Published in final edited form as:

Womens Health Issues. 2018 ; 28(5): 421–429. doi:10.1016/j.whi.2018.04.011.

The impact of traumatic experiences on risky sexual behaviors in Black and White young adult women

Kimberly B. Werner, PhD¹, Renee M. Cunningham-Williams², Whitney Sewell², Arpana Agrawal³, Vivia V. McCutcheon³, Mary Waldron^{3,4}, Andrew C. Heath³, and Kathleen K. Bucholz³

¹Missouri Institute of Mental Health, University of Missouri – St. Louis, MO, United States

²George Warren Brown School of Social Work, Washington University, St. Louis, MO, United States

³Alcohol Research Center, Department of Psychiatry, Washington University School of Medicine, St. Louis, MO, United States

⁴Department of Counseling and Educational Psychology, Indiana University School of Education, Bloomington, Indiana, United States

Abstract

Context—Trauma exposure has been linked to risky sexual behavior (RSB) but few studies have examined the impact of distinct trauma types on RSB in one model or how the association with trauma and RSB may differ across race.

Purpose—The objective of the current study was to examine the contribution of trauma exposure types to RSB – substance-related RSB and partner-related RSB identified through factor analysis – in young Black and White adult women.

Procedure—We investigated the associations of multiple trauma types and RSB factor scores in participants from a general population sample of young adult female twins ($n = 2948$). We examined the independent relationship between specific traumas and RSB, adjusting for substance use, psychopathology, and familial covariates. All pertinent constructs were coded positive only if they occurred prior to sexual debut.

Main Findings—In Black women, sexual abuse was significantly associated with substance-related and partner-related RSB, but retained significance only for partner-related RSB in a fully adjusted model. For White women, sexual abuse and physical abuse were associated with both RSB factors in the base and fully adjusted models. Witnessing injury or death was only associated with RSBs in base models. For both groups, initiating alcohol (for Black women), alcohol, or

Address correspondence and reprint requests to: Kimberly B. Werner, Ph.D.; Missouri Institute of Mental Health, University of Missouri – St. Louis, MO; 4633 World Parkway Circle; St. Louis, MO 63134; Phone: 314-516-8421; kim.werner@mimh.edu.

Conflicts of Interest: The authors declare that they have no conflict of interest.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

cannabis (for White women) prior to sexual debut (i.e. early exposure) was associated with the most elevated odds of RSB.

Conclusions—Data highlight the contribution of prior sexual abuse to RSBs for both White and Black women, and of prior physical abuse to RSBs for White women. Findings have implications for intervention following physical and sexual abuse exposure to prevent RSB, and thus, potentially reduce STI/HIV infection and unintended pregnancy in young women.

Keywords

Risky sexual behavior; trauma exposure; early substance use; race

Introduction

Adolescents and young adults (15–24 years of age) constitute nearly 50% of new cases of sexually transmitted infections (STI) and human immunodeficiency virus (HIV) in the United States [Center for Disease Control (CDC), 2014; Satterwhite et al., 2013]. In a national adolescent sample, nearly a quarter (24.1%) of adolescent and young adult women were infected with an STI (Forhan et al., 2009). Risky sexual behaviors (RSB) are well-supported as risk factors for STI/HIV and include behaviors such as sex while using substances and inconsistent condom use (Epstein, Bailey, Manhart, Hill, & Hawkins, 2014; Kann et al., 2014). Although some sexual experimentation during adolescence/young adulthood is normative (van de Bongardt, Yu, Dekovic, & Meeus, 2015), this population is at particular high risk of maladaptive outcomes and reports the highest rates of RSB (Fergus, Zimmerman, & Caldwell, 2007). In fact, evidence shows adolescent and young adult women are not only at highest risk for contracting STI (CDC, 2014) but are more biologically susceptible (Yi, Shannon, Procter, McKinnon, & Kaul, 2013) than older women. Therefore, research to understand the etiology of RSB to primarily prevent STI/HIV and unintended pregnancies is crucial in this population.

Trauma exposure has been linked to RSB and STI/HIV outcomes (Abajobir, Kisely, Williams, Strathearn, & Najman, 2018; Allsworth, Anand, Redding, & Peipert, 2009; Berenson, Wiemann, & McCombs, 2001; Cunningham, Stiffman, Dore, & Earls, 1994; Green et al., 2005; Voisin, Chen, Fullilove, & Jacobson, 2015). Sexual abuse during childhood has been associated with increased risk of RSB (for meta-analysis see Abajobir, Kisely, Maravilla, Williams, & Najman, 2017) with little research examining the impact of other trauma types or the specificity of the relationship between distinct trauma types and RSB. An exception is an investigation of the trauma-related etiology of RSB in a sample of young women (Senn & Carey, 2010). The authors found, when accounting for other forms of child maltreatment, that childhood sexual abuse remained associated with RSB. In a separate study of high risk adolescent women (Smith, Leve, & Chamberlain, 2006), researchers reported that cumulative childhood trauma exposure (i.e., witnessing violence, accidents, or death, or experiencing physical and sexual abuse) significantly increased the likelihood of RSB. Interestingly, posttraumatic stress disorder (PTSD) was not associated with RSB in this sample, suggesting the traumatic experiences – rather than trauma-related sequelae – increased likelihood for RSB. Although these studies provide insight into the relationship between trauma and RSB, they are limited by small samples and inclusion of

childhood sexual and physical trauma exposure only, and do not take into account other factors such as substance use and psychiatric disorders (e.g. conduct disorder, major depression) that could influence such behaviors.

A recent meta-analysis (Abajobir et al., 2017) called for additional research examining the impact of multiple forms of trauma on RSB while accounting for polyvictimization and other potential confounders. As a follow-up, Abajobir and colleagues (Abajobir, et al., 2018) attempted to fill this gap by examining the association of multiple forms of substantiated childhood maltreatment and RSB. Abajobir et al. (2108) reported all types of substantiated childhood maltreatment were independently associated with early sexual debut and youth pregnancy even after adjusting for familial level characteristics and any other forms of substantiated childhood maltreatment. However, this study did not consider forms of trauma outside of substantiated childhood maltreatment and was limited to an Australian sample, restricting generalizability to more racially diverse US populations.

