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Author manuscript

*AIDS Care*. Author manuscript; available in PMC 2021 May 18.

Published in final edited form as:

*AIDS Care*. 2019 September ; 31(9): 1106–1113. doi:10.1080/09540121.2019.1619666.

## Substance use, violence experiences, and mental health: Are these health risks associated with HIV testing among sexually experienced U.S. high school students?

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### Abstract

HIV testing is a critical strategy for prevention of HIV yet testing among sexually experienced adolescents is sub-optimal. The purpose of this study is to examine associations between risk behaviors and experiences related to substance use, violence, and mental health and suicide and receipt of testing. We analyzed cross-sectional data from the 2017 national Youth Risk Behavior Survey, a nationally representative sample of U.S. high school students in grades 9–12. Analyses were limited to sexually experienced participants ( $n = 5,192$ ). Measures included nine indicators related to substance use, violence, and mental health and suicide. Unadjusted and adjusted prevalence ratios were calculated for each indicator to examine associations with testing. Adjusted models controlled for same-sex sexual behavior, sexual risk, and demographic characteristics. Prevalence of HIV testing was 17.2%. In adjusted models, forced sexual intercourse, injection drug use, other illicit drug use, and persistent feelings of sadness or hopelessness were associated with a higher likelihood of testing. Prevalence of HIV testing in this sexually experienced sample was low. Some behaviors and experiences that may be indicative of HIV risk, including sexual dating violence and prescription opioid misuse, were not associated with testing.

### Keywords

HIV testing; adolescents; mental health; violence; substance use

### Introduction

In 2017, 21% of all new HIV diagnoses in the United States were among youth aged 13 to 24 years (Centers for Disease Control and Prevention, 2018). Further, 4 out of 5 youth diagnosed with HIV were aged 20–24 years (Centers for Disease Control and Prevention, 2018). HIV testing is an important strategy to reduce transmission of HIV, as well as connect youth living with HIV to appropriate treatment. The Centers for Disease Control and

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Prevention (CDC) recommends universal and routine HIV testing for all individuals aged 13–64 years (Branson et al., 2006). The American Academy of Pediatrics (AAP) recommends annual HIV testing for all youth at high risk for HIV, including youth who use intravenous drugs, exchange sex for money, have sex with multiple partners, or are men who have sex with men (Emmanuel and Martinez, 2011). However, the prevalence of HIV testing among adolescents is sub-optimal. Youth Risk Behavior Survey (YRBS) data from 2005–2013 indicate that an average of just 22% of sexually experienced high school students had ever been tested for HIV (Van Handel, Kann, Olsen, & Dietz, 2016). Further, trend analyses indicate that the overall prevalence of testing for HIV among high school students has decreased from 2013 to 2017 from 12.9% to 9.3% (Kann et al., 2018). In light of low and declining prevalence of testing, it is important to understand which adolescents are being tested for HIV to inform public health and clinical efforts to increase routine testing.

To date, research examining behavioral factors associated with HIV testing among adolescents has focused primarily on sexual behavior. Multiple studies suggest that youth who engage in sexual risk behaviors are more likely to be tested (Balaji et al., 2012; Crosby, Miller, Staten, & Noland, 2005; Maguen, Armistead, & Kalichman, 2000; Samet, Winter, Grant, & Hingson, 1997; Swenson, Hadley, Houck, Dance, & Brown, 2011). For example, an analysis using 2009 YRBS data found that high school students reporting 4 lifetime sex partners were approximately twice as likely to be tested (Balaji, et al., 2012). Research also suggests that youth who engage in same-sex behavior or who identify as gay/bisexual are more likely to be tested (Kann, et al., 2018; Rotheram-Borus, Gillis, Reid, Fernandez, & Gwadz, 1997). A few studies have also examined associations between demographic characteristics and HIV testing among adolescents. Prevalence of testing is higher among black (Balaji, et al., 2012; Kann, et al., 2018; Swenson, et al., 2011), female (Balaji, et al., 2012; Kann, et al., 2018), and older youth (Balaji, et al., 2012; Goodman and Berecochea, 1994; Kann, et al., 2018; Rotheram-Borus, et al., 1997).

