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Racial and ethnic differences in human papillomavirus positivity and risk factors among low-income women in Federally Qualified Health Centers in the United States

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Abstract

Reasons for racial/ethnic disparities in HPV infection are unclear. This study assessed racial/ethnic differences in and risk factors for HPV positivity among low-income women. Data were collected from 984 low-income women visiting Federally Qualified Health Centers across Illinois (2009–2011). Pearson chi square and Logistic regression analyses were used to examine associations with HPV positivity. Our results showed Mexican-born Hispanics had the lowest HPV positivity (16%), followed by non-Hispanic whites (29%), US-born Hispanics (35%), and non-Hispanic blacks (39%). Mexican-born Hispanics reported fewer risk behaviors for HPV positivity, including first sexual intercourse before age 16 years (9% versus 27%), multiple sexual partners in lifetime (48% versus 90%), and current cigarette smoking status (10% versus 35%) when compared to non-Hispanic whites ($p < 0.001$). In multivariate-adjusted logistic regression, being non-Hispanic black, first sexual intercourse before age 16 years, increasing numbers of recent or lifetime sexual partners and current cigarette smoking status were associated with a higher likelihood of HPV positivity. Our findings highlight racial/ethnic differences in HPV positivity and risk factors in a population of women with similar socioeconomic characteristics. When measuring HPV risk factors within the Hispanic population, foreign-born status and other mediating factors, such as social norms and cultural characteristics, may be relevant to assess the intragroup heterogeneity.

Keywords

Human papillomavirus; Hispanics; Ethnicity; Risk behaviors

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Conflicts of interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Introduction

In the United States (US), human papillomavirus (HPV) is the most common sexually transmitted infection (STI) with approximately 14 million people newly infected each year (Satterwhite et al., 2013). There are more than 100 types of HPV, with approximately 40 of which are known to infect the genital area. High-risk or oncogenic HPV types are associated with 99.7% of all cervical cancers, and low-risk types are responsible for all cases of genital warts (Centers for Disease Control and Prevention, 2012). HPV vaccines have been developed to provide protection against type-specific HPV infection (Centers for Disease Control and Prevention, 2012). Risk factors associated with HPV infection include early age at first sexual intercourse (Chelimo et al., 2013), multiple sexual partners (Chelimo et al., 2013; Dunne et al., 2007), and current cigarette smoking (Vaccarella et al., 2008). Racial/ethnic disparities in HPV infection have been shown; non-Hispanic blacks had the highest prevalence of HPV followed by Hispanic and non-Hispanic whites (Hariri et al., 2011). Reasons for differences in HPV prevalence by race/ethnicity are unclear but may be the result of differences in the structure of sexual networks. Evidence has shown that the sexual networks of black persons are more racially segregated and have higher rates of concurrent sexual partnerships as well as sexual mixing between high- and low-risk groups, which may facilitate the spread of STI within the community (Adimora and Schoenbach, 2005). Differences in country of birth in HPV infection among Hispanic populations have also been observed due to intragroup heterogeneity related to demographic variables and acculturation; however, epidemiological studies have not produced consistent findings (Giuliano et al., 1999; Montealegre et al., 2013; Ward et al., 2010).

Despite the decline in cervical cancer rates among all women, higher rates of both HPV infection and cervical cancer have typically been found among low-income and racial/ethnic minority women (Benard et al., 2008; Downs et al., 2008). This is particularly concerning, as these groups also have a lower HPV vaccination coverage (Reagan-Steiner et al., 2015). In this report, we aimed to assess racial/ethnic differences in and independent risk factors for HPV positivity among low-income women in Federally Qualified Health Centers (FQHCs) across Illinois. Because this sample contains a racial/ethnically diverse screened population of women with similar socioeconomic characteristics, it provides a unique opportunity to examine behavioral risk factors linked to HPV infection. Understanding factors related to HPV infection can aid in developing effective interventions targeting the low-income minority groups, which may inform HPV vaccination promotion efforts.