In addition to the impact of trauma exposure, substance use and pressure from sexual partners have been shown to compromise condom use and increase the likelihood of STI/HIV transmission and unintended pregnancies (Epstein et al., 2014; Levy, Sherritt, Gabrielli, Shrier, & Knight, 2009; Shorey et al., 2015; Upchurch, Mason, Kusunoki, & Kriechbaum, 2004). Substance use during the lifetime and immediately preceding sexual intercourse has been frequently implicated as an independent contributor to the likelihood of such RSBs, including early sexual debut, having multiple sexual partners, and repeated voluntary unprotected sex (Graves & Leigh, 1995; Guo et al., 2002; Staton et al., 1999). Similar to sexual experimentation, experimentation with substances in adolescence/young adulthood is also part of normal development. However, evidence shows that as many as 34% of adolescents were under the influence of substances during their most recent sexual encounter (Kann et al., 2014); therefore, understanding factors that may contribute to a shift from normative adolescent development to substance-related RSB is essential. Additionally, a recent study reported pressure from a woman's sexual partner could deleteriously influence her sexual decision-making and increase the likelihood of engaging in multiple RSBs, including sex while under the influence of substances and unprotected sexual intercourse (Raiford, Seth, & DiClemente, 2013).

Lastly, the impact of race on the association of trauma and RSB is important to consider, as substantial racial disparities exist in sexual behaviors, sexual health outcomes, and trauma exposure (Duncan et al., 2014; Forhan et al., 2009; Kann et al., 2014; Kost & Henshaw, 2014; Voisin et al., 2015). Among a nationally representative sample of adolescent women, Black females reported experiencing substantially higher rates of STI (44%) compared to their White counterparts (20%; Forhan et al., 2009). Black adolescent and young adult women were twice as likely to report sexual intercourse before the age of 13 years (Hallfors, Iritani, Miller, & Bauer, 2007) and have been found to experience more partner compromised condom use than their White counterparts (Smith, 2003). Research has also shown racial disparities in trauma exposure, where Black women report higher rates of overall traumatic experiences (Duncan et al., 2014) compared to White women. In the only study to our knowledge examining the impact of race on the association of traumatic exposure and RSB, a weaker relationship between community violence and early sexual

debut and total number of sexual partners was observed in Blacks compared to Whites and in women compared to men (Voisin et al., 2015).

Although there is limited research directly examining the association of race in the relationship between trauma exposure and RSB, existing knowledge of racial differences in RSB, STI rates, and trauma exposure highlight the heterogeneity of the adolescent and young adult female population. Furthermore, discrepancies between Black and White women in the trauma-related etiology of other risky behaviors such as alcohol and cannabis misuse have been reported (Sartor et al., 2015; Werner et al., 2016; Werner, Sartor, et al., 2016). Finally, there are marked socio-ecological differences between and within White and Black communities across the United States and subsequent implications for disparities in health and mental health outcomes. Therefore, it is critical to examine the differential impact that trauma exposure might have on RSB in Black and White women to develop culturally appropriate and sensitive prevention and intervention strategies. To investigate the distinct contribution of trauma exposure to RSB, previously identified risk factors associated with trauma exposure and RSB, including psychiatric disorders, must also be considered (Ramrakha et al., 2007; Tubman, Gil, Wagner, & Artigues, 2003).

This study aims to identify the distinct contributions of specific trauma exposure types to risky sexual behaviors – substance-related RSB and partner-related RSB identified through factor analysis – in young adult Black and White women.

Materials and Methods

The Missouri Adolescent Female Twin Study (MOAFTS) is a multi-wave investigation of alcohol-related problems and associated psychiatric disorders in adolescent and young adult women. Detailed descriptions of the MOAFTS methods have been previously reported (Heath et al., 2002; Waldron, Bucholz, Lynskey, Madden, & Heath, 2013), with summaries pertaining to the current investigation provided. Procedures for MOAFTS were approved by the Washington University School of Medicine, Human Research Protections Office and all participants provided informed consent prior to enrolling in the study.

Participants

Data from the MOAFTS 2002–2005 assessment (total sample $N=3787$), completed on average 5 years following baseline, were analyzed for the current investigation, since that assessment included the largest number of respondents and the most intensive risky sexual behavior and trauma assessments. Participants were identified through Missouri birth records and consisted of twins born to Missouri-resident mothers between July 1, 1975 and June 30, 1985 and initially recruited from 1995 to 1999. Cohorts of 13, 15, 17, and 19 year-old female twin pairs and their parents were recruited and, of those found eligible for participation, parental interviews were collected at baseline in 78% of the families. All available data for trauma exposure, psychopathology, and substance use from prior waves were also utilized and collapsed across waves to obtain lifetime rates. For this study, the sample was composed of 2948 young adult women who ever had consensual sex, representing 77.8% of the full sample.

Procedure and assessment battery

Assessments were completed by trained interviewers using an adaptation of the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA; Bucholz et al., 1994) modified for telephone administration. The SSAGA was designed to assess psychiatric symptoms using criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* [DSM-IV; American Psychiatric Association (APA), 1994] including substance use, psychopathology, and psychosocial domains.

Risky sexual behaviors—Previous research suggests women may choose to not use condoms for many reasons, not all of which may reflect risky use (Trussell, & Guthrie, 2007). Therefore, to be considered as engaging in RSB, participants were required to meet a high threshold of non-condom use due to substance involvement and/or partner-related compromised decision making. Specifically, individuals who reported non-condom use were questioned about whether they had ever had sexual intercourse without a condom because a) they were under the effects of alcohol; b) they were under the effects of drugs; c) they thought their partner would get angry if a condom was used; d) they didn't feel comfortable discussing using a condom; or e) their partner didn't want to use a condom or wouldn't allow a condom to be used (not because they were trying to get pregnant). Respondents were coded positive for each item only if the item was endorsed as occurring more than once in their entire life.

Two questions pertaining to alcohol-related RSB were also asked: a) when you had a lot to drink, did you ever engage in sexual intercourse when you otherwise would not have; and b) did drinking ever make you careless about sex so that you did not protect against AIDS or other sexually transmitted diseases or pregnancy. These seven RSB items were considered in exploratory factor analysis (EFA) and confirmatory factor analysis (CFA; Supplement 1) and two factors, representing substance-related RSB and partner-related RSB, were identified. Factor scores based on these results were used as the dependent variables in the analyses reported herein.

