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Factors Associated with Lifetime HIV Testing in Texas by Race/Ethnicity

Raquel A. Benavides-Torres[1], Kristin M. Wall[*,2], Georgina Máyela Núñez Rocha[3], Dora Julia Onofre Rodríguez[1] and Laura Hopson[4]

[1]*Universidad Autónoma de Nuevo León, UANL. FAEN, CIDICS, Av. Universidad S/N Ciudad Universitaria San Nicolás de los Garza Nuevo León, C.P. 66451, México*

[2]*Department of Epidemiology, Rollins School of Public Health, Emory, University, Atlanta, GA, USA*

[3]*Universidad Autónoma de Nuevo León, UANL, FaSPyN, Av. Eduardo Aguirre Pequeño y Yuriria, Col Mitras Centro, Monterrey N. L. C. P. 64460, México*

[4]*University at Albany, School of Social Welfare, New York, USA*

Abstract: *Introduction*: In United States, roughly 1/5 of all HIV infected persons remain undiagnosed. Because HIV testing is critical to improve prevention efforts, more research is needed to understand the characteristics of individuals who get tested for HIV.

Methods: This secondary analysis of the 2010 Texas Behavioral Risk Factor Surveillance System used data from 9,744 respondents between 18-64 years of age to evaluate the relationship between demographic characteristics (gender, race/ethnicity, age, area of residence, education, marital status, employment status, and income), healthcare characteristics (insurance status, having a primary provider, and access to healthcare), and HIV risk behaviors with ever having received an HIV test.

Results: Significant associations between gender, age, area of residence, marital and employment status, and HIV risk behaviors and HIV testing in a Texas population by race/ethnicity were observed.

Conclusions: These findings have important implications for future research into racial/ethnic disparities between lifetime HIV testing, and can help guide practitioners who work with populations at risk for HIV/AIDS in Texas.

Keywords: Diagnosis, HIV, prevention, racial, screening.

INTRODUCTION

More than 1,100,000 people in the United States (US) are living with HIV/AIDS, and an estimated 20% of these infections remain undiagnosed [1, 2]. As of 2008, over 77,000 cases of HIV/AIDS have been reported in Texas, the 4th highest number of cumulative cases reported by state [3]. Knowledge of HIV status is critical for reducing the rates of HIV/AIDS transmission, and HIV testing has been an important part of HIV prevention efforts with improvements in test accuracy and availability [4]. In 2009, an estimated 45% of persons aged 18-64 reported ever having received an HIV test in the US [1].

Poor rates of routine testing and late diagnosis of HIV, which are common in the US, represent missed opportunities for linkage to care, treatment of HIV positive persons, and prevention of new infections. Of incident HIV diagnoses in 2008, one-third progressed to AIDS within 1 year, indicating these persons had likely been infected for the decade prior to diagnosis [1, 5]. In Texas, over one-third of all HIV diagnoses between 2003-2009 were late stage diagnoses, and an estimated one-third of Texans with known HIV diagnoses were not receiving care [6].

Various demographic, healthcare, and behavioral characteristics have been associated with ever having been tested for HIV including gender, age, and race. As of 2008, of those living with HIV/AIDS over the age of 13 in the US, roughly 21% of males and 18% of females had undiagnosed infections. By age, an estimated 58.9% of HIV positive persons aged 13-24 are living with undiagnosed HIV infections; this percentage is lower for other age groups [5].

HIV disproportionally affects blacks and Hispanics in the US relative to whites, with rates of infection nine and three times higher, respectively (112.1/100,000 for blacks and 40.5/100,000 for Hispanics versus 12.6/100,000 for whites) [1]. By race/ethnicity, undiagnosed HIV infection is more common among Asians/Pacific Islanders (26.0%), and American Indians/Alaska Natives (25.0%) relative to blacks/African Americans (21.4%), whites (18.5%), and Hispanic/Latinos (18.9%) [5]. According to the CDC, over 30% of US men living with AIDS are black, and almost 20% are Hispanic. Among women living with AIDS, almost 60% are black and 20% are Hispanic. In addition, those who are tested late in the course of the disease are more likely to be black or Hispanic [7].

