HIV Testing Among US High School Students and Young Adults

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BACKGROUND: We assessed HIV testing trends among high school students and young adults.

METHODS: We analyzed National Youth Risk Behavior Survey (YRBS) and Behavioral Risk Factor Surveillance System (BRFSS) data to assess HIV testing prevalence among high school students and young adults aged 18 to 24, respectively. Logistic regression models for each sample stratified by gender and race/ethnicity were estimated to assess trends in the percentages ever tested, with year as a continuous linear variable. We report absolute differences in HIV testing prevalence and model results for 2005–2013 (YRBS) and 2011–2013 (BRFSS).

RESULTS: During the study periods, an average of 22% of high school students (17% of male and 27% of female students) who ever had sexual intercourse and 33% of young adults reported ever being tested for HIV. Among high school students, no change was detected in HIV testing prevalence during 2005–2013, regardless of gender or race/ethnicity. Among young adult males, an average of 27% had ever been tested, and no significant changes were detected overall or by race/ethnicity during 2011–2013. Significant decreases in testing prevalence were detected during 2011–2013 among young adult females overall (from 42.4% to 39.5%), young adult white females (from 37.2% to 33.9%), and young adult black females (from 68.9% to 59.9%).

CONCLUSIONS: HIV testing prevalence was low among high school students and young adults. No increase in testing among young adult males and decreased testing among young adult black females is concerning given their higher risk of HIV infection.

WHAT’S KNOWN ON THIS SUBJECT: HIV disproportionately affects adolescents and young adults compared with the overall population. The Centers for Disease Control and Prevention recommends routine HIV screening for Americans aged 13 to 64, yet 50% of adolescents and young adults with HIV remain undiagnosed.

WHAT THIS STUDY ADDS: This study found HIV testing prevalence was low among high school students (25%) and young adults (33%). No increase in testing among males and decreased testing among young adult black females is concerning given their higher risk of HIV infection.
In 2010, persons aged 13 to 24 years made up 17% of the US population but accounted for 26% of estimated new HIV infections.1 The majority of HIV infections occur among gay, bisexual, and other men who have sex with men (MSM) and among black females.1 Among adolescents and young adults living with HIV infection, 44% were undiagnosed, the highest percentage of any age group.2 Without HIV testing and diagnosis, adolescents and young adults cannot take advantage of HIV care and treatment that can improve their health and reduce the risk of transmission to others.3,4 In 2006, the Centers for Disease Control and Prevention (CDC) released the “Revised Recommendations for HIV Testing of Adults, Adolescents, and Pregnant Women in Health Care Settings” (referred to hereafter as Revised Recommendations) encouraging clinicians to screen all persons aged 13 to 64 years for HIV infection.5 Since then, multiple organizations, including the US Preventive Services Task Force (USPSTF) in 2013, also recommended that all adolescents and adults be screened for HIV infection.6 The CDC has implemented several testing initiatives, including the Expanded Testing Initiative (since 2007) and social media campaigns (eg, Act Against AIDS since 2009), to increase the number of persons (both adolescents and adults) tested and diagnosed with HIV, particularly persons disproportionally affected by HIV (ie, blacks or African Americans [referred to as black females or black males], Hispanics or Latinos, and MSM).7,8 In addition, HIV prevention projects for young MSM of color and young transgender persons of color (since 2011) specifically focus on intensifying prevention efforts among these populations.9

The CDC reported no evidence of increases in HIV testing among high school students during 2005–2011 or among young adults aged 18–24 years during 2000–2010.10 In this article, we update previous trend analyses because it is important to understand whether current testing programs have led to an increase in HIV testing. Increased testing would lead to a decrease in the high percentage unaware of their HIV infection. This study investigated trends in HIV testing among high school students during 2005–2013 and trends in HIV testing among young adults during 2011–2013 to determine if trends have changed from the stable testing patterns previously reported and to expand on the previous report by assessing trends for specific subgroups (eg, high school students who have ever had sexual intercourse).10

