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Racial Differences in HPV Knowledge, HPV Vaccine Acceptability, and Related Beliefs Among Rural, Southern Women

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ABSTRACT: ***Context:*** *Because cervical cancer mortality in the United States is twice as high among black women as white women and higher in rural areas, providing human papillomavirus (HPV) vaccine to rural black adolescents is a high priority.* ***Purpose:*** *To identify racial differences in knowledge and attitudes about HPV, cervical cancer, and the HPV vaccine that may influence uptake of the vaccine.* ***Methods:*** *We interviewed women (91 black and 47 white) living in a rural area of the Southern United States in 2006. Analyses controlled for socioeconomic status, age, and recruitment location.* ***Findings:*** *More white respondents had heard of HPV than had black respondents (57% vs 24%, $P < .001$), and whites had higher HPV knowledge (42% vs 29% correct responses, $P < .05$). Blacks were less likely than whites to think that cervical cancer would be a serious threat to their daughters' health (75% vs 96%, $P < .001$). More blacks than whites thought the ideal age to receive the vaccine was 17 years or older (63% vs 40%, $P < .05$). Blacks reported lower intentions to vaccinate their daughters than whites ($M = 4.14$ vs 4.55, $P < .05$ in unadjusted analyses, but not statistically significant in adjusted analyses).* ***Conclusions:*** *Black and white respondents had different awareness, knowledge, and beliefs related to the HPV vaccine. Communication-based interventions to maximize uptake of the HPV vaccine in the rural, Southern United States may need different messages for black parents of adolescent girls.*

Black women are 50% more likely to be diagnosed with cervical cancer and twice as likely to die from the disease as white women in the United States.[1–3] Moreover, women who live in rural areas, particularly in the Southern United States, have higher rates of cervical cancer morbidity and mortality than do women who live in urban areas.[1,4–7] Recently, a vaccine against human papillomavirus (HPV), the main cause of cervical cancer, was licensed for use in the United States for females 9-26 years of age.[1] Whether the new vaccine will ultimately help to reduce racial and geographic disparities in cervical cancer remains unknown. No study has systematically examined racial differences in vaccine acceptability in a rural area.[8–10] Our study examined whether rural black and white women have different knowledge and attitudes about HPV, cervical cancer and the HPV vaccine. The primary objective was to inform future HPV vaccine interventions in this population at high risk for cervical cancer.

Methods

Participants and Procedure. The study was conducted in Person County, North Carolina, a rural county (fewer than 200 persons per square mile; 73% of population lived in rural areas)[11,12] with one of the highest cervical cancer mortality rates in the state (5.8 deaths per 100,000 women vs 2.6 deaths statewide).[13] Participants were recruited in April and May 2006 from the waiting rooms of a public health clinic and an OB/GYN office and were paid $20 for completing a self-administered questionnaire. Eligibility criteria were

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being female, 18 years of age or older and able to read English. The study protocol was approved by the University of North Carolina's institutional review board.

Measures

HPV Infection. Awareness of HPV was assessed by asking, "The next questions are about human papillomavirus, also known as HPV. Have you ever heard of HPV (human papillomavirus)?" Knowledge of HPV infection was assessed with an existing 13-item scale,[14] adapted to reflect current understanding of the natural history of HPV infection. Single items assessed perceived likelihood of HPV infection and perceived severity of HPV infection, separately for themselves and their daughter. Women who did not have adolescent daughters (aged 11-16) were asked to answer as if they did.

Cervical Cancer. Single items assessed perceived likelihood of cervical cancer and perceived severity of cervical cancer, separately for themselves and their daughter. Based on the Brief Illness Perception Questionnaire,[15] 2 scales assessed beliefs that cervical cancer has negative consequences and is treatable, and 1 item measured how well cervical cancer was understood.

HPV Vaccination. 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 2 cancer-causing types of HPV. Seven out of 10 cervical cancer cases can be prevented if people use this vaccine. Have you ever heard of the HPV vaccine before today?"

