HIV Infection in U.S. Household Population Aged 18–59: Data From the National Health and Nutrition Examination Survey, 2007–2012

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Abstract

Objectives—This report presents estimates of HIV prevalence, the association of HIV status with key risk factors, and the prevalence of antiretroviral drug use among HIV-infected adults, based on the 2007–2012 National Health and Nutrition Examination Survey (NHANES).

Methods—HIV prevalence was estimated based on 10,466 NHANES respondents aged 18–59 during 2007–2012. Starting in 2009, the NHANES age range for HIV antibody testing was expanded from age group 18–49 to age group 18–59. HIV prevalence for 2007–2012 was estimated using 6 years of data and corresponding weights for participants aged 18–49 from NHANES 2007–2012, and 4 years of data and corresponding weights for participants aged 50–59 from NHANES 2009–2012. This HIV prevalence calculation assumes that HIV prevalence, and the relationship between prevalence and levels of all relevant cofactors, were the same between survey periods 2007–2008 and 2009–2012 for adults aged 50–59. HIV antibody status was measured using an enzyme-linked immunosorbent assay (ELISA) to detect antibody to HIV, followed by confirmatory Western blot for those with a positive ELISA test.

Results—During 2007–2012, the overall HIV prevalence among adults aged 18–59 residing in U.S. households was 0.39%. Men were more likely to be HIV-infected than women, and non-Hispanic black persons were more likely to be HIV-infected than all other race and Hispanic origin subgroups combined. HIV infection was associated with high-risk populations, including those with herpes simplex virus type 2 infection, 10 or more lifetime sexual partners, a history of prior sexually transmitted infection, or a history of same-sex sexual contact among men. One-half of HIV-infected adults were on antiretroviral therapy (51.9%). Among HIV-infected adults, 86.1% reported any lifetime history of HIV testing outside of blood donations.

Keywords: HIV testing • risk factors • population surveillance • health care disparities

Introduction

In the United States, 1.2 million people are living with HIV, and an estimated 50,000 people become infected with HIV each year (1). Approximately one of every five HIV-infected persons is undiagnosed (2), and persons unaware of their HIV status are estimated to transmit more than one-half of all infections (1,3,4). To help attain a national goal of having 90% of HIV-positive people become aware of their status by 2020 (5), delivering cost-effective, evidence-based, and scalable programs to at-risk populations has been shown to increase awareness of HIV status and reduce HIV transmission (6–9). Monitoring national trends of HIV prevalence and HIV risk factors remain important national health surveillance activities to better understand the health behaviors and characteristics influencing these trends.

The National Health and Nutrition Examination Survey (NHANES) is a cross-sectional survey designed to provide national statistics on the health and nutritional status of the noninstitutionalized civilian U.S. 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 U.S. participants each year (10). Based on NHANES 1999–2006, the prevalence of HIV infection among adults aged 18–49 residing in U.S. civilian households was 0.47% (11). This report provides HIV prevalence estimates from NHANES 2007–2012, describes the association of HIV status with key risk factors, and examines the prevalence of antiretroviral (ARV) drug use among HIV-infected adults.

Methods

Sample design

The NHANES sample is selected through a complex, multistage probability cluster design representative of all ages of the U.S. household population. Certain subgroups are sampled at higher frequencies than other subgroups to obtain more reliable estimates. In NHANES 2007–2012, non-Hispanic black, Mexican American, and all Hispanic persons were targeted for oversampling. Starting in 2011, Asian persons were also oversampled. Data files are released every 2 years and can be combined to produce more statistically reliable estimates. All participants provided informed consent, and the NHANES protocol was approved by the Research Ethics Review Board of the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS). More detailed information on NHANES is available elsewhere (10,12,13).

Measures

In 2005, CDC estimated that 15% of new HIV infections were acquired by adults aged 50 and over (14). By 2015, one-half of all persons living with HIV in the United States will be aged 50 and over (15). During 2007–2008, HIV antibody status was measured from the serum of examined sample persons aged 18–49. Starting in 2009, the age range for HIV antibody testing

was expanded to include ages 50–59. NHANES participants aged 50–59 were the only age group from 2003–2006 to 2007–2010 to show a significant increase in the percentage having ever been tested for HIV (16). The expansion of the age range to include ages 50–59 was done to accommodate the aging demographics of HIV postroutine use of antiretroviral combination treatment. This expansion was also done to accommodate numerous requests for HIV test results from NHANES participants over the age of 50 who called to receive their sexually transmitted infection (STI) results. All participants provided consent for HIV testing. Blood was drawn by trained phlebotomists in the MEC and tested using an enzyme-linked immunosorbent assay (ELISA) to detect antibody to HIV, followed by confirmatory Western blot for those with positive ELISA tests. Herpes simplex virus type 2 (HSV–2) status was measured in examined sample persons aged 18–49 from NHANES 2007–2012. Blood was tested by type-specific immunodot assays to detect anti-HSV–2 antibodies (17).

Sensitive questions involving sexual behavior, drug use, STIs, and HIV testing status were collected in the MEC using the audio computer-assisted self-interviewing (ACASI) and computer-assisted personal interviewing (CAPI) systems, which allow respondents to privately listen to and respond to questions delivered through a touch-screen computer. Studies have shown ACASI to yield more complete reporting of sensitive behaviors compared to self-administered, paper-based questionnaires (18,19). For lifetime history of HIV testing status, respondents aged 18 and over 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?" Drug use was classified as any drug use compared with none, based on a self-reported response to specific questions on cocaine or other street-drug use as well as injection-drug use during a lifetime. More specifically, respondents aged 18 and over were asked: "Have you ever, even once, used cocaine, in any form?"; "Have you ever, even once, used methamphetamine?"; "Have you ever, even once, used heroin?"; "Have you ever, even once,

used a needle to inject a drug not prescribed by a doctor?"; and "Which of the following drugs have you injected using a needle?" Insufficient sample size of injection-drug users resulted in the merging of injection and illicit drug use categories, with only one participant reporting injection drug use who denied any illicit drug use. Sexual activity data included lifetime number of sexual partners (LSP) and history of men who have had sex with men.