Trauma exposure—History of trauma exposure throughout the lifetime was assessed using a checklist of traumatic events adapted from the Revised Diagnostic Interview Schedule (Robins et al., 1985) used in the National Comorbidity Survey (Kessler, Sonnega, Bromet, & Hughes, 1995). Prior to the interview, respondents were mailed booklets that included a list of traumatic events. Each participant was asked if she had experienced any of the traumatic events listed in the respondent booklet and was instructed not to report the same event twice, with age at first experience of each endorsed traumatic event also recorded. To reduce report bias, respondents were asked if they experienced each traumatic event by the corresponding number in the booklet, not by explicitly naming the event. Traumatic experiences included *sexual abuse, physical abuse, witnessing injury or death, life threatening accident, and natural disaster* (Table 1). Additional questions that provided behavioral descriptions consistent with sexual or physical abuse during childhood were also queried, with endorsement of one or more behaviors as occurring “often” coded as positive for sexual abuse or physical abuse. (Table 1)

Substance initiation and psychopathology—Previous research has proposed substance use and psychopathology as associated constructs (Malow, Dévieux, & Lucenko, 2006); we also considered the contribution of substance-related and psychopathological factors: alcohol use, tobacco use, cannabis use and conduct disorder, Major Depressive Disorder (MDD), and PTSD. *Alcohol initiation* was defined as having ever consumed a full alcoholic beverage; *tobacco initiation* was defined as having first used/tried any form of tobacco; *cannabis initiation* was defined as ever using cannabis. Ages when first use occurred were obtained. *PTSD* diagnosis reflected full *DSM-IV* (APA, 1994) PTSD lifetime criteria. PTSD symptoms were assessed following the traumatic event reported as most disturbing that also resulted in feelings of “intense fear, helplessness, or horror.” Individuals who reported no trauma or who had experienced trauma but had no disturbing feelings were coded as negative for PTSD. *Conduct disorder* was defined as meeting three or more *DSM-IV* conduct disorder symptoms in a 12-month period prior to the age of 15. Lifetime diagnosis of *Major Depressive Disorder* (MDD) was met if dysphoria or anhedonia were reported as occurring for at least 2 weeks along with an additional 4 or more *DSM-IV* major depressive symptoms during the same 2-week period. To ensure that a temporal relationship with RSB could be inferred (as no age of onset of RSB was obtained), only traumatic experiences, substance initiation, and psychopathology that occurred prior to the age of sexual debut were counted as risk factors.

Covariates—Covariates were selected based on the literature. Age cutoffs for early onset of sexual debut and sexual maturation were empirically based and reflected the age (in years) closest to the lowest quartile (25%) of the distribution for each variable. *Early sexual debut* was defined as first consensual sex prior to age 15. *Early sexual maturation* was defined as onset of menses prior to age 12. To account for the impact of socio-economic status, both *familial annual household income* and *parental education* were reported by the participants’ mothers at baseline and included in multivariate regression models. Income was categorized as <\$30,000 per year, \$30,000–\$74,999, and \$75,000 per year. Individual variables representing mother’s and father’s education levels were created by dummy-coding parental reports on whether each parent had completed high school (including GED completion) or not. *Parental separation*: As reported by the mothers, parental separation was defined as parental relationship dissolution prior to the participant’s age of 18 years, including those where parental separation occurred before the participant’s first birthday. *Maternal and paternal alcohol problems* were assessed based on the mother’s baseline report of her own and that of the co-parent’s *DSM-IV* defined alcohol use disorder symptoms (APA, 1994). Endorsement of one or more alcohol use symptoms by maternal report was coded as a positive response for alcohol-related problems by that parent, coded separately for mothers and fathers.

Data analysis

Pooled analyses are not valid when substantial separation of the distribution of one or more variables exists between contrast groups (Imbens & Rubin, 2015), as was the case in our data where there was marked socio-economic status imbalance between Black and White participants assessed by annual household income and parental educational attainment. Therefore, to avoid compromising the statistical validity of findings, analyses were stratified

by race to allow for separate, generalizable statements about risk-mechanisms for Black and White women. All multivariate analyses were conducted using STATA 14 (StataCorp, 2007) and Huber-White robust standard errors were used to adjust for the non-independence of observations in twin pairs.

Prevalence rates of RSBs, trauma exposure, substance-related behaviors, psychiatric disorders, and parental characteristics were calculated for Black and White women. Tetrachoric correlations indicated sufficient independence for all variables considered in the regression models for Black (range from 0.008–0.598) and White (range from 0.007–0.636) participants. Continuous measures of substance-related RSB and partner-related RSB, identified through CFA (see Supplement 1), were the main outcome variables. To ensure some temporality of predictive factors with the RSB outcomes, we counted only trauma exposures, substance use, and psychopathology that occurred prior to first consensual sexual contact. Linear regression analyses were performed to examine the association of trauma and other previously associated risk factors with substance-related RSB and partner-related RSB. All models included covariates of familial annual income, maternal and paternal education, maternal and paternal alcohol related problems, parental separation, early sexual debut, and early sexual maturation. Separate base models of association included each independent factor (e.g. specific trauma exposure, psychopathology, substance initiation) and all covariates to estimate the distinct contribution of each factor to RSB. Those factors that reached significance in the base models were included simultaneously in the fully adjusted models.

Results

Risky Sexual Behaviors, Psychopathology, and Trauma Exposure by Race

Demographic characteristics and endorsement frequencies of individual RSB items used in the factor analyses by race are displayed in Table 2. Participants were on average 21.7 years of age ($SD=2.76$; range 18–29) at the 2002 assessment; 15.9% percent of participants identified as Black and 84.1% as White, consistent with Missouri state demographics. Significant racial differences in individual RSB items were evident. Black women were more likely to endorse not using a condom because of partner preferences. White women were more likely to report not using a condom when drinking. When limiting the sample to only those who endorsed ever using alcohol, Black women were less likely to report not using a condom when under the influence of alcohol, engaging in sexual activity when under the influence of alcohol when they otherwise would not have, and not protecting against HIV or other sexually transmitted diseases or pregnancy when drinking. Additional comparisons of risk factors across race are presented in Table 2.