Single items assessed perceived effectiveness of the vaccine in preventing HPV infection and cervical cancer, whether the HPV vaccine is safe, whether it has serious side effects, and the best age for vaccination. Scales assessed beliefs that vaccines (in general) are beneficial, vaccines are unnecessary, HPV vaccines are beneficial, HPV vaccines are appropriate for adolescents, the effect of cues to action, and the absence of perceived barriers to vaccination. Scales assessed intentions to get the HPV vaccine and willingness to pay for the vaccine, separately for themselves and their daughter. See Fazekas et al. (2008) for more details on these scales.[9]

Data Analyses. Logistic and linear regression analyses were used to examine racial differences. We dichotomized all single-item attitude questions with 6 or fewer response scales into "lower/higher" response levels. The scale cutoff points are listed in Table 1 footnotes. Multi-item scales and questions with 8 to 11 point response scales were treated as continuous variables. All analyses were performed unadjusted and then repeated controlling for age, recruitment site, and socioeconomic status. The text reports results only from the adjusted analyses unless the unadjusted and adjusted results differed. All tests were 2-tailed with a critical alpha of 0.05.

Results

Of 138 women who participated (response rate 75%), 91 were black and 47 white. Respondents' mean age was 42 years (range 18-84). Most (85%) were parents, and 20% had a daughter aged 11-17. Most (80%) had a high school education or greater, 44% worked for pay, 77% had some form of health insurance, including Medicaid, and 28% had difficulty paying their bills. More black respondents were recruited in the public clinic than white respondents (86% vs 70%, $P < .05$), and more blacks reported higher socioeconomic status than did whites (31% vs 11%, $P < .05$).

HPV Infection. Only 24% of black women reported having heard of HPV compared to 57% of white respondents ($P < .001$) (Table 1). Black respondents scored lower on an HPV knowledge scale (29% correct) compared to whites (42% correct) ($P < .05$). Blacks were less likely than whites to think that an HPV infection would be a serious threat to their own or their daughter's health.

Cervical Cancer. Blacks were less likely to say they had any chance of getting cervical cancer than whites (59% vs 79%, $P < .05$ in adjusted analyses only). They were also less likely to think that cervical cancer would be a serious threat to their daughter's health and has negative consequences.

HPV Vaccination. Only 20% of respondents had heard of the HPV vaccine, and this did not differ by race. Fewer blacks agreed that vaccines (in general) are beneficial and more agreed that they are unnecessary than did white respondents. On the HPV vaccine specifically, respondents from the 2 groups did not differ in their perceptions about whether it is beneficial and good for adolescents. Black women perceived higher effectiveness of the vaccine against cervical cancer than white women (in adjusted analyses only). Attitudes about effectiveness of the vaccine against HPV, safety of the vaccine and the potential for serious side effects were not significantly different. While most black respondents (63%) thought the ideal age for administering the HPV vaccine was 17 years of age or

Table 1. Awareness and Attitudes about HPV Infection, Cervical Cancer, Vaccines and the HPV Vaccine