Additional variables that were collected during the household interviews included: age; sex; poverty index ratio (calculated by dividing family income by a poverty threshold specific for family size, using the U.S. Department of Health and Human Services' poverty guidelines and categorized as either below poverty [less than 1] or at or above poverty [1 or more]) (20); education (self-categorized as having less than high school education, having completed high school or General Educational Development [GED] high school equivalency diploma, or having more than a high school education); receipt of any health care in the past 12 months; and any current health insurance. Race and Hispanic origin were based on the respondents' self-reported information and categorized as non-Hispanic white, non-Hispanic black, and Mexican American. Respondents who did not self-identify among these three groups were classified as "other," which included all non-Mexican-American Hispanic persons and persons reporting multiple races. Estimates for the "other" category were not reported separately; however, these respondents were included when calculating estimates for the total population. Use of ARV drugs was determined from the Dietary and Prescription Medication Section of the Sample Person Questionnaire. The prescription medication questionnaire was administered, in the home, by trained interviewers using the CAPI system. Survey participants were asked if they had taken a prescription medication in the past 30 days. Those who answered "yes" were asked to show the interviewer the medication containers of all prescription medications. For each drug reported, the interviewer recorded the product's complete name from the container (6). See Technical Notes for a list of the

classes of ARV medication identified and included in the analysis.

Respondents were also asked if 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. Small sample sizes for each self-reported STI resulted in dichotomous coding of either reporting a history of one or more STIs or none of these STIs.

A variable designating whether the individual was a member of any of the higher-risk groups was created. All persons who reported 10 or more lifetime number of sexual partners, were positive for HSV–2 (measured only for ages 18–49), reported ever having same-sex sexual contact (among men only), reported a history of an STI, or reported ever using injection or illicit drugs were designated as a member of that higher-risk group. Given that HSV–2 was limited to testing among those aged 18–49, this higher-risk variable was also limited to respondents aged 18–49.

Sample weighting

Examination sample weights, which account for the differential probabilities of selection, nonresponse, and noncoverage, are incorporated into the estimation process. Data from the three survey cycles (2007–2008, 2009–2010, and 2011–2012) were combined to create more stable estimates. As described earlier, the age range for HIV antibody testing was expanded in 2009 to include ages 50–59. As a result, HIV serologic testing data was available for persons aged 18–59 during 2009–2012, but only for persons aged 18–49 during 2007–2008. Because HIV prevalence is very low, with a corresponding small number of HIV-infected adults, the analysis seeks to use the full age range and the full 6 years of data. Restricting the sample to 2009–2012 would result in losing 23% of HIV-infected participants (12 out of 52) and 27% of the analysis sample. Similarly, 23% of HIV-infected participants (12 out of 52) and 33% of the analysis sample would be lost if those aged 50–59 were not included in the analyses. The distribution of the final sample by all demographic and high-risk variables is detailed in Table 1.

A single estimate was created for those aged 18–49, based on 6 years of data (2007–2012) and the applicable 6-year weights, by dividing the 2-year weights for each survey cycle by 3, as recommended in the analytic guidelines (13). For those aged 50–59, a single estimate for 2007–2012 was created, based on 4 years of data (2009–2012) and the applicable 4-year weights, by dividing the 2-year weights by 2, as recommended in the analytic guidelines. Using only the 4 years of data from 2009–2012 instead of 2007–2012 to calculate estimates for 2007–2012 required that the prevalence of HIV during 2007–2008 did not differ from the other 4 years (2009–2012), and that relationships between HIV and the cofactors analyzed also were not different during 2007–2008 compared with 2009–2012. A sensitivity analysis was conducted to validate these assumptions.

Sensitivity analysis

The first step in assessing the aforementioned assumptions was to compare the distributions of all potential demographic and behavioral risk factors for HIV positivity between those aged 50–59 in 2007–2008 without HIV serology and those aged 50–59 in 2009–2012 who had HIV serologic results, to determine whether the distributions of these factors were similar (Table 2). Compared with adults aged 50–59 from NHANES 2007–2008, those aged 50–59 from 2009–2012 had a higher percentage of ever using injection or illicit drugs ($p < 0.05$), a higher percentage with 10 or more LSPs compared to 0–4 LSPs ($p < 0.01$), and a lower percentage with health insurance ($p < 0.05$) (Table 2). No differences were found between the two groups with respect to all other demographic or risk factor variables examined in the analyses. Because a difference was found between the two samples for only one significant predictor of HIV positivity in the analysis (10 or more LSPs), the estimate of HIV prevalence for those aged 50–59 from NHANES 2007–2012 based on 2009–2012 data overall should be similar but may be somewhat greater than the true estimate for this age group over this time period.

The results from the original analysis using 2007–2012 data with 4-year weights for sample persons aged 50–59 and 6-year weights for ages 18–49 (Table 3) were compared with the results from an analysis of only 4 years of data from 2009–2012 for sample persons aged 18–59 (Table 4). Patterns and relationships were the same in both analyses. *P* values were less significant in some comparisons using the 2009–2012 data as expected, because the sample size was reduced by 27%.

