

HIV Infection in the United States Household Population Aged 18–49 Years: Results from 1999–2006

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Importance

Measurement of HIV prevalence in a nationally representative sample of the United States population provides an understanding of the background level of infection in the general household population aged 18–49 years as well as in demographic subgroups. This information can also be used to monitor trends in infection in the household population over time. Other public health surveillance systems address the impact of HIV infection among high risk groups including the homeless and prisoners that are not included in surveys of the general household population (1,2). The combination of information from these surveillance systems with estimates from surveys of the general household population provides a more complete picture of the HIV/AIDS epidemic in the United States.

Herpes simplex-virus type 2 (HSV-2) infection is associated with HIV infection; some studies have shown that HSV-2 infection doubles the risk of HIV acquisition (3–5). Estimates of the prevalence of both HSV-2 and HIV infection can provide further understanding of the risk of HIV infection in higher risk subgroups of the general household population.

CD4 counts (also known as T-helper cells) provide a measure of a person's immune function. Among HIV-infected individuals, measurement of CD4 counts is often used to demonstrate how well anti-HIV drugs are working. Estimates of this measure in the general population can provide a picture of health among HIV-infected individuals.

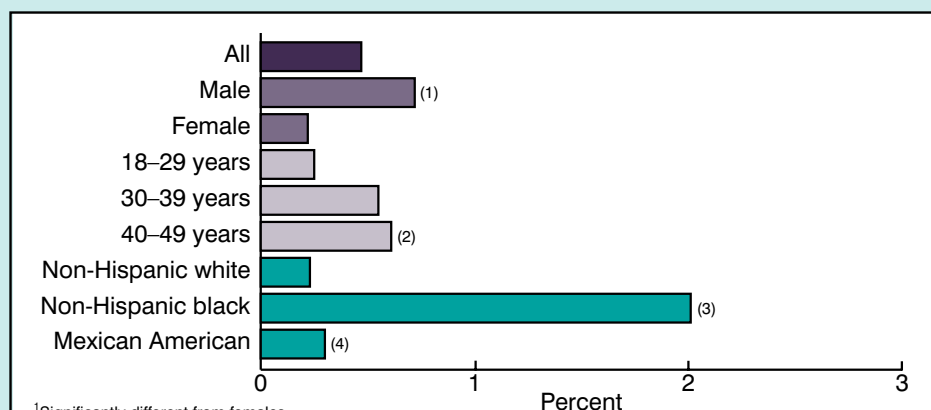
Keywords: HIV • CD4 • seroprevalence • trends

Findings

What is the prevalence of HIV infection among U.S. adults ?

- In 1999–2006, the prevalence of HIV infection among adults aged 18–49 years in the civilian noninstitutionalized household population of the United States was 0.47%.

Figure 1. Prevalence of HIV infection among adults by age, sex, and race/ethnicity: United States, 1999–2006



¹Significantly different from females.

²Significantly different from ages 18–29 years.

³Significantly different from the non-Hispanic white and Mexican-American population.

⁴Estimate unstable. Based on fewer than 10 HIV-positive persons. See Appendix table.

NOTE: Nationally representative sample of the civilian, noninstitutionalized household population.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Surveys, 1999–2006.

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Highlights

Data from the National Health and Nutrition Examination Surveys (NHANES)

► The prevalence of HIV infection among adults aged 18–49 years residing in households in the United States was 0.47% for the period 1999–2006.

► Men were more likely to be HIV positive than women. Race/ethnic disparities in HIV infection were also seen. Non-Hispanic blacks were more likely to be HIV positive than all other race/ethnic groups.

► Infection with HSV-2 was significantly associated with HIV infection among the total population aged 18–49 years and especially so among the non-Hispanic black population.

► In 1999–2006, nearly one-quarter of HIV-positive individuals but only 1% of the HIV-negative individuals aged 18–49 years had low CD4 counts (a marker of decreased immune function). Approximately one-third of HIV-positive persons had healthy immune systems as compared with 90% among those HIV negative.



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The prevalence among men was 0.72% and was significantly higher than the prevalence in women 0.22%.