*Address correspondence to this author at the Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, GA, USA; Tel: 512-785-4779; E-mail: kmwall@emory.edu

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Whites have been reported to be less likely to receive an HIV test than blacks or Latinos [8]. The CDC estimates that 61.8% of blacks, 47.6% of Latinos, and 40.9% of whites have ever been tested for HIV. However, despite higher rates of ever testing among blacks and Hispanics, the disproportionately high rates of HIV/AIDS diagnoses among these subpopulations indicate that blacks and Hispanics would benefit from increased testing frequency to increase early diagnoses [1]. This is a particularly relevant issue in Texas due to its large Hispanic population. According to the 2010 US Census, over 9.4 million Hispanics live in Texas, representing 37.6% of the population [9]. Of AIDS diagnoses in Texas, 45% were among whites, 32% were among blacks, and 22% were among Hispanics [3].

Other factors including area of residence, education, marital status, employment, income, and insurance status also influence rates of HIV testing. In a secondary analysis of 2005 and 2009 Behavioral Risk Factor Surveillance System (BRFSS) data, the relationship between metropolitan statistical area (MSA) and HIV testing was examined. Persons residing in urban areas were significantly more likely to have been ever tested for HIV relative to those residing in rural areas (43.6% *vs* 32.2) [10]. Research also indicates that individuals who have not graduated from high school are less likely than those with higher levels of education to be tested, and those who are tested late in the course of the disease are likely to be less educated than those tested earlier [7, 11].

Findings from 2008 BRFSS data indicated that a relatively higher proportion of those never married/divorced/widowed/separated had ever been tested relative to those who were married/a member of an unmarried couple (40.2% *vs* 36.8%) [12]. The 2008 BRFSS data indicate that relatively equal proportions of those who were employed versus unemployed had ever been tested. A higher proportion of those making an annual household income <$15,000 had ever been tested relative to those earning $15,000-$50,000 or over $50,000 (43.2% versus 40.1% and 37.6%, respectively) in the 2008 BRFSS [12].

Insurance status may affect HIV testing as insured individuals likely have more contact with health providers or health clinics and therefore more opportunities to get an HIV test. Data from the 2008 BRFSS indicated that a similar proportion of insured and uninsured had ever received an HIV test (37.5% and 39.7%, respectively) [12]. Barriers to HIV testing may represent unique challenges in Texas because of the large numbers of uninsured residents, which the US Census estimated to be 24.6% of the population for 2003-2005 [13].

An individual's relationship with a healthcare provider can also be an important factor in deciding whether to be tested for HIV. Physician endorsement of HIV testing is one of the most consistent predictors of HIV testing. Attitude toward the person providing the test is a factor that HIV test recipients have identified as important in their attitudes toward HIV testing [14]. In the 2008 BRFSS, a similar proportion of those with or without a primary healthcare provider had ever been tested (37.8% and 38.7%) and a higher proportion of those having not seen a doctor in the past year because of cost had ever been tested for HIV (46.3% and 36.4%) [12].

HIV risk behaviors may also be related to ever receiving an HIV test – roughly 28% of persons with any HIV risk factor had ever been tested using 2001-2009 NHIS data for those aged 18-64 [1]. A stronger predictor of HIV testing than actual behavior may be perception of risk for HIV, and research suggests that perceiving no risk for HIV is a barrier to testing [15].

During recent years, HIV transmission and progression prevention strategies have emerged, including early diagnosis of the infection. A delay in diagnosis until later stages may be associated with irreversible immune damage and related complications. Accordingly, the Joint United Nations Program on HIV/ADIS has developed a strategy to reduce infections in young people by half with a primary objective of increased access to HIV testing [16].

Given the high prevalence of HIV infections in Texas, many of which are undiagnosed, the relatively high rates of uninsured persons, and inconsistent research findings regarding HIV testing among Hispanics, more research is needed to understand how these and other factors influence HIV testing in Texas. This study investigated the association between demographic characteristics (gender, race/ethnicity, age, area of residence, education, marital status, employment status, and income), health care characteristics (insurance status, having a primary provider, and access to health care), and HIV risk behaviors with ever having received an HIV test using 2010 Texas BRFSS data.

