Human Papillomavirus Vaccination Initiation Among Sexual Orientation Identity and Racial/Ethnic Subgroups of Black and White U.S. Women and Girls: An Intersectional Analysis

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Abstract

Introduction: Human papillomavirus (HPV) vaccination, which is recommended for U.S. women and girls aged 11–26 years, effectively prevents cervical cancer. Researchers have identified HPV vaccination disparities among groups of women and girls defined in relation to sexual orientation identity or race/ethnicity. However, no study has used an intersectional approach to ascertain HPV vaccine uptake among sexual orientation identity and racial/ethnic subgroups of U.S. women and girls.

Methods: Using 2011–2015 National Survey of Family Growth data, we used multivariable logistic regression to estimate differences in the odds of HPV vaccination initiation (i.e., $\geq$ one dose) across sexual orientation identity and racial/ethnic subgroups of black and white U.S. women aged 15–24 years ($N=2,413$), adjusting for demographic factors. We also assessed whether socioeconomic and health care factors helped explain observed disparities.

Results: The overall prevalence of HPV vaccination initiation was 47.7%. Compared to white heterosexual women, black lesbians (odds ratio [OR]=0.16; 95% confidence interval [95% CI]: 0.06–0.46) had the lowest adjusted odds of HPV vaccination initiation, followed by white lesbians (OR=0.33; 95% CI: 0.13–0.82) and black heterosexual women (OR=0.63; 0.47–0.85). Including socioeconomic factors in the model only slightly attenuated the HPV vaccination initiation odds ratios for black lesbians (OR=0.19; 95% CI: 0.06–0.56), white lesbians (OR=0.37; 95% CI: 0.15–0.90), and black heterosexual women (OR=0.70; 95% CI: 0.52–0.93) compared to white heterosexual women. Adding health care factors only slightly additionally attenuated the odds ratio comparing black lesbians and white heterosexual women (OR=0.21; 95% CI: 0.07–0.67).

Conclusions: Our findings identified black lesbians as a particularly underserved subgroup and suggest that sexual orientation identity and race/ethnicity may have a compounding effect on HPV vaccination initiation among black and white U.S. women and girls. Evidence-based interventions that are adapted to the specific needs and experiences of black lesbians and other multiply marginalized groups are needed to promote equity in HPV-related outcomes.

Keywords: human papillomavirus vaccination, sexual orientation, race/ethnicity, health disparities, intersectionality, women

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Introduction

HUMAN PAPILLOMAVIRUS (HPV) IS the most common sexually transmitted infection (STI) in the United States,^{1,2} with approximately 14 million new infections² and 39,800 new HPV-associated (e.g., cervical and oropharyngeal) cancers occurring each year.³ Lesbian and bisexual women are at risk of acquiring HPV from a range of sexual behaviors with both male and female sexual partners.^{4,5} In fact, research shows that bisexual women are more likely than heterosexual women to acquire HPV^{6,7} and that both lesbian and bisexual women who become infected with HPV may be more likely than heterosexual women to develop cervical cancer⁸ because of a lower prevalence of regular Pap testing,^{9,10} higher prevalence of smoking,¹¹ and lower prevalence of health insurance and access to health care.^{12,13} Moreover, pronounced racial/ethnic disparities exist in HPV infection¹⁴ and cervical cancer outcomes¹⁵ among U.S. women. Of note, black women are more likely than white women to acquire HPV¹⁴ and develop cervical cancer^{15,16} and are the most likely racial/ethnic group to die from the disease.^{15,17}

The HPV vaccine effectively prevents HPV infection and cervical cancer among U.S. girls and women.¹⁸ Between 2006 and 2016, the Advisory Committee on Immunization Practices (ACIP) recommended 3 doses of the HPV vaccine for girls aged 11–12 years and unvaccinated young women aged 13–26 years.^{19,20} Since 2016, ACIP has recommended 2 doses of the HPV vaccine for girls aged 11–14 years and 3 doses for unvaccinated young women aged 15–26 years.²¹ In a recent clinical trial, researchers found that receiving 1 dose of the HPV vaccine was just as effective against HPV infection 4 years after vaccination as receiving 2 doses.²² Some studies suggest that lesbians may be less likely than heterosexual women to initiate²³ and complete²⁴ the 3-dose HPV vaccine series. Moreover, although results are mixed due to differences in study design, populations, and time periods, several studies have found that black girls and women may have lower levels of HPV vaccination initiation^{25–28} and completion^{26,27,29–33} than their white counterparts.