Similarly, the original analysis presented in this report was compared with an analysis of those aged 18–49 for 2007–2012 (data not shown). Again, patterns and differences were very similar to the original analysis, except that in the current analysis, no difference was found in the percentage of adults aged 18–49 who either received or did not receive health care in the past 12 months. As a result of the similar patterns in all three analyses, results for ages 18–59 for NHANES 2007–2012 were presented based on analysis using the 4-year weights for participants aged 50–59 and 6-year weights for those aged 18–49.

Statistical methods

Standard error estimates were calculated using Taylor series linearization in SUDAAN version 10.0 (RTI International, Research Triangle Park, N.C.), a method that accounts for the complex sample design. Ninety-five percent confidence intervals (95% CI) were computed using the Clopper-Pearson exact binomial method (21).

The relative standard error (RSE), defined as the estimate divided into its standard error, is an indicator for statistical reliability. Estimates should be interpreted as statistically unreliable when the standard error of the estimate relative to the estimate itself (RSE) is greater than 40% or when the estimate is based on fewer than 10 HIV-infected sample persons. Because HIV prevalence is very low overall in the U.S. noninstitutionalized population, a more liberal cutoff to designate an unstable estimate of an RSE greater than 40% was used instead of the cutoff normally recommended in the analytic guidelines of RSE more than 30% (13).

This criterion was used in previously published reports on HIV prevalence using NHANES data (11). The exact RSEs and the number of individuals in the numerator (i.e., those positive for the outcome) are provided in all tables to allow interpretation of the stability of all estimates. Because most HIV-infected adults (86.11%) had prior HIV testing, the RSE for those without prior HIV testing is reported in Table 5 for use in examining the instability of estimates for those with prior HIV testing.

Differences in HIV prevalence between groups were tested using a Student's t statistic from a linear contrast procedure in SUDAAN with a p value of less than 0.05 considered statistically significant. No corrections for multiple comparisons were made. Estimates for the prevalence of ARV use among HIV-infected adults (Table 5), and any lifetime history of HIV testing among HIV-infected adults (Table 6), were based on a total of 52 HIV-infected sample persons. The number of HIV-infected adults using ARV drugs, as well as the number of HIV-infected adults without any prior HIV testing, were both almost always very small (less than 10) with corresponding high RSEs (more than 40%) when examined by variable subgroups. The number of degrees of freedom in these subgroups was also very small, indicating that the standard error estimates are also unstable. Despite these limitations, estimates are presented to show the relative size of the differences found; however, due to instability of the estimates, statistical tests comparing subgroups for each of the cofactors reported were not performed.

Response rates

In NHANES 2007–2012, 73% of those sampled aged 20–59 were examined. Among those examined who were aged 18–59, 86% or 10,466 persons had serologic testing for HIV. This equates to an approximate overall response rate of 63% of those sampled who had HIV serologic results.

Results

Table 1 provides sociodemographic characteristics and high-risk behaviors

among U.S. adults aged 18–59. Thirty-five percent of adults reported having 10 or more sexual partners, 17.4% were positive for HSV–2 (ages 18–49), 9.0% reported a history of an STI, and 20.9% reported ever using injection or illicit drugs. Five percent of men aged 18–59 reported having had a male sexual encounter. Overall, 52.8% of adults aged 18–49 were in one or more of these high-risk behavior groups.

HIV prevalence

Overall, the HIV prevalence among adults residing in U.S. households aged 18–59 from NHANES 2007–2012 was 0.39% (95% CI: 0.22%–0.62%). HIV prevalence increased with age, from 0.24% among those aged 18–39 to 0.64% among those aged 50–59, but the increase with age was not statistically significant. Non-Hispanic black persons had a higher prevalence of HIV infection (1.6%) compared with all other race and Hispanic origin subgroups combined (0.23%) ($p < 0.001$). HIV infection was more than three times greater among men (0.61%) compared with women (0.16%) ($p < 0.01$). No difference was noted in HIV prevalence with respect to education, poverty index ratio, or current health insurance status. Participants who received health care in the past 12 months (0.45%) were more likely to be HIV-infected than those who did not receive health care in the past 12 months (0.13%) ($p < 0.05$) (Table 3).

HIV prevalence increased with the number of LSPs: 0.14% for those with 0–4 LSPs, 0.21% for those with 5–9 LSPs, and 0.68% for those with 10 or more LSPs. HIV prevalence was higher among those with a self-reported STI history (1.8% compared with 0.23% without STI history) ($p < 0.05$), among males reporting ever having had same-sex sexual contact (7.7% compared with 0.17% without such contact) ($p < 0.01$), and among ages 18–49 positive for HSV–2 (1.2% compared with 0.11% negative for HSV–2) ($p < 0.01$). Although HIV prevalence was higher among those reporting ever using injection or illicit drugs (0.79% compared with 0.24% denying ever using injection or illicit drugs), the difference between these subgroups did not reach statistical

significance. HIV prevalence was higher among adults in one or more of the higher-risk groups (0.56%, ages 18–49 only) compared with those lacking a history of being in any of the higher-risk groups (0.05%) ($p < 0.001$) (Table 3).

ARV drug use among HIV-infected adults

Approximately one-half of HIV-infected adults (51.9%, 95% CI: 32.5%–70.9%) used antiretroviral drugs in the past month. Estimates for this variable were based on a limited number of HIV-infected persons in each cell (3–52) with very small numbers of persons taking ARV drugs (0–20). The resulting estimates are highly unstable and have very wide 95% CIs. In addition, the estimate of the variance is also unstable due to the few degrees of freedom represented in each subgroup (0–7). ARV drug use appears to be higher among non-Hispanic white (88.4%) compared with non-Hispanic black (30.7%) persons, and among men (61.5%) compared with women (16.7%); increased with age (22.9% for ages 18–39, 45.2% for ages 40–49, and 80.1% for ages 50–59); and was greater among those with health insurance coverage (58.7%) compared with those lacking insurance coverage (16.2%). ARV drug use was also greater among subgroups associated with high risk for HIV infection—namely, those with 10 or more LSPs, men reporting ever having same-sex sexual contact, those reporting a history of an STI, those positive for HSV–2 (among ages 18–49 only), and those reporting use of cocaine or other street drugs (Table 5). The statistical significance of these differences is not presented due to the instability of the estimates and their variance.