Adults aged 40–49 years were more likely to be HIV positive compared with those aged 18–29 years. Approximately 0.61% of adults aged 40–49 years were HIV positive, compared with 0.55% of 30–39 year-olds and 0.25% of 18–29 year-olds.

- **In 1999–2006, the non-Hispanic black population had an increased prevalence of HIV infection compared with other population subgroups.**

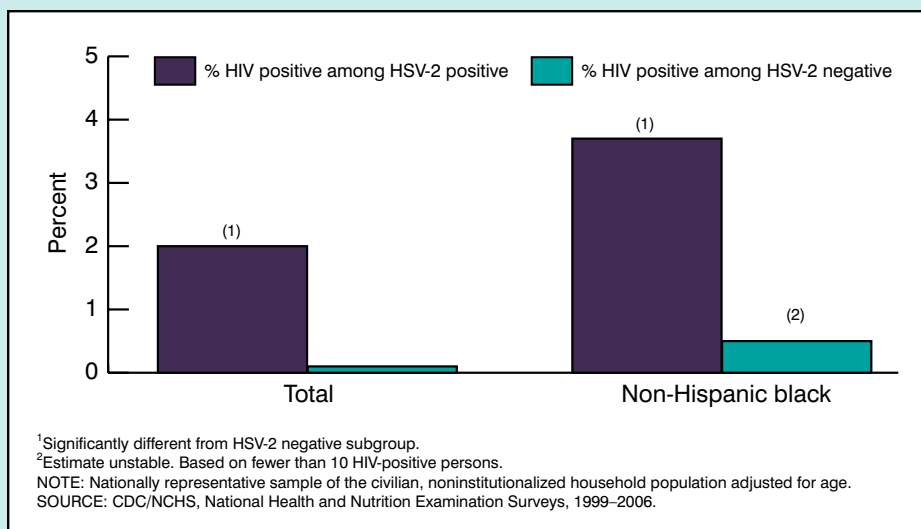
The prevalence of HIV infection among the non-Hispanic black population was 2.01%, which was significantly higher than among the non-Hispanic white population (0.23%) and the Mexican-American population (0.30%).

Among the non-Hispanic black population, the prevalence of HIV infection was higher among men (2.64%) than among women (1.49%).

Is Herpes simplex-virus type 2 (HSV-2) infection associated with HIV infection?

- **HIV status was associated with HSV-2 infection, especially among the non-Hispanic black population.**

Figure 2. HIV prevalence among adults aged 18–49 years, by Herpes simplex-virus type 2 (HSV-2) status and race/ethnicity: United States, 1999–2006



HSV-2 infection among persons aged 18–49 years was much higher among non-Hispanic blacks (46.6%) as compared with all other race/ethnic groups combined (15.3%) (data not shown).

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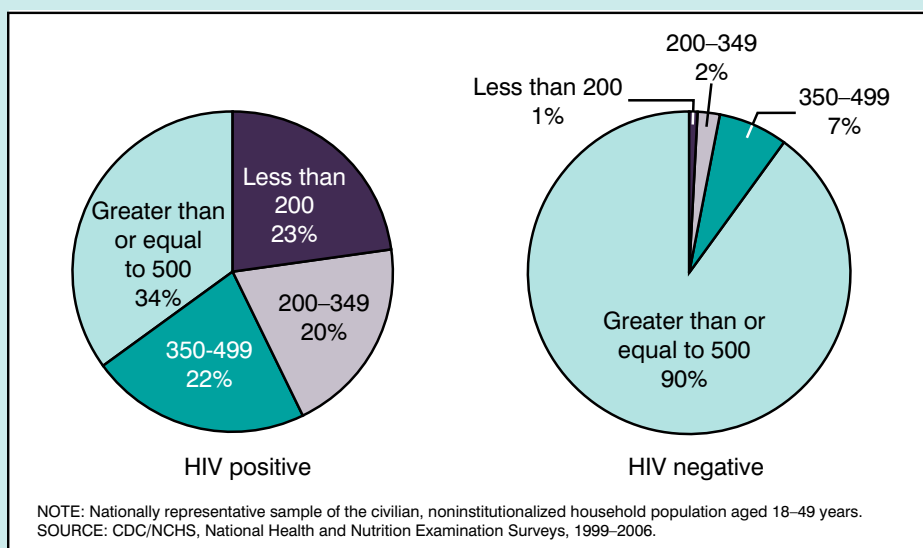
HIV prevalence was higher among all persons aged 18–49 years who were infected with HSV-2 compared with those who were not infected (1.99% and 0.13%, respectively).