In 2011, the Institute of Medicine called for additional research pertaining to lesbian, gay, bisexual, and transgender (LGBT) people of color, an understudied population that may be particularly marginalized and underserved.³⁴ Thus, using a national probability sample of adolescent and young adult U.S. women, we designed a quantitative study to ascertain the distribution of HPV vaccination initiation among subgroups of U.S. women and girls from marginalized sexual orientation identity and racial/ethnic backgrounds, which no prior study had investigated. We were especially interested in ascertaining HPV vaccination initiation among black sexual minority women (SMW), who may be at especially elevated risk of cervical cancer morbidity and mortality due to compounding sexual orientation and racial/ethnic inequities. Moreover, we also assessed whether socioeconomic and health care factors contributed to HPV vaccination initiation disparities across sexual orientation identity and racial/ethnic subgroups of women and girls. These findings will help inform the development of evidence-based interventions that address barriers to HPV vaccine uptake related to not only sexual orientation identity but also race/ethnicity and are adapted to the specific needs of underserved subgroups.

The present study was guided by intersectionality, an analytic framework with roots in black feminism^{35–38} that focuses on how marginalized groups' lived experiences are shaped by the intersectional effects of multiple social categories at the individual level (e.g., gender, race/ethnicity, and sexual orientation identity) and related forms of interpersonal and structural discrimination (e.g., sexism, racism, and heterosexism).^{39–41} In line with intersectionality, we conceptualized sexual orientation identity and race/ethnicity as individual-level social categories linked to not only personal and social identity but also social inequality.^{39–41} We hypothesized that black lesbians would be less likely than both white lesbians and black heterosexual women to obtain the HPV vaccine as a result of their multiply marginalized social position at the intersection of gender and sexism, race/ethnicity and racism, and sexual orientation identity and heterosexism.^{42–44}

Methods

Study participants

We analyzed self-reported, nationally representative data from the 2011–2013 and 2013–2015 waves of the National Survey of Family Growth (NSFG), which used a stratified, multistage cluster sampling design to generate a national probability sample of 11,300 civilian, noninstitutionalized U.S. women aged 15–44 years (female response rates: 73.4% in 2011–2013 and 71.2% in 2013–2015).^{45–47} Our analysis was restricted to black and white women aged 15–24 years (at the time of the survey screener), as older participants were not asked about HPV vaccination ($N=2,484$). We restricted our sample to black and white women because black women are more likely than white women to acquire HPV¹⁴ and develop cervical cancer^{15,16} and are the most likely racial/ethnic group to die from the disease.^{15,17}

Furthermore, black and white women aged 15–24 years who responded “don’t know” or did not provide information about their sexual orientation identity ($n=20$; 0.57%) were excluded from our study population due to their small numbers, which precluded reliable statistical analyses. Of note, they were less likely to be working for pay ($p=0.02$) and more likely to have less than a high school education ($p=0.03$) and to have a public health insurance plan ($p=0.03$) compared to women who self-identified as heterosexual, bisexual, or lesbian.

In addition, black and white women aged 15–24 years who responded “don’t know” or did not provide data on HPV vaccination initiation ($n=51$; 1.61%) were also excluded from our study. They were more likely to live in the central city of a Metropolitan Statistical Area (MSA; $p=0.01$), be non-U.S. born ($p<0.001$), be a student ($p=0.003$), and have a public health insurance plan ($p=0.005$) and were less likely to have some college education ($p=0.02$) relative to their counterparts not missing data on HPV vaccination initiation. Thus, our analytic sample was restricted to black and white U.S. women aged 15–24 years who self-identified as heterosexual, bisexual, or lesbian with no missing data on HPV vaccination initiation ($N=2,413$).