Lifetime history of HIV testing among HIV-infected adults

Among HIV-infected adults, 86.1% (95% CI: 69.5%–95.7%) reported any lifetime history of HIV testing outside of blood donations compared with 43.5% (95% CI: 41.7%–45.3%) of HIV-negative adults. History of HIV testing among

HIV-infected adults appeared to be greater among men (94.1%) than women (61.0%); among those with 5–9 LSPs or 10 or more LSPs (more than 90% each) compared with those reporting 0–4 LSPs (59.7%); among men reporting ever having had same-sex sexual contact (100%) compared with men denying ever having had such contact (79.1%); and among those reporting a history of an STI (100%) compared with those lacking an STI history (82.0%). Similar to the analysis of ARV use among HIV-infected adults mentioned above, these estimates were also highly unstable based on small sample sizes (range of 3–50), small cell sizes (0–7 persons not tested among some groups of HIV-infected adults), and limited number of degrees of freedom (0–6) (Table 6). Therefore, the statistical significance of these differences was not presented.

Conclusion

This report presents the most recent estimates on HIV prevalence in the United States, the association of HIV status with key risk factors, and the prevalence of ARV drug use among HIV-infected adults, based on ages 18–59 in the U.S. household population. During 2007–2012, the prevalence of HIV infection among adults aged 18–59 residing in U.S. households was 0.39%. A previous NHANES report showed HIV prevalence among adults aged 18–49 was 0.47% during 1999–2006 (11). 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—incarcerated, institutionalized, or homeless populations, among others), or those at the highest risk being more likely not to respond to the survey. In addition, reporting bias may exist 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 (18,19).

Among those aged 18–49, no significant change was noted in HIV prevalence from 1999–2006 (0.47%, 95% CI: 0.33%–0.64%) to 2007–2012 (0.31%, 95% CI: 0.19%–0.47%) ($p > 0.05$) (analysis not shown). During 2007–2012, HIV infection remained higher among men than women and among non-Hispanic black persons than other race and ethnicity groups combined. Additionally, a history of participating in any high-risk group, having received health care in the past 12 months, HSV–2 infection, or a history of 10 or more LSPs, same-sex sexual contact among men, or a history of STI were associated with HIV infection.

References

1. CDC. Vital signs: HIV prevention through care and treatment—United States. MMWR 60(47):1618–23. 2011.
2. CDC. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 U.S. dependent areas—2010. HIV Surveill Suppl Rep 17 (3 Pt A). 2012. Available from: http://www.cdc.gov/hiv/library/reports/surveillance/2010/surveillance_report_vol_17_no_3.html.
3. Hall HI, Song R, Rhodes P, Prejean J, An Q, Lee LM, et al. Estimation of HIV incidence in the United States. JAMA. 300(5):520–9. 2008.
4. Marks G, Crepaz N, Janssen RS. Estimating sexual transmission of HIV from persons aware and unaware that they are infected with the virus in the USA. AIDS. 20(10):1447–50. 2006.
5. U.S. Department of Health and Human Services. Healthy People 2020: 2020 topics and objectives. Available from: http://www.healthypeople.gov/2020/topicsobjectives2020/default.aspx.
6. Walensky RP, Weinstein MC, Kimmel AD, Seage GR 3rd, Losina E, Sax PE, et al. Routine human immunodeficiency virus testing: An economic evaluation of current guidelines. Am J Med 118(3):292–300. 2005.
7. Paltiel AD, Weinstein MC, Kimmel AD, Seage GR 3rd, Losina E, Zhang H, et al. Expanded screening for HIV in the United States—an analysis of cost-effectiveness. N Engl J Med; 352(6):586–95. 2005.
8. Sanders GD, Bayoumi AM, Sundaram V, Bilir SP, Neukermans CP, Rydzak CE, et al. Cost-effectiveness of screening for HIV in the era of highly active antiretroviral therapy. N Engl J Med 352(6):570–85. 2005.
9. Paltiel AD, Walensky RP, Schackman BR, Seage GR 3rd, Mercincavage LM, Weinstein MC, et al. Expanded HIV screening in the United States: Effect on clinical outcomes, HIV transmission, and costs. Ann Intern Med 145(11):797–806. 2006.
10. Zipf G, Chiappa M, Porter KS, et al. National Health and Nutrition Examination Survey: Plan and operations, 1999–2010. National Center for Health Statistics. Vital Health Stat 1(56). 2013.
11. McQuillan G, Kruszon-Moran D. HIV infection in the United States household population aged 18–49 years: Results from 1999–2006. NCHS data brief, no 4. Hyattsville, MD: National Center for Health Statistics. 2008.
12. National Center for Health Statistics. About the National Health and Nutrition Examination Survey, NHANES file documentation. Available from: http://www.cdc.gov/nchs/nhanes/about_nhanes.htm.
13. National Center for Health Statistics. National Health and Nutrition Examination Survey: Survey methods and analytical guidelines. Available from: http://www.cdc.gov/nchs/nhanes/survey_methods.htm.
14. CDC. HIV/AIDS surveillance report: Cases of HIV infection and AIDS in the United States and dependent areas, 2005. Vol 17:1–54, rev ed. Atlanta, GA. 2007. Available from: http://www.cdc.gov/hiv/pdf/statistics_2005_hiv_surveillance_report_vol_17.pdf.
15. Kirk JB, Goetz MB. Human immunodeficiency virus in an aging population, a complication of success. J Am Geriatr Soc 57(11):2129–38. 2009.
16. 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 67(3):331–40. 2014.
17. National Center for Health Statistics. National Health and Nutrition Examination Survey (NHANES) laboratory procedures manual. 2011. Hyattsville, MD. Available from: http://www.cdc.gov/nchs/data/nhanes/nhanes_11_12/2011-12_Laboratory_Procedures_Manual.pdf.
18. Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: Increased reporting with computer survey

technology. Science 280(5365):867–73. 1998.