METHODS

Data Collection and Study Participants

The BRFSS is a CDC supported state-based, random-digit telephone survey of the civilian, noninstitutionalized US population aged 18 years and older. Through a series of structured telephone interviews, states collect uniform data monthly on the behaviors and conditions that place adults at risk for chronic diseases, injuries, and preventable infectious diseases that are the leading causes of morbidity and mortality in the US. Information on BRFSS design and sampling methods are reported elsewhere [17].

This study was a secondary analysis of data obtained from the 2010 Texas BRFSS. Study participants were those who were asked to provide information regarding ever having been tested for HIV, which was only asked of respondents younger than 65 years of age.

Measures

The outcome of interest was ascertained with the following question: "Have you ever been tested for HIV? Do not count tests you may have had as part of a blood donation. Include testing fluid from your mouth." Responses to this question included 'yes', 'no', 'don't know/not sure', and 'refused to answer'.

Race/ethnicity was measured by combining an item that asked participants to identify their ethnicity as Hispanic or non-Hispanic and another item that asked participants to identify their race. Response categories for the combined race/ethnicity variable are 'white (non-Hispanic)', 'black (non-Hispanic)', 'other (non-Hispanic)', 'multiracial (non-Hispanic)', 'Hispanic', 'don't know/not sure', and 'refused'. The 'other (non-Hispanic)'

race category included Asian, Native Hawaiian or other Pacific Islander, and American Indian/Alaskan native.

Gender was measured with an item that directed interviewers to indicate the sex of the respondent and to ask the respondent's sex if necessary. Possible responses are 'male' and 'female'. Age was measured with the following question: "What is your age?" and responses were categorized as: '18 – 24 years', '25 – 34 years', '35 – 44 years', '45 – 54 years', and '55 – 64 years'.

MSA was recorded as whether the participant was 'in the center city of MSA', 'outside the center city of a MSA but inside the county containing the center city', 'inside a suburban county of the MSA', 'in a MSA that has no city center', and 'not in a MSA'.

Education was measured with the following question: "What is the highest grade or year of school you completed?" Responses to this question were: 'Never attended school or only kindergarten', 'Grades 1 through 8 (Elementary)', 'Grades 9 through 11 (Some high school)', 'Grade 12 or GED (High school graduate)', 'College 1 year to 3 years (Some college or technical school)', 'College 4 years or more (College graduate)', and 'refused'.

Marital status was captured with the prompt "Are you…" and response options were 'married', 'divorced', 'widowed', 'separated', 'never married', 'member of an unmarried couple', 'don't know/not sure', and 'refused.'

Employment status was captured with the prompt: "Are you currently…" Responses included 'employed for wages', 'self-employed', 'out of work for more than 1 year', 'out of work for less than 1 year', 'a homemaker', 'a student', 'retired', 'unable to work', and 'refused'.

Respondent income was captured with the question: "Is your annual household income from all sources…" Responses included 'less than 10,000', '$10,000 to less than $15,000', '$15,000 to less than $20,000', '$20,000to less than $25,000', '$25,000 to less than $35,000', '$35,000 to less than $50,000', '$50,000 to less than $75,000', '$75,000 or more', 'don't know/not sure', and 'refused'.

Health care insurance was measured with the following question: "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?" Responses to this question are 'yes', 'no', 'don't know/not sure', and 'refused'.

A primary healthcare provider was measured with the following question: "Do you have one person you think of as your personal doctor or health care provider? (If "No" ask "Is there more than one or is there no person who you think of as your personal doctor or health care provider." Responses to this question are 'yes, only one', 'more than one', 'no', 'don't know/not sure', and 'refused'.

Healthcare access was measured by the question: "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?" Responses to this question are 'yes', 'no', 'don't know/not sure', and 'refused'.