However, other indicators of HIV risk warrant examination in addition to sexual risk behaviors and demographic characteristics. Substance use, violence experiences, and mental health issues co-occur with each other and sexual risk and could be markers for HIV risk (Decker et al., 2014; Elkington, Bauermeister, & Zimmerman, 2010; Shorey et al., 2015; Silverman, Raj, & Clements, 2004; Silverman, Raj, Mucci, & Hathaway, 2001; Teplin et al., 2005). Studies have found that psychological distress, including depression and suicidality, is associated with sexual risk behaviors among adolescents (DiClemente et al., 2001; Lowry, Crosby, Brener, & Kann, 2014; Murphy et al., 2001). Further, a robust body of literature has documented associations between various types of substance use and sexual risk behaviors (Clayton, Lowry, August, & Jones, 2015; Lowry et al., 1994; Teplin, et al., 2005). Violence experiences, such as physical or sexual intimate partner violence, have also been found to be associated with STI/HIV risk behaviors among adolescent girls and young women (Decker, et al., 2014). Moreover, behaviors and experiences such as injection drug use and forced sexual intercourse can directly lead to HIV acquisition.

Limited research has assessed associations between factors in these health domains and HIV testing. Some evidence suggests that injection drug use, forced sex, and physical and sexual dating violence are associated with increased likelihood of testing, although the data are

from a nearly a decade ago or a single state (Balaji, et al., 2012; Decker, Silverman, & Raj, 2005). Other indicators, including prescription opioid misuse and suicidality, have not been studied in relation to testing among youth, although they are associated with sexual risk (Clayton, et al., 2015; Lowry, et al., 2014).

Accordingly, we use nationally representative data to examine the prevalence of HIV testing by risk behaviors and experiences related to substance use, violence, and mental health and suicide. Further, we examine whether these health risks are associated with testing, including independently of sexual behavior. Our study builds upon the robust literature documenting co-occurrence of health risk behaviors to understand whether such health risks are also associated with a key preventive behavior—HIV testing. Substance use, violence, and mental health and suicide indicators may help identify youth for whom testing is particularly important, and integrating HIV testing with services to address these health risks and behaviors may increase receipt of testing.

## Methods

### Data Source

Data for this study come from the 2017 national Youth Risk Behavior Survey (YRBS). YRBS is a biennial, cross-sectional survey using a three-stage cluster sampling design that yields a nationally representative sample of students in grades 9–12 attending public and private schools in the 50 states and the District of Columbia. Local parental permission procedures were implemented and student participation was anonymous and voluntary. In 2017, the sample size was 14,765 and the school response rate was 75%, the student response rate was 81%, and the overall response rate was 60%. More details about the sampling strategy and scope of the survey can be found elsewhere (Brener et al., 2013). CDC's Institutional Review Board approved the national YRBS.

### Measures

The outcome variable of interest was a lifetime measure of HIV testing determined by asking, “Have you ever been tested for HIV, the virus that causes AIDS? (Do not count tests done if you donated blood.)” Nine indicators related to substance use, violence, and mental health and suicide were examined as independent variables (Table 1). Substance use indicators included lifetime measures of injection drug use, prescription opioid misuse, and other illicit drug use. Violence experiences included: forced sexual intercourse (ever), physical dating violence (past 12 months), and sexual dating violence (past 12 months). Mental health and suicide indicators included persistent feelings of sadness or hopelessness for two or more weeks in a row (past 12 months), suicidal ideation (past 12 months), and suicide attempt (past 12 months).