	Blacks (n = 91) %	Whites (n = 47) %	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
HPV infection				
Awareness of HPV	24	57	0.23 (0.11-0.50)***	0.21 (0.09-0.49)***
Any chance of getting HPV[a]	54	53	1.06 (0.52-2.16)	1.18 (0.54-2.55)
Perceived severity of HPV[b]	71	91	0.23 (0.08-0.71)*	0.23 (0.07-0.72)*
Any chance that daughter will get HPV[a]	78	91	0.33 (0.11-1.03)	0.36 (0.11-1.16)
Perceived severity of daughter's HPV[b]	70	91	0.22 (0.07-0.68)**	0.24 (0.07-0.76)*
Cervical cancer				
Any chance of getting cervical cancer[a]	59	79	0.40 (0.18-0.89)*	0.42 (0.17-1.01)
Perceived severity of cervical cancer[b]	92	98	0.26 (0.03-2.19)	0.30 (0.03-2.57)
Any chance that daughter will get cervical cancer[a]	81	85	0.76 (0.30-1.99)	0.82 (0.30-2.28)
Perceived severity of daughter's cervical cancer[b]	75	96	0.13 (0.03-0.59)**	0.10 (0.02-0.47)**
HPV vaccine				
Awareness of HPV vaccine	20	21	0.91 (0.38-2.17)	0.92 (0.33-2.57)
Perceived effectiveness against HPV[c]	44	28	1.99 (0.93-4.27)	2.03 (0.91-4.57)
Perceived effectiveness against cervical cancer[c]	52	34	2.05 (0.98-4.27)	2.59 (1.14-5.89)*
High safety[d]	41	26	2.12 (0.97-4.62)	1.88 (0.82-4.35)
Serious side effects[d]	44	28	1.99 (0.93-4.27)	2.03 (0.91-4.57)
Best age to vaccinate 17 years or older[e]	63	40	2.47 (1.20-5.08)*	2.85 (1.30-6.26)**
	Means (SD)	Means (SD)	Unadjusted Differences (95% CI)	Adjusted Differences (95% CI)
HPV infection				
HPV knowledge	29% (0.22)	42% (0.28)	−0.12 (−0.22 to −0.04)**	−0.1 (−0.19 to −0.01)*
Cervical cancer				
Cervical cancer has negative consequences[f]	6.7 (2.4)	7.5 (1.7)	−0.86 (−1.64 to −0.08)*	−0.86 (−1.69 to −0.04)*
Cervical cancer is treatable[f]	6.3 (2.8)	6.7 (2.1)	−0.42 (−1.34 to 0.51)	−0.30 (−1.26 to 0.65)
Cervical cancer is well understood[f]	6.7 (3.5)	6.1 (3.4)	0.60 (−0.63 to 1.84)	0.40 (−0.94 to 1.74)
HPV vaccine				
Vaccines (in general) are beneficial[g]	4.1 (1.1)	4.5 (0.6)	−0.40 (−0.74 to −0.07)*	−0.44 (−0.80 to −0.08)*
Vaccines (in general) are unnecessary[g]	2.9 (0.9)	2.5 (0.7)	0.34 (0.04 to 0.63)*	0.37 (0.06 to 0.68)*
HPV vaccines are beneficial[g]	3.3 (0.9)	3.3 (0.7)	0.08 (−0.22 to 0.38)	0.08 (−0.24 to 0.40)
HPV vaccines are good for adolescents[g]	3.4 (1.2)	3.8 (0.9)	−0.33 (−0.72 to 0.06)	−0.26 (−0.67 to 0.15)
Cues to action to vaccinate daughter[h]	4.8 (1.0)	4.3 (0.7)	−0.04 (−0.36 to 0.29)	0.01 (−0.31 to 0.34)
Low perceived barriers to vaccinating daughter[h]	4.3 (0.9)	4.4 (0.6)	−0.11 (−0.41 to 0.18)	−0.09 (−0.39 to 0.21)
Intention to vaccinate self[i]	3.6 (1.4)	4.1 (1.3)	−0.53 (−1.01 to −0.05)*	−0.32 (−0.79 to 0.16)
Willingness to pay for own vaccine[j]	4.1 (2.5)	4.5 (2.7)	−0.44 (−1.37 to 0.49)	−0.31 (−1.27 to 0.66)
Intention to vaccinate daughter[i]	4.1 (1.2)	4.6 (0.8)	−0.41 (−0.78 to −.04)*	−0.29 (−0.68 to 0.10)
Willingness to pay for daughter's vaccine[j]	4.9 (2.3)	5.1 (2.4)	−0.20 (−1.04 to 0.64)	0.02 (−0.86 to 0.90)

Note: Adjusted analyses controlled for age, socioeconomic status, and clinic location but not other variables in the table. HPV = human papillomavirus. The reference group in logistic regressions was white respondents. Single item attitude variables with 6 or fewer response scale options were dichotomized as indicated in table footnotes. Linear regression analyses of the variables before they were dichotomized found "any chance of getting cervical cancer" and "best age to vaccinate" not statistically significant while "any chance that daughter will get HPV" became statistically significant. Multi-item scales and questions with 8 to 11 point response scales were treated as continuous variables.

