Racial and Ethnic Disparities in HIV and STIs in the United States—National Health and Nutrition Examination Survey 1999–2012

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To the Editor,

UNITED STATES NATIONAL DATA indicate an estimated 110 million prevalent sexually transmitted infections (STIs) and nearly 20 million new infections annually.¹ Among these incident STIs, of particular concern are the approximately 50,000 new HIV infections annually.² Racial and ethnic disparities in HIV and STIs are national priorities. National representative data are critical to examine health disparities at the population level.³

We analyzed the National Health and Nutrition Examination Survey (NHANES) conducted from 1999 to 2012. NHANES is a nationally representative sample of civilian, non-institutionalized populations in the United States. Full description of the NHANES plan and operations is provided elsewhere.⁴ Data for this study came from the 1999–2012 cycles of NHANES. We restricted analyses to adults ages 20–49. Adults under the age of 20 and over the age of 49 were excluded because NHANES did not systematically collect data on key variables for those age ranges. The analytic sample included only those participants who provided data on all covariates and who participated in the clinical examination phase of the NHANES protocol, during which biospecimen data were collected. This yielded a final analytic sample of $n = 19,510$ adults.

Participants self-reported sociodemographics including race/ethnicity, age, education, family income, marital status, place of birth, and possession of health insurance and a regular health provider. Participants provided biological specimens, including blood draw and urine, which allowed for detection of the HIV antibody, chlamydia, HSV-2, and the hepatitis C antibody. Participants self-reported on any lifetime gonorrhea, chlamydia, herpes, genital warts, and lifetime HIV testing. Participants who self-reported on any of four STIs were grouped as ‘ever had STI’.

Analyses were conducted separately for males and females. Multivariable logistic regression analyses were compared with prevalence of biologically assessed HIV and STIs and self-reported STIs according to racial/ethnic group. Regression analyses adjusted for all sociodemographic characteristics mentioned previously, and non-Hispanic whites

served as the reference group for all regressions. Analyses were conducted using the STATA version 13.0. All analyses were executed using the *svy* prefix command to incorporate the NHANES sampling weights and account for the complex sampling design, including oversampling, survey nonresponse, and post-stratification.

Weighted prevalence estimates and racial/ethnic group comparisons for HIV and STIs are presented in Table 1. Among males, both white and black males had the highest prevalence of any self-reported lifetime STIs; black males also had the highest prevalence of HIV antibody, urine chlamydia, HSV-2, hepatitis C antibody, and self-reported lifetime gonorrhea and chlamydia. Lifetime prevalence of HIV testing was highest among black males. Hispanic males had elevated prevalence of urine chlamydia and HSV-2 compared with whites. Self-reported lifetime prevalence of genital warts was highest among white males.

Among females, black females had the highest prevalence of HIV antibodies, urine chlamydia, HSV-2, and any self-reported lifetime STI including lifetime gonorrhea, chlamydia, and herpes. Lifetime prevalence of HIV testing was highest among black females. Self-reported lifetime prevalence of genital warts was highest among white females.

In adjusted multivariable analyses comparing males by racial/ethnic group (Table 2), black males were more likely than white males to test positive for HIV antibody (OR = 5.20, 95% CI 2.19, 12.35), urine chlamydia (OR = 5.04, 95% CI 2.97, 8.56), and HSV-2 (OR 4.75, 95% CI = 3.87, 5.83). Black males were also more likely than white males to report lifetime gonorrhea (OR = 7.84, 95% CI 2.41, 25.50), lifetime chlamydia (OR = 2.67, 95% CI 1.27, 5.62), and lifetime HIV testing (OR = 2.16, 95% CI 1.88, 2.49).