19. O'Reilly JM, Hubbard ML, Lessler JT, Biemer PP, Turner CF. Audio and video computer-assisted self interviewing: Preliminary tests of new technologies for data collection. J Off Stat 10(2):197–214. 1994.

20. U.S. Department of Health and Human Services. Poverty guidelines. Available from: http://aspe.hhs.gov/poverty-guidelines.

21. Korn EL, Graubard BI. Confidence intervals for proportions with small expected number of positive counts estimated from survey data. Survey Methodol 24:193–201. 1998.

Table 1. Sample description for ages 18–59, by demographic and high-risk groups: National Health and Nutrition Examination Survey, 2007–2012

Variable	Sample size	Percent of sample population	95% CI
Sex:			
Male	10,466	49.6	48.6–50.7
Female	10,466	50.4	49.3–51.5
Age (years):			
18–39	10,466	50.8	48.4–53.2
40–49	10,466	25.3	24.0–26.7
50–59	10,466	23.9	21.9–25.9
Race and Hispanic origin:			
Non-Hispanic white	10,466	64.9	60.2–69.3
Non-Hispanic black	10,466	11.7	9.7–14.0
Mexican American	10,466	9.9	7.6–12.6
All nonblack	10,466	88.3	86.0–90.4
Education:			
Less than high school diploma or GED	10,458	17.8	15.9–19.6
High school diploma or GED	10,458	22.1	20.6–23.7
More than high school diploma or GED	10,458	60.2	57.4–62.9
Poverty index ratio:			
Below PIR	9,615	17.8	16.0–19.8
At or above PIR	9,615	82.2	80.2–84.1
Current health insurance coverage?			
Yes	10,451	75.0	73.2–76.8
No	10,451	25.0	23.2–26.8
Received health care in past 12 months?			
Yes	10,459	80.4	79.2–81.5
No	10,459	19.6	18.5–20.8
Number of lifetime sexual partners:			
0–4	9,151	40.3	38.6–42.0
5–9	9,151	24.9	23.6–26.3
10 or more	9,151	34.8	33.1–36.5
Herpes simplex virus type 2 infection status[1]:			
Positive	8,796	17.4	16.2–18.6
Negative	8,796	82.7	81.4–83.8
History of same-sex sexual contact? (men only):			
Yes	4,642	5.1	3.9–6.6
No	4,642	94.9	93.4–96.1
History of sexually transmitted infection?[2]			
Yes	9,023	9.0	8.2–9.9
No	9,023	91.0	90.1–91.8
Ever used injection or illicit drugs?			
Yes	9,246	20.9	19.4–22.4
No	9,246	79.1	77.6–80.6
History of participation in any higher-risk group?[1,3]			
Yes	7,808	52.8	51.4–54.3
No	7,808	47.2	45.7–48.6

[1]Measured only for ages 18–49.
[2]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.
[3]Includes those with 10 or more lifetime sexual partners, positive for herpes simplex virus type 2, with a history of same-sex sexual contact (men only), with a history of sexually transmitted infection, or with a history of injection or illicit drug use.
NOTE: CI is confidence interval, GED is General Educational Development high school equivalency diploma, and PIR is poverty index ratio.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2007–2012.

Table 2. Sample description for ages 50–59, by demographic and high-risk groups: National Health and Nutrition Examination Survey, 2007–2008 and 2009–2012

Variable	Sample population aged 50-59, 2007–2008		Sample population aged 50-59, 2009–2012		P value[1]
	Percent	95% CI	Percent	95% CI	
Sex:					
Male	48.8	44.9–52.8	49.7	46.7–52.8	NS
Female	51.2	47.2–55.1	50.3	47.2–53.3	…
Race and Hispanic origin:					
Non-Hispanic white	71.7	62.7–79.3	73.1	67.3–78.3	NS
Non-Hispanic black	10.6	6.8–16.2	10.9	8.4–14.0	…
Mexican American	5.9	3.4–10.0	5.6	3.7–8.3	…
All nonblack	89.4	83.8–93.2	89.1	86.0–91.6	…
Education:					
Less than high school diploma or GED	17.1	13.7–21.2	16.3	13.5–19.6	NS
High school diploma or GED	25.7	21.0–31.0	22.3	20.0–24.7	…
More than high school diploma or GED	57.2	50.5–63.7	61.4	57.4–65.3	…
Poverty index ratio:					
Below PIR	8.6	6.0–12.1	12.3	10.1–15.0	NS
At or above PIR	91.4	87.9–94.0	87.7	85.0–89.9	…
Current health insurance coverage?					
Yes	85.8	82.2–88.7	81.1	77.8–84.0	< 0.05
No	14.2	11.3–17.8	18.9	16.0–22.2	…
Received health care in past 12 months?					
Yes	87.4	84.3–89.9	85.1	82.2–87.5	NS
No	12.6	10.1–15.7	14.9	12.5–17.8	…
Number of lifetime sexual partners:					
0–4	47.1	43.8–50.4	38.0	34.1–42.1	< 0.01
5–9	25.5	22.0–29.3	26.1	22.7–29.8	…
10 or more	27.5	23.1–32.3	35.9	31.9–40.0	…
History of same-sex sexual contact? (men only):					
Yes	4.5	2.6–7.7	5.9	3.3–10.4	NS
No	95.5	92.3–97.4	94.1	89.6–96.7	…
History of sexually transmitted infection?[2]					
Yes	6.8	4.4–10.4	9.2	7.0–11.9	NS
No	93.2	89.6–95.6	90.8	88.1–93.0	…
Ever used injection or illicit drugs?					
Yes	19.1	15.8–23.0	25.1	21.5–29.1	< 0.05
No	80.9	77.0–84.2	74.9	70.9–78.5	…

