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Did CDC's 2006 Revised HIV Testing Recommendations Make a Difference? Evaluation of HIV Testing in the US Household Population, 2003–2010

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Abstract

Objective: To examine changes in the prevalence of HIV testing among adults following the Centers for Disease Control and Prevention's 2006 revised HIV testing recommendations.

Design: The 2003–2010 National Health and Nutrition Examination Survey, a nationally representative cross-sectional survey of the noninstitutionalized US population.

Methods: Weighted estimates and multivariable modeling to assess the prevalence of lifetime HIV testing, outside of blood donations, based on 13,975 respondents aged 18–59 years, comparing the 2003–2006 and 2007–2010 National Health and Nutrition Examination Survey.

Results: Overall, HIV testing was 42.1% during 2003–2006 and 44.5% during 2007–2010 ($P > 0.05$). After adjusting for significant predictors in a multivariate model, HIV testing increased from 2003–2006 to 2007–2010 (adjusted odds ratio [aOR] 1.14, $P < 0.05$), mostly among males (aOR 1.33, $P < 0.001$) as compared with females (aOR 1.02, $P > 0.05$). HIV testing also increased significantly among non-Hispanic blacks, heterosexuals, those aged 50–59 years, those without a sexually transmitted infection history, those without health insurance, and those who did not access health care in the past year. HIV testing did not change significantly among high-risk groups, including men who have sex with men, those with a history of injection or illicit drug use, and those with a sexually transmitted infection history.

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Conclusions: In multivariate modeling, we found a modest but significant increase in HIV testing overall and among males after publication of the revised recommendations for HIV testing. The significant increase in non–high-risk groups suggests an expansion in generalized HIV testing, as recommended. However, even in 2007–2010, 56% of the US population has never been tested for HIV.

Keywords

HIV; population surveillance; HIV testing; health care disparities; risk factors; Centers for Disease Control and Prevention

INTRODUCTION

In the United States, an estimated 1.2 million people are living with HIV infection and approximately 50,000 people become infected with HIV each year.[1] Of those living with HIV infection, 1 out of every 5 is undiagnosed,[2] and persons unaware of their HIV status are estimated to transmit more than half of all infections.[1,3,4] Among those aware of their seropositivity, antiretroviral treatment combined with behavior modifications that decrease high-risk behaviors prevent further HIV transmission to sexual partners.[5,6] The US Department of Health and Human Services Healthy People 2020 program includes an objective to increase the percent of HIV-positive people who know their serostatus with a target of 90% to be reached by 2020.[7] The US National HIV/AIDS Strategy aims to reach this same goal by 2015.[8,9]

In September 2006, the Centers for Disease Control and Prevention (CDC) released revised recommendations for HIV testing of adults, adolescents, and pregnant women in health care settings.[10] The revised recommendations broadened HIV screening to include all patients aged 13–64 years in all health care settings, unless the prevalence of undiagnosed HIV infection in health care providers' patient population is documented to be <0.1%. This shift from focusing testing on at-risk populations to testing all persons aged 13–64 years prompted our research question—namely, was there an increase in HIV screening for the US population and did it vary for known high- and low-risk populations after publication of the 2006 revised recommendations? This report examines changes in any self-reported HIV testing outside of blood donations by key sociodemographic, economic, and behavioral characteristics comparing the National Health and Nutrition Examination Survey (NHANES) data from 2003–2006 to 2007–2010.

METHODS

Sample Design

NHANES is a cross-sectional survey designed to provide national statistics on the health and nutritional status of the US noninstitutionalized civilian population through household interviews and standardized physical examinations, including the collection of biologic samples in Mobile Examination Centers (MECs). Starting in 1999, the survey became continuous, collecting demographic, socioeconomic, dietary, and health-related data from

approximately 5,000 US participants each year. The sampling plan for the survey is a stratified, multistage probability cluster design.[11]

From 2003 to 2006, adolescents aged 12–19 years, low-income whites, non-Hispanic blacks, Mexican Americans and persons aged 70 years and older were sampled at higher frequencies than other populations to obtain more reliable and precise estimates for these subgroups. From 2007 to 2010, oversampled subgroups included all Hispanics instead of just Mexican Americans and all other groups previously mentioned except adolescents. Informed consent was obtained for persons aged 18 years or older. More detailed information on survey design for NHANES, including approval from the CDC Research Ethics Review Board for data collection and analysis, is available from the survey documentation.[11,12]

Study Population

Deidentified nationally representative public use data files are released every 2 years and can be combined with other 2-year data releases to increase the statistical reliability of estimates. For this study, data released in 2003–2004 and 2005–2006 were combined to represent the 4-year survey period before the revised HIV testing recommendations. Similarly, the 2007–2008 and 2009–2010 survey cycles were combined to represent the 4-year period after the revised recommendations.