HIV risk behavior was measured with the following question: "I am going to read you a list. When I am done, please tell me if any of the situations apply to you. You do not need to tell me which one. You have used intravenous drugs in the past year. You have been treated for a sexually transmitted or venereal disease in the past year. You have given or received money or drugs in exchange for sex in the past year. You had anal sex without a condom in the past year. Do any of these situations apply to you?" This question was only asked to respondents under the age of 65. Responses to this question are 'yes', 'no', 'don't know/not sure', and 'refused'.

Statistical Analyses

Responses of 'don't know/not sure', or 'refused' were considered missing and excluded from the analysis, as were respondents with missing data for any covariate. All exposures of interest were categorical and tabulated as counts, percentages, and weighted percentages (weighted to account for differences in selection probabilities) stratified by the response to the HIV testing history question. Weighting was achieved using _FINALWT to account for differences in selection probabilities. Differences between the distributions of weighted independent variables by HIV testing history were evaluated *via* $\chi 2$ tests using PROC SURVEYFREQ.

Crude odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to evaluate the association between weighted independent variables and HIV testing history using PROC SURVEYLOGISTIC. All exposure variables significant (Bonferroni corrected p-value=0.0042) in crude analyses were entered as predictors into a multivariate logistic regression model predictive of HIV testing history.

Effect measure modification by race/ethnicity was hypothesized *a priori* to effect the outcome of interest. Because effect measure modification by race/ethnicity was observed, separate multivariate logistic regression models were run for each race/ethnic group.

The potential for collinearity between exposure variables within each model was evaluated by cutoffs of condition indices >30 and variance decomposition proportions >0.5. Statistical analyses were performed with SAS v9.3 (Cary, North Carolina).

RESULTS

Of the 18,077 respondents in the 2010 Texas BRFSS, 11,518 were under the age of 65 and were asked whether they had ever received an HIV test, of which 9,744 had complete exposure information. Of those, 3,575 (36.69%; weighted 39.99%) had ever received an HIV test, 5,933 (60.89%; weighted 57.62%) had never received an HIV test, and 236 (2.42%; weighted 2.40%) responded 'don't know/not sure' or 'refused to answer'.

The final analysis was restricted to the 9,744 respondents with complete exposure information answering 'yes' or 'no' to have been ever tested for HIV. The 236 respondents answering 'don't know/not sure' or 'refused' were excluded from modeling analyses. These respondents were significantly ($p<0.05$) different from those that answered the HIV testing history question as either 'yes' or 'no' by race/ethnicity (more likely to be white or multiracial/other and less likely to be black or Hispanic), education (more likely to have attained a higher level of education), and marital status (more likely to be married and less likely to be separated or a member of an unmarried couple).

Respondent Demographics

Respondents who had ever received an HIV test were significantly ($p<0.05$) more likely to be black (non-Hispanic), female, of a younger age category, live in the central city of a MSA, divorced, unable to work, be of a lower income bracket, have a primary healthcare provider, to have not accessed health care in the previous year due to cost, and to have at least one self-reported HIV risk behavior (Table **1**).

Multivariate Logistic Regression Models

The multivariate logistic regression model included the following variables: gender, age, MSA, marital status, employment status, not seeking healthcare due to financial cost, and HIV risk behavior(s). Model results are shown stratified by race/ethnicity due to statistically significant effect measure modification by this variable. No collinearity was found. Models run within the stratum of the multiracial or other ethnic group did not have sufficient sample size, leading to perfect separation by several covariates (age, HIV risk, and marital status) and the inability to generate meaningful point estimates. Thus, only models for white (non-Hispanic), black (non-Hispanic), and Hispanic are presented.

Among white respondents, females were significantly more likely to have been ever tested for HIV relative to males (aOR = 1.26; 95%CI: 1.00-1.59). Respondents aged 25-34 (aOR = 2.45; 95%CI: 1.24-5.18) and 35-44 (aOR = 2.53; 95%CI: 1.24-5.18) were also significantly more likely to have been ever tested versus respondents' aged 18-24. White individuals residing outside the center city of a MSA (aOR = 0.72; 95%CI: 0.55-0.93) and not in a MSA (aOR = 0.52; 95%CI: 0.39-0.70) were less likely to have tested relative to those residing in the center city of a MSA. Those who were divorced versus married (aOR = 1.47; 95%CI: 1.03-2.09), unable to work versus employed (aOR = 2.15; 95%CI: 1.37-3.36), and reporting HIV risk behavior(s) (aOR =2.51; 95%CI: 1.15-5.48) were also more likely to have ever tested for HIV (Table **2**).

