

## HIV Testing Among Black and Hispanic Immigrants in the United States

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### Abstract

Late presentation is common among black and Hispanic US immigrants living with HIV. Little is known about HIV testing in this population because data are aggregated into racial and ethnic categories without regard to nativity. This study was undertaken to determine HIV testing patterns in these populations. We used data from the National Health Interview Survey (2007–2010), a nationally representative source of HIV testing data disaggregated by nativity. The sample consisted of 10,397 immigrants (83.9% Hispanic white, 13.1% non-Hispanic black, and 3.0% Hispanic black). The majority of participants were from the Caribbean, Central America, and Mexico (81.5%). Hispanic white immigrants were least likely to have undergone testing compared with non-Hispanic and Hispanic black immigrants (46.7% vs. 70.5% and 65.8%). Among immigrants with known risk factors or prior STDs, 59.2% and 74.8% reported previous HIV testing. Immigrants who had not recently talked to a healthcare provider were less likely to report testing: Hispanic white (AOR 0.65, 95% CI 0.58–0.72), non-Hispanic black (AOR 0.64, 95% CI 0.48–0.85), and Hispanic black (AOR 0.26, 95% CI 0.14–0.48). Only 17.2% of all immigrants intended to undergo HIV testing in the 12 months following participation in the survey. Among all three racial and ethnic groups, immigrants who reported a history of prior STDs were more likely to intend to test for HIV in the future. Many black and Hispanic immigrants to the United States have not undergone HIV testing. Interventions to increase access to HIV testing and awareness of transmission risk should be developed.

### Introduction

OF THE 1.1 MILLION INDIVIDUALS LIVING with HIV in the United States, an estimated 15.8% remain undiagnosed.<sup>1</sup> HIV diagnosis is the first entryway into vital treatment services. Early diagnosis leads to timely initiation of antiretroviral therapy and decreased risk of sexual transmission.<sup>2,3</sup> Black/African American and Hispanic people living with HIV (PLWH) are more likely to be undiagnosed compared with white individuals.<sup>4</sup> One of the foremost goals of the US National AIDS Strategy is to increase the percentage of PLWH who know their HIV status to at least 90% by 2020.<sup>5</sup> Efforts targeting higher risk populations, particularly minorities, have been implemented. The percentage of black and Hispanic individuals who had ever been tested for HIV increased significantly within the last decade (to 64.5% and 46.4%, respectively,  $p < 0.0001$ ).<sup>6</sup>

Among black and Hispanic individuals, immigrants are more likely to be undiagnosed and to present late for care.<sup>7,8</sup>

Although the number of racial and ethnic minority immigrants in the United States is growing, few efforts to increase HIV testing have specifically targeted these groups. According to the US Census Bureau, 84% of non-US-born black individuals emigrate from the Caribbean and sub-Saharan Africa, where HIV prevalence ranges from 1.1% to 26.1%.<sup>9,10</sup> A small, but compelling, body of literature indicates that black immigrants are more likely to be uninsured than US-born black individuals and have challenges navigating the healthcare system.<sup>11–13</sup> Discrimination based on race, ethnicity and/or accent, low English proficiency, stigma, and low knowledge may serve as barriers to testing.<sup>14–16</sup>

Among Hispanic individuals living in the United States, more than 37% (or 18 million) are immigrants who have emigrated from Mexico where the HIV prevalence is low (0.2%).<sup>17,18</sup> A significant proportion also derive from Central America and the Caribbean where HIV prevalence ranges from 0.3% to 3% with higher rates in concentrated subpopulations (e.g., men who have sex with men, injection drug

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users, and sex workers).<sup>19</sup> Immigrants from Mexico and Central America constitute the largest proportion of non-US-born individuals living with HIV in the United States.<sup>20</sup> A robust literature has documented barriers to healthcare access among Hispanic immigrants, which have likely contributed to higher rates of late HIV testing in this population.<sup>21</sup> For both black and Hispanic immigrants, acquisition of infection in the country of origin and delayed timing of immigration may also contribute to late diagnosis.

The US immigration policy may have further complicated access to HIV testing. In 1987, according to section 212(a)(1) of the Immigration and Nationality Act, any “alien” who was determined to be HIV infected would be inadmissible to the United States.<sup>22</sup> Under this Act, known as the “HIV travel ban,” many immigrants were subject to HIV testing as a component of the medical screening examination for entry into the United States and denied entry if positive. In 2010, the United States removed this federal rule.<sup>23</sup> This policy change places the United States in concert with most countries who also permit unrestricted travel for PLWH.

This study was undertaken to determine the rate and characteristics associated with prior HIV testing and intention to test in the next year among immigrants to the United States. We hypothesize that immigrants faced and continue to experience barriers to HIV testing. For this study, we used data from the National Health Interview Study (NHIS), which is one of the few large, nationally representative data sets that tracked HIV testing and provides publically available access to nativity data by region of origin.