A sexual risk index and indicator of same-sex behavior were included as sexual behavior covariates. We combined items about number of partners (“During the past 3 months, with how many people did you have sexual intercourse?”) and condom use (“The last time you had sexual intercourse, did you or your partner use a condom?”) to create the 4-level sexual risk index: (1) had sexual intercourse, not during the past 3 months; (2) sexual intercourse

during past 3 months, condom used during last intercourse; (3) sexual intercourse during past 3 months with 1 partner, no condom used during last intercourse; and (4) sexual intercourse during past 3 months with 2+ partners, no condom used during last intercourse. A dichotomous variable indicating whether students had ever engaged in same-sex behavior was also included. Same-sex behavior was measured by asking, “During your life, with whom have you had sexual contact?” Participants who indicated they engaged in sexual contact with the same sex or both sexes were classified as engaging in same-sex behavior. Demographic covariates included sex, race/ethnicity, and grade in school.

## Data Analysis

We used SAS-callable SUDAAN Version 9.3 to conduct all analyses (RTI International). All analyses were limited to participants who ever had sexual intercourse (i.e., sexually experienced participants;  $n = 5,192$ ). Data were weighted to produce nationally representative estimates. We calculated the weighted prevalence of substance use behaviors, violence experiences, mental health and suicide indicators, sexual behaviors, and demographic characteristics among the sexually experienced sample overall and by testing status. Then, we used chi-square statistics to identify overall differences in the prevalence of these health risks by HIV testing status. To document associations between HIV testing and sexual behavior, we fit a logistic regression model including both the sexual risk index and same-sex behavior indicator, as well as demographic characteristics. We then used logistic regression to examine both unadjusted and adjusted prevalence ratios for testing for each of the substance use, violence, and mental health and suicide indicators in separate models using the PREDMARG command to obtain estimates via predicted marginal standardization, the preferred method when making inference to the overall population (Muller and MacLehose, 2014). Adjusted models controlled for both sexual behavior indicators and demographic characteristics.

## Results

Overall, about half of students were female (48.6%), and the majority were white (51.9%) (Table 2). Most were in grades 11 (28.7%) or 12 (33.8%). Prevalence of HIV testing among sexually experienced students was 17.2% overall. Among those who had been tested for HIV, the majority were female (60.5%), approximately half were non-Hispanic white (48.6%), and the majority were in 11<sup>th</sup> or 12<sup>th</sup> grade (29.6% and 39.7%, respectively). Females (prevalence ratio [PR], 1.60; 95% CI, 1.42–1.79), Black students (PR, 1.50; 95% CI, 1.17–1.93), and 11th graders (PR, 1.32; 95% CI, 1.02–1.70) and 12th graders (PR, 1.50; 95% CI, 1.15–1.95) were more likely to have received an HIV test than male students, white students, and 9th graders, respectively (Table 3).

Table 3 shows associations between sexual behaviors and HIV testing. Same-sex behavior was associated with a higher likelihood of HIV testing (adjusted prevalence ratio [aPR], 1.40; 95% CI, 1.13–1.74). Students who reported having sexual intercourse during the past 3 months with 2 or more partners and not using a condom during last intercourse were significantly more likely to have been tested compared to students who had not had sexual intercourse during the past 3 months (aPR, 2.15; 95% CI, 1.59–2.92). However, students

who had sexual intercourse during the past 3 months and used a condom during last intercourse were not more likely to have been tested for HIV compared to students who had not had sexual intercourse during the past 3 months in both unadjusted and adjusted models.

Prevalence of HIV testing by substance use behaviors, violence experiences, and mental health and suicide indicators is presented in Table 4, along with unadjusted and adjusted associations. Overall, the prevalence of HIV testing was low, ranging from 14.7% among individuals who had not experienced persistent feelings of sadness or hopelessness to 38.6% among those who had ever injected drugs. In unadjusted analyses, most experiences and behaviors were associated with a higher likelihood of HIV testing. However, associations with sexual dating violence and prescription opioid misuse were null. After adjusting for sexual behavior and demographics, forced sexual intercourse (aPR, 1.60; 95% CI, 1.34–1.91), injection drug use (aPR, 1.92; 95% CI, 1.23–3.01), other illicit drug use (aPR, 1.38; 95% CI, 1.17–1.64), and persistent feelings of sadness or hopelessness (aPR, 1.26; 95% CI, 1.06–1.50) remained associated with a higher likelihood of HIV testing. Physical dating violence, suicidal ideation, and suicide attempt were no longer significantly associated with HIV testing.