Among black (non-Hispanic) respondents, those not living in a MSA were significantly more likely to have been ever tested (aOR = 3.29; 95%CI: 1.11-9.78) relative to those living in the central city of a MSA. Black respondents who were widowed (aOR = 0.33; 95%CI: 0.13-0.86) or separated (aOR = 0.14; 95%CI: 0.05-0.37) were significantly less likely to have ever tested relative to married respondents (Table **2**).

Among Hispanic respondents, females were significantly more likely to have been ever tested relative to males (aOR = 1.92; 95%CI: 1.39-2.66). Additionally, those aged 25-35 versus those aged 18-24 (aOR = 2.63; 95%CI: 1.35-5.13) and divorced relative to married respondents (aOR = 1.75; 95%CI: 1.06-2.90) were also more likely to have ever received an HIV test (Table **2**).

DISCUSSION

These findings suggest that there are important relationships between gender, age, area of residence, marital and employment status, and HIV risk behaviors and HIV testing in a Texas population by race/ethnicity. Whites and Hispanics shared many significant predictors of ever receiving an HIV test that were not observed among blacks. White and Hispanic women were significantly more likely to have been tested relative to men of the same racial/ethnic group, and whites and Hispanic in the 25-44 year age group were also significantly more like to have ever been tested for HIV relative to members of the same racial/ethnic group ages 18-24. Additionally, white and Hispanic respondents who were divorced versus married and those reporting at least one HIV risk behavior were more likely to be tested. Similarly, BRFSS data from four states found that 19% of respondents reported at least one risk behavior, which was different by gender (men 23%; women 15%), and that among this subgroup, younger age groups also had a higher likelihood of having received a recent HIV test; perception of risk also influenced HIV testing behaviors [18]. These findings are consistent with our study for white and Hispanic populations, and emphasize the need to further explore racial/ethnic differences in HIV testing behaviors. Another study using 2005 BRFSS data to evaluate testing rates and predictors of testing among racial/ethnic groups found that, similar to our study, gender was not a significant predictor among blacks; in contrast to our findings, this study showed that marital status was not a significant predictor among Hispanics [19].

MSA was a significant predictor among whites and blacks. Whites who lived outside the central city of a MSA and those who did not live in a MSA were significantly less likely to have been ever tested relative to those who lived in the central city of a MSA. In contrast, blacks not living in a MSA were more likely to have been ever tested relative to those residing in the central city of a MSA. Studies have shown that persons residing in rural areas are less likely to report ever receiving an HIV test, possibly contributing to relatively high rates of late-stage HIV diagnoses in rural areas [10]. Findings from this study indicate that area of residence needs to be further explored in relation to HIV testing by racial/ethnic groups with the goal of planning interventions and allocating resources targeted to high risk groups. The implications for these differences may be compounded by disparities in HIV diagnoses by race/ethnicity between urban and rural areas [20]. Additionally, employment status was a significant predictor among whites but not the other racial/ethnic groups – whites who were unable to work were more than twice as likely to have been ever tested for HIV relative to those who were employed for wages. Also, blacks that were widowed or separated were significantly less likely to have been tested relative to those who were married.