Supplemental materials include a full description of EFA and CFA with results and tables pertaining to analyses undertaken to identify RSB outcome variables: Two factors were recovered and labeled as “substance-related RSB” and “partner-related RSB”. Significant mean differences between Black and White women were observed for both the substance-related RSB factor and partner-related RSB factor. On average, Black women scored lower on the substance-related RSB factor ($M=-0.09$; $SD=0.54$) than White women [$M=0.20$; $SD=0.60$; ($F=80.70$; $p<0.001$)] while Black women ($M=0.27$; $SD=0.54$) scored higher on

partner-related RSB factor than their White counterparts [$M=0.18$; $SD=0.54$; ($F=9.46$, $p=0.002$)].

Linear Regression for Substance Related and Partner Related Risky Sexual Behaviors

Base and fully adjusted models of trauma related risk associated with substance-related RSB and partner-related RSB for Black and White women are reported in Tables 3 and 4 respectively.

Black Women—In the base models, sexual abuse, alcohol initiation, and tobacco initiation that occurred prior to sexual debut were independently and significantly associated with substance-related RSB (Table 3). When including these factors in the fully adjusted model, only alcohol initiation remained a significant contributor to substance-related RSB [$F(13,267) = 7.20$; $p=0.010$; $R^2 = 0.072$]. In contrast, for partner-related RSB, only sexual abuse achieved statistical significance, and thus the base and fully adjusted models are identical for Black women [$F(11,267) = 1.870$; $p=0.043$; $R^2 = 0.066$].

White Women—In base models examining substance-related RSB, sexual abuse, physical abuse, witnessing injury or death, alcohol initiation, tobacco initiation, cannabis initiation, conduct disorder, and MDD (all prior to the age of first consensual encounter) significantly contributed to substance-related RSB for White women (Table 4). In the fully adjusted model, sexual abuse, physical abuse, alcohol use, cannabis use, and conduct disorder remained significantly associated with substance related RSB [$F(18,1443) = 12.18$; $p<0.001$; $R^2 = 0.104$]. For partner-related RSB, base models revealed significant associations with most of the variables. However, when these were included simultaneously in the fully adjusted model, only sexual abuse, physical abuse, cannabis use, and MDD remained significantly associated with increased risk for partner-related RSB [$F(18,1443) = 9.12$; $p<0.001$; $R^2 = 0.088$].

Discussion

The current investigation extends the existing state of science by examining the association of multiple specific types of trauma exposure to two RSB factors – substance-related RSB and partner-related RSB – above and beyond the contribution of psychiatric disorder and substance involvement in Black and White young adult women. Our findings support existing evidence (Abajobir et al., 2018; Abajobir et al., 2018) that both sexual and physical abuse are important contributors to RSB even when accounting for timing of events, multiple trauma exposure types, substance involvement, psychopathology, and familial factors. Findings also supported differential models for Black versus White women, pointing to the importance of considering culturally specific pathways in the association between trauma exposure and RSB. Furthermore, racial differences in substance use and substance use related etiology of RSB were revealed. Taken together, findings support the need for further research into the pathways from trauma and early substance initiation to RSB to inform the design and implementation of culturally competent prevention and intervention programs.

This study found that sexual and physical abuse was a distinct contributor to both substance- and partner-related risky sexual behavior, but only for White women. Sexual abuse was related to partner-related RSB, but not substance-related RSB, in Black women after accounting for other factors, including substance involvement and psychiatric disorders, in the fully adjusted model. As previously reported, physical abuse has been associated with other risky behaviors (e.g. problem cannabis use) in White but not Black women (Werner, Grant, et al., 2016). This disparity could be due to increased prevalence of physical abuse exposure in Black women or to racial differences in acculturation/acceptability of physical punishment among Black versus White women (Deater-Deckard, Pettit, Lansford, Dodge, & Bates, 2003; Patton, 2017). Equally, these findings may reflect a heightened physical trauma-related liability for risky behaviors for White women, even after accounting for adverse family circumstances – including parental alcohol problems. Furthermore, in White but not Black women, witnessing injury or death was significantly associated with both RSB factor scores but did not persist once other factors were included in the model simultaneously. These findings are consistent with and build on reports by Voisin and colleagues (2015) that a stronger association exists between community violence exposure and RSB in White compared to Black young adults. Although findings support differences in race specific etiology of RSB, it is important to further elucidate why these differences exist. Further research is needed to explore race specific pathways to RSBs to inform development of culturally appropriate interventions.

In addition to the racial disparities in the association of trauma exposure and RSB, findings in the relationship between substance use and RSB differed between White women and Black women. Although alcohol and cannabis use were significantly less prevalent in Black women compared to White women, alcohol use was most strongly associated with substance-related RSB in Black women, while cannabis use was associated with both RSB outcomes for White women.

These findings build upon previous research in a small mixed race and gender young adult sample (Dir et al., 2018) that observed alcohol use only (and not cannabis use) was related to higher likelihood of unprotected sex. Although we also observed that alcohol use was associated with substance-related RSB in both White and Black women, our findings revealed an association of cannabis use for RSBs in White women as well. Previous research has shown that alcohol involvement is more prevalent in White young adults (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2016) – and this was true in our sample as well. Cannabis use for White women may reflect more extreme behavior, serving as an indicator for increased risk taking behaviors overall. Prior research has documented differences in substance use patterns for Black and White women (Sartor et al., 2013) as well as racial disparities in sexual development and health (Forhan et al., 2009). Taken together, such findings suggest that further research into race-specific models of substance use risk and RSB is warranted. These findings should be viewed in the context of some key limitations. The aim of this investigation was to characterize the impact of trauma exposure on RSB and did not investigate if RSB increased the risk of experiencing trauma. That is, engaging in RSB may also increase the risk for additional trauma exposure – particularly sexual assault – by increasing the likelihood of high-risk behaviors (Baskin-Sommers & Sommers, 2006). In an attempt to ensure temporality with the RSB outcomes, this study

took a very conservative approach by only counting trauma exposures, substance initiation, and psychopathology that occurred prior to first consensual sexual contact as risk factors. As such, trauma exposure that occurred following first consensual sexual contact and multiple exposures to the same trauma were not considered. To be more inclusive, we re-ran our analyses using all lifetime trauma exposures, which did not change inferences. While we included statistical controls for a number of variables, there are other community-level and family-level risks that also contribute to RSB, including but not limited to family disruption, neighborhood adversity, and community cohesion. Although there is a small body of research incorporating a longitudinal perspective in these associations, more studies are needed, particularly in samples with adequate numbers of racially diverse participants.