METHODS

Data Sources

The Youth Risk Behavior Surveillance System includes a national school-based Youth Risk Behavior Survey (YRBS) conducted biennially among students in grades 9 through 12. The survey methodology has been previously described.11 Briefly, the sampling frame for the 2005–2013 national YRBSSs consisted of all regular public (might include charter schools and public alternative, special education, or vocational schools) and private (might include religious and other private schools, but not private alternative, special education, or vocational schools) schools with students in at least 1 of grades 9 through 12 in the 50 states and the District of Columbia. A 3-stage cluster sample design was used. Survey procedures were designed to protect students’ privacy by allowing for anonymous and voluntary participation. The CDC’s Institutional Review Board approved the protocol for the national YRBSSs. The school, student, and overall response rates during 2005–2013 averaged 80%, 87%, and 69%, respectively, and the average sample size was 14,675 students. A weight based on student gender, race/ethnicity, and grade was applied to each record to adjust for school and student nonresponse and oversampling of black and Hispanic/Latino students. Weighted estimates are representative of all students in grades 9 through 12 attending public and private schools in the United States. The YRBS questionnaire is self-administered during regular class time and includes a question on HIV testing: “Have you ever been tested for HIV, the virus that causes AIDS (Do not count tests done if you donated blood).”

BRFSS is a state-based, annual cross-sectional random-digit-dialed telephone (landline and cell) survey that collects information on preventive health practices and health care access. State-level data were combined to produce annual national estimates for the civilian, noninstitutionalized adult US population. BRFSS interviewers asked respondents 2 questions: “Have you ever been tested for HIV? Do not count tests you may have had as part of a blood donation. Include testing fluid from your mouth” and “Where did you have your last HIV test – [specific settings listed?]” The average median weighted survey response rate was 47% (average state range: 30%–62%) during 2011–2013.12 We analyzed 2011–2013 BRFSS data for respondents residing in the 50 states and District of Columbia to match the area covered by the national YRBSSs and included those who were aged 18 to 24 years and reported a “yes” or “no” response to having ever been tested. We limited our analysis to 2011–2013 data because of recent methodological changes that could affect assessment of HIV testing trends.13 The final sample included 90% of respondents who were aged 18 to 24 years, which was an average of 21,790 respondents annually.

Data are weighted to account for the complex survey design, nonresponse,
and sociodemographic factors to yield estimates representative of civilian, noninstitutionalized young adults aged 18 to 24 years in the United States.

Data Analysis

We report the prevalence of HIV testing among high school students (YRBS) and young adults aged 18 to 24 years (BRFSS). Analyses were conducted using YRBS data overall and by gender and race/ethnicity among 3 subgroups: students who reported ever having sexual intercourse, having sexual intercourse with ≥4 persons, and having sexual intercourse with ≥1 persons during the past 3 months. Analyses were conducted using BRFSS data overall, by gender and race/ethnicity. Statistical analyses were conducted on weighted data using SUDAAN (for YRBS) and SAS version 9.3 (for BRFSS) and accounted for the complex sampling designs for each survey. For each subgroup, separate logistic regression models were used to assess linear time trends in the percentages of students and young adults who reported having ever been tested for HIV, with year as a continuous linear variable, adjusting for gender, race/ethnicity, and grade (YRBS only) when applicable. We report the absolute difference and the linear β and associated P value from 2005 to 2013 for YRBS and from 2011 to 2013 for BRFSS data.