## Discussion

We found that the majority of sexually experienced high school students have never been tested for HIV, underscoring the importance of characterizing which students are tested. Because health risks that co-occur with sexual risk, including those related to substance use, violence, mental health and suicide, may be a marker for or directly contribute to HIV risk, we might expect youth with these behaviors and experiences to be more likely to be tested for HIV. Further, youth with these health risks may have greater engagement in healthcare and be offered an HIV test.

Indeed, we found that injection drug use and forced sex, which are directly linked to HIV transmission, were associated with a higher likelihood of HIV testing, including independently of sexual behavior. Sexually experienced high schools students who ever injected drugs were nearly two times as likely to be tested for HIV. Our findings are promising in that this high risk population of youth are more likely to be tested for HIV as recommended by HIV testing guidelines (Emmanuel and Martinez, 2011). That said, prevalence of HIV testing for sexually experienced high school students who inject drugs is still sub-optimal, with only about 40% having ever been tested. Similarly, practice guidelines for treating sexual assault survivors include HIV testing (Committee on Health Care for Underserved Women, 2014). Our findings show that sexually experienced high school students who had experienced forced sex were more likely to be tested; however, the prevalence of testing among this group was low (29%).

An equally concerning finding is that sexual dating violence and prescription opioid misuse were not associated with HIV testing, even in unadjusted analyses. Research suggests experiencing and perpetrating dating violence is associated with sexual behaviors, such as condomless sex and having multiple sex partners, which increase HIV risk (Casey et al., 2016; Reed, Miller, Raj, Decker, & Silverman, 2014; Vagi, Olsen, Basile, & Vivolo-Kantor,

2015). Likewise, adolescents and young adults who misuse prescription drugs are more likely to engage in sexual risk behaviors (Benotsch, Koester, Luckman, Martin, & Cejka, 2011; Clayton, et al., 2015). Given that sexual risk-taking may mediate or confound associations between these behaviors or experiences and HIV risk, it is not entirely surprising that associations between HIV testing and prescription opioid misuse or dating violence victimization were not significant after controlling for sexual risk. However, we would expect to see increased likelihood of testing in the unadjusted analyses if those at higher risk are more likely to be tested. Moreover, some evidence suggests that young people experiencing both sexual and physical dating violence are nearly three times as likely to have an STI/HIV even when controlling for sexual risk (Decker, et al., 2005), suggesting an independent risk effect that would make this group in need of HIV testing regardless of sexual behavior. Yet an independent effect between dating violence and testing was not observed.

Interestingly, suicidal ideation and suicide attempts were associated with HIV testing in unadjusted but not adjusted models, whereas persistent feelings of sadness or hopelessness were positively associated with HIV testing in both models. Research has shown that adolescents with mental health issues are more likely to engage in sexual risk behaviors (DiClemente, et al., 2001; Murphy, et al., 2001), but in general, there has been little attention to potential links between mental health and testing behaviors, particularly among adolescents. More research is needed to interpret associations documented in our study. Further, efforts to increase testing among individuals with mental health concerns are warranted given that only about 20% of sexually experienced participants with mental health concerns have been tested for HIV.

Finally, it is worth mentioning several notable findings related to associations between sexual risk and HIV testing. Although prior studies have found that adolescents with sexual risk behaviors were more likely to be tested (Balaji, et al., 2012; Crosby, et al., 2005; Maguen, et al., 2000; Samet, et al., 1997; Swenson, et al., 2011), we found that some levels of the sexual risk index were not associated with HIV testing in adjusted analyses. This finding suggests that considering a more nuanced indicator of sexual risk that combines multiple behaviors may be useful in identifying young people who may particularly benefit from, but are not receiving, testing. Additionally, only one-third of high school students with the highest level of risk (i.e., sexual intercourse past 3 months with 2+ partners, no condom used during last intercourse) had ever been tested. Clearly, efforts to improve testing among this sub-population of adolescents are needed.