Additional methodological limitations include the possibility of underreporting about sensitive topics such as RSB and trauma exposures as well as the potential for recall bias for ages of sexual debut, substance use, and trauma related measures. Still, we note this is a young sample; therefore, recall bias may be less potent. To further mitigate reluctance to report trauma exposure, participants were asked to report a numbered event from the trauma list and not explicitly endorse each trauma exposure.

We also employed a Midwestern twin cohort that might not be generalizable to national and global populations. Relatedly, although reflective of state demographic proportions, the small sample of Black women that were available in the data set may have resulted in lower power and wider confidence intervals in the Black cohort and a concomitant increase in type II error rate. We also acknowledge large socio-ecological disparities between the White and Black participants in our study sample and attempted to address this limitation by stratifying analyses by race and accounting for socioeconomic characteristics within each group. Although outside of the current study's scope, future research should examine the impact of socio-economic disparities and additional race-specific stressors (i.e. racial discrimination) as a potential contributor to both trauma exposure and RSB. Lastly, as our sample only included women, the current findings cannot be generalized to men and male RSB. Future research would benefit from including both men and women and considering differences in RSBs across both sex and race. Current findings point to the importance of considering race/ethnicity and related cultural constructs when describing etiology of risky sexual behaviors.

Implications for Practice and/or Policy

This research highlights the contribution of sexual and physical abuse exposures and substance use to RSB in women. Additionally, future research investigating the underlying mechanisms linking trauma exposure and RSB is warranted. These findings have implications for intervention following such sexual and physical abuse to prevent RSB onset and to reduce STI/HIV and unintended pregnancy in young women. Recognition of increased RSB consequent to such abuse is especially important for practitioners, as women reporting physical and sexual abuse might be targeted for additional medical evaluations or further preventive interventions. Additionally, substance use and patterns of use across race should be considered when developing future prevention and intervention efforts. Future research to identify potential processes underlying these observed associations between trauma exposure, substance use, and RSBs will be important to extend the present findings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding: This work was primarily supported by National Institute of Health grants to RCW (T32DA15035); KKB (AA012640); ACH (AA011998, AA017688); VVM (AA018146); AA (K02DA32573, DA23668)

References

- Abajobir AA, Kisely S, Maravilla JC, Williams G, Najman JM. Gender differences in the association between childhood sexual abuse and risky sexual behaviours: A systematic review and meta-analysis. *Child Abuse Negl.* 2017; 63:249–260. DOI: 10.1016/j.chiabu.2016.11.023 [PubMed: 27908449]
- Abajobir AA, Kisely S, Williams G, Strathearn L, Najman JM. Risky sexual behaviors and pregnancy outcomes in young adulthood following substantiated childhood maltreatment: findings from a prospective birth cohort study. *The Journal of Sex Research.* 2018; 55(1):106–119. [PubMed: 28972390]
- Allsworth JE, Anand M, Redding CA, Peipert JF. Physical and sexual violence and incident sexually transmitted infections. *Journal of Women's Health.* 2009; 18(4):529–534.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders: Diagnostic criteria from DSM-IV. American Psychiatric Association; 1994.
- Baskin-Sommers A, Sommers I. The co-occurrence of substance use and high-risk behaviors. *Journal of Adolescent Health.* 2006; 38(5):609–611. DOI: 10.1016/j.jadohealth.2005.07.010 [PubMed: 16635777]
- Berenson AB, Wiemann CM, McCombs S. Exposure to violence and associated health-risk behaviors among adolescent girls. *Arch Pediatr Adolesc Med.* 2001; 155(11):1238–1242. [PubMed: 11695933]
- Bucholz KK, Cadoret R, Cloninger CR, Dinwiddie SH, Hesselbrock VM, Nurnberger JI Jr, ... Schuckit MA. A new, semi-structured psychiatric interview for use in genetic linkage studies: a report on the reliability of the SSAGA. *Journal of Studies on Alcohol and Drugs.* 1994; 55(2):149.
- Center for Disease Control and Prevention. Sexually Transmitted Disease Surveillance. Atlanta, GA: 2014 p.
- Cunningham RM, Stiffman AR, Dore P, Earls F. The association of physical and sexual abuse with HIV risk behaviors in adolescence and young adulthood: implications for public health. *Child Abuse Negl.* 1994; 18(3):233–245. [PubMed: 8199905]
- Deater-Deckard K, Pettit GS, Lansford JE, Dodge KA, Bates JE. The Development of Attitudes about Physical Punishment: An 8-Year Longitudinal Study. *Journal of Family Psychology.* 2003; 17(3): 351–360. DOI: 10.1037/0893-3200.17.3.351 [PubMed: 14562459]
- Dir AL, Gilmore AK, Moreland AD, Davidson TM, Borkman AL, Rheingold AA, Danielson CK. What's the harm? Alcohol and marijuana use and perceived risks of unprotected sex among adolescents and young adults. *Addictive behaviors.* 2018; 76:281–284. [PubMed: 28886577]
- Duncan AE, Munn-Chernoff MA, Hudson DL, Eschenbacher MA, Agrawal A, Grant JD, ... Heath AC. Genetic and Environmental Risk for Major Depression in African-American and European-American Women. *Twin Res Hum Genet.* 2014; :1–10. DOI: 10.1017/thg.2014.28 [PubMed: 24417773]
- Epstein M, Bailey JA, Manhart LE, Hill KG, Hawkins JD. Sexual risk behavior in young adulthood: broadening the scope beyond early sexual initiation. *J Sex Res.* 2014; 51(7):721–730. DOI: 10.1080/00224499.2013.849652 [PubMed: 24423058]
- Fergus S, Zimmerman MA, Caldwell CH. Growth Trajectories of Sexual Risk Behavior in Adolescence and Young Adulthood. *American Journal of Public Health.* 2007; 97(6):1096–1101. DOI: 10.2105/AJPH.2005.074609 [PubMed: 17463379]