The higher risk of HIV infection among those HSV-2 positive was especially true for non-Hispanic blacks, where the HIV prevalence was 3.69% among HSV-2 positive non-Hispanic blacks.

How does the immune function of HIV-positive individuals compare with HIV-negative individuals?

- The CD4 count (also known as T-helper cells) is a measure of a person's immune status. The immune function among HIV-infected individuals is often different from HIV-negative individuals.

Figure 3. CD4 count, by HIV status: United States, 1999–2006



In 1999–2006, the majority (90%) of HIV-negative individuals had CD4 counts within the normal range (CD4 counts greater than or equal to 500 cells/mm³).

As expected, many more HIV-positive persons had lower CD4 counts (counts less than 200 cells/mm³ or between 200 and 349 cells/mm³) (43% combined) as compared with HIV-negative persons (3% combined).

In 1999–2006, 23% of HIV-positive individuals had depressed immune function (CD4 counts less than 200 cells/mm³) and only 34.4% of HIV-positive individuals had healthy immune systems (CD4 counts greater than or equal to 500 cells/mm³).

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Summary

In 1999–2006, the prevalence of HIV infection among U.S. adults aged 18–49 years residing in households was 0.47%. In addition, race/ethnic and gender disparities were present. HIV infection was higher among non-Hispanic blacks compared with other race/ethnic groups and higher among men than women.

HIV infection was significantly associated with HSV-2 infection. The association was especially strong among non-Hispanic blacks where infection with HSV-2 is significantly higher than in all other race/ethnic groups.

Low CD4 counts (less than 200 cells/mm³), a marker for depressed immune function, were much more frequent among those who were HIV positive than those HIV negative. Conversely, higher CD4 counts (greater than or equal to 500 cells/mm³) indicative of normal immune function, were much lower among individuals HIV positive as compared with those HIV negative.

Since the HIV/AIDS epidemic was first recognized in 1981, the Centers for Disease Control and Prevention (CDC), in coordination with all states and U.S. dependent areas has conducted AIDS surveillance. As part of the national surveillance program to monitor the HIV/AIDS epidemic, CDC's NHANES survey data provide prevalence estimates from the general household population aged 18–49 years. Information on risk factors for HIV infection, such as sexual activity and intravenous drug use, were not addressed in this analysis, but are collected as part of the NHANES survey.

Definitions

HIV positivity: Presence of antibody to human immunodeficiency virus (HIV) in blood or urine (6).

CD4 counts: Enumeration of CD4 T-lymphocytes (also called T-helper cells, a measure of immune function) in blood (7). Counts greater than or equal to 500 cells/mm³ represents a healthy immune system. Counts less than 200 cells/mm³ represent adults with depressed immune function (6).

HSV-2 positivity: Presence of antibody to Herpes simplex virus type-2 (HSV-2) in blood (6,8–10).

Race/ethnicity: Race/ethnicity was based on self-report and categorized as non-Hispanic white, non-Hispanic black, and Mexican American. Persons not fitting into these categories were classified as “other” and included in the total population estimates.

Data source

National Health and Nutrition Examination Surveys (NHANES) data were used for these analyses. NHANES is a cross-sectional survey designed to monitor the health and nutritional status of the civilian, noninstitutionalized U.S. population (11). The survey consists of interviews conducted in participants' homes, standardized physical examinations conducted in specially outfitted mobile examination centers, and laboratory tests utilizing blood and urine specimens provided by participants during the physical examination.