One potential approach to increasing HIV testing among young people at particularly high risk is to consider co-occurring risks, taking into account adolescent behaviors and experiences across sexual behavior, substance use, violence, and mental health and suicide. Comprehensive risk assessments during preventive care visits that allow providers to learn about an adolescent's full range of risk behaviors and experiences indicative of HIV risk could help minimize missed opportunities for HIV testing. However, data indicate that only 9% of adolescent health care visits in the United States were for preventive care (Rand et al., 2007). In light of evidence from the state of Minnesota suggesting that non-preventive care visits were more common than preventive care visits among adolescents (Nordin, Solberg, &



Parker, 2010), integrating routine HIV testing with medical care related to co-occurring conditions may improve the receipt of HIV testing. As an example, integrating routine HIV rapid testing in a methadone clinic was shown to be feasible and increase the uptake of testing (Seewald et al., 2013). Possible bidirectional benefits of integrating HIV testing, both in clinic and community settings, could be an opportunity to screen for substance use, violence, and mental health issues.

There are limitations to this study. First, the YRBS does not measure health care visits so we were unable to consider how access to care contributes to the observed associations. Further, the national YRBS only examined HIV testing; testing for STDs and other blood-borne pathogens was not assessed. All YRBS data are self-reported and may be subject to recall bias. The YRBS does not sample out-of-school youth and thus these findings are only generalizable to adolescents in high school. We were also unable to examine state-level variation in these association because the national YRBS does not include variables necessary for such analyses. Finally, YRBS data are cross-sectional and we do not know the temporal relationship between the health risks examined and HIV testing. In particular, our outcome measure of interest (HIV testing) was a lifetime measure and many of our violence and mental health indicators were past-year measures. Thus, it is possible that HIV testing could have occurred before the violence and mental health experiences of interest occurred.

## Conclusions

This is one of the only studies to date to characterize HIV testing among adolescents based on health risks that co-occur with sexual risk. Because HIV testing is recommended for all individuals aged 13–64 years, prevalence of ever testing should ideally be high among all groups of young people, regardless of risk. However, given low prevalence overall, prioritizing efforts to increase testing among those most at risk is a logical first step. Ongoing attention is needed to reduce barriers to healthcare access through patient education and provider-initiated efforts, as well as systems-level innovation (e.g., electronic health record reminders), which are key components of recent clinic-based interventions (Anaya et al., 2008; Carey, Coury-Doniger, Senn, Venable, & Urban, 2008; Goetz et al., 2008). Our study suggests that screening for co-occurring health risks and integrating HIV testing in services to address substance use, violence experiences, and mental health may offer an additional opportunity to improve receipt of HIV testing among young people.

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**Table 1.**

YRBS questionnaire items and operationalization for substance use behaviors, violence experiences, and mental health and suicide indicators

<b>Behavior or Experience</b>	<b>YRBS Question</b>	<b>Operationalization</b>
<b>Substance use behaviors</b>		
Prescription opioid misuse, ever	During your life, how many times have you taken prescription pain medicine without a doctor's prescription or differently than how a doctor told you to use it?	1 times vs 0 times
Injected drugs, ever	During your life, how many times have you used a needle to inject any illegal drug into your body?	1 times vs 0 times
Other illicit drug use, ever	Composite measure of all of the following individual questionnaire items: During your life, how many times have you used any form of cocaine, including powder, crack, or freebase? During your life, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high? During your life, how many times have you used heroin (also called smack, junk, or China White)? During your life, how many times have you used methamphetamines (also called speed, crystal, crank, or ice)? During your life, how many times have you used ecstasy (also called MDMA)? During your life, how many times have you used hallucinogenic drugs, such as LSD, acid, PCP, angel dust, mescaline, or mushrooms?	1 times vs 0 times
<b>Violence experiences</b>		
Forced sexual intercourse, ever	Have you ever been physically forced to have sexual intercourse when you did not want to?	Yes vs. No
Sexual dating violence, past 12 months	During the past 12 months, how many times did someone you were dating or going out with force you to do sexual things that you did not want to do? (Count such things as kissing, touching, or being physically forced to have sexual intercourse.)	1 times vs 0 times
Physical dating violence, past 12 months	During the past 12 months, how many times did someone you were dating or going out with physically hurt you on purpose? (Count such things as being hit, slammed into something, or injured with an object or weapon.)"	1 times vs 0 times
<b>Mental health and suicide indicators</b>		
Persistent feelings of sadness and hopelessness, past 12 months	During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?	Yes vs. No
Suicidal ideation, past 12 months	During the past 12 months, did you ever seriously consider attempting suicide?	Yes vs. No
Attempted suicide, past 12 months	During the past 12 months, how many times did you actually attempt suicide	1 times vs 0 times