***$P < .001$, **$P < .01$, *$P < .05$.

[a]5-point scale recoded such that 0 = no chance and 1 = low, moderate, high chance and certain.

[b]6-point scale recoded such that 0 = no threat, very low and low threat 1 = moderate, high and very high.

[c]5-point scale recoded such that 0 = not at all, slightly, moderately and 1 = very and extremely.

[d]5-point scale recoded such that 0 = strongly disagree, slightly disagree, neither agree nor disagree and 1 = slightly and strongly agree.

[e]5-point scale recoded such that 0 = (0-2, 3-10, 11-16 years) and 1 = (17-25, 25+).

[f]11-point scale (no effect to severely affects my life).

[g]5-point scale (strongly disagree to strongly agree).

[h]5-point scale (discourage a lot to encourage a lot).

[i]5-point scale (very unlikely to very likely).

[j]8-point scale (nothing to $400+).

older, most (60%) white respondents thought the ideal age was younger than 17 years. Black respondents reported lower intentions to vaccinate either themselves or their daughters than did white respondents (unadjusted analyses only).

Discussion

This study is the first, to our knowledge, to explore in depth the differences and similarities between rural black and white women's beliefs about HPV infection, cervical cancer, and HPV vaccination. Black respondents were less aware of and less knowledgeable about HPV infection than white respondents. Blacks reported lower perceived severity of HPV infection for themselves and their daughters, lower perceived severity of their daughter's cervical cancer and lower susceptibility to cervical cancer for themselves than did whites. Moreover, black women favored an older age for vaccination and reported lower vaccination intentions (unadjusted analyses only) for the vaccine for themselves or their daughters than whites.

Our data are consistent with the few studies that identified isolated racial differences in awareness and knowledge of HPV and cervical cancer, and acceptability of the HPV vaccine, although no previous study has investigated all of these effects.[9,16–20] Racial differences in acceptability of the HPV vaccine may have their roots in some blacks' lower trust in traditional health care practices and providers and sources of health information.[21–23] Misperceptions about the safety of vaccination in general may be a barrier against uptake of the vaccine.[10,24] The findings from this study could be especially relevant for developing educational messages designed to reach the black parents in rural areas who are less knowledgeable about HPV and more skeptical about vaccination.[10,21] Strategies that include community health advisors[25] and other opinion leaders to raise awareness may also be appropriate.

A strength of our study is the focus on women in a rural area of North Carolina with high rates of cervical cancer. Limitations include the modestly sized, convenience sample of women recruited from health care facilities. The cross-sectional design did not allow for measurement of vaccination decisions over time or causal inferences. The numerous statistical comparisons raise the possibility that some findings may reflect chance. All measures were based on self-reports, making recall and reporting errors a potential concern. Whether ratings reflect true feelings about the HPV vaccine is unclear, as women may not have fully understood what they were asked to rate. However, their responses provide relevant baseline data before the substantial advertising and media coverage that followed vaccine licensing.

Our study offers important early insight into the HPV educational needs of black women in the rural South, a population at high risk for cervical cancer. To ensure uptake of the vaccine, additional studies are needed to understand better the HPV vaccine decision making in high-risk populations. Communication interventions to increase uptake of the HPV vaccine in the rural, Southern United States may need to develop messages for black women who may have different awareness and knowledge of HPV and beliefs about vaccines.

