved population. Programs that make the vaccine affordable and parents aware of these resources, for example, the federal Vaccines for Children Program, remain highly relevant.

The study findings suggest that beliefs about cervical cancer, HPV, and HPV vaccines are associated with vaccination acceptability, consistent with previous studies.[9] HPV vaccine educational materials targeted to rural Southern women should attempt to remedy the many misunderstandings about HPV, emphasize the vaccines' effectiveness against cervical cancer, and take into account women's risk perceptions of HPV infection and cervical cancer. Efforts to increase HPV vaccine uptake should also reduce barriers to vaccination, ensure physician recommendation, and implement vaccine reminder systems, as suggested by this study and previous vaccine intervention research.[42] Although wide provision of the HPV vaccines presents a remarkable opportunity to prevent cervical cancer,[43] eliminating cervical cancer disparities requires future research, health communication activities, and vaccination programs to increase uptake of HPV vaccines among high-risk women, including those from the rural South.

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DISCLOSURE STATEMENT

No competing financial interests exist.

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