**Table 2.**

Demographic characteristics and prevalence of sexual behaviors, substance use behaviors, violence experiences, and mental health and suicide indicators by HIV testing status among sexually experienced<sup>a</sup> U.S. high school students, 2017

	Total % (95% CI) n=5192 <sup>b,c</sup>	Ever tested for HIV % (95% CI) n=925 <sup>b</sup>	Never tested for HIV % (95% CI) n=4108 <sup>b</sup>	p-value <sup>d</sup>
<b>Demographic characteristics</b>				
Sex				<0.01
Male	51.4 (49.4–53.5)	39.5 (35.7–43.5)	53.5 (51.7–55.2)	
Female	48.6 (46.5–50.6)	60.5 (56.5–64.3)	46.6 (44.8–48.3)	
Race/ethnicity				<0.05
Non-Hispanic white	51.9 (46.3–57.5)	48.6 (41.7–55.6)	53.2 (47.3–58.9)	
Non-Hispanic black	14.7 (11.6–18.5)	19.9 (13.9–27.6)	13.1 (10.3–16.5)	
Hispanic	24.3 (20.1–29.1)	21.4 (16.3–27.7)	24.8 (20.4–29.8)	
Other <sup>e</sup>	9.1 (7.6–10.9)	10.0 (6.7–14.8)	9.0 (7.5–10.6)	
Grade				<0.05
9th	14.0 (12.7–15.4)	10.8 (8.5–13.7)	14.5 (13.0–16.1)	
10th	23.5 (21.7–25.3)	19.9 (16.8–23.4)	24.2 (22.0–26.6)	
11th	28.7 (27.2–30.4)	29.6 (25.9–33.5)	28.5 (27.0–30.1)	
12th	33.8 (32.1–35.6)	39.7 (35.4–44.2)	32.8 (30.7–34.8)	
<b>Sexual behavior</b>				
Same-sex behavior <sup>f</sup>	12.4 (11.2–13.7)	19.2 (16.3–22.5)	11.1 (9.9–12.5)	<0.01
Sexual risk index				<0.01
Had sexual intercourse, not during past 3 months	27.9 (26.4–29.4)	22.1 (18.9–25.8)	28.9 (27.3–30.6)	
Sexual intercourse past 3 months with condom used during last intercourse	38.9 (36.9–40.9)	34.8 (31.0–38.9)	39.7 (37.5–42.0)	
Sexual intercourse past 3 months with 1 partner, no condom used during last intercourse	25.9 (24.3–27.5)	28.6 (25.1–32.3)	25.4 (23.8–27.0)	
Sexual intercourse past 3 months with 2+ partners, no condom used during last intercourse	7.4 (6.3–8.7)	14.5 (11.3–18.4)	6.00 (5.0–7.2)	
<b>Substance use behaviors</b>				
Prescription opioid misuse, ever	23.6 (21.1–26.3)	27.8 (22.2–34.3)	22.7 (20.2–25.3)	0.07
Injected drugs, ever	2.3 (1.8–2.8)	5.1 (3.5–7.4)	1.7 (1.2–2.2)	<0.01
Other illicit drug use, ever	23.4 (21.2–25.7)	31.2 (26.6–36.2)	21.6 (19.5–23.9)	<0.01
<b>Violence experiences</b>				
Forced sexual intercourse, ever	15.1 (13.5–16.8)	25.3 (21.1–30.1)	13.1 (11.6–14.8)	<0.01
Sexual dating violence, past 12 months	9.0 (8.0–10.2)	11.3 (8.2–15.4)	8.4 (7.4–9.6)	0.12
Physical dating violence, past 12 months	12.0 (11.0–13.0)	15.6 (12.6–19.2)	11.0 (10.1–12.0)	<0.01
<b>Mental health and suicide indicators</b>				
Persistent feelings of sadness and hopelessness, past 12 months	39.8 (37.3–42.4)	48.5 (43.6–53.5)	37.9 (35.3–40.7)	<0.01