RESULTS

HIV Testing Among High School Students, YRBS

During 2005–2013, an average of 22% of high school students who ever had sexual intercourse, 34% of students who had sexual intercourse with ≥4 persons, and 24% of students who had sexual intercourse with ≥1 persons during the past 3 months had ever been tested for HIV. The prevalence of HIV testing did not change overall or by gender among these 3 subgroups (P > .05). Trends in HIV testing among young adults aged 18 to 24 years were assessed overall and by gender using the BRFSS data from 2011 to 2013. The prevalence of HIV testing decreased significantly overall from 34.5% in 2011 to 32.7% in 2013 (P = .016), did not change significantly among young men (average 27%, P > .05), and decreased significantly among young women from 42.4% in 2011 to 39.5% in 2013 (P = .016).

a No linear change.
TABLE 1 Trends in HIV Testing Among High School Students, 2005 to 2013, YRBS

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>2005</th>
<th>2007</th>
<th>2009</th>
<th>2011</th>
<th>2013</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>% Tested</td>
<td>95% CI</td>
<td>% Tested</td>
<td>95% CI</td>
<td>% Tested</td>
</tr>
<tr>
<td>Ever had sexual intercourse</td>
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<td></td>
<td></td>
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<tr>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td>16.5</td>
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<td>21.4</td>
<td>18.4–24.8</td>
<td>29.1</td>
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<td>14.1–20.0</td>
<td>17.1</td>
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<td></td>
<td></td>
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<tr>
<td>White</td>
<td>22.8</td>
<td>20.2–25.6</td>
<td>23.8</td>
<td>21.0–26.8</td>
<td>26.4</td>
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<td>29.0–37.8</td>
<td>38.7</td>
<td>33.0–44.7</td>
<td>37.3</td>
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<td>16.8–25.8</td>
<td>21.3</td>
<td>17.5–25.8</td>
<td>24.5</td>
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<td>Had sexual intercourse with ≥4 persons</td>
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<td></td>
<td></td>
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<tr>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>White</td>
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<td>18.5–30.7</td>
<td>29.4</td>
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<td>30.4</td>
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<td>18.8–30.1</td>
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<tr>
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<td>54.9</td>
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<td>34.4</td>
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</tr>
<tr>
<td>Had sexual intercourse with ≥1 persons during the past 3 mo</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Male</td>
<td></td>
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<tr>
<td>White</td>
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<td>16.8</td>
<td>14.3–19.7</td>
<td>19.0</td>
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<td>27.5</td>
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<td>26.0</td>
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<tr>
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<td>19.6</td>
</tr>
<tr>
<td>Female</td>
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<td></td>
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</tr>
<tr>
<td>White</td>
<td>25.2</td>
<td>21.4–29.4</td>
<td>25.8</td>
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<td>17.4–28.3</td>
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<td>25.4</td>
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</tbody>
</table>

* Logistic regression modeling conducted controlling for grade.
Among young adult males, an average of 27% had ever been tested for HIV. No significant changes were detected in the prevalence of HIV testing among males overall or by race/ethnicity subgroup (Fig 1D; Table 2). Among young adult females, a significant decrease in the prevalence of HIV testing was detected overall from 42.4% in 2011 to 39.5% in 2013 (3.0% decrease, \( \beta = -0.06, P = .02 \)), among young adult white females from 37.2% in 2011 to 33.9% in 2013 (3.3% decrease, \( \beta = -0.07, P = .02 \)), and among young adult black females from 68.9% in 2011 to 59.9% in 2013 (9.0% decrease, \( \beta = -0.20, P = .002 \)). Young adults who had ever been tested for HIV reported that their last HIV test was at a private doctor office/health maintenance organization (40.5%), clinic (31.2%), hospital (8.8%), HIV testing site (4.8%), correctional facility (1.2%), or other setting (13.6%) (Fig 2).