Measures

HIV testing history was collected at the MEC using computer-assisted personal interviewing (CAPI) during the health examination. Respondents aged 16 years and older were asked, “Except for tests you may have had as part of blood donations, have you ever had blood tested for the AIDS virus infection?” Based on the respondents’ self-reported information, race and Hispanic origin were categorized as non-Hispanic white, non-Hispanic black, and Mexican American. Respondents who did not self-identify into these 3 groups were classified as “other,” which included all non–Mexican American Hispanics and individuals reporting multiple races. The “other” category was not reported separately; however, these respondents were included when calculating estimates for the total combined population. Additional variables analyzed included age, gender, poverty index ratio (PIR) [calculated by dividing family income by a poverty threshold specific for family size using the US Department of Health and Human Services’ poverty guidelines and categorized as either below poverty (<1) or at or above poverty (≥1)],[13] education [self-categorized as having less than high school education, having completed high school or General Educational Development (GED), or having more than high school education], US military service history, any current health insurance, receipt of any health care in the past 12 months, having a regular place to receive health care, injection or illicit drug use history, sexually transmitted infection history, number of lifetime sexual partners, same-sex sexual contact history, and sexual identity.

Sensitive questions involving sexual behavior and drug use were collected using the Audio Computer-Assisted Self-Interviewing (ACASI) and CAPI systems, which allow respondents to privately listen and respond to questions delivered through a touch screen computer at the

MEC. Studies have shown ACASI to yield more complete reporting of sensitive behaviors compared with self-administered paper-based questionnaires.[14,15] Complete sexual activity and drug use data for the 4-year survey periods was only available among those aged 18–59 years; as a result, we limited our analyses to this age group. Insufficient sample size of respondents reporting a history of injection drug use resulted in merging of both the history of injection and history of illicit drug use categories. Only 1 participant who reported a history of injection drug use denied a history of illicit drug use.

Sexual activity data included lifetime number of sexual partners and history of sex with members of the same sex [men who have had sex with men (MSM) or women who have had sex with other women]. Self-reported sexual identity was coded as either heterosexual or non-heterosexual because of the insufficient sample size among individual non-heterosexual categories. Respondents were asked whether a provider had told them they had gonorrhea or chlamydia in the past 12 months and whether they were ever diagnosed with genital herpes or genital warts. Because of the small sample sizes for each self-reported sexually transmitted infection (STI) diagnosis, we used a dichotomous variable of either reporting a history of one or more STIs or none of these STIs.

Statistical Methods

To account for oversampling and nonresponse to the household interview and physical examination, all estimates for prevalence of lifetime HIV testing were weighted to represent the total civilian noninstitutionalized US household population.[16] Standard errors were calculated using software SUDAAN (release version 10.0; Research Triangle Institute, Research Triangle Park, NC). Estimates are indicated as statistically unreliable when the standard error of the estimate relative to the estimate itself was >30%. No such instance occurred for this study. Student *t*-tests were used (1) to evaluate the association between sociodemographic, economic, and behavioral characteristics and HIV testing; and (2) to examine changes in testing prevalence between 2003–2006 and 2007–2010. No corrections for multiple comparisons were made, and a $P < 0.05$ was considered statistically significant.

We then examined which variables were independently associated with HIV testing status, using a backward stepwise logistic modeling procedure in SUDAAN. All variables with significant associations from the univariate analysis, and a variable for survey period (2003–2006 vs. 2007–2010), were eligible for inclusion in the multiple logistic regression model. We tested for interactions between each variable and survey period, and each variable and gender. Variables with a Satterthwaite-adjusted F statistic of $P < 0.05$ were considered to be significant predictors and were retained in the final model for the total population. Because of significant interactions between gender and survey cycle, and gender and several predictors of HIV testing status, we also calculated univariate estimates and created multiple logistic models individually for both males and females. These gender-specific multivariate models included all variables from the final model for the total population. Four-year population estimates were calculated for 2003–2006 and 2007–2010 based on annual average data from the US Census Bureau's Current Population Survey.[17]

Response Rates

Overall, 41,156 (79%) of the 51,838 persons sampled in NHANES during 2003–2010 were interviewed in the survey. Among the interviewed, 16,240 persons were aged 18–59 years. Among the 15,704 persons (97% of those interviewed) aged 18–59 years who were examined (and therefore received questions on HIV testing and behavioral characteristics), 13,975 (89%) responded to the question on HIV testing and were included in our analysis.

RESULTS

Overall Prevalence of HIV Testing

Overall, 42.1% of US adults aged 18–59 years during 2003–2006 and 44.5% during 2007–2010 reported any lifetime history of HIV testing, outside of blood donations ($P > 0.05$, Table 1). This indicates that during 2003–2006, about 70.7 million (95% confidence interval [CI]: 67.1 to 74.4 million) had received HIV testing during their lifetime, whereas during 2007–2010, 76.8 million (95% CI: 73.8 to 79.7 million) had received testing during their lifetime. Females were significantly more likely than males to have HIV testing within both the 2003–2006 (46.9% vs. 37.2%, respectively) and 2007–2010 (48.0% vs. 41.1%, respectively) survey periods. The proportion of males tested significantly increased from 37.2% in 2003–2006 to 41.1% in 2007–2010, whereas the proportion of females tested did not change significantly (46.9% in 2003–2006 and 48.0% in 2007–2010). Other groups with significant increases in HIV testing included persons aged 50–59 years, non-Hispanic blacks, persons without health insurance coverage, persons who did not receive health care in the past 12 months, persons without a history of STIs, persons without a history of same-sex behavior, and heterosexual persons (Table 1).