## Methodology

Established in 1957, the NHIS is an annual, cross-sectional survey of adults and children living in households and non-institutionalized group settings throughout the United States.<sup>24</sup> The survey is administered to participants by means of a personal visit to their living quarters by an employee of the US Bureau of the Census. From 1997 through 2010, NHIS included questions related to HIV risk, testing history, and intention to test in the future for persons aged 18 and older. As of 2011, detailed questions regarding HIV were eliminated from future surveys. For this analysis, data were aggregated over 4 years (2007–2010).

## Outcomes

The two primary outcomes of this study are self-report of prior HIV testing and intention to test within 12 months following survey administration. For self-report of prior HIV testing, participants were asked “Except for tests you may have had as part of blood donations, have you ever been tested for HIV?” The response categories were “yes,” “no,” and “unknown.” For intention to test, those who previously tested were asked, “Do you expect to have another test for HIV in the next 12 months, not including blood donations?” Those who had no history of HIV testing were asked, “Do you expect to have a test for HIV in the next 12 months, not including blood donations?” Intention to test in the next 12 months was analyzed for all participants in this study, those with any known and no known risk factors and those with and without prior STDs.

## Sociodemographic covariates

Available sociodemographic covariates included age, gender, region of origin, US citizenship, time in the United States, language (Spanish speaking if respondent indicated that they would prefer to be interviewed either in part or entirely in Spanish), marital status, education, income, health insurance status, and if the person saw a healthcare provider in the last year. NHIS aggregates country of origin into regions: (e.g., South America; Africa; and Caribbean, Mexico, and Central America grouped together and abbreviated as CMC). Participants were also asked to report their duration of residence in the United States. For income, 47% of responses were either missing or unknown. Missing income data were imputed using the procedures suggested by the National Center for Health Statistics.<sup>25</sup> A new covariate (reported+imputed income) was coded and reflects the following: reported income (if that was known), imputed income (if reported income was unknown), and “unknown” if both reported and imputed income were unknown. “Unknown” may contain some individuals who had no income. To determine healthcare access, respondents were asked, “Are you covered by any kind of health insurance or some other kind of health care plan?” Recent healthcare access was determined by asking, “During the past 12 months, have you seen or talked to any of the following healthcare providers (general doctor who treats a variety of illnesses, a doctor in general practice, family medicine, or internal medicine) about your own health?”

## Predictors of HIV risk

To assess HIV risk, respondents were asked to indicate if any of the following previous risk factors were true: (1) You have hemophilia and have received clotting factor concentrations; (2) You are a man who has had sex with other men, even just one time; (3) You have taken street drugs by needle, even just one time; (4) You have traded sex for money or drugs, even just one time; (5) You have tested positive for HIV (the virus that causes AIDS); and (6) You have had sex (even just one time) with someone who would answer “yes” to any of these statements.

History of other STDs that contribute to HIV risk was assessed by asking, “in the past five years, have you had an STD other than HIV or AIDS?” Respondents were asked to include newly contracted STDs as well as recurrent flare-ups of previously contracted STDs.

## Reasons to test or not to test

To ascertain reasons for undergoing prior HIV testing, participants are read the following: “I am going to show you a list of reasons why some people have been tested for HIV. Not including your blood donations, which of these would you say was the main reason for your last HIV test?” Participants who had not undergone HIV testing were asked to select all applicable reasons for not testing (e.g., low risk, did not know where to obtain testing, did not want to think about HIV, as well as others).

## Data analysis

All analyses and estimates were conducted using the NHIS sampling weights. Tests of differences in the distributions of respondent characteristics and reasons for testing (or not testing) used the Rao–Scott weighted version of the chi-

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF IMMIGRANT PARTICIPANTS (WEIGHTED PERCENTAGES BY COLUMN) IN THE NATIONAL HEALTH INTERVIEW SURVEY (2007–2010) BY RACE AND ETHNICITY