Measures

The primary predictor in our analysis was a combined measure of sexual orientation identity and race/ethnicity. Sexual orientation identity was assessed by asking respondents

whether they thought of themselves as “heterosexual or straight,” “homosexual, gay, or lesbian,” or “bisexual”; participants could also respond “don’t know” or refuse to answer this question. Participants were categorized as heterosexual, bisexual, or lesbian. Although sexual orientation is a multidimensional construct that encompasses sexual attraction, sexual identity, and sexual behavior,⁴⁸ we selected an identity-based measure of sexual orientation which, along with sexual behavior, is particularly relevant to sexual health care to facilitate comparisons with prior studies on sexual orientation and HPV vaccination among U.S. women and girls. The dichotomous (yes/no) outcome of interest was HPV vaccination initiation (i.e., receiving ≤ 1 dose of the HPV vaccine), which was ascertained by asking participants aged 15–24 years whether they had “received the cervical cancer vaccine, also known as the HPV shot or Gardasil.”

Race/ethnicity was assessed using an item based on the 1997 Office of Management and Budget measure that included the following categories: Hispanic, non-Hispanic white (single race), non-Hispanic black (single race), and non-Hispanic “other” or multiple race. Participants were categorized as non-Hispanic black (henceforth, black) or non-Hispanic white (henceforth, white). Demographic factors (i.e., age, nativity, place of residence, and religion), which we conceptualized as potential confounders and are shown along with their categorization in Table 1, were selected a priori based on the scientific literature on the social determinants of HPV vaccination. Socioeconomic factors (i.e., educational attainment, household federal poverty level [FPL] and employment status) and health care factors (i.e., health insurance status and usual source of care; see Table 1 for categorization) were also chosen a priori based on the literature and conceptualized as potential mediators. Missing data for all covariates (other than nativity, which had no missing data, and religion, for which the proportion of missing data was small [$n=9$; 0.41%]) were multiply imputed by NSFG staff using sequential regression imputation.⁴⁶

Statistical analysis

We first assessed the percent distribution of demographic, socioeconomic, and health care factors in relation to our combined measure of sexual orientation identity and race/ethnicity among black and white heterosexual, bisexual, and lesbian U.S. women aged 15–24 years ($N=2,413$). We then estimated the prevalence of HPV vaccination initiation for each of our sexual orientation identity and racial/ethnic subgroups (i.e., white heterosexual, black heterosexual, white bisexual, black bisexual, white lesbian, and black lesbian) and tested for differences using adjusted Wald tests (reference: white heterosexual). In line with an intersectional approach,^{44,49,50} we estimated a multivariable logistic regression model to generate odds ratios (ORs) and 95% confidence intervals (CIs) (reference: white heterosexual) specific to each sexual orientation identity and racial/ethnic subgroup, adjusting for demographic factors and survey year (Model 1). We then additionally and sequentially entered socioeconomic factors (Model 2) followed by health care factors (Model 3) into the model to assess whether these variables helped explain HPV vaccination initiation disparities among sexual orientation identity and racial/ethnic subgroups relative to white heterosexual women. We interpreted attenu-

ation of ORs upon inclusion of these variables in the model as evidence of potential mediation.⁵¹ All analyses were conducted using Stata 14 (College Station, TX) and accounted for the survey’s complex sampling design.