Prevalence of HIV Testing by Subgroup Stratified by Gender

For males, there was a significant increase in testing between survey periods for certain subgroups (Table 2). Specifically, testing increased between survey periods from 50.3% to 61.7% among non-Hispanic black men and from 36.1% to 40.3% among non-Hispanic white men, with no significant increase among Mexican American men. Testing also significantly increased from 27.9% to 38.7% among men with less than a high school diploma or GED but not among those with more education. Significant increases between survey periods were also seen for males at or above PIR; males without health insurance; males who have a regular location for health care; males who had not received health care in the past 12 months; males with and without a history of US military service; males without a history of injection or illicit drug use; males without an STI history; males with 5–9 lifetime sexual partners; males with no history of sex with other men; and heterosexual males.

Among females, the only subgroups that experienced a significant increase in testing between survey periods were females aged 50–59 years (28.1% vs. 35.4%, $P < 0.05$) and females without health insurance coverage (43.8% vs. 50.5%, $P < 0.05$; Table 3).

Multivariate Results

After adjusting for all significant predictors of HIV testing, the odds of receiving HIV testing were significantly higher in 2007–2010 compared with 2003–2006 overall [adjusted

odds ratio (aOR) 1.14, 95% CI: 1.03 to 1.27] but varied by gender ($P < 0.05$ for interaction term). In separate multivariable models for males and females, the adjusted odds for the increase in testing over time reached statistical significance among males (aOR 1.33, 95% CI: 1.14 to 1.56) but not among females (aOR 1.02, 95% CI: 0.87 to 1.18, Table 4). HIV testing varied by age group and was significantly higher among non-Hispanic blacks as compared with non-Hispanic whites; among those with greater than a high school education compared with those with a high school diploma or GED; among those living below the poverty line compared with those at or above; among those who received health care in the past 12 months compared with those who did not; among those with a history of US military service compared with those without; among those with a history of an STI compared with those with no history; among those with a history of illicit drug use compared with those without a history; among those with a non-heterosexual sexual identity compared with heterosexuals and increased with greater numbers of lifetime sexual partners. These associations were statistically significant ($P < 0.05$) in multivariate models for the total population and among both males and females for most variables (Table 4).

DISCUSSION

CDC's revised HIV testing recommendations indicated that HIV testing should be routinely performed for all patients aged 13–64 years in health care settings. In brief, our results show that 42.1% (95% CI: 40.0% to 44.3%) of US adults aged 18–59 years during 2003–2006 and 44.5% (95% CI: 42.8% to 46.2%) during 2007–2010 reported any lifetime history of HIV testing, outside of blood donations ($P > 0.05$). In comparison, a study using data from the National Health Interview Survey reported that 38.5% (95% CI: 38.0% to 39.0%) of respondents aged 18 years and older self-reported previous HIV testing outside of blood donations in 2007–2010.[18] After adjustment for the significant predictors of HIV testing, we found that the proportion of persons reporting any previous HIV testing significantly increased, albeit modestly, from 2003–2006 to 2007–2010. This is consistent with data from the National Health Interview Survey, which also showed that from 2003 to 2010, HIV testing outside of blood donations among respondents 18 years and older increased from 35.4% (95% CI: 34.7% to 36.1%) in 2003 to 39.5% (95% CI: 38.6% to 40.4%) in 2010.[19]

Some populations experienced significant increases in HIV testing after the revised recommendations, namely, males, non-Hispanic blacks, those aged 50–59 years, those denying a history of STIs, those without current health insurance, those who did not receive health care in the past year, those who denied having same-sex sexual contact, and heterosexual persons. Excluding non-Hispanic blacks and male demographic groups, the other groups provide evidence that HIV testing has expanded beyond known at-risk groups to encompass more of the general and previously non-targeted population. Still, gains in most groups were modest, and in 2007–2010, more than half of respondents denied ever having an HIV test. Therefore, although our analysis demonstrates progress, additional work remains to ensure that testing is delivered broadly to the general population.

We did not detect a significant increase in HIV testing among known high-risk populations, including MSM, a history of injection or illicit drug use, or those reporting an STI history. Each of these groups, for whom annual HIV testing is recommended, had significantly

higher HIV testing prevalence than their counterparts (i.e., non-MSM males, those denying an injection or illicit drug use history, and those denying a history of STIs) within both survey periods. Sample sizes for these groups were small; therefore, the power to detect change and differences for these groups may have been limited. Other CDC behavioral surveillance systems, such as the National HIV Behavioral Surveillance System, which focuses on MSM, injection drug users, and heterosexuals at increased risk, may be better poised to assess changes in HIV testing behavior among these populations. Although NHANES does not currently inquire about HIV testing within the past year, 34%–44% of respondents from 2007–2010 in these aforementioned high-risk populations denied having any HIV testing outside of blood donations.