Materials and methods

Data were collected from 984 women from 2009 to 2011 as part of the Centers for Disease Control and Prevention's (CDC) Cervical Cancer Screening (C×3) Study—a multi-component educational intervention to identify facilitators and barriers to guideline-consistent cervical cancer screening in an under-served population (Benard et al., 2014; Hawkins et al., 2013). The study was conducted in 15 clinics associated with six Federally Qualified Health Centers (FQHCs) across Illinois. FQHCs are safety-net clinics that provide comprehensive primary health care services to medically underserved communities, with a goal to ensure equal access to affordable, quality health care for all patients (Health

Resources and Services Administration). Illinois was selected as the study location based on the Illinois Breast and Cervical Cancer Early Detection Program's high Pap test volume, follow-up rate, and outreach activities targeting under-served women for cervical cancer screening (http://www.cdc.gov/cancer/nbccedp/data/summaries/illinois.htm), and high incidence of cervical cancer in Illinois. Participants were eligible to participate if they were aged 30–60 years and were visiting the clinic for routine cervical cancer screening. Other eligible criteria included no abnormal Pap test results in the preceding year, no history of cervical cancer, no record of being HIV positive, and no hysterectomy. They were identified through medical chart review by clinic staff and were invited to participate when they arrived at the clinic for their screening. Baseline surveys (available in both English and Spanish) assessing demographics, beliefs, and health behaviors were self-administered prior to the women's exam. HPV tests were provided by the study as part of their cervical cancer screening, and were sent to CDC for processing. HPV positivity was defined as the detection of 37 HPV types (6, 11, 16, 18, 26, 31, 33, 35, 39, 40, 42, 45, 51, XR(52), 53, 54, 55, 56, 58, 59, 61, 62, 64, 66, 67, 68, 69, 70, 71, 72,73, 81, 82, 83, 84, 89, and IS39), assessed by Linear Array HPV genotyping assay (Roche Diagnostics, Indianapolis, IN) (Saraiya et al., 2014). Participants were offered a $5 cash incentive for completing the survey. This study was approved by the CDC's Institutional Review Board.

Sociodemographic characteristics

Race/ethnicity was self-reported. Participants reporting Hispanic ethnicity were classified as Hispanic regardless of race. The remainder of the women were classified as non-Hispanic white, non-Hispanic black, or non-Hispanic other based on a follow-up question about their race. Participants were also asked about their country of birth. Given the large number of Hispanic participants born in Mexico, Hispanics were further divided into US-born and Mexican-born. Participants classified as non-Hispanic other or multiple race (n = 26), Hispanic born outside of US and Mexico (n = 36) or missing data on race/ethnicity (n = 8) were assigned to "Other" race/ethnicity. Other sociodemographic characteristics included age, education level, primary language spoken at home, health insurance coverage, and type of health insurance.

HPV risk factors

Participants were asked about behaviors that have been found to be associated with HPV infection. These included: age at first sexual intercourse, number of sexual partners in lifetime and in the last 12 months, and current cigarette smoking status.

Statistical analysis

Overall differences in sociodemographic characteristics by race/ethnicity were computed using the Pearson chi-square test for categorical and linear regression for continuous variables. Pearson chi-square was used to test for significant differences in HPV positivity and risk factors by race/ethnicity. Odds ratios (ORs) from unadjusted and multivariate adjusted logistic regression models were used to examine associations with HPV positivity. All analyses were conducted with Stata version 13 (StataCorp, 2013) and adjusted for the cluster sampling design of women within clinics (Stata *svyset* and *svy:* procedures). Multiple

imputation of missing data was conducted for use in logistic regression models of HPV prevalence. Multiple imputation by chained equations was applied (Raghunathan et al., 2001; StataCorp, 2013; van Buuren, 2007) and included all variables present in the multivariate logistic regression model: HPV positivity, age, race-ethnicity, age at first sexual intercourse, total number of lifetime partners, total number of sexual partners in the last 12 months, and smoking status. Significance level was set at $p < 0.05$.

Results

The sample consisted of 384 non-Hispanic whites (42.0%), 254 non-Hispanic blacks (27.8%), 245 Mexican-born Hispanics (26.8%), and 31 US-born Hispanics (3.4%), with Mexican-born Hispanics being the youngest (42.2 ± 6.7 years). Non-Hispanic blacks (14.2%) were the least likely to be married among all the racial groups. Mexican-born Hispanics had the lowest educational attainment (79.8% with no high school diploma) and were the most likely to be uninsured (74.8%) (Not tabled).