Black males were less likely than white males to report lifetime genital warts (OR = 0.48, 95% CI 0.31, 0.73). Hispanic males were more likely than white males to test positive for HIV antibody (OR = 3.78, 95% CI 1.62, 8.82), urine chlamydia (OR = 2.52, 95% CI 1.24, 5.10), and HSV-2 (OR = 1.54, 95% CI 1.15, 2.07). Mixed/other males were less likely than white males to report lifetime HIV testing (OR = 0.70, 95% CI 0.54, 0.91).

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TABLE 1. WEIGHTED PREVALENCE OF HIV AND STIs AMONG US ADULT MALES
AND FEMALES (N=19,510) BY RACE/ETHNICITY: NHANES, 1999–2012

	<i>African American % (95 CI)</i>	<i>Hispanic % (95 CI)</i>	<i>White % (95 CI)</i>	<i>Mixed, other % (95 CI)</i>	p
<i>Males</i>					
HIV antibody					<0.001
Yes	2.6 (2.0, 3.6)	0.9 (0.5, 1.4)	0.3 (0.2, 0.7)	0.0	
No	99.7 (99.4, 99.8)	99.2 (98.6, 99.5)	99.7 (99.4, 99.8)	100.0	
Urine chlamydia (ages 20–39 only)					<0.0001
Yes	4.6 (3.4, 6.1)	1.9 (1.3, 2.7)	1.0 (0.7, 1.4)	0.4 (0.1, 1.0)	
No	95.4 (93.9, 96.6)	98.1 (97.3, 98.7)	99.0 (98.6, 99.3)	99.7 (99.0, 99.9)	
HSV-2					<0.0001
Yes	34.2 (31.6, 36.9)	12.8 (11.1, 14.7)	10.1 (9.0, 11.3)	10.1 (6.9, 14.5)	
No	65.8 (63.2, 68.4)	87.3 (85.3, 89.0)	89.9 (88.7, 91.0)	89.9 (85.5, 93.1)	
Hep C antibody					0.02
Yes	3.0 (2.3, 4.1)	1.7 (1.2, 2.3)	2.4 (1.9, 3.0)	0.9 (0.3, 2.5)	
No	97.0 (95.9, 97.8)	98.4 (97.7, 98.8)	97.6 (97.0, 98.1)	99.1 (97.5, 99.7)	
Ever had STI ^a					<0.001
Yes	7.3 (6.1, 8.7)	4.1 (3.2, 5.3)	7.3 (6.2, 8.5)	4.5 (2.7, 7.4)	
No	92.7 (91.3, 93.9)	95.9 (94.7, 96.8)	92.7 (91.5, 93.8)	95.5 (92.7, 97.3)	
Ever had gonorrhea ^a					<0.0001
Yes	1.4 (1.0, 2.0)	0.4 (0.2, 0.8)	0.2 (<0.01, 0.4)	0.2 (<0.01, 0.8)	
No	98.6 (98.0, 99.0)	99.6 (99.2, 99.8)	99.9 (99.6, 99.9)	99.8 (98.6, 100.0)	
Ever had chlamydia ^a					<0.01
Yes	1.9 (1.3, 2.7)	0.4 (0.2, 0.8)	0.5 (0.3, 0.8)	0.7 (<0.01, 4.5)	
No	98.1 (97.3, 98.7)	99.6 (98.2, 99.8)	99.5 (99.2, 99.7)	99.4 (95.5, 99.9)	
Ever had herpes ^a					0.38
Yes	2.8 (2.2, 3.7)	1.8 (1.2, 2.8)	2.4 (1.9, 3.1)	1.7 (0.8, 3.7)	
No	97.2 (96.3, 97.8)	98.2 (97.5, 98.7)	97.6 (96.9, 98.2)	98.3 (96.4, 99.2)	
Ever had warts ^a					<0.0001