HIV testing increased significantly among persons who did not receive health care in the past year. Interpretation of this finding is difficult because NHANES does not currently assess whether a participant was tested in the past year. This increase in testing may reflect a shift from never testing to infrequently testing for persons at self-perceived low risk for infection. This was shown in a recent National Health Interview Survey analysis where perceived low risk of HIV exposure was the most common reason given for 61% of the participants during 2007–2010 who reported never receiving HIV testing.[18]

Also, the US Food and Drug Administration approved the first rapid home-use HIV test in July 2012.[20] As a result, understanding when and where participants' last HIV testing was performed will become increasingly important to understand future changes in HIV testing.

We found that significant increases in testing only occurred among males. Although females had a significantly higher prevalence of HIV testing than males in both univariate and multivariate analyses, increased testing among males indicates that disparities in HIV testing behavior between women and men are narrowing.

In 2005, CDC estimated that 15% of new infections were acquired by adults aged 50 years and older.[21] By 2015, half of all persons living with HIV in the United States will be 50 years and older.[22] Our study shows that participants aged 50–59 years were the only age group with a significant increase in HIV testing prevalence between survey periods. With the Centers for Medicare and Medicaid Services allowing Medicare reimbursement for routine HIV testing since December 2009[23] and with the US Preventive Services Task Force giving a Grade A Recommendation to screen adolescents and adults aged 15–65 years in April 2013;[24] we may continue to see increases in HIV testing among aging US populations as they can now access HIV testing more readily and without a copayment or coinsurance.[23,25]

Our study showed that the revised HIV testing recommendations are reaching populations that may not have been previously targeted but are still at risk. Persons living with HIV are more likely to be uninsured, of low income, and a racial/ethnic minority.[26–28] We also found HIV testing improvements between survey periods among non-Hispanic black and uninsured participants, and in addition, those below the PIR were more likely to have HIV testing than those living at or above poverty index ratio in all 3 models.

NHANES excludes homeless and incarcerated populations and those living on military bases who may have differing HIV risk–related behaviors and testing histories. Current or

former military members who do not live on military bases are eligible to participate in NHANES. Results show that respondents who served or are serving in the military but live outside military bases are independently more likely to have received HIV testing than other populations. Having conducted routine HIV testing since 1985, the Department of Defense instituted a standard 2-year interval between HIV-1 antibody tests for all service members in 2004.[29] This mandated HIV testing could account for the high rate of lifetime HIV testing among current and former military members.

To our knowledge, this is the first national study to assess, through multivariate analysis that adjusted for the significant predictors of HIV testing, whether CDC's updated and more comprehensive recommendations for HIV testing in clinical settings have affected the testing practices of the general US population. However, limitations include possible bias resulting from those at the highest risk not being within the scope of the NHANES sample (i.e., outside of the civilian, noninstitutionalized household population) and/or those at the highest risk being more likely to not respond to the NHANES survey. In addition, there may be reporting bias with sexual risk behaviors and illicit drug use, which may have led to underreporting by certain subpopulations. Some potential underreporting may be ameliorated by NHANES' use of ACASI and CAPI, which have been shown to elicit more comprehensive answers to potentially sensitive questions than paper-based questionnaires.[14,15] NHANES assesses lifetime history of HIV testing, and therefore we were not able to determine by means of this cross-sectional study whether testing occurred before or after 2006. In addition, availability of cofactors forced us to limit our sample to 18–59 year olds, and therefore we could not fully assess changes in HIV testing among adolescents. Finally, several subgroups experienced a nonsignificant increase in HIV testing (eg, those with military service, males with an STI history, and males with 0 and 1 lifetime number of sexual partners), possibly because of larger standard errors and smaller sample sizes in these subgroups.

In summary, we found that, after accounting for factors associated with HIV testing, there was a significant increase in lifetime HIV testing among the US population between 2003–2006 and 2007–2010. This may reflect adoption of CDC's revised recommendations for routine HIV testing in clinical settings and efforts to implement these and other testing strategies, such as CDC's Expanded Testing Initiative, which was funded during 2007–2011 and incorporated into general HIV prevention programs in 2012. Still, even in 2007–2010, less than half of US adults aged 18–59 years reported any history of HIV testing. HIV testing, which is effective, cost-effective, and scalable,[30–33] is a cornerstone of CDC's High-Impact HIV Prevention strategy.[9] Continued improvements in HIV testing can increase the proportion of HIV-infected persons who are aware of their infection and reduce HIV transmission.

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TABLE 1.