	<i>Total population</i>	<i>Hispanic white</i>	<i>Black non-Hispanic</i>	<i>Hispanic black</i>	<i>Rao–Scott p value</i>
	N = 10397	N = 8719	N = 1368	N = 310	
Percent of total sample	100.0	83.9	13.1	3.0	
Sociodemographic factors (%)					
Age					
18–24	10.1	9.8	11.1	9.4	0.0015
25–44	57.4	58.6	52.3	52.4	
45–64	32.5	31.5	36.6	38.1	
Gender					
Male	49.5	49.9	48.1	47.1	0.41
Region of origin (%)					
Mexico, Caribbean, Central America	81.5	87.7	49.2	89.9	<0.0001
South America	10.1	11.2	4.8	9.5	
Africa	6.4	0.04	39.2	0.1	
Other	2.0	1.0	6.8	0.5	
Immigration status <sup>a</sup>					
Not a US citizen	61.4	64.3	48.7	49.7	<0.0001
Unknown	0.7	0.8	0.7	<0.4	
Time in the United States					
<5 years	10.9	10.6	12.6	9.5	0.22
≥5 years	87.2	87.5	85.6	89.6	
Unknown	1.8	1.8	1.8	0.9	
Spanish language <sup>b</sup>	45.2	54.2	0.41	44.9	<0.0001
Unknown language	0.04	0.04	<0.01	<0.4	
Marital status					
Single	38.2	35.1	51.6	51.2	<0.0001
Married	54.7	57.5	43.2	41.4	
Cohabiting with a partner	6.7	7.2	4.3	7.3	
Unknown	0.3	0.2	0.9	<0.4	
Education					
Less than high school	43.5	49.7	14.2	36.0	<0.0001
High school, diploma, or GED	21.4	21.1	23.1	22.2	
Some college, college degree, or more	33.7	27.9	61.5	40.9	
Unknown	1.2	1.3	1.1	0.8	
Income <sup>c</sup>					
<\$19,000	28.8	29.8	22.9	30.9	<0.0001
\$20,000–34,999	25.2	25.3	24.8	23.6	
\$35,000–54,999	14.1	12.6	21.3	16.5	
≥55,000	8.0	7.0	13.7	5.1	
Unknown	23.9	25.2	17.2	23.8	
Healthcare access					
Health insurance status					
Uninsured	45.8	49.8	27.1	38.1	<0.0001
Unknown	0.4	0.4	0.4	<0.4	
Seen a provider in prior 12 months					
No	49.8	52.2	38.9	43.7	<0.0001
Unknown	1.4	1.4	1.2	1.0	
HIV risk					
Previous risk factors <sup>d</sup>					
Yes	2.6	2.8	1.6	3.9	0.0163
Unknown	4.6	4.7	4.3	2.5	
Prior STDs <sup>e</sup>					
Yes	1.6	1.5	2.3	2.8	0.08
Unknown	23.5	23.0	25.2	25.9	

<sup>a</sup>National Health Interview Study asks participants to indicate whether or not they are a US citizen. The survey does not ask about other legal status (e.g., permanent resident).

<sup>b</sup>Individuals who reported that they only or mostly spoke Spanish and preferred to complete the interview either completely or partially in Spanish.

<sup>c</sup>Combined reported and imputed income data.

<sup>d</sup>Hemophilia and received clotting factor concentrates, men who have sex with other men, injection drug use, traded sex or money or drugs, tested positive for HIV, or had sex with anyone who has any of the aforementioned risk factors.

<sup>e</sup>History of sexually transmitted diseases other than HIV.

square test (SAS 9.2). The two outcome variables were modeled separately as functions of respondent characteristics in each of the three groups (as well as in the combined population) using weighted logistic regression without interactions (Zelig package in R<sup>26,27</sup>). Characteristics were divided into binary covariates, including the covariate for “unknown” if some answers were missing. The step-up procedure was used and at each step, the binary covariate that added most significantly to the prior step’s model was added as long as  $p < 0.01$ , using the log-likelihood ratio test (LLR), with estimated adjusted odds ratio (AORs) and confidence intervals (CIs) from the Zelig package. In addition, whenever a binary covariate representing a known value of a characteristic entered the model, its relevant “unknown” covariate was also entered (whether or not significant) so that the estimated adjusted odds ratio for the covariate would represent a comparison between people with known values. When the step-up procedure ended, only covariates that still had LLR  $p < 0.01$  were kept in the model based on deviances. For the Hispanic black group, only 98 respondents reported no prior HIV test, so a smaller group of candidate covariates were chosen a priori for this group: prior STDs (based on the importance in the other models in this study), male, married, age  $< 25$ , education, and seen a healthcare provider in the last year.<sup>28,29</sup>

## Results

### Sociodemographic

The sample consisted of 10,397 black and Hispanic immigrants younger than 65 years (83.9% Hispanic white, 13.1% non-Hispanic black, and 3.0% Hispanic black). One-half of participants were male (49.5%). Most Hispanic participants were from CMC. Of non-Hispanic black participants, 49.2% were from CMC and 39.2% were from Africa. The majority of immigrants (87.2%) had resided in the United States for 5 years or more. Hispanic white immigrants were more likely to be uninsured than non-Hispanic or Hispanic black immigrants (49.8% vs. 27.1% and 38.1%, respectively,  $p < 0.0001$ ). Hispanic white immigrants were also less likely to have seen a healthcare provider in the prior 12 months than non-Hispanic or Hispanic black immigrants (52.2% vs. 38.9% and 43.7%, respectively,  $p < 0.0001$ ). Only 3% of all participants reported known HIV risk factors, and 2% reported prior STDs. Among all participants, unknown responses were most common for income and prior STDs (Table 1).

### HIV testing

Among all participants, 51.1% reported prior HIV testing. Prior HIV testing was reported by 46.7% of Hispanic white, 70.5% of non-Hispanic black, and 65.8% of Hispanic black immigrants,  $p < 0.0001$ . Intention to test in the next year was reported by 17.2% of the total population (15.9% of Hispanic white, 22.0% of non-Hispanic black, and 24.6% of Hispanic black individuals,  $p < 0.0001$ ). Among Hispanic whites, the percentage of individuals with known risk factors who had a prior HIV test (or who intended to test in the next year) was higher than among those with no known risk factors (prior HIV test:  $p = 0.03$ ; intent to test in the future:  $p < 0.0001$ ). Among all groups, the percentage of individuals with prior STDs who reported prior HIV testing and who intended to test in the next year was significantly higher than among those with no history of STDs (Table 2).