**DISCUSSION**

Less than one-quarter of high school students who have had sexual intercourse and one-third of young adults have ever been tested for HIV. During 2005–2013, the percentage of sexually experienced high school students who had ever been tested for HIV did not change overall or for any subgroup. During 2011–2013, the percentage of young adults who have ever been tested did not increase among young adult males and decreased significantly among young adult white and black females. No increase in testing among young adult males and decreased testing among young adult black females is concerning because they account for the majority of new HIV infections among persons aged 13–24 years. These results indicate that recommendations to screen all adolescents and young adults for HIV infection, regardless of risk, have not been widely implemented. HIV testing programs do not appear to be successfully reaching high school students and young adults.
than any other age group, with an estimated 25,300 living with undiagnosed HIV infection, yet our results indicate that HIV testing rates are low and not increasing among this population, regardless of sexual behavior, race/ethnicity, and gender. CDC and the USPSTF recommend that all adolescents and adults be screened for HIV infection. The USPSTF considered prevalence of sexual activity and STIs by age to determine the age range to recommend screening. Because nearly half of US high school students had engaged in sexual intercourse and prevalence of STIs is high among high school–age adolescents, routine HIV screening starting at age 15 years was chosen. We limited our analysis to sexually experienced high school students to focus our analysis on persons who may have been exposed to HIV through sexual intercourse. Although our analysis is the first to assess trends in HIV testing among sexually experienced high school students, previous analyses of YRBS data found similarly low HIV testing rates. For example, in 2007, 13% of all high school students had ever been tested for HIV. The prevalence of HIV testing was higher among students who had ever had sexual intercourse (22%) than those who had never had sexual intercourse (4%). More recently, Coeytaux et al (2014) used YRBS data pooled from 2005 to 2011 and found that HIV testing was positively associated with HIV-related risk behaviors among sexually experienced high school students.

Similarly, CDC previously reported no change in the percentages of young adults ever tested for HIV (34%) using 2000–2010 National Health Interview Survey data. In contrast, data from 1999–2010 NHANES indicated a decreasing trend, from 38% in 1999–2000 to 30% in 2009–2010 among young adults aged 18 to 24 years. Although the previous report including National Health Interview Survey and NHANES data did not further investigate trends by subgroup and therefore could not identify the groups driving the overall trends among young adults, its results and our results indicate testing is not increasing among young adults.

Additional efforts are needed to achieve widespread uptake of HIV testing among high school students and young adults. HIV testing programs should consider how to best reach young persons in racial/ethnic minority groups, especially blacks and Hispanics/Latinos and all MSM, because these groups are disproportionately affected by HIV infection. Black adolescents and young adults account for an estimated 57% of all new HIV infections among this age group in the United States, followed by Hispanic/Latino adolescents and young adults (20%). Evidence indicates increasing racial/ethnic disparities in new HIV infections among adolescents and young adults. Although HIV testing was higher among young adult black males compared with young adult white males, the prevalence of HIV testing among young adult males did not change among any race/ethnicity subgroup to reflect increasing disparities.

We found a decrease in the prevalence of HIV testing among young adult black females during 2011–2013, which is disconcerting given the high rate of infection among black adult females. In 2013, the diagnosis rate among black females (34.8 per 100,000) was higher than the rate for females of any other race/ethnicity subgroup. Black females remain an important target population for HIV testing programs. For example, an Act Against AIDS campaign, “Take Charge. Take the Test,” is a national campaign implemented in 2012 to encourage HIV testing among black/African American females aged 18 to 34 years.

Adolescents and young adults may face unique barriers that need to be addressed to increase access to and utilization of HIV testing services, such as lack of access to health care, low provider awareness of recommendations, and insufficient sexual health knowledge. Inadequate access to HIV prevention and treatment services is a major barrier for adolescents, particularly those of racial/ethnic minority subgroups, because many have only limited contact with the health care system and are less likely to receive regular preventive health care. Even among those with access to preventive health care, studies have found limited knowledge of HIV testing recommendations for adolescents and young adults among pediatricians and health care providers. In an analysis of adolescents at a large urban pediatric emergency department, 78% of providers were unaware of the revised recommendations. Provider recommendation has been shown to be the most important predictor of obtaining an HIV test among adolescents. Our results support the importance of provider recommendation because 80% of young adults who were ever tested for HIV last tested in a clinical setting.