Prevalence of HIV Testing by Descriptive Characteristics and 4 Year Survey Periods, NHANES, 2003–2010

	2003–2006			2007–2010			
Variable	**Sample Size**	**Percent Ever Tested**	**95% CI**	**Sample Size**	**Percent Ever Tested**	**95% CI**	***P****
Overall	6692	42.1	40.0 to 44.3	7283	44.5	42.8 to 46.2	NS
Gender							
Male (ref)	3169	37.2	34.7 to 39.8	3641	41.1	39.2 to 43.1	<0.05
Female	3523	46.9†	44.1 to 49.8	3642	48.0†	45.7 to 50.2	NS
Age, yr							
18–19 (ref)	1037	21.4	17.6 to 25.1	519	19.4	14.8 to 23.9	NS
20–29	1696	41.7†	37.8 to 45.6	1670	43.41	40.5 to 46.2	NS
30–39	1420	54.5†	51.8 to 57.2	1700	57.3†	54.1 to 60.4	NS
40–49	1426	44.7†	40.7 to 48.7	1766	46.3†	42.8 to 49.8	NS
50–59	1113	30.7†	27.7 to 33.7	1628	36.2†	32.3 to 40.1	<0.05
Race/Hispanic origin							
Non-Hispanic white (ref)	3023	40.8	38.6 to 43.0	3122	42.9	40.6 to 45.1	NS
Non-Hispanic black	1651	56.7†	53.9 to 59.5	1443	63.9†	60.1 to 67.7	<0.01
Mexican American	1481	35.3†	31.6 to 38.9	1506	35.7†	32.8 to 38.5	NS
Education							
Less than high school diploma or GED	1589	37.9†	34.2 to 41.7	1948	42.41	39.0 to 45.9	NS
High school diploma or GED	1632	38.3†	34.7 to 42.0	1751	39.9†	37.1 to 42.6	NS
Above high school diploma or GED (ref)	3397	44.9	42.1 to 47.7	3555	47.1	45.0 to 49.3	NS
PIR							
Below PIR	1435	46.3†	42.7 to 50.0	1641	47.3	43.3 to 51.3	NS
At or above PIR (ref)	4968	41.7	39.4 to 43.9	5029	43.9	41.9 to 45.9	NS
Current health insurance coverage?							
Yes	4809	43.1†	40.8 to 45.5	4858	44.4	42.6 to 46.3	NS
No (ref)	1848	38.1	35.2 to 41.1	2417	44.9	42.4 to 47.4	<0.001
Regular location for health care?							

Variable	2003–2006 Sample Size	2003–2006 Percent Ever Tested	2003–2006 95% CI	2007–2010 Sample Size	2007–2010 Percent Ever Tested	2007–2010 95% CI	P*
Yes	5340	43.2†	40.7 to 45.6	5738	45.7†	44.0 to 47.4	NS
No (ref)	1352	37.5	33.9 to 41.1	1544	38.9	35.4 to 42.3	NS
Received health care in the past 12 months?							
Yes	5387	44.3†	42.2 to 46.5	5675	46.0†	43.9 to 48.1	NS
No (ref)	1301	32.4	28.8 to 36.0	1603	38.4	35.1 to 41.8	<0.05
History of US military service?							
Yes	461	61.2†	55.7 to 66.8	451	69.0†	62.9 to 75.1	NS
No (ref)	6231	40.4	38.3 to 42.4	6831	42.7	40.8 to 44.7	NS
History of injection or illicit drug use?							
Yes	1253	53.1†	49.2 to 57.1	1365	55.8†	52.5 to 59.1	NS
No (ref)	5293	39.5	37.2 to 41.9	5750	42.0	40.2 to 43.9	NS
History of sexually transmitted infections?‡							
Yes	531	65.7†	59.6 to 71.7	507	66.11	60.7 to 71.4	NS
No (ref)	6001	40.1	38.0 to 42.2	6572	43.2	41.5 to 44.9	<0.05
Number of lifetime sexual partners							
0	636	17.8§	14.6 to 21.0	551	20.6§	16.3 to 25.0	NS
1	939	26.3	22.3 to 30.2	889	28.0	23.9 to 32.1	NS
2–4	1569	33.7	30.4 to 37.1	1656	36.6	34.1 to 39.0	NS
5–9	1437	45.2	41.3 to 49.1	1648	47.9	44.0 to 51.8	NS
≥10	1893	58.4	55.6 to 61.1	2282	58.9	55.6 to 62.2	NS
History of same-sex sexual contact? ‖							
Yes	381	67.2†	61.7 to 72.8	482	64.5t	59.0 to 69.9	NS
No (ref)	6158	40.7	38.6 to 42.8	6612	43.5	41.8 to 45.2	<0.05
Non-heterosexual sexual identity?¶							
Yes	359	64.7†	57.0 to 72.3	435	57.3†	49.0 to 65.6	NS
No (ref)	6162	41.2	39.3 to 43.2	6621	44.2	42.6 to 45.8	<0.05

*Difference between 2003–2006 and 2007–2010.

†$P < 0.05$ for t test comparing subgroup and reference group within the survey cycle.

‡ Includes a self-reported history of chlamydia or gonorrhea in the past 12 months or a self-reported history of ever having genital herpes or genital warts.

§ $P < 0.05$ for linear test for trend across all subgroups for lifetime number of sexual partners within survey cycle.

‖ Includes men who had sex with men and women who had sex with women.

¶ Includes whether respondents thought of themselves as either non-heterosexual (homosexual, gay, bisexual, something else or not sure) or heterosexual. GED, General Educational Development; NS, not significant; ref, reference; PIR, Poverty Index Ratio.

TABLE 2.