- Forhan SE, Gottlieb SL, Sternberg MR, Xu F, Datta SD, McQuillan GM, ... Markowitz LE. Prevalence of sexually transmitted infections among female adolescents aged 14 to 19 in the United States. *Pediatrics*. 2009; 124(6):1505–1512. DOI: 10.1542/peds.2009-0674 [PubMed: 19933728]
- Graves KL, Leigh BC. The relationship of substance use to sexual activity among young adults in the United States. *Fam Plann Perspect*. 1995; 27(1):18–22. 33. [PubMed: 7720848]
- Green BL, Krupnick JL, Stockton P, Goodman L, Corcoran C, Petty R. Effects of adolescent trauma exposure on risky behavior in college women. *Psychiatry*. 2005; 68(4):363–378. [PubMed: 16599402]
- Guo J, Chung IJ, Hill KG, Hawkins JD, Catalano RF, Abbott RD. Developmental relationships between adolescent substance use and risky sexual behavior in young adulthood. *J Adolesc Health*. 2002; 31(4):354–362. [PubMed: 12359381]
- Hallfors DD, Iritani BJ, Miller WC, Bauer DJ. Sexual and drug behavior patterns and HIV and STD racial disparities: the need for new directions. *Am J Public Health*. 2007; 97(1):125–132. DOI: 10.2105/ajph.2005.075747 [PubMed: 17138921]
- Heath AC, Howells W, Bucholz KK, Glowinski AL, Nelson EC, Madden PAF. Ascertainment of a mid-western US female adolescent twin cohort for alcohol studies: Assessment of sample representativeness using birth record data. *Twin Research*. 2002; 5(2):107–112. DOI: 10.1375/1369052022974 [PubMed: 11931688]
- Imbens GW, Rubin DB. *Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction*. New York, NY, USA: Cambridge University Press; 2015.
- Johnston LD, O'Malley PM, Miech RA, Bachman JG, Schulenberg JE. Monitoring the Future national survey results on drug use, 1975–2015: Overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan; 2016.
- Kann L, Kinchen S, Shanklin SL, Flint KH, Kawkins J, Harris WA, ... Zaza S. Youth risk behavior surveillance--United States, 2013. *MMWR Suppl*. 2014; 63(4):1–168.
- Kessler RC, Sonnega A, Bromet E, Hughes M. Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry*. 1995; 52(12):1048–1060. [PubMed: 7492257]
- Kost K, Henshaw S. US teenage pregnancies, births and abortions, 2010: National and state trends by age, race and ethnicity. 2014
- Levy S, Sherritt L, Gabrielli J, Shrier LA, Knight JR. Screening adolescents for substance use-related high-risk sexual behaviors. *J Adolesc Health*. 2009; 45(5):473–477. DOI: 10.1016/j.jadohealth.2009.03.028 [PubMed: 19837353]
- Malow R, Dévieux J, Lucenko BA. History of Childhood Sexual Abuse as a Risk Factor for HIV Risk Behavior. *Journal of Trauma Practice*. 2006; 5(3):13–32. DOI: 10.1300/J189v05n03_02
- Patton S. *Spare the Kids: Why Whipping Children Won't Save Black America*. Beacon Press; 2017.
- Raiford JL, Seth P, DiClemente RJ. What girls won't do for love: human immunodeficiency virus/sexually transmitted infections risk among young African-American women driven by a relationship imperative. *J Adolesc Health*. 2013; 52(5):566–571. DOI: 10.1016/j.jadohealth.2012.09.006 [PubMed: 23298990]
- Ramrakha S, Bell ML, Paul C, Dickson N, Moffitt TE, Caspi A. Childhood behavior problems linked to sexual risk taking in young adulthood: a birth cohort study. *J Am Acad Child Adolesc Psychiatry*. 2007; 46(10):1272–1279. DOI: 10.1097/chi.0b013e3180f6340e [PubMed: 17885568]
- Robins LN, Helzer JE, Orvaschel H, Anthony JC, Blazer DG, Burnam A, Burke JD. The diagnostic interview schedule. *Epidemiologic field methods in psychiatry: the NIMH epidemiologic catchment area program*. 1985:143–170.
- Sartor CE, Agrawal A, Grant JD, Duncan AE, Madden PAF, Lynskey MT, ... Bucholz KK. Differences between African-American and European-American Women in the Association of Childhood Sexual Abuse with Initiation of Marijuana Use and Progression to Problem Use. *Journal on Studies of Alcohol and Drugs*. 2015
- Sartor CE, Agrawal A, Lynskey MT, Duncan AE, Grant JD, Nelson EC, ... Bucholz KK. Cannabis or alcohol first? Differences by ethnicity and in risk for rapid progression to cannabis-related