Yes	2.3 (1.7, 3.2)	1.8 (1.3, 2.5)	5.0 (4.1, 6.2)	2.5 (1.2, 5.0)	
No	97.7 (96.8, 98.3)	98.2 (97.5, 98.7)	95.0 (93.9, 95.9)	97.5 (95.0, 98.8)	
Ever tested for HIV ^a					<0.0001
Yes	58.6 (56.0, 61.2)	32.9 (30.4, 35.5)	42.2 (40.4, 44.1)	33.0 (28.3, 38.1)	
No	41.4 (38.8, 44.0)	67.1 (64.5, 69.6)	57.8 (55.5, 59.7)	67.0 (61.9, 71.7)	
<i>Females</i>					
HIV antibody					<0.0001
Yes	1.3 (0.9, 2.0)	<0.01 (<0.01, 0.1)	<0.01 (<0.01, 0.1)	0.3 (<0.01, 1.9)	
No	98.7 (98.0, 99.1)	100.0 (99.9, 100.0)	100.0 (99.9, 100.0)	99.7 (98.1, 100.0)	
Urine chlamydia (ages 20–39)					<0.0001
Yes	4.4 (3.4, 5.7)	2.0 (1.3, 2.9)	0.9 (0.6, 1.4)	3.0 (1.4, 6.2)	
No	95.6 (94.3, 96.6)	98.0 (97.1, 98.7)	99.1 (98.6, 99.4)	97.0 (93.8, 98.6)	
HSV-2					<0.0001
Yes	58.3 (55.9, 60.6)	23.7 (21.4, 26.3)	19.8 (18.4, 21.2)	18.3 (14.6, 22.6)	
No	41.7 (39.4, 44.1)	76.3 (73.7, 78.7)	80.2 (78.8, 81.6)	81.7 (77.4, 85.4)	
Hep C antibody					0.16
Yes	2.0 (1.4, 2.7)	0.9 (0.5, 1.7)	1.5 (1.2, 2.0)	0.9 (0.3, 2.4)	
No	98.1 (97.3, 98.6)	99.1 (98.3, 99.5)	98.5 (98.0, 98.9)	99.1 (97.6, 99.7)	
Ever had STI ^a					<0.0001
Yes	16.7 (14.8, 18.7)	8.6 (7.0, 10.4)	13.5 (12.2, 14.8)	10.9 (7.7, 15.4)	
No	83.3 (81.3, 85.2)	91.4 (89.6, 93.0)	86.5 (85.2, 87.8)	89.1 (84.7, 92.3)	
Ever had gonorrhea ^a					<0.0001
Yes	1.3 (0.9, 2.0)	0.2 (<0.01, 0.7)	0.2 (<0.01, 0.4)	1.1 (0.3, 3.7)	
No	98.7 (98.0, 99.1)	99.8 (99.3, 99.9)	99.8 (99.6, 99.9)	99.0 (96.3, 99.7)	
Ever had chlamydia ^a					<0.0001
Yes	2.9 (2.2, 4.0)	1.5 (0.9, 2.3)	0.5 (0.3, 0.9)	1.5 (0.7, 3.0)	
No	97.1 (96.0, 97.9)	98.5 (97.7, 99.1)	99.5 (99.2, 99.7)	98.6 (97.0, 99.3)	
Ever had herpes ^a					<0.0001
Yes	8.6 (7.2, 10.2)	4.0 (2.9, 5.5)	6.1 (5.3, 7.1)	4.7 (2.8, 7.7)	
No	91.4 (89.8, 92.8)	96.0 (94.5, 97.1)	93.9 (92.9, 94.7)	95.3 (92.3, 97.2)	
Ever had warts ^a					<0.0001
Yes	6.2 (5.2, 7.4)	3.6 (2.8, 4.8)	8.4 (7.5, 9.5)	5.3 (2.9, 9.4)	
No	93.8 (92.6, 94.8)	96.4 (95.3, 97.2)	91.6 (90.5, 92.5)	94.7 (90.6, 97.1)	
Ever tested for HIV ^a					<0.0001
Yes	67.9 (64.9, 70.8)	48.5 (45.7, 51.4)	51.3 (49.3, 53.3)	40.2 (34.8, 45.8)	
No	32.1 (29.2, 35.1)	51.5 (48.6, 54.3)	48.7 (46.7, 50.7)	59.8 (54.2, 65.3)	

^aSelf-reported.