Prevalence of HIV Testing Among Males by Descriptive Characteristics and 4 Year Survey Periods, NHANES, 2003–2010

	2003–2006			2007–2010			
Variable	**Sample Size**	**Percent Ever Tested**	**95% CI**	**Sample Size**	**Percent Ever Tested**	**95% CI**	***P****
Overall	3169	37.2	34.7 to 39.8	3641	41.1	39.2 to 43.1	<0.05
Age, yr							
18–19 (ref)	500	14.9	10.5 to 19.2	294	17.3	10.6 to 24.0	NS
20–29	742	33.3†	28.2 to 38.5	817	36.4†	31.9 to 40.9	NS
30–39	669	45.7†	41.5 to 49.9	847	51.2†	46.5 to 56.0	NS
40–49	708	40.4†	35.3 to 45.5	834	44.9†	40.0 to 49.7	NS
50–59	550	33.4†	28.7 to 38.2	849	37.0†	32.3 to 41.8	NS
Race/Hispanic Origin							
Non-Hispanic white (ref)	1436	36.1	32.9 to 39.2	1565	40.3	37.7 to 42.8	<0.05
Non-Hispanic black	794	50.3†	47.1 to 53.5	721	61.7†	56.6 to 66.8	<0.001
Mexican American	701	28.9†	24.0 to 33.8	779	29.7†	25.3 to 34.2	NS
Education							
Less than high school diploma or GED	784	27.9†	23.4 to 32.4	1011	38.7	34.1 to 43.4	<0.01
High school diploma or GED	830	36.5	31.4 to 41.7	944	37.6†	34.2 to 41.0	NS
Above high school diploma or GED (ref)	1513	40.4	36.8 to 43.9	1666	43.6	40.9 to 46.4	NS
PIR							
Below PIR	630	38.2	33.9 to 42.5	754	39.0	35.0 to 43.1	NS
At or above PIR (ref)	2406	37.2	34.6 to 39.8	2572	41.2	39.0 to 43.5	<0.05
Current health insurance coverage?							
Yes	2119	38.2†	35.4 to 41.0	2266	41.3	39.2 to 43.3	NS
No (ref)	1026	33.8	29.8 to 37.9	1372	40.8	37.6 to 43.9	<0.01
Regular location for health care?							
Yes	2277	38.2	34.9 to 41.5	2626	42.6†	40.4 to 44.8	<0.05
No (ref)	892	34.3	30.4 to 38.2	1015	36.3	32.2 to 40.4	NS
Received health care in the past 12 months?							
Yes	2250	39.7†	36.7 to 42.8	2549	43.0†	40.5 to 45.5	NS

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Variable	2003–2006 Sample Size	2003–2006 Percent Ever Tested	2003–2006 95% CI	2007–2010 Sample Size	2007–2010 Percent Ever Tested	2007–2010 95% CI	P*
No (ref)	916	30.3	26.3 to 34.3	1087	36.1	32.3 to 39.9	<0.05
History of US military service?							
Yes	401	59.7†	53.9 to 65.6	394	68.8†	62.6 to 75.1	<0.05
No (ref)	2768	33.1	30.5 to 35.7	3246	37.5	35.2 to 39.9	<0.05
History of injection or illicit drug use?							
Yes	771	47.4†	42.5 to 52.3	882	51.7†	47.1 to 56.3	NS
No (ref)	2331	34.0	31.1 to 36.8	2678	37.8	35.7 to 39.9	<0.05
History of sexually transmitted infections?‡							
Yes	175	59.5†	48.5 to 70.5	170	67.4†	58.7 to 76.1	NS
No (ref)	2917	35.9	33.3 to 38.5	3370	40.2	38.1 to 42.2	<0.05
Number of lifetime sexual partners							
0	371	18.2§	13.3 to 23.1	358	24.9§	19.4 to 30.5	NS
1	296	17.2	12.2 to 22.3	297	23.8	18.5 to 29.1	NS
2–4	606	27.3	21.8 to 32.9	636	27.3	24.0 to 30.6	NS
5–9	627	33.6	29.1 to 38.1	746	40.6	35.3 to 45.8	<0.05
10 or more	1159	53.9	50.2 to 57.5	1481	55.2	51.7 to 58.7	NS
History of same-sex sexual contact?‖							
Yes	149	72.5†	62.5 to 82.5	172	64.7†	54.8 to 74.6	NS
No (ref)	2950	35.6	33.1 to 38.0	3377	40.3	38.4 to 42.4	<0.01
Non-heterosexual sexual identity?¶							
Yes	155	68.6†	58.6 to 78.6	164	63.4†	52.1 to 74.7	NS
No (ref)	2939	36.0	33.7 to 38.3	3378	40.5	38.7 to 42.4	<0.01

*Difference between 2003–2006 and 2007–2010.

†$P < 0.05$ for t test comparing subgroup and reference group within the survey cycle.

‡Includes a self-reported history of chlamydia or gonorrhea in the past 12 months or a self-reported history of ever having genital herpes or genital warts.

§$P < 0.05$ for linear test for trend across all subgroups for lifetime number of sexual partners within survey cycle.

‖Includes men who had sex with men.

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¶Includes whether respondents thought of themselves as either non-heterosexual (homosexual, gay, bisexual, something else or not sure) or heterosexual. GED, General Educational Development; NS, not significant; ref, reference; PIR, Poverty Index Ratio.