Provider education and implementation of system-level interventions, such as those used to implement routine HIV screening in prenatal and urgent care settings, could be applied to testing for adolescents and young adults. These interventions should also consider the complex issues of confidentiality, disclosure, and consent in adolescent care because adolescents also cite concerns about confidentiality. As currently structured, routine clinic visits for adolescents often do not include blood tests. The Committee on Pediatric AIDS
provides recommendations on how health care providers for adolescents can successfully provide HIV screening and prevention services to their clients. The American Academy of Pediatrics, Committee on Pediatric AIDS, can build on these recommendations to better understand when, where, and by whom adolescents should be tested.

Schools can also play a critical role in increasing access to HIV testing services for students. Federal Title X clinics must provide confidential sexual health services; however, other clinical settings might not offer such protections depending on the state. Teens may need access to confidential services, meaning services are provided without parental involvement in either the delivery or payment of the service. Consequently, parent's insurance may not be a viable payment option if an “Explanation of Benefits” statement reveals the receipt of services to parents. In addition, young people might not have the ability to get to services that are only open during school hours. Schools can either provide services at onsite or nearby clinics or create referral systems to clinics that have been assessed for their teen-friendly (ie, confidential) nature and accessibility. In addition to overcoming barriers related to access to care, knowledge about HIV among adolescents and young adults is limited, and often they underestimate their personal infection risk. Sexual health education could improve the ability of adolescents and young adults to assess their risk for HIV infection and increase testing.

At least 5 limitations to this analysis should be noted. First, the cross-sectional design of YRBS prevents identification of temporal order between HIV testing and risk behaviors. Second, the self-reported nature of YRBS and BRFSS can introduce bias (eg, recall, nonresponse, social desirability). The extent of underreporting or overreporting of behaviors cannot be determined, although the survey questions in YRBS demonstrate good test–retest reliability. Third, YRBS data apply only to youth who attend school and therefore are not representative of all persons in this age group. Nationwide, in 2009, of persons aged 16 to 17 years, ~4% were not enrolled in a high school program and had not completed high school. Fourth, the gender of sexual partners is not included in these surveys. Therefore, we could not identify MSM who account for the greatest number of adolescents and young adults living with HIV infection. However, all adolescents and young adults should be screened for HIV, regardless of risk, specifically in areas with prevalence of undiagnosed HIV ≥0.1%. Annual HIV testing, not addressed in this analysis, should focus on those at higher risk and in need of repeat HIV testing. Fourth, we could not determine if respondents were tested for other STIs, which would provide useful context information about potential risk for HIV and other sexual health care interactions. Lastly, sexually experienced respondents in BRFSS could not be identified; therefore, some persons included in the analysis may not have been exposed to HIV through sexual intercourse, the most common transmission risk behavior. However, on the basis of data from National Survey of Family Growth, 86% of women and 83% of men aged 18 to 24 years have had sexual intercourse by age 22, indicating the effect of this nonsexually experienced population on our results is likely minimal.

CONCLUSIONS
Increasing the percentage of adolescents and young adults screened for HIV is important for increasing awareness of HIV infection and reducing new HIV infections among this population. However, less than one-quarter of high school students who have had sexual intercourse and one-third of young adults have ever been tested for HIV, and there was no evidence of increased testing. No increase in testing among male students and young adult males and decreased testing among young adult black females is of special concern given the higher risk of HIV infection among men and black women.

Multipronged testing strategies, including provider education, system-level interventions in clinical settings, adolescent-friendly testing services, and sexual health education will likely be needed to increase testing and reduce the percentage of adolescents and young adults living with HIV infection.

ACKNOWLEDGMENTS
The authors thank Janet Heitgerd, PhD, and Dale Stratford, PhD, for their expertise and helpful feedback on earlier drafts of this article.

ABBREVIATIONS
BRFSS: Behavioral Risk Factor Surveillance System
CDC: Centers for Disease Control and Prevention
MSM: gay, bisexual, and other men who have sex with men
USPSTF: United States Preventive Services Task Force
YRBS: National Youth Risk Behavior Survey
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Pediatrics originally published online January 19, 2016;

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