TABLE 2. RATE (USING SURVEY WEIGHTS) OF HIV TESTING AND INTENTION TO TEST IN THE NEXT YEAR IN BLACK AND HISPANIC IMMIGRANTS IN THE NATIONAL HEALTH INTERVIEW SURVEY (2007–2010)

	Total population	Hispanic white	Black non-Hispanic	Hispanic black
% with prior HIV test				
All participants	51.1	46.7	70.5	65.8
Known risk factors				
Yes	59.2	57.1	69.1	78.2
No	51.0	46.4	70.7	65.3
$p^a$ value	0.07	0.03	0.46	0.97
Prior STDs				
Yes	74.8	66.5	97.9	91.2
No	52.9	48.6	73.1	69.4
$p$ value	<0.0001	<0.0001	<0.0001	0.0090
% intend to test				
All participants	17.2	15.9	22.0	24.6
Previous risk factors				
Yes	33.7	31.6	40.0	60.7
No	16.7	15.4	21.7	22.9
$p$ value	<0.0001	<0.0001	0.1696	0.0472
Prior STDs				
Yes	43.5	37.9	54.9	72.3
No	18.4	17.2	23.9	26.6
$p$ value	<0.0001	<0.0001	<0.0001	0.0076

<sup>a</sup>The  $p$  values are from the Rao–Scott test of whether people in each column (ethnic/racial group) who had the answers of yes, no, or unknown for previous risk factors (or “prior STDs”) had a different probability of a prior HIV test (or intention of having an HIV test in the next year).

### Reasons for HIV testing or not HIV testing

The most common reason for obtaining an HIV test was as part of a routine medical check-up or procedure (29.5% Hispanic white, 31.1% non-Hispanic black, and 39.2% Hispanic black,  $p < 0.0001$ ). Among women who reported a prior HIV test, the most common reason for HIV testing was pregnancy (36.9% Hispanic white, 24.0% non-Hispanic black, and 21.5% Hispanic black,  $p < 0.0001$ ). More non-Hispanic black immigrants were tested for immigration purposes than Hispanic white or Hispanic black participants (17.2%, 11.2%, and 7.5%,  $p < 0.0001$ ). The majority of participants (62.2%) who reported they had no prior HIV testing said they believed they were at low risk. Fewer participants did not test for no particular reason (31.5%), for some other reason (1.4%), because they did not know where to get tested (1.2%), or because they did not want to think about HIV (1.0%).

### Models for prior HIV testing

Among Hispanic white immigrants, younger than 25 (AOR 0.67) and older than 44 (AOR 0.68), males (AOR 0.52), those from the CMC region (AOR 0.81), married (AOR 0.86), not talking to a healthcare provider in prior 12 months (AOR 0.65), unknown history of STDs (AOR 0.69), and individuals reporting an unknown time in the United States (AOR 0.59) were less likely to have obtained a prior HIV test. Hispanic white immigrants who were US citizens (AOR 1.24), cohabitating (AOR 1.29), had some college or

TABLE 3. ADJUSTED ODDS RATIOS (WEIGHTED LOGISTIC REGRESSION) FOR PRIOR HIV TESTING AMONG RACIAL AND ETHNIC MINORITY IMMIGRANTS, NATIONAL HEALTH INTERVIEW SURVEY 2007–2010

	<i>Hispanic white,</i> N = 8412		<i>Non-Hispanic black,</i> N = 1318		<i>Hispanic black,</i> N = 300	
	AOR (95% CI)	p <sup>a,b</sup>	AOR (95% CI)	p <sup>a,b</sup>	AOR (95% CI)	p <sup>a,b</sup>
Age						
<25	0.67 (0.56–0.81)	*	0.38 (0.23–0.62)	*	0.30 (0.12–0.76)	§
≥45	0.68 (0.57–0.81)	†	0.51 (0.35–0.76)	*	NCC <sup>c</sup>	
Gender						
Male	0.52 (0.47–0.59)	‡	— <sup>d</sup>		—	
Region of origin						
Mexico, Central America, Caribbean	0.81 (0.67–0.97)	§	NA <sup>e</sup>		NCC	
Immigration status						
US citizen	1.24 (1.10–1.40)	*	0.66 (0.49–0.87)	§	NCC	
Unknown	0.51 (0.27–0.96)		0.78 (0.15–4.15)		NCC	
Marital status						
Cohabiting with a partner	1.29 (1.05–1.60)	§	3.40 (1.54–7.48)	*	NCC	
Married	0.86 (0.77–0.97)	§	0.84 (0.63–1.13)		—	
Education						
Some college or more	1.98 (1.73–2.26)	‡	—		2.40 (1.21–4.75)	§
Unknown	0.67 (0.38–1.18)		—		0.77 (0.05–12.89)	
Income						
≥\$55,000	1.32 (1.05–1.67)	§	—		NCC	
Unknown	1.10 (0.97–1.25)		—		NCC	
Health insurance						
Uninsured	—		—		NCC	
Talked to provider in last 12 months						
No	0.65 (0.58–0.72)	‡	0.64 (0.48–0.85)	*	0.26 (0.14–0.48)	*
Previous risk factors						
Yes	1.65 (1.19–2.27)	*	—		NCC	
Unknown	1.29 (0.91–1.83)	*	—		NCC	
Prior STDs						
Yes	2.10 (1.26–3.51)	*	18.62 (2.52–137.26)	*	—	
Unknown	0.69 (0.56–0.83)	*	0.80 (0.53–1.20)		0.26 (0.13–0.53)	*
Time in the United States						
Unknown	0.59 (0.39–0.88)	§	—		NCC	