Mexican-born Hispanics (16%) had the lowest HPV positivity, followed by non-Hispanic whites (29%), US-born Hispanics (35%), and non-Hispanic blacks (39%) ($p < 0.001$) (Fig. 1). Mexican-born Hispanics also reported fewer HPV risk factors than other racial/ethnic groups. For example, Mexican-born Hispanics were less likely to report first sexual intercourse before age 16 years (9% versus 27%), two or more sexual partners in lifetime (48% versus 90%), and current cigarette smoking status (10% versus 35%) when compared to non-Hispanic whites (all $p < 0.001$).

Table 1 describes results from the unadjusted and multivariate adjusted logistic regression analyses. In univariate analysis, HPV positivity was significantly lower in Mexican-born Hispanics compared to non-Hispanic whites (OR: 0.46; 95% CI: 0.31, 0.71). However, the relationship was no longer significantly different after adjusting for age and HPV risk factors (adjusted OR (aOR): 0.82; 95% CI: 0.48, 1.40). In the adjusted model, HPV positivity among US-born Hispanics was not significantly different from HPV positivity among non-Hispanic whites (aOR: 1.38; 95% CI: 0.53, 3.56). Non-Hispanic blacks were 1.4 times as likely to be HPV positive compared to non-Hispanic whites (aOR: 1.36; 95% CI: 1.04–1.78). Participants who reported first sexual intercourse before age 16 years, increasing numbers of recent or lifetime sexual partners, and current cigarette smoking status had a higher likelihood of HPV positivity.

Discussion

In this study, we assessed racial/ethnic differences in HPV positivity and risk factors among low-income women aged 30–60 years in FQHCs across Illinois. Most studies often combine Hispanics as a homogeneous group without considering differences by country of birth (Hariri et al., 2011). Within our sample of Hispanic women, 88.8% (n = 245) of them were from Mexico and therefore we could disaggregate into US and Mexican-born Hispanics. Our results showed that Mexican-born Hispanics had the lowest HPV positivity and engaged in a fewer number of HPV risk behaviors, including early age at first sexual intercourse, multiple sexual partnerships, and current cigarette smoking, when compared to US-born Hispanics

and other racial groups. These findings are consistent with other studies (Escarce et al., 2006; Giuliano et al., 1999; Montealegre et al., 2013), suggesting that Mexican-born Hispanics retain protective factors associated with foreign-born status for health risk behaviors. The protective factors for risk behaviors are likely due to unmeasured factors, such as social norms and cultural characteristics in the country of birth, which have been found to diminish with increased acculturation and time in the US (Escarce et al., 2006; Ward et al., 2010). For example, a longitudinal study found that Mexican-born girls with reported strong familism values and more traditional gender role attitudes in early adolescence were less likely to engage in risky behaviors in their later adolescence (Updegraff et al., 2012). These specific cultural characteristics among women of Mexican descent may have declined over time in enculturation, explaining the higher HPV risk behaviors and positivity among US-born Hispanics in our study.

Non-Hispanic blacks in our study had the highest HPV positivity and reported more HPV risk behaviors than the other racial/ethnic groups. While individual-level risk factors could explain differences in the prevalence of HPV positivity, population-level risk factors may also be an important determinant (Brisson et al., 2013). Previous research has shown that the sexual networks of black persons have a higher rate of sexual mixing patterns between members of different populations that are conducive to the transmission of STIs (Adimora and Schoenbach, 2005). Such differences in sexual network structure have been demonstrated in the study by Hariri et al., who found that the risk for HPV infection among non-Hispanic blacks with one lifetime partner was six-fold higher than their white counterparts, suggesting a higher HPV prevalence within black communities (Hariri et al., 2011). Other independent risk factors for HPV in our analysis included sexual behaviors (early age at first sexual intercourse and increasing numbers of recent or lifetime sex partners) and current cigarette smoking, consistent with previous studies (Chelimo et al., 2013; Dunne et al., 2007; Vaccarella et al., 2008).

The strengths of our study include a racial/ethnically diverse screened population, but there are several limitations as well. Our sample was recruited from women attending FQHCs across Illinois, making it difficult to generalize the findings to other clinical settings. Our unique sample of Hispanic women also limited the generalizability to Hispanics from countries other than Mexico. The racial distribution, however, may reflect the reality of where they live and receive care. The small sample size of foreign-born whites (n = 13) and blacks (n = 12) prevented us from conducting meaningful comparisons; more data would allow these categories to be further analyzed. Our documents did not have a record of women who refused to participate so we failed to detect differences between respondents and non-respondents to the survey. Self-reported behavioral data may result in misclassification. Factors that may explain differences in HPV risk behaviors by country of birth, such as social and cultural characteristics, were not available.