TABLE 3.

Prevalence of HIV Testing Among Females by Descriptive Characteristics and 4 Year Survey Periods, NHANES, 2003–2010

	2003–2006			2007–2010			
Variable	**Sample Size**	**Percent Ever Tested**	**95% CI**	**Sample Size**	**Percent Ever Tested**	**95% CI**	***P****
Overall	3523	46.9	44.1 to 49.8	3642	48.0	45.7 to 50.2	NS
Age							
18–19 (ref)	537	27.9	22.6 to 33.2	225	21.8	14.5 to 29.1	NS
20–29	954	50.3†	45.9 to 54.7	853	50.7†	47.4 to 54.0	NS
30–39	751	63.1 †	59.3 to 66.9	853	63.5†	60.3 to 66.6	NS
40–49	718	48.7†	43.4 to 54.0	932	47.8†	43.3 to 52.2	NS
50–59	563	28.1	23.7 to 32.5	779	35.4†	30.4 to 40.4	<0.05
Race/Ethnicity							
Non-Hispanic white (ref)	1587	45.5	42.2 to 48.8	1557	45.5	42.4 to 48.6	NS
Non-Hispanic black	857	62.2†	58.2 to 66.2	722	65.9†	61.7 to 70.1	NS
Mexican American	780	42.6	37.7 to 47.5	727	43.3	39.9 to 46.6	NS
Education							
Less than high school diploma or GED	805	49.3	44.5 to 54.1	937	46.5	42.4 to 50.6	NS
High school diploma or GED	802	40.4†	36.2 to 44.7	807	42.5†	37.7 to 47.3	NS
Above high school diploma or GED (ref)	1884	48.9	45.2 to 52.5	1889	50.4	47.6 to 53.2	NS
PIR							
Below PIR	805	53.1†	47.8 to 58.5	887	54.3†	48.8 to 59.7	NS
At or above PIR (ref)	2562	46.1	42.6 to 49.7	2457	46.7	44.1 to 49.3	NS
Current health insurance coverage?							
Yes	2690	47.6	44.3 to 50.8	2592	47.4	44.9 to 49.9	NS
No (ref)	822	43.8	39.4 to 48.2	1045	50.5	46.8 to 54.1	<0.05
Regular location for health care?							
Yes	3063	47.2	44.1 to 50.4	3112	48.5	46.3 to 50.7	NS
No (ref)	460	44.5	38.4 to 50.7	529	44.2	38.0 to 50.5	NS
Received health care in the past 12 months?							
Yes	3137	48.0†	45.0 to 51.0	3126	48.6	46.0 to 51.1	NS

Variable	2003–2006 Sample Size	2003–2006 Percent Ever Tested	2003–2006 95% CI	2007–2010 Sample Size	2007–2010 Percent Ever Tested	2007–2010 95% CI	P*
No (ref)	385	37.8	31.5 to 44.0	516	43.7	38.5 to 48.8	NS
History of US military service?							
Yes	60	76.0†	57.4 to 94.7	57	69.7†	51.5 to 88.0	NS
No (ref)	3463	46.5	43.8 to 49.2	3585	47.5	45.1 to 50.0	NS
History of injection or illicit drug use?							
Yes	482	61.8†	56.1 to 67.6	483	62.9†	57.1 to 68.6	NS
No (ref)	2962	44.3	41.3 to 47.4	3072	45.8	43.7 to 47.9	NS
History of sexually transmitted infections?‡							
Yes	356	69.1†	62.7 to 75.5	337	65.5†	59.0 to 72.0	NS
No (ref)	3084	44.4	41.5 to 47.4	3202	46.5	44.0 to 48.9	NS
Number of lifetime sexual partners							
0	265	17.1§	11.1 to 23.1	193	13.2§	8.2 to 18.2	NS
1	643	31.4	26.8 to 36.0	592	30.8	25.2 to 36.3	NS
2–4	963	38.2	32.8 to 43.6	1020	42.7	38.8 to 46.7	NS
5–9	810	55.0	50.6 to 59.4	902	54.3	49.6 to 58.9	NS
≥10	734	65.4	61.5 to 69.3	801	65.1	60.5 to 69.7	NS
History of same-sex sexual contact?‖							
Yes	232	63.7†	57.7 to 69.7	310	64.3†	58.1 to 70.6	NS
No (ref)	3208	45.9	42.9 to 48.8	3235	46.8	44.4 to 49.3	NS
Non-heterosexual sexual identity?¶							
Yes	204	61.4†	52.2 to 70.7	271	53.8	45.4 to 62.1	NS
No (ref)	3223	46.4	43.6 to 49.2	3243	48.1	45.8 to 50.5	NS

*Difference between 2003–2006 and 2007–2010.

†$P < 0.05$ for t test comparing subgroup and reference group within the survey cycle.

‡Includes a self-reported history of chlamydia or gonorrhea in the past 12 months or a self-reported history of ever having genital herpes or genital warts.

§$P < 0.05$ for linear test for trend across all subgroups for lifetime number of sexual partners within survey cycle.