Results

Table 1 presents the sociodemographic and health care characteristics of sexual orientation identity and racial/ethnic subgroups of white and black heterosexual, bisexual, and lesbian U.S. women aged 15–24 years ($N=2,413$). Compared to white heterosexual women, black heterosexual women were more likely to live in the central city of a MSA, live below 100% FPL, be enrolled in a public health insurance plan, and be uninsured and were less likely to have a bachelor’s degree or more and be working for pay. Furthermore, white bisexual women were more likely to be aged 15–17 years, live below 200% FPL, be enrolled in a public health insurance plan, and be uninsured relative to white heterosexual women. Black bisexual women were more likely to live in the central city of a MSA, live below 100% FPL, be enrolled in a public health insurance plan, and be uninsured and were less likely to have a bachelor’s degree or more and be working for pay compared to white heterosexual women. Relative to white heterosexual women, white lesbians were more likely to be aged 18–21 years, live below 200% FPL, and be uninsured. Black lesbians were more likely to be aged 15–17 years, live below 100% FPL, be enrolled in a public health insurance plan, and be uninsured and less likely to have a usual source of care compared to white heterosexual women.

Figure 1 shows that the overall prevalence of HPV vaccination initiation was 47.7%, with the highest prevalence occurring among white heterosexual women (50.7%) and the lowest among black lesbians (16%). Compared to white heterosexual women (50.7%), black lesbians (16%; $p<0.001$), white lesbians (28.4%; $p=0.02$), and black heterosexual women (39.0%; $p=0.001$) were significantly less likely to have initiated HPV vaccination. In contrast, we observed no statistically significant difference in the prevalence of HPV vaccination initiation between black (37.4%; $p=0.13$) or white (49.8%; $p=0.85$) bisexual women and white heterosexual women (50.7%).

Table 2 shows that, adjusting for demographic factors and survey year, black lesbians (OR=0.16; 95% CI: 0.06, 0.46) had the lowest odds of HPV vaccination initiation compared to white heterosexual women, followed by white lesbians (OR=0.33; 95% CI: 0.13, 0.82) and black heterosexual women (OR=0.63; 95% CI: 0.47, 0.85; Model 1). In contrast, the adjusted odds of initiating HPV vaccination were similar among white bisexual and white heterosexual women (OR=0.98; 95% CI: 0.67, 1.44; Model 1). While black bisexual women appeared to have lower adjusted odds of HPV vaccination initiation than white heterosexual women, this difference was not statistically significant (OR=0.52; 95% CI: 0.24, 1.13; Model 1). Including socioeconomic factors in the model only slightly attenuated the HPV vaccination initiation odds ratios for black lesbians (OR=0.19; 95% CI: 0.06, 0.56), white lesbians (OR=0.37; 95% CI: 0.15, 0.90), and black heterosexual women (OR=0.70; 95% CI: 0.52, 0.93) compared to white heterosexual women (Model 2). Further adding health care factors only slightly attenuated the

TABLE 1. PERCENT DISTRIBUTION OF DEMOGRAPHIC, SOCIOECONOMIC, AND HEALTH CARE FACTORS AMONG SEXUAL ORIENTATION IDENTITY AND RACIAL/ETHNIC SUBGROUPS OF WHITE AND BLACK HETEROSEXUAL, BISEXUAL, AND LESBIAN U.S. WOMEN AGED 15–24 YEARS (N=2,413)