Overall, higher rates of testing were observed among blacks relative to other racial/ethnic groups. The higher rates of lifetime testing for blacks may be a result of increased perception of risk [21]. The lower rates of testing among Hispanics could be associated with a reluctance to discuss sexual issues in the Hispanic culture, a barrier to visiting clinics or medical centers for an HIV test, and possibly differential risk perception [22, 23]. Additionally, the relationship between risk perceptions/behaviors and HIV testing may be more important for some ethnic groups than others. Fernandez *et al*., reported that Hispanic men who engaged in HIV risk behaviors were more likely to have been tested and to have been tested recently than men who

Table 1. Respondent Demographics, Health Care Factors, and HIV Risk by HIV Testing History, 2010 Texas BRFSS

	Ever Received an HIV Test (N = 3575)			Never Received and HIV Test (N = 5933)			Don't Know/ Not Sure/ Refused to Answer (N = 236)			P Value (One-Sided)*	P Value (One-Sided)**
	N	%	Weighted %	N	%	Weighted %	N	%	Weighted %		
Race/ethnicity										<.0001	0.0007
White (non-Hispanic)	1788	50.0%	49.0%	3346	56.4%	56.6%	163	69.1%	73.5%		
Black (non-Hispanic)	432	12.1%	16.2%	271	4.6%	4.8%	11	4.7%	6.0%		
Multiracial (non-Hispanic)	98	2.7%	3.8%	180	3.0%	5.5%	12	5.1%	7.1%		
Other (non-Hispanic)	62	1.7%	1.8%	52	0.9%	1.0%	5	2.1%	1.4%		
Hispanic	1195	33.4%	29.3%	2084	35.1%	32.2%	45	19.1%	12.1%		
Sex										<.0001	0.7915
Male	1214	34.0%	45.1%	2373	40.0%	54.5%	87	36.9%	49.1%		
Female	2361	66.0%	54.9%	3560	60.0%	45.5%	149	63.1%	50.9%		
Age										<.0001	0.107
18-24	130	3.6%	5.5%	229	3.9%	9.2%	4	1.7%	3.5%		
25-34	701	19.6%	27.9%	610	10.3%	18.6%	17	7.2%	16.0%		
35-44	1044	29.2%	38.7%	1061	17.9%	28.4%	54	22.9%	32.3%		
45-54	952	26.6%	18.5%	1728	29.1%	24.0%	63	26.7%	22.6%		
55-64	748	20.9%	9.4%	2305	38.9%	19.8%	98	41.5%	25.7%		
Metropolitan area of residence										0.0022	0.1196
In the center city of a MSA	2327	65.1%	56.8%	3442	58.0%	50.8%	123	52.1%	44.5%		
Outside the center city of a MSA	633	17.7%	27.0%	1116	18.8%	29.4%	53	22.5%	28.5%		
Inside a suburban county of the MSA	115	3.2%	8.2%	229	3.9%	7.9%	16	6.8%	15.9%		
Not in a MSA	500	14.0%	8.0%	1146	19.3%	12.0%	44	18.6%	11.2%		