<sup>a</sup>The *p* values are derived from the final step-up model, using a modified version of the likelihood ratio test performed using deviances.  
<sup>b</sup>‡*p* ≤ 10<sup>-9</sup>; †*p* ≤ 10<sup>-6</sup>; \**p* ≤ 10<sup>-3</sup>; §*p* ≤ 10<sup>-2</sup>.

<sup>c</sup>NCC means not a candidate covariate. The small sample size of the Hispanic black group limited the number of covariates that could be tried in the model.

<sup>d</sup>Dashes mean the covariate was not significant. Most covariates that were not significant in any of the three models were omitted from the table.

<sup>e</sup>NA means not applicable.

more (AOR 1.98), income >\$55,000 (AOR 1.32), with previous risk factors (AOR 1.65), and prior STDs (AOR 2.10) were more likely to have obtained an HIV test. Among non-Hispanic black immigrants, younger (AOR 0.38) and older (AOR 0.51) individuals, US citizens (AOR 0.66), and individuals who had not talked to a health care provider in the prior 12 months (AOR 0.64) were less likely to have obtained a prior HIV test. Cohabiting (AOR 3.40) and individuals with prior STDs (AOR 18.62) were more likely to have obtained an HIV test. Among Hispanic black immigrants, of the pre-selected covariates, younger individuals (AOR 0.30), those who had not talked to a healthcare provider in the last 12 months (AOR 0.26), and individuals with unknown prior STDs (AOR 0.26) were less likely to report prior HIV testing. Hispanic black immigrants who had some college or more (AOR 2.40) were more likely to have obtained an HIV test (Table 3).

*Models for intention to obtain HIV test in the next year*

Among Hispanic white immigrants, individuals with no or unknown prior HIV test (AOR 0.31 and 0.37), older (AOR 0.74), South American origin (AOR 0.74), married (AOR 0.60), and had not talked to a healthcare provider in 12 months (AOR 0.81) were less likely to intend to take an HIV test in the next year. Hispanic white immigrants who were younger (AOR 1.73), male (AOR 1.31), spoke Spanish (AOR 1.88), had previous risk factors (AOR 2.14), and prior STDs (AOR 2.32) were more likely to intend to take an HIV test in the next year. Among non-Hispanic black immigrants, individuals with no prior HIV test (AOR 0.34), older (AOR 0.53), and married (AOR 0.42) were less likely to intend to take an HIV test. Males (AOR 1.53) and individuals with prior STDs (AOR 2.71) were more likely to intend to take an HIV test.

TABLE 4. ADJUSTED ODDS RATIOS (WEIGHTED LOGISTIC REGRESSION) FOR INTENTION TO TEST FOR HIV IN THE FUTURE AMONG RACIAL AND ETHNIC MINORITY IMMIGRANTS, NATIONAL HEALTH INTERVIEW SURVEY 2007–2010

	<i>Hispanic white,</i> N = 8320		<i>Non-Hispanic black,</i> N = 1288		<i>Hispanic black,</i> N = 299	
	AOR (95% CI)	p <sup>a,b</sup>	AOR (95% CI)	p <sup>a,b</sup>	AOR (95% CI)	p <sup>a,b</sup>
Prior HIV test						
No	0.31 (0.26–0.36)	‡	0.34 (0.22–0.52)	†	0.28 (0.13–0.63)	*
Unknown	0.37 (0.17–0.78)	§	0.13 (0.01–1.14)		— <sup>c</sup>	
Age						
<25	1.73 (1.39–2.16)	†	—		—	
≥45	0.74 (0.56–0.96)	§	0.53 (0.32–0.90)	§	NCC <sup>d</sup>	
Gender						
Male	1.31 (1.13–1.52)	*	1.53 (1.12–2.09)	§	—	
Region of origin						
South America	0.74 (0.57–0.95)	§	NA <sup>e</sup>		NCC	
Spanish language	1.88 (1.61–2.19)	‡	NA <sup>e</sup>		NCC	
Marital status						
Married	0.60 (0.51–0.69)	‡	0.42 (0.30–0.58)	†	0.45 (0.24–0.85)	§
Unknown	1.74 (0.41–7.50)		3.21 (0.74–14.06)		NA	
Income						
<\$19,000	—		—		NCC	
Unknown	—		—		NCC	
Talked to provider in last 12 months						
No	0.81 (0.69–0.94)	§	—		—	
Unknown	0.56 (0.02–13.0)		—		—	
Previous risk factors						
Yes	2.14 (1.50–3.04)	*	—		NCC	
Unknown	1.24 (0.73–2.10)		—		NCC	
Prior STDs						
Yes	2.32 (1.16–4.66)	*	2.71 (1.24–5.91)	§	—	
Unknown	0.76 (0.57–1.03)		0.78 (0.43–1.44)		—	

<sup>a</sup>The *p* values come from the final step-up model, using a modified version of the likelihood ratio test performed using deviances.