<i>Variable (%)</i>	<i>Total</i>	<i>White heterosexual</i> (n = 1,450; 70.8%)	<i>Black heterosexual</i> (n = 670; 19.0%)	<i>White bisexual</i> (n = 163; 6.6%)	<i>Black bisexual</i> (n = 75; 1.7%)	<i>White lesbian</i> (n = 28; 1.0%)	<i>Black lesbian</i> (n = 27; 0.8%)
Age (years; at time of screening)							
15–17	26.8	25.5	28.6	35.9	26.0	10.2	40.3
18–21	40.3	40.8	38.7	38.6	33.7	59.7	42.2
22–24	32.9	33.7	32.8	25.5	40.4	30.2	17.5
U.S. born: yes	97.1	97.8	93.4	99.5	99.5	100.0	88.7
Place of residence							
MSA, central city	32.2	26.7	50.5	33.1	52.8	33.6	30.1
MSA, other	51.3	54.7	40.9	48.0	41.8	43.2	57.6
Non-MSA	16.5	18.6	8.6	19.0	5.4	23.2	12.2
Religion in which raised							
No religion	14.6	14.9	10.5	23.8	14.3	16.0	13.1
Catholic	21.1	25.7	5.7	21.6	8.2	26.4	3.1
Fundamentalist Protestant	5.4	4.6	9.7	3.8	0.6	5.8	2.3
Another type of Protestant	51.9	47.7	68.1	41.2	74.7	47.7	77.6
Another religion	6.9	7.1	6.0	9.5	2.3	4.1	3.9
Educational attainment							
< High school degree	32.6	29.7	39.2	41.6	41.5	25.3	41.1
High school diploma/GED	25.5	23.9	26.2	32.6	42.1	34.0	43.1
Some college/Associate's degree	31.9	34.1	28.1	24.8	15.5	38.9	15.9
Bachelor's degree or higher	10.1	12.3	6.5	1.1	0.9	1.9	0.0
Household federal poverty level (%)							
<100	31.4	26.1	48.8	31.0	46.1	32.2	55.9
100–199	21.7	19.6	23.8	37.0	14.8	42.6	17.5
200–299	17.2	19.1	12.9	11.3	20.3	9.1	3.8
≥300	29.7	35.1	14.6	20.7	18.9	16.2	22.9
Employment status							
Working for pay	56.2	59.6	50.1	45.6	40.7	42.3	45.3
Not working for pay	18.8	17.3	21.0	19.4	39.9	37.1	20.7
Student	25.0	23.1	28.9	35.0	19.4	20.6	34.0
Health insurance status							
Private	62.1	70.6	38.7	50.8	31.4	56.1	37.7
Public	27.5	21.2	47.7	31.7	52.0	21.0	31.9
Uninsured or underinsured*	10.4	8.2	13.7	17.5	16.6	23.0	30.4
Usual source of care: yes	83.9	84.3	81.6	86.7	86.5	93.4	63.8

All prevalence estimates account for the complex sampling design and may not add to 100.0% due to rounding error. Underinsured refers to individuals enrolled in a single service plan or Indian Health Service only.

MSA, metropolitan statistical area.

FIG. 1. Prevalence of human papillomavirus vaccination initiation among sexual orientation identity and racial/ethnic subgroups of white and black heterosexual, bisexual, and lesbian U.S. women aged 15–24 years ($N=2,413$).

Prevalence estimates and error bars account for the complex sampling design. *Prevalence estimate was significantly different from that of white heterosexual women (reference) at $p > 0.05$ based on the adjusted Wald test.

odds ratio for black lesbians relative to white heterosexual women (OR=0.21; 95% CI: 0.07, 0.67; Model 3).

Discussion

Guided by intersectionality,^{39–41} we conducted the first study of which we are aware to examine the population distribution of HPV vaccination initiation across sexual orientation identity and racial/ethnic subgroups in a national probability sample of black and white heterosexual, bisexual, and lesbian U.S. women aged 15–24 years. The present study contributes to the scientific literature by identifying black lesbians, whose lived and health care experiences are shaped by *both* heterosexism *and* racism,^{42–44} as a particularly underserved subgroup. Moreover, white lesbians, whose lived and health care experiences are shaped by heterosexism but not racism,^{34,52} had the second lowest adjusted odds of HPV vaccination initiation relative to white heterosexual women, followed by black heterosexual women, whose lived and health care experiences are influenced by racism but not heterosexism.⁵³ Thus, our findings suggest that sexual orientation identity and race/ethnicity may have a compounding effect on HPV vaccination initiation among black and white U.S. women and girls. In addition, our results indicate that socioeconomic factors only slightly contributed to HPV vaccination initiation disparities among black lesbians, white lesbians, and black heterosexual women compared to white heterosexual women and that health care factors only slightly additionally contributed to disparities between black lesbians and white heterosexual women.