References

1. Centers for Disease Control and Prevention. Quadrivalent human papillomavirus vaccine: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Report.* 2007;56(RR02):1-24.
2. National Cancer Institute. *A Snapshot of Cervical Cancer*. Available at: http://planning.cancer.gov/disease/Cervical-Snapshot.pdf. Accessed April 5, 2008.
3. American Cancer Society. *Cancer Facts & Figures 2007*. Atlanta, GA: American Cancer Society; 2007.
4. Akers A, Newman S, Smith JS. Factors underlying disparities in cancer incidence, screening and treatment in the United States. *Curr Prob Cancer.* 2007;31(3):157-181.
5. Newmann SJ, Garner EO. Social inequities along the cervical cancer continuum: A structured review. *Cancer Causes Control.* 2005;16(1):63-70.
6. Saraiya M, Ahmed F, Krichnan S, Richards TB, Unger ER, Lawson HW. Cervical cancer incidence in a prevaccine era. *Obst Gynecol.* 2007;109(2 Pt 1):360-370.
7. Yabroff KR, Lawrence WF, King JC, et al. Geographic disparities in cervical cancer mortality: What are the roles of risk factor prevalence, screening, and use of recommended treatment? *J Rural Health.* Spr 2005;21(2):149-157.
8. Brewer NT, Fazekas KI. Predictors of HPV vaccine acceptability: A Theory-Informed Literature Review. *Prev Med.* 2007;45:107-114.
9. Fazekas KI, Brewer NT, Smith JS. HPV vaccine acceptability in a rural, southern area. *J Womens Health.* 2008;17(4):1-10.
10. Zimet GD, Liddon N, Rosenthal SL, Lazcano-Ponce E, Allen B. Chapter 24: Psychosocial aspects of vaccine acceptability. *Vaccine.* 2006;24(Suppl 3):S201-S209.
11. North Carolina Rural Economic Development Center. *Rural Data Bank.* Available at: http://www.ncruralcenter.org/databank/DataDictionary.pdf. Accessed April 7, 2008.
12. U. S. Census Bureau. United States: Urban/Rural and Inside/Outside Metropolitan Area (custom table for Person Co., N.C.). Author. Available at: http://factfinder.census.gov/. Accessed April 21, 2008.
13. State of North Carolina Center for Health Statistics. County Health Data Book. *North Carolina Department of Health and Human Services.* Available at: http://www.schs.state.nc.us/SCHS/data/databook/1999/Mortality.xls. Accessed April 10, 2008.
14. Yacobi E, Tennant C, Ferrante J, Pal N, Roetzheim R. University students' knowledge and awareness of HPV. *Prev Med.* 1999;28(6):535-541.
15. Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. *J Psychosom Res.* 2006;60(6):631-637.

16. Tiro JA, Meissner HI, Kobrin S, Chollette V. What do women in the US know about human papillomavirus and cervical cancer? *Cancer Epidemiol Biomarkers Prev.* 2007;16(2):288-294.
17. Scarinci IC, Garces-Palacia IC, Partridge EE. An examination of acceptability of HPV vaccination among African American Women and Latina immigrants. *J Womens Health.* 2007;16(8): 1224-1233.
18. Constantine NA, Jerman P. Acceptance of human papillomavirus vaccination among Californian parents of daughters: A representative statewide analysis. *J Adolesc Health.* 2007;40(2): 108-115.
19. National Cancer Institute. *HINTS Briefs Number 5.* Washington, DC: National Institutes of Health; March 2007.
20. Sapsis KF, Ryan EL. Findings from Focus Groups with Female Caregivers of 11 and 12 Year Old Girls about HPV Vaccine. Paper Presented at: 17th ISSTDR and 10th IUSTI World Congress; July 29-August 1, 2007; Seattle, WA.
21. Kahn JA. Maximizing the potential public health impact of HPV vaccines: A focus on parents. *J Adolesc Health.* 2007;40(2):101-103.
22. Jacobs EA, Rolle I, Ferrans CE, Whitaker EE, Warnecke RB. Understanding African Americans' views of the trustworthiness of physicians. *J Gen Intern Med.* 2006;21(6):642-647.
23. Prothrow-Stith D, Gibbs B, Allen A. Reducing health disparities: From theory to practice. *Cancer Epidemiol Biomarkers Prev.* 2003;12(3):S256-S260.
24. Dempsey AF, Davis MM. Overcoming barriers to adherence to HPV vaccination recommendations. *Am J Manag Care.* 2006; 12(17):S484-S491.
25. Lisovicz N, Johnson RE, Higginbotham J, et al. The deep South network for cancer control—Building a community infrastructure to reduce cancer health disparities. *Cancer.* 2006;107(8):1971-1979.