… Category not applicable.
[1]P values < 0.05, < 0.01, or < 0.001 from chi-square testing that compares the distribution of levels for each cofactor in NHANES 2007–2008 to the distribution in NHANES 2009–2012.
[2]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.
NOTE: CI is confidence interval; NS is not significant; GED is General Educational Development high school equivalency diploma; PIR is poverty index ratio; and NHANES is the National Health and Nutrition Examination Survey.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2007–2012.

Table 3. HIV prevalence for ages 18–59, by demographic and high-risk groups: National Health and Nutrition Examination Survey, 2007–2012

Variable	Sample size	Total HIV-infected*	Percent HIV-infected	95% CI	P value[1]	RSE*
Overall	10,466	52	0.39	0.22–0.62	...	23
Sex:						
Male (ref)	5,119	40	0.61	0.34–1.01	...	26
Female.	5,347	12	0.16	0.07–0.31	< 0.01	38
Age (years):						
18–39 (ref)	6,112	23	0.24	0.14–0.39	...	25
40–49.	2,699	17	0.44	0.21–0.79	NS	30
50–59.	1,655	12	0.64	0.19–1.54	NS	47
Race and Hispanic origin:						
Non-Hispanic white	4,190	6	0.19	0.05–0.52	< 0.001	53
Non-Hispanic black (ref).	2,208	34	1.56	0.96–2.39	...	22
Mexican American	1,875	6	0.39	0.17–0.75	< 0.01	33
All nonblack	8,258	18	0.23	0.10–0.46	< 0.001	35
Education:						
Less than high school diploma or GED	2,640	14	0.51	0.25–0.93	NS	31
High school diploma or GED	2,403	15	0.60	0.19–1.40	NS	45
More than high school diploma or GED (ref)	5,415	23	0.27	0.12–0.53	...	37
Poverty index ratio:						
Below PIR	2,578	15	0.49	0.26–0.84	NS	29
At or above PIR (ref)	7,037	30	0.35	0.17–0.63	...	31
Current health insurance coverage?						
Yes.	7,029	41	0.43	0.23–0.73	NS	28
No (ref).	3,422	11	0.25	0.12–0.46	...	32
Received health care in past 12 months?						
Yes.	8,144	47	0.45	0.25–0.74	< 0.05	27
No (ref).	2,315	5	0.13	0.04–0.30	...	46
Number of lifetime sexual partners:						
0–4.	3,918	10	0.14	0.08–0.25	< 0.05	29
5–9.	2,198	8	0.21	0.09–0.41	< 0.05	33
10 or more (ref)	3,035	28	0.68	0.31–1.29	...	34
Herpes simplex virus type 2 infection status[2]:						
Positive.	1,777	28	1.23	0.67–2.08	< 0.01	27
Negative (ref)	7,019	12	0.11	0.05–0.22	...	36
History of same-sex sexual contact? (men only):						
Yes.	227	22	7.68	3.5–14.2	< 0.01	33
No (ref).	4,415	15	0.17	0.08–0.31	...	29
History of sexually transmitted infection?[3]						
Yes.	716	13	1.76	0.61–3.94	< 0.05	43
No (ref).	8,307	35	0.23	0.13–0.37	...	26
Ever used injection or illicit drugs?						
Yes.	1,711	17	0.79	0.29–1.72	NS	41
No (ref).	7,535	31	0.24	0.15–0.37	...	21
History of participation in any higher-risk group?[2,4]						
Yes.	4,163	36	0.56	0.33–0.88	< 0.001	23
No (ref).	3,645	3	0.05	0.01–0.15	...	60

* RSE more than 40% and subgroups with fewer than 10 HIV-infected persons should be interpreted with caution due to possible estimate instability.
... Category not applicable.
[1]P values < 0.05, < 0.01, or < 0.001 from t test comparing subgroup to reference group for each cofactor.
[2]Measured only for ages 18–49.
[3]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.
[4]Includes those with 10 or more lifetime sexual partners, positive for herpes simplex virus type 2, with a history of same-sex sexual contact (men only), with a history of sexually transmitted infection, or with a history of injection or illicit drug use.
NOTES: See Methods section for details on HIV prevalence calculations. CI is confidence interval; RSE is relative standard error; ref is the reference group used when comparing each cofactor; NS is not significant; GED is General Educational Development high school equivalency diploma; and PIR is poverty index ratio.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2007–2012.