We draw on intersectionality^{39–41} and the scientific literature to interpret our research findings and elucidate how inequities and barriers related to sexual orientation identity and race/ethnicity may simultaneously undermine HPV vaccination initiation among U.S. women and girls. First, other research suggests that the lower adjusted odds of initiating HPV vaccination among both black and white lesbians compared to white heterosexual women may be due to erroneous assumptions, among both women and health care providers, that lesbians are not at risk of acquiring HPV and developing cervical cancer and therefore do not need to receive the HPV vaccine.^{54–56} Moreover, other studies have identified lower levels of high-quality patient–provider com-

munication, shared decision-making, and patient trust,^{57–60} a lack of access to relevant sexual health information,^{56,61,62} and a lack of recommendation of sexual and reproductive health services by health care providers^{63–65} among lesbians compared to heterosexual women, which may also contribute to observed HPV vaccination initiation disparities between black and white lesbians and white heterosexual women. Furthermore, studies indicate that prior experiences and fears of heterosexism in the health care system may also negatively impact the utilization of preventive health services such as HPV vaccines among lesbians in general.⁵⁴

Second, although results are mixed due to differences in study design, populations, and time periods, several studies indicate that black women and girls may be less likely than their white counterparts to initiate HPV vaccination.^{25–28} Other research suggests that the lower adjusted odds of HPV vaccination initiation that we observed among both black lesbians and black heterosexual women relative to white heterosexual women may be due to the negative effect of interpersonal and structural racism on black women's access to high-quality health care,^{66–70} highly-qualified health care providers,⁷⁰ high-quality health information,^{26,71–73} high-quality patient–provider communication and shared decision-making,^{53,71,74,75} and trust in health care providers.^{53,76} Moreover, other studies also suggest that health care provider bias toward black women and girls may undermine their recommendation of preventive health services,^{53,70} including HPV vaccines,^{77,78} to this underserved population regardless of sexual orientation.

Third, HPV vaccination initiation may be especially low among black lesbians in particular because of the compounding effect of inequities related to *both* sexual orientation identity *and* race/ethnicity.^{42,44,50} Indeed, other research shows that black SMW (including black lesbians) are more likely than white SMW to experience a higher degree of and more frequent discrimination related to a greater number of social statuses, including gender, race/ethnicity, and sexual orientation,⁸⁵ and that experiencing discrimination in the health care system is linked to lower levels of health service utilization in this population.⁸² Thus, it is possible that the barriers to HPV vaccination initiation identified by other studies among lesbians and black women are compounded among black lesbians,^{79–84} who other scholars have described as being at “triple jeopardy” as a result of their multiply marginalized social position at the

TABLE 2. ADJUSTED ODDS OF HUMAN PAPILLOMAVIRUS VACCINATION INITIATION AMONG SEXUAL ORIENTATION IDENTITY AND RACIAL/ETHNIC SUBGROUPS OF WHITE AND BLACK HETEROSEXUAL, BISEXUAL, AND LESBIAN U.S. WOMEN AGED 15–24 YEARS (*N*=2,413)