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The NHANES sample is selected through a complex, multistage design that includes selection of primary sampling units (counties), household segments within the counties, and finally sample persons from selected households. The sample design includes oversampling in order to obtain reliable estimates of health and nutritional measures for population subgroups. In 1999–2006, African Americans, Mexican Americans, persons with low income, persons 12–19 years of age, and persons 60 years and older were oversampled. In 1999, NHANES became a continuous survey, fielded on an ongoing basis. Each year of data collection is based on a representative sample covering all ages of the civilian, noninstitutionalized population. Public-use data files are released in 2-year cycles.

Sample weights, which account for the differential probabilities of selection, nonresponse and non-coverage, are incorporated into the estimation process (12). The standard errors of the percentages were estimated using Taylor Series Linearization in SUDAAN, a method that incorporates the sample weights and sample design (13). Ninety-five percent confidence intervals were estimated by using the logit transformation (14).

HIV antibody positive status was measured in examined sample persons aged 18–49 years. To examine possible predictors of HIV positivity, differences in prevalence were evaluated by examining *P*-values calculated using a univariate *t*-statistic obtained from a general linear contrast procedure in SUDAAN. All differences reported are statistically significant ($p < 0.05$) unless otherwise indicated. When comparing race/ethnic groups, using linear contrasts and when examining the association of HSV-2 with HIV status among race/ethnic groups, estimates were age adjusted to the 2000 U.S. standard census population using three age groups, 18–29, 30–39, and 40–49 years. This adjustment enabled us to compare prevalence estimates between subgroups that differ with respect to their age distributions (15).

All data analyses were performed using the statistical packages SAS version 9.1 (SAS Institute, Cary, N.C.) and SUDAAN version 9.0 (Research Triangle Institute, Research Triangle Park, N.C.) (13).

The relative standard error (RSE), defined as the estimate divided by its standard error, is an indicator for statistical reliability. Most estimates in this study are of small magnitude relative to their standard errors (i.e., the RSE are large). All estimates whose RSE was greater than a cut point of 40% are designated with a footnote to indicate that the estimate is statistically unreliable. In addition, estimates based on fewer than 10 positive persons are also designated with a footnote to indicate statistical unreliability (16).

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Appendix

Prevalence of HIV infection from NHANES 1999–2006, by age, gender, and race/ethnicity

	N	Number positive	Percent positive	95% CI	RSE
Total ¹	11928	67	0.47	0.34–0.64	15
Gender					
Males	5529	47	0.72 ^a	0.49–1.06	19
Non-Hispanic black	1327	29	2.64 ^b	1.88–3.70	17
All other race/ethnic groups ²	4202	18	0.48 ^b	0.26–0.86	29
Females	6399	20	0.22 ^a	0.14–0.36	23
Non-Hispanic black	1478	17	1.49 ^c	0.91–2.43	24
All other race/ethnic groups ²	4921	3	0.03 ^{c,3}	0.01–0.13	67
Age ¹					
18–29	5696	15	0.25 ^d	0.13–0.48	32
30–39	3147	23	0.55	0.32–0.94	27
40–49	3085	29	0.61 ^d	0.38–0.98	23
Race/Ethnicity					
Non-Hispanic white	4838	10	0.23 ^e	0.11–0.48	39
Non-Hispanic black	2805	46	2.01 ^{e,f}	1.50–2.69	14
Mexican American	3228	7	0.30 ^{f,3}	0.13–0.69	40

¹ Totals differ from the sum for the non-Hispanic white, non-Hispanic black, and Mexican-American populations because those in the “other” race/ethnic category are included in the totals.

² Includes non-Hispanic white, Mexican American, and “other” race/ethnicity.

³ RSE greater than 40 or number of positive cases less than 10.

^a $p < 0.05$ for difference between gender.

^b $p < 0.05$ for difference between non-Hispanic black males and males in “All other race/ethnic groups.”

^c $p < 0.05$ for difference between non-Hispanic black females and females in “All other race/ethnic groups.”

^d $p < 0.05$ for difference between ages 18–29 and 40–49 years.

^e $p < 0.05$ for difference between the non-Hispanic black and non-Hispanic white populations.

^f $p < 0.05$ for difference between the non-Hispanic black and Mexican-American populations.

NOTES: CI is confidence interval. RSE is relative standard error.

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