<sup>b</sup>‡*p* ≤ 10<sup>-9</sup>; †*p* ≤ 10<sup>-6</sup>; \**p* ≤ 10<sup>-3</sup>; §*p* ≤ 10<sup>-2</sup>.

<sup>c</sup>Dashes mean the covariate was not significant. Most covariates that were not significant in any of the three models were omitted from the table.

<sup>d</sup>NCC means not a candidate covariate. The small sample size of the Hispanic black group limited the number of covariates that could be tried in the model.

<sup>e</sup>NA means not applicable.

Among Hispanic black immigrants, of the preselected covariates, individuals with no reported prior HIV testing (AOR 0.28) and married (AOR 0.45) were less likely to intend obtain an HIV test in the next year (Table 4).

## Discussion

This study demonstrates that many black and Hispanic immigrants to the United States have not been tested for HIV. Hispanic white immigrants were least likely to report prior HIV testing and least likely to report intent to obtain HIV testing in the future. Compared to prior studies describing HIV testing rates that have not been disaggregated by nativity, this study found similar rates of future testing intentions among Hispanic and non-Hispanic black individuals (14.7% and 24.6% in prior study).<sup>30</sup> This study also found that among black and Hispanic immigrants who reported previous risk factors for HIV or prior STDs, the rate of HIV testing is sub-optimal. Furthermore, few immigrants who reported risk for HIV infection intended to be tested in the future. Interestingly,

the majority of the data utilized in this analysis were captured pre-2010 when the “HIV travel ban,” which mandated HIV screening as a component of the medical examination for entry into the United States, was still in effect. Many immigrants were presumably tested as a result of this mandate. Yet, only half of this sample reported HIV testing, and very few participants reported that they obtained HIV testing for immigration purposes. It is possible that many study participants immigrated to the United States before the “HIV travel ban” was enacted (1987) and therefore were not subject to mandatory testing. It is uncertain how lifting the “HIV travel ban” will impact access to HIV testing among immigrants.

These results highlight the need to overcome barriers to HIV testing that exist among black and Hispanic immigrants. In this study, the most common reason for HIV testing was that it was offered by a healthcare provider during a medical visit. This finding has been noted previously.<sup>31</sup> In this study, 52% of Hispanic white, 39% of non-Hispanic blacks, and 44% of Hispanic black immigrants had not seen a healthcare provider within the last 12 months. Nearly one-half of

participants were uninsured, which may explain why they had not seen a healthcare provider. However, surprisingly, insurance status was not associated with prior HIV testing or intent to test in the future for any immigrant group. One potential reason for this finding is that uninsured participants obtained HIV testing at sites where healthcare insurance was not a requirement for accessing care (community health centers, free clinics, etc.).

This study also found that black immigrants (Hispanic and non-Hispanic) were significantly more likely to have a prior HIV test than Hispanic white immigrants. It is possible that healthcare providers offered HIV testing to black immigrants more frequently because they emigrated from higher prevalence countries and are perceived to be at higher risk of infection. Interestingly, racial differences were also noted in regard to the relationship between immigration status (US citizenship) and HIV testing. Among non-Hispanic black immigrants, US citizenship was associated with a significantly lower probability of prior HIV test, while US citizenship among Hispanic white immigrants was associated with a significantly higher probability of prior HIV test. The reason for this difference in direction of association is unclear, particularly in light of the “HIV travel ban.”

In concordance with other studies, we found that several sociodemographic factors were associated with prior HIV testing. Among Hispanic white and non-Hispanic black immigrants, younger and older age was associated with a significantly lower likelihood of prior HIV testing.<sup>6</sup> The association of young age with lower likelihood of HIV testing was similarly noted among Hispanic black immigrants (older age was not included in the step-up procedure for this group). Among Hispanic white immigrants, males were also significantly less likely to be tested for HIV. Although gender was not significant in the models for the other groups, previous analyses of nationally representative data reveal similar findings.<sup>32</sup> Among both Hispanic white and non-Hispanic black immigrants, individuals cohabiting with a partner were more likely to have obtained an HIV test. One explanation for this finding is that some of these individuals may have been in male same sex relationships where the prevalence of HIV is higher, and testing may have been offered more frequently. As noted in other studies, a higher education level and higher income increased the likelihood of obtaining an HIV test among Hispanic white immigrants.<sup>32,33</sup> A higher education level was also associated with greater likelihood of HIV testing among Hispanic black immigrants. Not surprisingly, among both Hispanic white and non-Hispanic black immigrants, a history of STDs increased the likelihood of HIV testing, which is often offered at the same time as STD treatment. Having a history of previous risk factors was also found to increase the likelihood of HIV testing, but only among Hispanic white individuals.