<i>Variable</i>	<i>Model 1 OR (95% CI)</i>	<i>Model 2 OR (95% CI)</i>	<i>Model 3 OR (95% CI)</i>
Sexual orientation identity × race/ethnicity subgroup			
White heterosexual (reference)	1.00	1.00	1.00
Black heterosexual	0.63 (0.47, 0.85)	0.70 (0.52, 0.93)	0.71 (0.53, 0.94)
White bisexual	0.98 (0.67, 1.44)	1.08 (0.73, 1.61)	1.09 (0.72, 1.64)
Black bisexual	0.52 (0.24, 1.13)	0.65 (0.29, 1.46)	0.65 (0.29, 1.47)
White lesbian	0.33 (0.13, 0.82)	0.37 (0.15, 0.90)	0.35 (0.14, 0.88)
Black lesbian	0.16 (0.06, 0.46)	0.19 (0.06, 0.56)	0.21 (0.07, 0.67)
Age (years; at time of screener)			
15, 17 (reference)	1.00	1.00	1.00
18, 21	1.64 (1.19, 2.27)	1.20 (0.72, 1.99)	1.23 (0.74, 2.05)
22, 24	1.22 (0.90, 1.66)	0.74 (0.43, 1.25)	0.78 (0.46, 1.32)
Place of residence			
MSA, central city (reference)	1.00	1.00	1.00
MSA, other	0.81 (0.61, 1.07)	0.83 (0.62, 1.10)	0.82 (0.61, 1.09)
Non-MSA	0.62 (0.42, 0.93)	0.69 (0.46, 1.03)	0.67 (0.44, 1.01)
U.S. born			
Yes	2.30 (1.03, 5.16)	2.42 (1.11, 5.29)	2.38 (1.08, 5.22)
No (reference)	1.00	1.00	1.00
Religion in which raised			
No religion (reference)	1.00	1.00	1.00
Catholic	1.51 (0.97, 2.36)	1.38 (0.90, 2.12)	1.33 (0.87, 2.05)
Fundamentalist Protestant	0.71 (0.35, 1.43)	0.67 (0.33, 1.33)	0.65 (0.33, 1.28)
Another type of Protestant	1.25 (0.90, 1.74)	1.18 (0.86, 1.63)	1.16 (0.83, 1.60)
Another religion	0.65 (0.38, 1.10)	0.62 (0.36, 1.05)	0.59 (0.35, 1.01)
Educational attainment			
<High school degree		0.42 (0.23, 0.77)	0.45 (0.24, 0.85)
High school diploma/GED		0.46 (0.27, 0.76)	0.48 (0.28, 0.84)
Some college/Associate's degree		0.72 (0.46, 1.14)	0.75 (0.47, 1.18)
Bachelor's degree or higher (reference)		1.00	1.00
Household federal poverty level (%)			
<100		0.89 (0.63, 1.27)	0.95 (0.66, 1.37)
100, 199		1.00 (0.73, 1.37)	1.07 (0.77, 1.48)
200, 299		0.98 (0.66, 1.44)	0.99 (0.67, 1.46)
≥300 (reference)		1.00	1.00
Employment status			
Working for pay (reference)		1.00	1.00
Not working for pay		0.98 (0.70, 1.39)	0.97 (0.69, 1.38)
Student		0.96 (0.69, 1.33)	0.91 (0.65, 1.27)
Health insurance status			
Private (reference)			1.00
Public			0.92 (0.68, 1.25)
Uninsured or underinsured			0.77 (0.51, 1.16)
Usual source of care			
Yes			1.65 (1.22, 2.23)
No (reference)			1.00

All models are adjusted for survey year and account for the survey's complex sampling design. Bolded values refer to ORs with 95% CI that exclude 1. Model 1 is adjusted for demographic factors (i.e., age, place of residence, nativity, and religion) only. Model 2 adds socioeconomic factors (i.e., educational attainment, household federal poverty level, and employment status) to Model 1. Model 3 adds healthcare factors (i.e., health insurance status and usual source of care) to Model 2.

OR, odds ratio; CI, confidence interval.

intersection of gender and sexism, race/ethnicity and racism, and sexual orientation identity and heterosexism.^{42–44}

Guided by intersectionality,^{39–41} we identified several implications of our research for public health and clinical practice. In light of our finding that black lesbians had the

lowest adjusted odds of initiating HPV vaccination relative to white heterosexual women among all subgroups in our study, interventions that specifically address the needs and concerns of this particularly underserved population are warranted. For example, health care facilities can partner with community-

based organizations that serve young black lesbians to host regular HPV vaccination clinics, conduct HPV prevention education programs, and create and disseminate multimedia educational resources that are tailored to this underserved subgroup's specific HPV vaccination concerns and unique lived experiences.^{79,83} In addition, health care providers and front desk staff should be trained to create a welcoming clinic environment and offer patient-centered, structurally competent, and culturally safe care to black lesbians and other marginalized groups whose health and health care experiences are negatively affected by multiple dimensions of social inequality.^{70,79,83} Similarly, health care providers can use shared decision-making—a central component of patient-centered care that takes into account patients' specific needs, concerns, preferences, and social contexts and has been linked to improved clinical outcomes⁸⁶—to discuss HPV vaccination with black lesbians and other multiply marginalized populations. Finally, federal and state health policies that improve access to health insurance and a regular source of care and provide subsidies for HPV vaccines may also help facilitate HPV vaccination among black lesbians and other economically marginalized populations.^{79,87–89}