- problems in women. *Psychol Med.* 2013; 43(4):813–823. DOI: 10.1017/s0033291712001493 [PubMed: 22804877]
- Satterwhite CL, Torrone E, Meites E, Dunne EF, Mahajan R, Ocfemia MC, ... Weinstock H. Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2008. *Sex Transm Dis.* 2013; 40(3):187–193. DOI: 10.1097/OLQ.0b013e318286bb53 [PubMed: 23403598]
- Senn TE, Carey MP. Child maltreatment and women's adult sexual risk behavior: childhood sexual abuse as a unique risk factor. *Child Maltreat.* 2010; 15(4):324–335. DOI: 10.1177/1077559510381112 [PubMed: 20930181]
- Shorey RC, Fite PJ, Choi H, Cohen JR, Stuart GL, Temple JR. Dating Violence and Substance Use as Longitudinal Predictors of Adolescents' Risky Sexual Behavior. *Prev Sci.* 2015; 16(6):853–861. DOI: 10.1007/s11121-015-0556-9 [PubMed: 25797949]
- Smith DK, Leve LD, Chamberlain P. Adolescent girls' offending and health-risking sexual behavior: the predictive role of trauma. *Child Maltreat.* 2006; 11(4):346–353. DOI: 10.1177/1077559506291950 [PubMed: 17043319]
- Smith LA. Partner influence on noncondom use: Gender and ethnic differences. *Journal of Sex Research.* 2003; 40(4):346–350. [PubMed: 14735408]
- StataCorp, L.P. Stata data analysis and statistical Software. Special Edition Release. 2007:10.
- Staton M, Leukefeld C, Logan TK, Zimmerman R, Lynam D, Milich R, ... Clayton R. Risky sex behavior and substance use among young adults. *Health Soc Work.* 1999; 24(2):147–154. [PubMed: 10340165]
- Tubman JG, Gil AG, Wagner EF, Artigues H. Patterns of sexual risk behaviors and psychiatric disorders in a community sample of young adults. *J Behav Med.* 2003; 26(5):473–500. [PubMed: 14593854]
- Trussell J, Guthrie KA. Choosing a contraceptive: efficacy, safety, and personal considerations. In: Hatcher RA, Trussell J, Nelson AL, Cates W, Stewart FH, Kowal D, editors *Contraceptive technology*. 19. New York (NY): Ardent Media, Inc; 2007. 19–47. revised ed
- Upchurch DM, Mason WM, Kusunoki Y, Kriebbaum MJ. Social and behavioral determinants of self-reported STD among adolescents. *Perspect Sex Reprod Health.* 2004; 36(6):276–287. DOI: 10.1363/psrh.36.276.04 [PubMed: 15687086]
- Voisin DR, Chen P, Fullilove R, Jacobson KC. Community Violence Exposure and Sexual Behaviors in a Nationally Representative Sample of Young Adults: The Effects of Race/Ethnicity and Gender. *Journal of Social Service Research.* 2015; 41(3):295–306. DOI: 10.1080/01488376.2014.987941
- van de Bongardt D, Yu R, Dekovic M, Meeus WH. Romantic relationships and sexuality in adolescence and young adulthood: The role of parents, peers, and partners. *European Journal of Developmental Psychology.* 2015; 12(5):497.
- Waldron M, Bucholz KK, Lynskey MT, Madden PAF, Heath AC. Alcoholism and timing of separation in parents: Findings in a midwestern birth cohort. *Journal of Studies on Alcohol and Drugs.* 2013; 74(2):337–348. [PubMed: 23384382]
- Werner KB, Grant JD, McCutcheon VV, Madden PAF, Heath AC, Bucholz KK, Sartor CE. Differences in childhood physical abuse reporting and the association between CPA and alcohol use disorder in European American and African American women. *Psychology of Addictive Behaviors.* 2016:30.
- Werner KB, McCutcheon VV, Agrawal A, Sartor CE, Nelson EC, Heath AC, Bucholz KK. The association of specific traumatic experiences with cannabis initiation and transition to problem use: Differences between African-American and European-American women. *Drug and alcohol dependence.* 2016; 162:162–169. DOI: 10.1016/j.drugalcdep.2016.03.003 [PubMed: 27012434]
- Werner KB, Sartor CE, McCutcheon VV, Grant JD, Nelson EC, Heath AC, Bucholz KK. The association of specific traumatic experiences with alcohol initiation and transitions to problem use in European American and African American women. *Alcoholism: Clinical and Experimental Research.* 2016
- Yi TJ, Shannon B, Prodder J, McKinnon L, Kaul R. Genital immunology and HIV susceptibility in young women. *American Journal of Reproductive Immunology.* 2013; 69:74–79. DOI: 10.1111/aji.12035 [PubMed: 23157424]

Table 1**Items Used to Define Traumatic Experiences in MOAFTS**

<u>Sexual Abuse</u>	
BEHAVIORAL ITEMS from the section on discipline, early childhood experiences, and health problems and habits	
•	Before you turned 16, was there any forced sexual contact between you and any family member like a parent or step-parent, grandfather, etc.? By sexual contact I mean their touching your sexual parts, you touching their sexual parts or intercourse.
•	Before you turned 16, was there any forced sexual contact between you and anyone who was 5 or more years older than you (other than a family member)?
•	Has anyone ever forced you to have sexual intercourse? (age of onset)
FROM THE TRAUMATIC EVENTS SECTION OF THE INTERVIEW	
•	Raped (age of onset)
•	Sexually molested (age of onset)
<u>Physical Abuse</u>	
BEHAVIORAL ITEMS from the section on discipline, early childhood experiences, and health problems and habits	
•	When you were 6 to 13, when you did something wrong, how often were you slapped by your (mother figure/father figure)? *
•	When you were 6 to 13, when you did something wrong, how often were you hit with a belt or a stick or something like that by you (mother figure/father figure)? *
•	When you were 6 to 13, how often did your (mother figure/father figure) physically punish you so hard that you hurt the next day? *
•	When you were 6 to 13, were you injured or hurt on purpose by any adult? Examples of such injuries would include: broken bones, burns, being hit so hard you developed bruises, or any other physical injuries. *
FROM THE TRAUMATIC EVENTS SECTION OF THE INTERVIEW	
•	Physical Abuse “You were physically abused as a child” (age of onset)
•	Physical Assault “You were seriously physically attacked or assaulted” (age of onset)
•	Threatened with a Weapon “You were threatened with a weapon, held captive, or kidnapped” (age of onset)
<u>Witnessed Injury or Death</u>	
•	“You witnessed someone being badly injured or killed” (age of onset)
<u>Involved in a Disaster</u>	
•	“You were involved in a fire, flood, or natural disaster” (age of onset)
<u>Experienced a Life Threatening Accident</u>	
•	“You were involved in a life-threatening accident” (age of onset)

Note: MOAFTS = Missouri Adolescent Female Twin Study; Trauma exposure limited to exposures that occurred prior to first consensual sexual contact;

* Only responses coded as occurring “often” were counted.

Table 2

Prevalence of Variables Considered in Analyses by Race

	Total	White	Black	
	<i>N</i> =2948	<i>n</i> =2480	<i>n</i> =468	
	%	%	%	<i>p</i>
Demographics and Covariates				
Mean age at most recent interview (<i>M/SD</i>)	24.9 (2.8)	24.9 (2.7)	25.0 (2.8)	0.44
Parental separation prior to 18	47.6	42.3	75.7	0.00
Mother 1 alcohol problem	37.3	30.3	38.6	0.01
Father 1 alcohol problem	55.2	55.2	55.3	0.97
Maternal education				0.00
High school or less	56.1	55.4	60.2	
More than high school	43.9	44.6	39.7	
Paternal education				0.00
High school or less	56.9	54.9	68.3	
More than high school	43.0	45.1	31.7	
Family household income				0.00
< \$30,000	38.0	33.3	68.9	
\$30,000 – \$74,999	45.8	49.0	24.3	
\$75,000	16.3	17.7	6.9	
Sexual Behavior and Related Variables				
Mean age at sexual maturation (<i>M/SD</i>)	12.6 (1.5)	12.6 (1.4)	12.3 (1.8)	0.00
Early sexual maturation (< 12)	20.5	18.7	30.3	0.00
Mean age at sexual debut (<i>M/SD</i>)	16.8 (2.2)	16.9 (2.2)	16.3 (2.0)	0.00
Early sexual debut (first consensual < 15)	27.2	26.4	31.2	0.06
Did not use a condom when under the effects of alcohol	11.6	12.5	6.5	0.00
Did not use a condom when under the effects of drugs	2.2	2.2	1.9	0.69
Did not use condom because you thought partner would get angry	2.3	2.1	3.2	0.16
Did not use a condom because you didn't feel comfortable discussing condom use	5.1	4.9	6.2	0.24
Did not use a condom because partner wouldn't allow one to be used	6.8	6.3	9.4	0.02
When had a lot to drink, engaged in sexual intercourse when otherwise wouldn't #	17.7	18.5	12.3	0.01
Drinking made careless about sex so did not protect against STI/HIV or pregnancy #	13.1	13.6	9.7	0.05
Trauma Exposure[†]				
Sexual abuse	14.2	13.5	18.0	0.03
Physical abuse	23.5	20.2	40.6	0.00
Witnessed injury or death	8.9	7.5	15.9	0.00
Involved in a disaster	13.8	14.4	10.3	0.04
Experienced a life threatening accident	7.6	7.5	8.0	0.75
Substance Related Behaviors[†]				
Alcohol initiation before sexual debut	51.5	56.2	26.7	0.00