Education										0.0523	0.0158
Elementary or less	174	4.9%	3.9%	407	6.9%	5.9%	6	2.5%	1.6%		
Some high school	266	7.4%	7.8%	423	7.1%	6.7%	7	3.0%	2.5%		
High school graduate	775	21.7%	22.9%	1424	24.0%	23.7%	57	24.2%	18.0%		
Some college or technical school	983	27.5%	27.5%	1449	24.4%	24.0%	63	26.7%	23.6%		
College graduate or more	1377	38.5%	38.0%	2230	37.6%	39.7%	103	43.6%	54.2%		
Marital status										0.0042	0.0269
Married	2009	56.2%	65.2%	4010	67.6%	70.5%	171	72.5%	81.2%		
Divorced	623	17.4%	11.0%	725	12.2%	7.6%	36	15.3%	9.6%		
Widowed	109	3.0%	1.2%	268	4.5%	1.5%	7	3.0%	0.5%		
Separated	163	4.6%	3.6%	144	2.4%	2.1%	4	1.7%	1.4%		
Never married	525	14.7%	14.5%	647	10.9%	14.7%	15	6.4%	6.3%		
A member of an unmarried couple	146	4.1%	4.6%	139	2.3%	3.5%	3	1.3%	1.1%		
Employment status										<.0001	0.7909
Employed for wages	1938	54.2%	57.6%	3295	55.5%	59.5%	128	54.2%	61.6%		
Self-employed	352	9.8%	9.0%	601	10.1%	9.5%	21	8.9%	9.6%		
Out of work	310	8.7%	9.7%	368	6.2%	7.4%	12	5.1%	4.1%		
Homemaker	409	11.4%	12.3%	660	11.1%	10.2%	26	11.0%	9.4%		
Student	90	2.5%	2.8%	141	2.4%	4.6%	3	1.3%	3.4%		
Retired	154	4.3%	2.2%	482	8.1%	4.7%	22	9.3%	5.3%		
Unable to work	322	9.0%	6.5%	386	6.5%	4.0%	24	10.2%	6.7%		
Annual household income (USD)										0.0133	0.128
<20,000	869	24.4%	20.4%	1245	21.0%	18.8%	41	17.4%	13.6%		
20,000 to <35,000	716	20.1%	19.1%	1044	17.6%	14.6%	36	15.3%	11.5%		
35,000 to <50,000	417	11.7%	11.1%	738	12.4%	11.7%	19	8.1%	8.4%		
50,000 to <75,000	487	13.7%	12.6%	904	15.2%	14.9%	39	16.5%	13.7%		
≥75,000	1068	30.0%	36.9%	2002	33.7%	40.0%	101	42.8%	52.8%		
Has health care insurance										0.4524	0.1346
Yes	2632	73.6%	73.7%	4357	73.4%	75.1%	198	83.9%	82.3%		
No	943	26.4%	26.3%	1576	26.6%	25.0%	38	16.1%	17.7%		
Has a primary health care provider(s)										0.0091	0.3365
Yes	2786	77.9%	77.3%	4592	77.4%	72.5%	205	86.9%	79.9%		
No	789	22.1%	22.7%	1341	22.6%	27.5%	31	13.1%	20.2%		
Did not access health care due to cost in past year										<.0001	0.4174
Yes	926	25.9%	25.0%	1161	19.6%	18.0%	47	19.9%	17.0%		
No	2649	74.1%	75.0%	4772	80.4%	82.0%	189	80.1%	83.0%		
HIV risk behavior(s)										0.0008	0.8046
Yes	154	4.3%	5.5%	74	1.3%	2.0%	6	2.5%	4.0%		
No	3407	95.7%	94.5%	5846	98.8%	98.1%	230	97.5%	96.0%		