Our findings should be interpreted in light of some important limitations. First, all data used were self-reported, and HPV vaccination initiation was not confirmed using medical records. Although no data exist on sexual orientation identity and vaccination reporting bias, studies have shown that black individuals are more likely than their white counterparts to overreport vaccine use.⁹⁰ However, this reporting bias would underestimate black/white disparities in HPV vaccination, which may thus be larger than those identified by our study. Second, our findings are based on cross-sectional data; thus, we were not able to establish temporality or causal relationships among the predictors, covariates, and outcome. Third, the NSFG does not collect data on the number of HPV vaccine doses received; as such, we could not ascertain disparities in receiving three doses of the HPV vaccine (as recommended during the study period) across sexual orientation identity and racial/ethnic subgroups. However, new research indicates that receiving one dose of the HPV vaccine provides as much protection against HPV infection as two doses (as recommended since 2016).²²

Fourth, this study combined girls and women who received the HPV vaccine between the ages of 11 and 24 years. Although sexual orientation (namely, sexual attraction, which is correlated with sexual orientation identity) develops as early as late childhood (8–9 years)^{91,92} and could thus affect HPV vaccination throughout this entire period, future studies should stratify analyses of sexual orientation and HPV vaccination by age at the time of vaccination (e.g., 11–17 vs. 18–26 years), which was not assessed in the NSFG, to disentangle the role of patient, parent/caregiver, and provider factors in shaping HPV vaccine uptake among SMW. Fifth, although the NSFG provides a large national probability sample of civilian, noninstitutionalized U.S. women with very little missing data, our findings may not be applicable to women in the military or in prisons. Finally, including socioeconomic and health care factors did not substantially help explain disparities in HPV vaccination initiation among sexual orientation identity and racial/ethnic subgroups of U.S. women and girls relative to white heterosexual women; however, we were unable to test whether other potential

mediators (e.g., HPV risk perceptions and medical mistrust) helped explain observed disparities as these were not assessed in the NSFG.

Future research should include women from other racial/ethnic backgrounds (e.g., Latina, Asian, Native) to generate estimates that are applicable to other sexual orientation identity and racial/ethnic subgroups not included in our study (e.g., Asian lesbians) and more comprehensively assess the intersectional effects of sexual orientation identity and race/ethnicity on HPV vaccine uptake among U.S. women and girls. Moreover, studies that assess the role of other potential mechanisms underlying HPV vaccination disparities among sexual orientation identity and racial/ethnic subgroups are needed to inform tailored programs and practices that facilitate HPV vaccine uptake among black lesbians and other multiply marginalized populations. Furthermore, in line with an intersectional approach,^{49,50} future research should explicitly assess how interpersonal and structural heterosexism and racism affect HPV vaccine uptake among U.S. women, as our study could only estimate associations between individual-level sexual orientation identity and race/ethnicity and HPV vaccination. Finally, studies that examine how other social categories (e.g., gender identity, nativity) and related forms of interpersonal and structural discrimination (e.g., transphobia, xenophobia) intersect with sexual orientation identity and heterosexism, race/ethnicity and racism, and one another are needed to understand how these factors simultaneously influence HPV vaccine uptake among U.S. women.

Using an intersectional approach,^{44,49,50} we identified black lesbians as a particularly underserved subgroup and elucidated the joint effect of sexual orientation identity and race/ethnicity on HPV vaccination initiation among black and white U.S. women and girls. Additional quantitative and qualitative research is needed to identify the potential mechanisms of HPV vaccination initiation disparities at the intersection of sexual orientation identity and race/ethnicity and inform tailored programs and practices that facilitate access to HPV vaccines among black lesbians. These interventions will help ensure that black lesbians and other multiply marginalized populations have access to the services they need to prevent cervical and other HPV-associated cancers and, in turn, help contribute to the promotion of not only population health but also health equity in the United States.

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