TABLE 2. ADJUSTED MULTIVARIATE REGRESSIONS TO EXAMINE RACIAL/ETHNIC DISPARITIES ON HIV, STIs, ALCOHOL, AND ILLICIT DRUG USE AMONG US ADULT MALES AND FEMALES (N=19,510): NHANES, 1999–2012

	<i>African American</i>		<i>Hispanic</i>		<i>Mixed, other</i>		<i>White</i>
	<i>OR (95% CI)</i>	<i>p</i>	<i>OR (95% CI)</i>	<i>p</i>	<i>OR (95% CI)</i>	<i>p</i>	<i>(ref.)</i>
<i>Males</i>							
HIV antibody	5.20 (2.19, 12.35)	<0.001	3.78 (1.62, 8.82)	<0.01	b		1.00
Urine chlamydia (ages 20–39)	5.04 (2.97, 8.56)	<0.001	2.52 (1.24, 5.10)	0.01	0.38 (0.10, 1.50)	0.16	1.00
HSV-2	4.75 (3.87, 5.83)	<0.001	1.54 (1.15, 2.07)	<0.01	1.42 (0.85, 2.37)	0.18	1.00
Hep C antibody	0.64 (0.39, 1.06)	0.08	1.29 (0.77, 2.16)	0.34	0.56 (0.15, 2.10)	0.38	1.00
Ever had STI ^a	1.15 (0.85, 1.54)	0.36	0.91 (0.60, 1.36)	0.64	0.71 (0.36, 1.38)	0.31	1.00
Ever had gonorrhea ^a	7.84 (2.41, 25.50)	<0.01	2.76 (0.70, 10.96)	0.15	1.88 (0.32, 11.14)	0.48	1.00
Ever had chlamydia ^a	2.67 (1.27, 5.62)	0.01	0.84 (0.31, 2.28)	0.74	1.37 (0.19, 9.63)	0.75	1.00
Ever had herpes ^a	1.40 (0.92, 2.11)	0.11	1.53 (0.83, 2.82)	0.18	1.02 (0.39, 2.62)	0.97	1.00
Ever had warts ^a	0.48 (0.31, 0.73)	<0.01	0.58 (0.33, 1.02)	0.06	0.50 (0.19, 1.29)	0.15	1.00
Ever tested for HIV ^a	2.16 (1.88, 2.49)	<0.001	0.94 (0.78, 1.12)	0.47	0.70 (0.54, 0.91)	<0.01	1.00
<i>Females</i>							
HIV antibody	46.27 (5.06, 423.36)	<0.01	0.49 (0.04, 6.50)	0.58	9.18 (0.68, 123.04)	0.09	1.00
Urine chlamydia (ages 20–39)	4.83 (2.41, 9.67)	<0.001	2.25 (0.86, 5.89)	0.10	3.47 (1.50, 8.02)	<0.01	1.00
HSV-2	5.83 (4.91, 6.92)	<0.001	1.34 (1.08, 1.66)	<0.01	1.28 (0.92, 1.78)	0.14	1.00
Hep C antibody	0.70 (0.42, 1.16)	0.16	0.73 (0.35, 1.54)	0.41	1.19 (0.37, 3.86)	0.77	1.00
Ever had STI ^a	1.35 (1.10, 1.66)	<0.01	0.80 (0.60, 1.07)	0.12	1.04 (0.66, 1.63)	0.86	1.00
Ever had gonorrhea ^a	5.23 (1.45, 18.86)	0.01	0.65 (0.15, 2.72)	0.55	7.39 (0.87, 62.91)	0.07	1.00
Ever had chlamydia ^a	3.36 (1.89, 5.96)	<0.001	1.56 (0.67, 3.68)	0.30	2.69 (1.00, 7.19)	0.05	1.00
Ever had herpes ^a	1.52 (1.15, 2.01)	<0.01	0.89 (0.59, 1.34)	0.58	0.88 (0.46, 1.67)	0.69	1.00
Ever had warts ^a	0.25 (0.65, 1.12)	0.25	0.55 (0.35, 0.85)	<0.01	0.80 (0.38, 1.69)	0.55	1.00
Ever tested for HIV ^a	2.49 (2.10, 2.96)	<0.001	1.02 (0.85, 1.22)	0.84	0.80 (0.61, 1.03)	0.09	1.00