‖Includes women who had sex with women.

¶Includes whether respondents thought of themselves as either non-heterosexual (homosexual, gay, bisexual, something else or not sure) or heterosexual. GED, General Educational Development; NS, not significant; ref, reference; PIR, Poverty Index Ratio.

TABLE 4.

Multivariate Logistic Model of HIV Testing Prevalence for the Total Population and by Gender, NHANES, 2003–2010

	Total Population			Males			Females		
Variable	**aOR**	**95% CI**	**P**	**aOR**	**95% CI**	**P**	**aOR**	**95% CI**	**P**
Survey cycle									
NHANES 2003–3006	Ref			Ref			Ref		
NHANES 2007–2010 *	1.14	1.03 to 1.27	<0.05	1.33	1.14 to 1.56	<0.001	1.02	0.87 to 1.18	NS
Gender									
Male	0.57	0.51 to 0.64	<0.001	N/A			N/A		
Female	Ref								
Age, yr									
18–19	Ref			Ref			Ref		
20–29	2.30	1.82 to 2.91	<0.001	2.01	1.35 to 2.99	<0.001	2.52	1.85 to 3.42	<0.001
30–39 *	3.65	2.88 to 4.62	<0.001	2.88	2.01 to 4.12	<0.001	4.26	3.14 to 5.78	<0.001
40–49	2.31	1.86 to 2.86	<0.001	2.24	1.55 to 3.23	<0.001	2.20	1.60 to 3.02	<0.001
50–59	1.30	1.03 to 1.65	<0.05	1.28	0.89 to 1.85	NS	1.20	0.87 to 1.66	NS
Race/Hispanic Origin									
Non-Hispanic white	Ref			Ref			Ref		
Non-Hispanic black	2.09	1.80 to 2.42	<0.001	2.08	1.71 to 2.53	<0.001	2.08	1.76 to 2.47	<0.001
Mexican American *	0.99	0.88 to 1.12	NS	0.86	0.71 to 1.05	NS	1.11	0.94 to 1.32	NS
Education									
Less than high school diploma or GED	0.83	0.69 to 1.00	NS	0.76	0.59 to 0.96	<0.05	0.90	0.72 to 1.14	NS
High school diploma or GED	0.79	0.69 to 0.89	<0.001	0.81	0.69 to 0.95	<0.01	0.77	0.63 to 0.95	<0.05
Above high school diploma or GED	Ref			Ref			Ref		
PIR									
Below PIR	1.28	1.10 to 1.49	<0.01	1.23	1.01 to 1.51	<0.05	1.30	1.05 to 1.62	<0.05
At or above PIR	Ref			Ref			Ref		
Received health care in the past 12 months?									
Yes	1.34	1.17 to 1.54	<0.001	1.27	1.05 to 1.53	<0.05	1.36	1.07 to 1.74	<0.05
No	Ref			Ref			Ref		
History of US military service									

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	Total Population			Males			Females		
Variable	**aOR**	**95% CI**	**P**	**aOR**	**95% CI**	**P**	**aOR**	**95% CI**	**P**
Yes	3.22	2.63 to 3.94	<0.001	3.34	2.71 to 4.13	<0.001	2.04	1.13 to 3.68	<0.05
No	Ref			Ref			Ref		
History of injection or illicit drug use									
Yes	1.28	1.12 to 1.46	<0.001	1.37	1.15 to 1.63	<0.001	1.21	0.98 to 1.50	NS
No	Ref			Ref			Ref		
History of sexually transmitted infections?[†]									
Yes	1.70	1.35 to 2.13	<0.001	1.66	1.14 to 2.42	<0.01	1.74	1.33 to 2.26	<0.001
No	Ref			Ref			Ref		
Number of lifetime sexual partners									
0	Ref			Ref			Ref		
1[*]	1.56	1.20 to 2.02	<0.01	0.99	0.64 to 1.51	NS	2.82	1.89 to 4.21	<0.001
2–4[*]	2.04	1.58 to 2.63	<0.001	1.31	0.92 to 1.88	NS	3.79	2.49 to 5.76	<0.001
5–9[*]	2.95	2.31 to 3.76	<0.001	1.84	1.35 to 2.52	<0.001	5.80	3.92 to 8.59	<0.001
≥10[*]	4.45	3.47 to 5.71	<0.001	3.17	2.32 to 4.32	<0.001	7.64	5.10 to 11.44	<0.001
Non-heterosexual sexual identity[‡]									
Yes[*]	2.03	1.58 to 2.60	<0.001	3.97	2.88 to 5.47	<0.001	1.30	1.00 to 1.68	NS
No	Ref			Ref			Ref		

[*] Association of subgroup with outcome significantly ($P < 0.05$) interacted with gender.

[†] Includes a history of chlamydia or gonorrhea in the past 12 months or a history of ever having genital herpes or genital warts.

[‡] Includes whether respondents thought of themselves as either non-heterosexual (homosexual, gay, bisexual, something else or not sure) or heterosexual. GED, General Educational Development; N/A, not applicable; NS, not significant; Ref, reference; PIR, Poverty Index Ratio.