Table 4. HIV prevalence for ages 18–59, by demographic and high-risk groups: National Health and Nutrition Examination Survey, 2009–2012

Variable	Sample size	Total HIV-infected*	Percent HIV-infected	95% CI	P value[1]	RSE*
Overall	7,660	40	0.39	0.21–0.64	…	26
Sex:						
Male (ref)	3,746	29	0.60	0.31–1.04	…	28
Female	3,914	11	0.18	0.08–0.34	< 0.05	33
Age (years):						
18–39 (ref)	4,168	16	0.26	0.12–0.49	NS	35
40–49	1,837	12	0.41	0.22–0.70	NS	27
50–59	1,655	12	0.64	0.19–1.54	…	47
Race and Hispanic origin:						
Non-Hispanic white	3,017	5	0.18	0.04–0.52	< 0.01	56
Non-hispanic black (ref)	1,653	27	1.66	0.92–2.74	…	26
Mexican American	1,273	5	0.47	0.20–0.93	< 0.01	36
All nonblack	6,007	13	0.22	0.09–0.44	< 0.01	36
Education:						
Less than high school diploma or GED	1,839	9	0.46	0.18–0.98	NS	39
High school diploma or GED	1,699	11	0.59	0.18–1.42	NS	46
More than high school diploma or GED (ref)	4,115	20	0.30	0.12–0.59	…	37
Poverty index ratio:						
Below PIR	1,911	11	0.49	0.24–0.88	NS	31
At or above PIR (ref)	5,110	23	0.34	0.16–0.63	…	32
Current health insurance coverage?						
Yes	5,205	31	0.41	0.21–0.74	NS	32
No (ref)	2,444	9	0.31	0.13–0.60	…	36
Received health care in past 12 months?						
Yes	6,017	37	0.45	0.24–0.78	< 0.05	29
No (ref)	1,636	3	0.12	0.02–0.37	…	58
Number of lifetime sexual partners:						
0–4	2,723	7	0.15	0.06–0.30	< 0.05	33
5–9	1,645	7	0.25	0.10–0.53	NS	40
10 or more (ref)	2,251	21	0.67	0.28–1.37	…	37
Herpes simplex virus type 2 infection status[2]:						
Positive	1,167	21	1.37	0.63–2.58	< 0.01	33
Negative (ref)	4,826	7	0.09	0.03–0.20	…	44
History of same-sex sexual contact? (men only):						
Yes	160	15	7.17	2.80–14.60	< 0.05	38
No (ref)	3,223	11	0.18	0.07–0.38	…	39
History of sexually transmitted infections?[3]						
Yes	516	11	1.81	0.63–4.03	< 0.05	43
No (ref)	5,952	26	0.24	0.11–0.45	…	33
Ever used injection or illicit drugs?						
Yes	1,212	14	0.76	0.25–1.75	NS	43
No (ref)	5,474	23	0.28	0.16–0.45	…	25
History of participation in any higher-risk group?[2,4]						
Yes	2,782	25	0.59	0.30–1.06	< 0.05	31
No (ref)	2,430	3	0.08	0.02–0.24	…	63

* RSE more than 40% and subgroups with fewer than 10 HIV-infected persons should be interpreted with caution due to possible estimate instability.
… Category not applicable.
[1]P values < 0.05, < 0.01, or < 0.001 from t test comparing subgroup to reference group for each cofactor.
[2]Measured only for ages 18–49.
[3]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.
[4]Includes those with 10 or more lifetime sexual partners, positive for herpes simplex virus type 2, with a history of same-sex sexual contact (men only), with a history of sexually transmitted infection, or with a history of injection or illicit drug use.
NOTE: CI is confidence interval; RSE is relative standard error; ref is the reference group used when comparing each cofactor; NS is not significant; GED is General Educational Development high school equivalency diploma; and PIR is poverty index ratio.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2009–2012.

Table 5. Prevalence of antiretroviral use among HIV-infected aged 18–59, by demographic and high-risk groups: National Health and Nutrition Examination Survey, 2007–2012

Variable	Number of HIV-infected in sample*	Number of ARV users among HIV-infected*	Percent using ARV among HIV-infected	95% CI	Degrees of freedom[1]	RSE*
Overall	52	20	51.9	32.5–70.9	7	18
Sex:						
Male (ref)	40	18	61.5	38.6–81.2	5	17
Female	12	2	16.7	1.8–50.4	0	68
Age (years):						
18–39 (ref)	23	5	22.9	7.9–45.6	1	39
40–49	17	8	45.2	18.9–73.6	1	30
50–59	12	7	80.1	54.0–95.1	1	12
Race and Hispanic origin:						
Non-Hispanic white	6	4	88.4	55.8–99.4	0	11
Non-Hispanic black (ref)	34	10	30.7	18.6–45.1	5	21
Mexican American	6	2	40.9	3.6–89.7	1	61
All nonblack	18	10	70.9	39.9–92.0	2	18
Education:						
Less than high school diploma or GED	14	8	65.3	36.3–87.7	2	19
High school diploma or GED	15	3	45.5	6.8–89.3	0	51
More than high school diploma or GED (ref)	23	9	49.6	25.6–73.8	2	24
Poverty index ratio:						
Below PIR	15	8	54.5	23.1–83.4	1	28
At or above PIR (ref)	30	11	56.0	32.0–78.1	3	20
Current health insurance coverage?						
Yes	41	18	58.7	39.1–76.6	5	16
No (ref)	11	2	16.2	1.9–48.1	0	66
Received health care in past 12 months?						
Yes	47	20	55.5	36.3–73.6	6	16
No (ref)	5	0	0	0.0–97.5	0	...
Number of lifetime sexual partners:						
0–4	10	0	0	0.0–97.5	2	...
5–9	8	1	11.9	0.3–51.1	0	95
10 or more (ref)	28	14	62.8	35.9–84.8	3	19
Herpes simplex virus type 2 infection status[2]:						
Positive.	28	11	43.3	22.8–65.7	2	24
Negative (ref)	12	2	10.6	2.0–29.3	1	58
History of same-sex sexual contact? (men only):						
Yes	22	11	65.0	33.9–88.7	1	21
No (ref)	15	4	27.0	9.1–53.0	1	39
History of sexually transmitted infections?[3]						
Yes	13	9	79.7	47.8–96.6	0	15
No (ref)	35	8	21.6	9.4–38.9	2	33
Ever used injection or illicit drugs?						
Yes	17	9	71.6	38.6–93.1	1	19
No (ref)	31	8	25.7	8.7–50.9	4	39
History of participation in any higher-risk group?[2,4]						
Yes	36	13	38.7	20.7–59.3	2	24
No (ref)	3	0	0	0.0–97.5	0	...