Differences between intention to test in the future and prior HIV testing were striking. Among Hispanic white individuals, younger age and Spanish language fluency (completing the survey either in part or entirely in Spanish) were associated with higher likelihood of intention to test in the future. Males were also more likely to intend to test for HIV in the future among both Hispanic white and non-Hispanic black immigrants. It is possible that in all three cases (younger age, Spanish language, and male gender), the direction of association changed because participation in the survey influenced future decisions regarding HIV testing.

This study has several limitations. Participants were not asked to identify specific risk factors for HIV. Instead, the risk factor assessment is captured in aggregate, as described in the methodology. Therefore, it is impossible to identify specific groups for targeted interventions using these data. Although participants are asked their citizenship status (US citizen or not), NHIS does not ask respondents their legal immigration status (documented vs. undocumented). Both HIV risk factors and legal immigration status are likely not queried to protect participant privacy. In addition, the sample includes very few Hispanic black individuals. Although black immigrants from the Caribbean and Central America who may identify as Hispanic comprise a growing segment of the Hispanic immigrant population in the United States, data regarding HIV testing, prevalence, and outcomes in this population are limited and few are included in this sample. As discussed, a substantial amount of data are missing for two variables (income and history of STDs), both of which may be important for accurate estimation of HIV testing rates and risk of infection. Finally, survey responses may be subject to self-report bias and underreporting.

Despite these limitations, this study demonstrates that many racial and ethnic minority immigrants have not been tested for HIV and may be at risk for late presentation for HIV care and treatment. To overcome persistent disparities in HIV prevalence and outcomes, we need to understand HIV testing trends among all racial and ethnic minorities, including immigrants. Data should be disaggregated and captured by country of origin to accurately identify subgroups who may face unique barriers to accessing preventive services. To specifically meet the needs of all black and Hispanic immigrants, expansion of novel approaches such as free door to door HIV testing or HIV testing in community-based settings, such as churches, may be appropriate.<sup>34,35</sup> To fully address racial and ethnic disparities in the United States HIV epidemic, we must develop culturally appropriate interventions to improve access to healthcare for all minorities, including various immigrant groups.

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### References

- Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 U.S. dependent areas—2011. *HIV Surveillance Supplemental Report* 2013;18 (No. 5). Published October 2013.
- Fisher M. Late diagnosis of HIV infection: Major consequences and missed opportunities. *Curr Opin Infect Dis* 2008;21:1–3.
- Girardi E, Sabin CA, Monforte AD. Late diagnosis of HIV infection: Epidemiological features, consequences and strategies to encourage earlier testing. *J Acquir Immune Defic Syndr* 2007;46 Suppl 1:S3–S8.