*Chi-square test for significant differences between those ever and never receiving an HIV test.

**Chi-square test for significant difference between those answering yes/no to ever having received an HIV test *vs* non-responders/refusals.

Table 2. Multivariate Logistic Regression Model of Factors Associated with Ever Receiving and HIV Test by Race/Ethnicity, 2010 Texas BRFSS

	White (Non-Hispanic) (N = 5134)				Black (Non-Hispanic) (N = 703)				Hispanic (N = 3279)			
	OR	95%CI		p-value	OR	95%CI		p-value	OR	95%CI		p-value
Sex												
Male	1.00 (reference)				1.00 (reference)				1.00 (reference)			
Female	1.26	1.00	1.59	0.05	1.30	0.74	2.26	0.36	1.92	1.39	2.66	<.0001
Age												
18-24	1.00 (reference)				1.00 (reference)				1.00 (reference)			
25-34	2.45	1.20	5.01	0.01	0.64	0.16	2.52	0.52	2.63	1.35	5.13	0.005
35-44	2.53	1.24	5.18	0.01	0.59	0.17	2.11	0.42	1.81	0.93	3.54	0.08
45-54	1.09	0.53	2.23	0.81	1.36	0.37	4.94	0.64	1.25	0.63	2.49	0.52
55-64	0.78	0.38	1.61	0.49	3.79	0.98	14.60	0.05	0.70	0.33	1.47	0.35
Metropolitan area												
In the center city of a MSA	1.00 (reference)				1.00 (reference)				1.00 (reference)			
Outside the center city of a MSA	0.72	0.55	0.93	0.01	1.75	0.87	3.50	0.12	0.98	0.65	1.47	0.91
Inside a suburban county of the MSA	0.98	0.65	1.46	0.90	1.05	0.32	3.42	0.93	0.69	0.33	1.42	0.31
Not in a MSA	0.52	0.39	0.70	<.0001	3.29	1.11	9.78	0.03	0.84	0.48	1.46	0.53
Marital status												
Married	1.00 (reference)				1.00 (reference)				1.00 (reference)			
Divorced	1.47	1.03	2.09	0.03	0.52	0.21	1.28	0.15	1.75	1.06	2.90	0.03
Widowed	0.93	0.44	1.98	0.85	0.33	0.13	0.86	0.02	1.30	0.50	3.39	0.59
Separated	0.51	0.12	2.18	0.36	0.14	0.05	0.37	<.0001	1.09	0.54	2.20	0.82
Never married	0.93	0.61	1.40	0.71	0.72	0.35	1.46	0.35	1.05	0.66	1.67	0.85
A member of an unmarried couple	1.77	0.86	3.64	0.12	1.17	0.25	5.56	0.84	1.13	0.60	2.15	0.70
Employment status												
Employed for wages	1.00 (reference)				1.00 (reference)				1.00 (reference)			
Self-employed	1.28	0.91	1.80	0.16	0.43	0.11	1.63	0.22	0.75	0.43	1.29	0.29
Out of work	1.14	0.66	1.97	0.64	1.19	0.51	2.78	0.69	1.42	0.84	2.40	0.20
Homemaker	1.12	0.78	1.60	0.53	1.01	0.23	4.42	0.99	0.95	0.63	1.43	0.81
Student	0.53	0.24	1.19	0.12	1.40	0.30	6.47	0.67	0.81	0.39	1.67	0.57
Retired	0.66	0.43	1.00	0.05	0.70	0.26	1.87	0.47	0.77	0.27	2.15	0.61
Unable to work	2.15	1.37	3.36	0.001	1.21	0.52	2.82	0.66	1.42	0.82	2.46	0.21
Did not access health care due to cost in past year												
Yes	1.17	0.86	1.59	0.32	0.92	0.52	1.64	0.78	1.14	0.82	1.58	0.45
No	1.00 (reference)				1.00 (reference)				1.00 (reference)			
HIV risk behavior(s)												
Yes	2.51	1.15	5.48	0.02	0.50	0.08	3.20	0.46	2.78	1.26	6.12	0.01
No	1.00 (reference)				1.00 (reference)				1.00 (reference)			

had not engaged in such behaviors [24]. Perceptions of risk may be a better predictor of HIV testing than actual riskbehavior, and a measurement of such perceptions may be a valuable addition to the BRFSS. Since perception of risk is cited as an important predictor of HIV testing, the CDC emphasizes the need for counselors involved in HIV prevention to assist clients in developing a more accurate perception of risk [25].

Limitations of the study include those inherent to the BRFSS, namely the cross-sectional nature of the data, self-reported data which may lead to information bias, potentially ambiguous question structures, and lack of inclusion of persons without telephones [17]. Further limitations to this analysis include the inability to evaluate the association between respondent knowledge of HIV and HIV treatments and HIV testing. Knowledge about treatments for HIV may be an important predictor since knowledge about treatments may reduce the fear of receiving a positive HIV test. Additional research should examine differences in knowledge about HIV among different racial/ethnic groups in order to develop strategies for improving differential knowledge and increasing rates of HIV testing for those most at risk. Studies reported that the level of awareness of HIV and HIV treatments varies by age, race, ethnicity, and education [26].

Our findings have implications for future studies and may aid healthcare professionals working with various racial/ethnic groups at-risk for HIV/AIDS in Texas. Because there were significant differences in the rates of HIV testing by demographic characteristics, more research is needed to investigate whether men and women or individuals from different ethnic groups need specialized interventions to promote HIV testing. Finding interventions that promote increased testing among Hispanics and blacks is especially important because of their increased risk for HIV/AIDS. Since the findings indicated that Hispanics were less likely to be tested than blacks, there is a critical need for more research studying the predictors of HIV testing for this population and interventions that may improve their rate of testing.

CONFLICT OF INTEREST

No potential conflict of interest to disclose.

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