Adjusted for age, education, employment, marital status, born in US, health care access, family income, health insurance and regular provider.

^aSelf-reported; ^b, omitted.

In adjusted multivariable analyses comparing females by racial/ethnic group (Table 2), Black females were more likely than white females to test positive for urine chlamydia (OR=4.83, 95% CI 2.41, 9.67), and HSV-2 (OR=5.83, 95% CI 4.91, 6.92). Black females were also more likely than white females to report any lifetime STI (OR=1.35, 95% CI 1.10, 1.66), lifetime gonorrhea (OR=5.23, 95% CI 1.45, 18.86), lifetime chlamydia (OR=3.36, 95% CI 1.89, 5.96), lifetime herpes (OR=1.52, 95% CI 1.15, 2.01), and lifetime HIV testing (OR=2.49, 95% CI 2.10, 2.96).

Although black females were more likely than white females to test positive for HIV antibody (OR=46.27, 95% CI 5.06, 423.36), it is important to note the wide-range confidence interval. Hispanic females were more likely than white females to test positive for HSV-2 (OR=1.34, 95% CI 1.08, 1.66) and less likely to report lifetime genital warts (OR=0.55, 95% CI 0.35, 0.85). Mixed/other females were more likely than white females to test positive for urine chlamydia (OR=3.47, 95% CI 1.50, 8.02).

To our knowledge, this is among the most robust reports of national representative data on racial and ethnic disparities in HIV and STIs by including population data spanning 14 years of recruitment. Adjusting for sociodemographic characteristics, black males had nearly 5 times greater odds than white males to test positive for HIV, and black females had nearly 46 times greater odds than white females to test positive for HIV antibodies, though the latter is marked by wide range confidence intervals. Other STIs were more prevalent in black and Hispanic males and females compared with their white counterparts.

Findings highlight the continued need to address disparities in HIV and STIs among black and Hispanic adults in the United States.⁵ Increased efforts to reduce undiagnosed HIV infection are also warranted.⁶ In light of national policy-level changes associated with the Affordable Care Act (ACA), access to primary care in racial/ethnic minority populations may increase. The ACA offers a compelling opportunity for enacting new strategies to address the heavy burden of HIV and STIs in black and Hispanic Americans.⁷

Integrating HIV and STI testing and STI treatment into primary care is one such strategy. Efforts to coordinate health services and increase linkage to HIV care for black and Hispanics who test HIV positive are critical to improving individual health outcomes and lowering transmission rates. Targeting services in geographic locations with dense concentrations of African Americans and Hispanics might facilitate service uptake and retention. Culturally competent care is also needed to improve trust, uptake, and engagement with members of these populations.⁸

Notably, disparities in HIV and STIs persisted after adjusting for individual-level sociodemographics variables. This suggests that health determinants operating outside of these socioeconomic variables contribute to the health disparities faced by racial/ethnic minorities, and may include access to diagnosis, prevention, and treatment;⁹ social factors such as racial and ethnic discrimination;¹⁰ and neighborhood disadvantage.¹¹ The roles of racial/ethnic discrimination, access to services, and social and environmental factors should be explored further in order to develop appropriate interventions to reduce HIV and STIs among blacks and Hispanics.

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