	Total % (95% CI) n=5192 <sup>b,c</sup>	Ever tested for HIV % (95% CI) n=925 <sup>b</sup>	Never tested for HIV % (95% CI) n=4108 <sup>b</sup>	p-value <sup>d</sup>
Suicidal ideation, past 12 months	23.1 (21.3–24.9)	28.5 (24.6–32.8)	22.0 (20.2–23.9)	<0.01
Attempted suicide, past 12 months	11.4 (9.9–13.0)	16.0 (12.3–20.6)	10.4 (9.0–12.1)	<0.01

CI=confidence interval

<sup>a</sup>Sexually experienced is defined as participants who ever had sexual intercourse

<sup>b</sup>Sample n is unweighted; percentage is weighted

<sup>c</sup>Sample size includes sexually experienced students missing HIV testing data

<sup>d</sup>Chi-square test was used to identify overall differences by HIV testing status

<sup>e</sup>Other race category includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and Multiple, non-Hispanic

<sup>f</sup>Same-sex behavior was defined as those who engaged in sexual contact with the same sex or both sexes

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**Table 3.**

Associations between sexual behaviors and demographic characteristics and HIV testing among sexually experienced<sup>a</sup> U.S. high school students, 2017

	Prevalence of HIV testing % (95% CI)	PR (95% CI)	APR <sup>b</sup> (95% CI)
<b>Sexual behavior</b>			
Same-sex behavior <sup>c</sup>			
No	15.7 (13.8–17.8)	Ref	Ref
Yes	26.2 (21.5–31.6)	<b>1.67 (1.40–1.99)***</b>	<b>1.40 (1.13–1.74)**</b>
Sexual risk index			
Had sexual intercourse, not during past 3 months	13.6 (11.0–16.7)	Ref	Ref
Sexual intercourse past 3 months with condom used during last intercourse	15.3 (13.1–17.8)	1.12 (0.90–1.41)	1.14 (0.92–1.41)
Sexual intercourse past 3 months with 1 partner, no condom used during last intercourse	18.8 (16.2–21.8)	<b>1.38 (1.12–1.71)**</b>	1.21 (0.98–1.50)
Sexual intercourse past 3 months with 2+ partners, no condom used during last intercourse	33.2 (26.4–40.8)	<b>2.44 (1.85–3.22)***</b>	<b>2.15 (1.59–2.92)***</b>
<b>Demographic characteristics</b>			
Sex			
Male	13.3 (11.6–15.1)	Ref	Ref
Female	21.2 (18.5–24.1)	<b>1.60 (1.42–1.79)***</b>	<b>1.59 (1.40–1.81)***</b>
Race/ethnicity			
Non-Hispanic white	15.9 (13.8–18.4)	Ref	Ref
Non-Hispanic black	24.0 (18.9–30.0)	<b>1.50 (1.17–1.93)**</b>	<b>1.48 (1.13–1.95)*</b>
Hispanic	15.2 (11.8–19.4)	0.95 (0.73–1.24)	0.96 (0.75–1.24)
Other <sup>d</sup>	18.9 (13.2–26.3)	1.18 (0.83–1.68)	1.15 (0.80–1.67)
Grade			
9th	13.4 (10.6–16.8)	Ref	Ref
10th	14.6 (12.0–17.6)	1.09 (0.80–1.48)	1.06 (0.76–1.47)
11th	17.7 (14.7–21.2)	<b>1.32 (1.02–1.70)*</b>	<b>1.32 (0.99–1.77)*</b>
12th	20.1 (17.0–23.6)	<b>1.50 (1.15–1.95)**</b>	<b>1.43 (1.07–1.92)*</b>