4. Chen M, Rhodes PH, Hall IH, et al. Prevalence of undiagnosed HIV infection among persons aged >13 years—National HIV Surveillance System, United States, 2005–2008. *MMWR Suppl* 2012;61(Suppl):57–64.
5. The White House. 2015. National AIDS Strategy for the United States. Available at: [www.aids.gov/federal-resources/national-hiv-aids-strategy/nhas-update.pdf](http://www.aids.gov/federal-resources/national-hiv-aids-strategy/nhas-update.pdf) (Last accessed May 30, 2016).
6. Centers for Disease Control and Prevention. HIV Testing Trends in the United States, 2000–2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2013; pp. 1–14. Available at: [www.cdc.gov/hiv/pdf/testing\\_trends.pdf](http://www.cdc.gov/hiv/pdf/testing_trends.pdf) (Last accessed May 30, 2016).
7. Johnson AS, Hu X, Dean H, et al. Epidemiologic differences between native-born and foreign-born black people diagnosed with HIV infection in 33 U.S. states 2001–2007. *Public Health Rep* 2010;125(Suppl 4):61–69.
8. Chen NE, Gallant JE, Page KR. A systematic review of HIV/AIDS survival and delayed diagnosis among Hispanics in the United States. *J Immigr Minor Health* 2012;14:65–81.
9. United States Census Bureau. 2005. We the People: Blacks in the United States (Census 2000 special reports). Available at: [www.census.gov/prod/2005pubs/censr-25.pdf](http://www.census.gov/prod/2005pubs/censr-25.pdf) (Last accessed May 30, 2016).
10. Kaiser Family Foundation. The global HIV/AIDS epidemic. Available at: <http://kff.org/global-health-policy/fact-sheet/the-global-hiv-aids-epidemic/> (Last accessed May 30, 2016).
11. Odedina FT, Dagne G, LaRose-Pierre M, et al. Within-group differences between native-born and foreign-born black men on prostate cancer risk reduction and early detection practices. *J Immigr Minor Health* 2011;13:996–1004.
12. Francois F, Elysee G, Shah S, Gany F. Colon cancer knowledge and attitudes in an immigrant Haitian community. *J Immigr Minor Health* 2009;11:319–325.
13. Foley EE. HIV/AIDS and African immigrant women in Philadelphia: Structural and cultural barriers to care. *AIDS Care* 2005;17:1030–1043.
14. Wafula EG, Snipes SA. Barriers to health care access faced by black immigrants in the US: Theoretical considerations and recommendations. *J Immigr Minor Health* 2014;16:689–698.
15. Ojikutu B, Nnaji C, Sithole J, Bogart L, Gona P. Barriers to HIV testing in Black immigrants to the US. *J Health Care Poor Underserved* 2014;25:1052–1066.
16. Ojikutu B, Nnaji C, Sithole-Berk J, Higgins-Biddle M, Schneider K, Cranston K, et al. All Black people are not alike: Differences in HIV testing patterns, knowledge, and experience of stigma between US born and non-US born blacks in Massachusetts. *AIDS Patient Care STDs* 2013;27:45–54.
17. Migration Policy Institute. Frequently Requested Statistics on Immigrants and Immigration in the United States. Available at: [www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states-1#2f](http://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states-1#2f) (Last accessed May 30, 2016).
18. UNICEF. At a glance: Mexico. 2010. Available at: [www.unicef.org/infobycountry/mexico\\_statistics.html](http://www.unicef.org/infobycountry/mexico_statistics.html) (Last accessed May 30, 2016).
19. UNAIDS. Cuba: HIV and AIDS Estimates. Available at: [www.unaids.org/en/regionscountries/countries/cuba](http://www.unaids.org/en/regionscountries/countries/cuba) (Last accessed May 30, 2016).
20. Prosser AT, Tang T, Hall HI. HIV in persons born outside the United States, 2007–2010. *JAMA* 2012;308:601–607.
21. del Rio C. Latinos and HIV care in the southeastern United States: New challenges complicating longstanding problems. *Clin Infect Dis* 2011;53:488–489.
22. Fairchild AL, Tynan EA. Policies of containment: Immigration in the era of AIDS. *Am J Public Health* 1994;84:2011–2022.
23. Centers for Disease Control and Prevention. Final Rule Removing HIV Infection from U.S. Immigration Screening. 2010. Available at: [www.cdc.gov/immigrantrefugeehealth/laws-regs/hiv-ban-removal/final-rule-technical-qa.html](http://www.cdc.gov/immigrantrefugeehealth/laws-regs/hiv-ban-removal/final-rule-technical-qa.html) (Last accessed January 1, 2015).
24. Centers for Disease Control and Prevention. About the National Health Interview Survey. Available at: [www.cdc.gov/nchs/nhis/about\\_nhis.htm](http://www.cdc.gov/nchs/nhis/about_nhis.htm) (Last accessed May 30, 2016).
25. Schenker N, Raghunathan TE, Chiu P-L, et al. Multiple imputation of missing income data in the National Health Interview Survey. *J Am Stat Assoc* 2006;101:924–933.
26. Agresti A. *Categorical Data Analysis*. 3rd edition. Hoboken, NJ: John Wiley & Sons, 2013.
27. Carnes N. Logit.survey: Survey-weighted logistic regression for dichotomous dependent variables. In: Zelig: Everyone's Statistical Software. K Imai, G King, and O Lau (eds.). Available at: <http://gking.harvard.edu/zelig> (Last accessed January 28, 2016).
28. Andrews B. Sociodemographic and behavioural characteristics of youth reporting HIV testing in three Caribbean countries. *West Indian Med J* 2011;60:276–283.
29. Montealegre JR, Risser JM, Selwyn BJ, Sabin K, McCurdy SA. HIV testing behaviors among undocumented Central American immigrant women in Houston, Texas. *J Immigr Minor Health* 2012;14:116–123.
30. Murray K, Oraka E. Racial and ethnic disparities in future testing intentions for HIV: United States, 2007–2010: results from the National Health Interview Survey. *AIDS Behav* 2014;18:1247–1255.
31. Inungu JN. Potential barriers to seeking human immunodeficiency virus testing among adults in the United States: Data from the 1998 National Health Interview Survey. *AIDS Patient Care STDS* 2002;16:293–299.
32. Woodring JV, Kruszon-Moran D, Oster AM, McQuillan GM. Did CDC's 2006 revised HIV testing recommendations make a difference? Evaluation of HIV testing in the US household population, 2003–2010. *J Acquir Immune Defic Syndr* 2014;67:331–340.
33. Fox JB, Shaw FE; Office of Health System Collaboration, Office of the Associate Director for Policy, CDC. Relationship of income and health care coverage to receipt of recommended clinical preventive services by adults—United States, 2011–2012. *MMWR Morb Mortal Wkly Rep* 2014;63:666–670.
34. Seña AC, Hammer JP, Wilson K, Zeveloff A, Gamble J. Feasibility and acceptability of door-to-door rapid HIV testing among Latino immigrants and their HIV risk factors in North Carolina. *AIDS Patient Care STDS* 2010;24:165–173.
35. Bogart LM, Derosé KP, Kanouse DE, Griffin BA, Haas AC, Williams MV. Correlates of HIV testing among African American and Latino church congregants: The role of HIV stigmatizing attitudes and discussions about HIV. *J Urban Health* 2015;92:93–107.

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