In conclusion, our findings highlight racial/ethnic differences in HPV positivity and risk factors in a population of women with similar socioeconomic characteristics. When measuring HPV risk factors within the Hispanic population, foreign-born status and other mediating factors, such as social norms and cultural characteristics, may be relevant to assess the intragroup heterogeneity.

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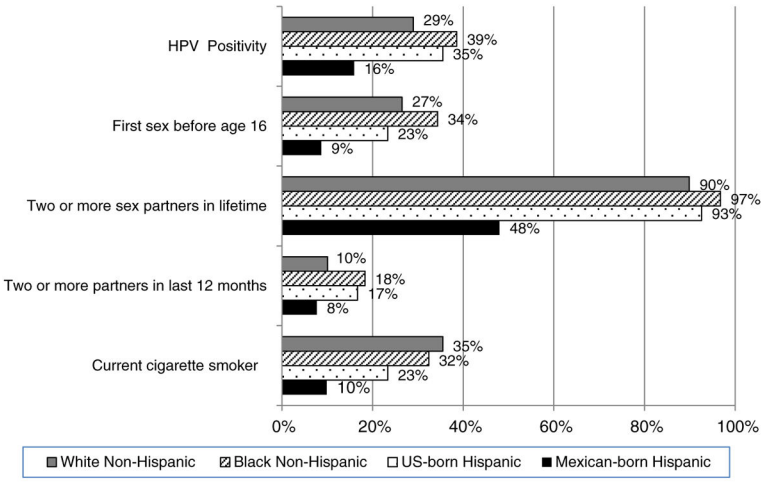

Fig. 1.

HPV positivity and individual risk factors by race/ethnicity among low-income women aged 30 to 60 years. HPV positivity was defined as the detection of 37 HPV types (6, 11, 16, 18, 26, 31, 33, 35, 39, 40, 42, 45, 51, XR(52), 53, 54, 55, 56, 58, 59, 61, 62, 64, 66, 67, 68, 69, 70, 71, 72,73, 81, 82, 83, 84, 89, and IS39), assessed by Linear Array HPV genotyping assay (Roche Diagnostics, Indianapolis, IN). Pearson chi-square, $p < 0.001$ for all comparisons.

Table 1

Logistic regression analysis on HPV positivity among low-income women aged 30 to 60 years (n = 984)*.

Variables	N	HPV+ (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age, years				
30–45	520	28.8	1.11 (0.66–1.86)	1.20 (0.78–1.85)
46–60	464	26.8	Reference	Reference
Race–Ethnicity				
Non-Hispanic White	384	29.0	Reference	Reference
Non-Hispanic Black	254	38.6	1.54 (1.18–2.01)	1.36 (1.04–1.78)
Hispanic, born in Mexico	245	15.9	0.46 (0.31–0.71)	0.82 (0.48–1.40)
Hispanic, born in US	31	35.5	1.35 (0.51–3.60)	1.38 (0.53–3.56)
Age at first sexual intercourse				
<16	215	40.9	2.23 (1.58–3.14)	1.46 (1.03–2.07)
≥16	705	23.8	Reference	Reference
Total number of lifetime sex partners				
0–1	179	9.0	Reference	Reference
2–5	326	25.5	3.46 (2.10–5.70)	2.63 (1.48–4.68)
≥6	374	37.7	6.23 (3.73–10.41)	3.33 (1.50–7.42)
Total number of sex partners in last 12 months				
0–1	792	25.8	Reference	Reference
≥2	103	49.5	2.92 (2.11–4.05)	1.96 (1.29–2.99)
Current smoker				
No	690	23.6	Reference	Reference
Yes	251	39.6	2.10 (1.46–3.02)	1.49 (1.03–2.14)

*N varies due to missing responses. Percent HPV+ were computed from non-missing data. Adjusted model includes all variables. The “Other” race/ethnicity group (non-Hispanic other or multiple race, Hispanic born outside of US and Mexico, and missing race/ethnicity) were included in the regression analysis but coefficients are not presented in the table.