* RSE more than 40% and subgroups with fewer than 10 HIV-infected persons should be interpreted with caution due to possible estimate instability.
... Category not applicable.
[1]Degrees of freedom less than 10 are associated with unstable estimates of the standard error.
[2]Measured only for ages 18–49.
[3]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.
[4]Includes those with 10 or more lifetime sexual partners, positive for herpes simplex virus type 2, with a history of same-sex sexual contact (men only), with a history of sexually transmitted infection, or with a history of injection or illicit drug use.
NOTE: ARV is antiretroviral; CI is confidence interval; RSE is relative standard error; ref is the reference group used when comparing each cofactor; GED is General Educational Development high school equivalency diploma; and PIR is poverty index ratio.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2007–2012.

Table 6. Prevalence of any lifetime history of HIV testing among HIV-infected aged 18–59, by demographic and high-risk groups: National Health and Nutrition Examination Survey, 2007–2012

Variable	Number of HIV-infected in sample*	Number with any HIV testing*	Number without HIV testing*	Percent with any HIV testing among HIV-infected	95% CI	Degrees of freedom[1]	RSE*,[2]
Overall	50	43	7	86.1	69.5–95.7	6	44
Sex:							
Male (ref)	38	35	3	94.1	81.7–99.1	4	64
Female.	12	8	4	61.0	24.9–89.8	0	42
Age (years):							
18–39 (ref)	23	21	2	90.7	68.7–99.0	1	71
40–49.	17	12	5	67.2	36.9–89.6	1	39
50–59.	10	10	0	100	69.2–100.0	0	...
Race and Hispanic origin:							
Non-Hispanic white	4	4	0	100	39.8–100.0	0	...
Non-Hispanic black (ref).	34	31	3	90.5	72.8–98.4	5	60
Mexican American	6	3	3	59.9	12.0–96.0	1	59
All nonblack	16	12	4	81.2	50.4–96.9	1	58
Education:							
Less than high school diploma or GED	14	13	1	94.9	74.0–99.9	2	100
High school diploma or GED	15	10	5	72.0	34.0–95.2	0	54
More than high school diploma or GED (ref)	21	20	1	94.9	75.5–99.8	1	94
Poverty index ratio:							
Below PIR	15	12	3	81.7	49.0–97.5	1	62
At or above PIR (ref)	28	25	3	88.8	65.6–98.5	2	66
Current health insurance coverage?							
Yes.	39	35	4	89.4	71.1–98.0	4	57
No (ref).	11	8	3	71.1	35.7–93.8	0	50
Received health care in past 12 months?							
Yes.	45	41	4	89.8	73.0–97.9	5	55
No (ref).	5	2	3	38.7	4.7–84.8	0	36
Number of lifetime sexual partners:							
0–4.	10	6	4	59.7	24.9–88.4	2	40
5–9.	8	8	0	100	63.1–100.0	0	...
10 or more (ref)	28	26	2	94.3	78.9–99.5	3	76
Herpes simplex virus type 2 infection status[3]:							
Positive.	28	24	4	86.8	65.8–97.2	2	54
Negative (ref)	12	9	3	62.7	27.7–89.9	1	42
History of same-sex sexual contact? (men only):							
Yes.	22	22	0	100	84.6–100.0	1	...
No (ref).	15	12	3	79.1	48.3–96.0	1	54
History of sexually transmitted infections?[4]							
Yes.	13	13	0	100	75.3–100.0	0	...
No (ref).	35	29	6	82.0	62.6–94.0	2	41
Ever used injection or illicit drugs?							
Yes.	17	16	1	97.2	84.0–100.0	1	105
No (ref).	31	26	5	83.5	61.4–95.8	4	48
History of participation in any higher-risk group?[3,5]							
Yes.	36	31	5	87.0	69.5–96.5	2	48
No (ref).	3	2	1	60.7	6.2–98.7	0	74

* RSE more than 40% and subgroups with fewer than 10 HIV-infected persons should be interpreted with caution due to possible estimate instability.
... Category not applicable.
[1]Degrees of freedom less than 10 are associated with unstable estimates of the standard error.
[2]RSE corresponds to the percentage without HIV testing among HIV-infected persons, because this is a small sample compared to the percentage with any HIV testing among those HIV-infected, demonstrating the relative instability of the estimate.
[3]Measured only for ages 18–49.
[4]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.
[5]Includes those with 10 or more lifetime sexual partners, positive for herpes simplex virus type 2, with a history of same-sex sexual contact (men only), with a history of sexually transmitted infection, or with a history of injection or illicit drug use.
NOTE: CI is confidence interval; RSE is relative standard error; ref is the reference group used when comparing each cofactor; GED is General Educational Development high school equivalency diploma; and PIR is poverty index ratio.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey, 2007–2012.

Technical Notes

List of classes of antiretroviral medications used by HIV-infected participants in National Health and Nutrition Examination Survey, 2007–2012

- Antiviral chemokine receptor antagonists
- Antiviral combinations
- Antiviral interferons
- Integrase strand transfer inhibitors
- Non-nucleoside reverse transcriptase inhibitors
- Nucleotide reverse transcriptase inhibitors
- Protease inhibitors
- Purine inhibitors

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