PR=Prevalence ratio; APR=Adjusted prevalence ratio; CI = confidence interval

<sup>a</sup> Sexually experienced is defined as participants who ever had sexual intercourse

<sup>b</sup> Adjusted model includes both sexual behavior (same-sex behavior and sexual risk index) and demographic variables

<sup>c</sup> Same-sex behavior was defined as those who engaged in sexual contact with the same sex or both sexes

<sup>d</sup> Other race category includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and Multiple, non-Hispanic

\* p<.05

\*\* p<.01

\*\*\* p<.001; bolding indicates any finding that is significant at p<.05

**Table 4.**

Associations between substance use behaviors, violence experiences, and mental health and suicide indicators and HIV testing among sexually experienced<sup>a</sup> U.S. high school students, 2017

	Prevalence of HIV testing % (95% CI)	PR (95% CI)	APR <sup>b</sup> (95% CI)
<b>Substance use behaviors</b>			
Prescription opioid misuse, ever			
Yes	20.3 (16.5–24.8)	1.25 (1.00–1.56)	1.13 (0.89–1.42)
No	16.2 (14.2–18.5)	Ref	Ref
Injected drugs, ever			
Yes	38.6 (26.6–52.1)	<b>2.36 (1.71–3.24) ***</b>	<b>1.92 (1.23–3.01) *</b>
No	16.4 (14.5–18.4)	Ref	Ref
Other illicit drug use, ever			
Yes	22.4 (18.8–26.3)	<b>1.50 (1.25–1.80) ***</b>	<b>1.38 (1.17–1.64) ***</b>
No	14.9 (13.1–16.9)	Ref	Ref
<b>Violence experiences</b>			
Forced sexual intercourse, ever			
Yes	28.7 (24.4–33.4)	<b>1.89 (1.58–2.26) ***</b>	<b>1.60 (1.34–1.91) ***</b>
No	15.2 (13.2–17.4)	Ref	Ref
Sexual dating violence, past 12 months			
Yes	21.8 (16.6–28.0)	1.30 (0.96–1.77)	1.04 (0.74–1.47)
No	16.7 (14.6–19.0)	Ref	Ref
Physical dating violence, past 12 months			
Yes	22.7 (18.5–27.6)	<b>1.39 (1.13–1.69) **</b>	1.16 (0.90–1.48)
No	16.4 (14.5–18.5)	Ref	Ref
<b>Mental health and suicide indicators</b>			
Persistent feelings of sadness or hopelessness, past 12 months			
Yes	21.0 (18.1–24.3)	<b>1.43 (1.21–1.69) ***</b>	<b>1.26 (1.06–1.50) *</b>
No	14.7 (12.7–17.0)	Ref	Ref
Suicidal ideation, past 12 months			
Yes	21.3 (18.6–24.3)	<b>1.33 (1.12–1.58) **</b>	1.16 (0.97–1.39)
No	16.0 (13.8–18.5)	Ref	Ref
Attempted suicide, past 12 months			
Yes	23.7 (19.0–29.2)	<b>1.49 (1.15–1.91) **</b>	1.23 (0.96–1.59)
No	16.0 (13.6–18.7)	Ref	Ref

PR=Prevalence ratio; APR=Adjusted prevalence ratio; CI=confidence interval

<sup>a</sup> Sexually experienced is defined as participants who ever had sexual intercourse

<sup>b</sup> Adjusted models include the single risk behavior or experience of interest, both sexual behavior variables (same-sex behavior and the sexual risk index), and all demographic variables (sex, race/ethnicity, and grade).

\* p<.05



\*\*  
p<.01

\*\*\*  
p<.001; bolding indicates any finding that is significant at p<.05

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