	Total	White	Black	
	<i>N</i> =2948	<i>n</i> =2480	<i>n</i> =468	
	%	%	%	<i>p</i>
Cannabis initiation before sexual debut	19.4	20.2	15.4	0.02
Tobacco initiation before sexual debut	61.5	65.0	43.0	0.00
Psychiatric Disorders[†]				
Posttraumatic Stress Disorder (PTSD; full sample)	2.5	2.0	4.9	0.00
PTSD in those exposed to trauma [‡]	4.3	3.6	6.8	0.01
Major depressive disorder	6.7	6.7	6.2	0.68
Conduct disorder	4.3	4.0	5.8	0.11

Note: All trauma exposure, substance use, and psychopathology is conditional on occurring prior to first consensual sexual encounter

[#] Conditional on ever using the substance;

[†]; [‡] Conditional on exposure to a traumatic event

Table 3Linear Regression Analysis Predicting Risky Sexual Behaviors in Black Women ($n=468$)

	Substance-related RSB		Partner-related RSB	
	Base Models	Fully Adjusted *	Base Models	Fully Adjusted *
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Sexual abuse	0.148 (0.001,0.299)	0.132 (−0.018,0.281)	0.264 (0.081,0.446)	0.264 (0.081,0.446)
Physical abuse	0.051 (−0.055,0.157)	-	0.065 (−0.04,−0.175)	-
Witnessed injury or death	0.079 (−0.074,0.232)	-	0.073 (−0.077,0.224)	-
Involved in a disaster	0.065 (−0.104,0.233)	-	0.028 (−0.132,0.189)	-
Experienced a life threatening accident	0.153 (−0.076,0.382)	-	0.120 (−0.082,0.323)	-
Posttraumatic stress disorder	0.189 (−0.067,0.443)	-	0.170 (−0.207,0.546)	-
Alcohol use	0.177 (0.050,0.303)	0.150 (0.023,0.276)	0.099 (−0.009,0.208)	-
Tobacco use	0.097 (0.003,0.196)	0.065 (−0.034,0.165)	0.069 (−0.032,0.171)	-
Cannabis use	0.132 (−0.034,0.298)	-	0.103 (−0.039,0.245)	-
Conduct disorder	0.278 (−0.014,0.570)	-	0.195 (−0.059,0.449)	-
Major depressive disorder	0.124 (−1.128,0.377)	-	0.199 (−0.048,0.447)	-

Note: All trauma exposure, substance use, and psychopathology is conditional on occurring prior to first consensual sexual encounter. Bold indicates significant association ($p < .05$); Huber-White robust standard errors were used to adjust for the non-independence of observations in twin pairs; all trauma exposure, substance initiation, and psychopathology is conditional on occurring prior to first consensual sexual encounter. All models controlled for familial annual household income, maternal and paternal alcohol problems, maternal and paternal education, parental separation prior to age 18, participant age, early sexual debut (<15), early sexual maturation (<12).

* Fully adjusted models include only independent variables significantly associated with outcome in the base models.

Table 4Linear Regression Analysis Predicting Related Risky Sexual Behaviors in White Women ($n=2480$)

	Substance-related RSB		Partner-related RSB	
	Base Models	Fully Adjusted*	Base Models	Fully Adjusted*
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Sexual abuse	0.185 (0.108,0.262)	0.131 (0.052,0.210)	0.183 (0.110,0.256)	0.119 (0.046,0.193)
Physical abuse	0.170 (0.103,0.237)	0.131 (0.062,0.199)	0.183 (0.120,0.248)	0.143 (0.079,0.207)
Witnessed injury or death	0.117 (0.025,0.209)	0.053 (−0.041,0.146)	0.102 (0.014,0.189)	0.047 (−0.041,0.136)
Involved in a disaster	0.022 (−0.045,0.089)	-	0.044 (−0.020,0.107)	-
Experienced a life threatening accident	0.054 (−0.029,0.136)	-	0.034 (−0.043,0.111)	-
Posttraumatic stress disorder	0.160 (−0.021,0.340)	-	0.124 (−0.043,0.292)	-
Alcohol use	0.100 (0.052,0.148)	0.060 (0.009,0.110)	0.057 (0.012,0.102)	0.023 (−0.025,0.071)
Tobacco use	0.091 (0.042,0.140)	0.031 (−0.021,0.083)	0.086 (0.042,0.129)	0.050 (0.003,0.098)
Cannabis use	0.143 (0.080,0.205)	0.084 (0.020,0.148)	0.097 (0.043,0.151)	0.047 (−0.009,0.102)
Conduct disorder	0.308 (0.168,0.448)	0.241 (0.100,0.382)	0.152 (0.037,0.269)	0.096 (−0.022,0.213)
Major depressive disorder	0.129 (0.031,0.228)	0.052 (−0.045,0.150)	0.210 (0.107,0.313)	0.143 (0.043,0.245)

Note: all trauma exposure, substance use, and psychopathology are conditional on occurring prior to first consensual sexual encounter. Bold indicates significant association ($p < .05$); Huber-White robust standard errors were used to adjust for the non-independence of observations in twin pairs; All models controlled for familial annual household income, maternal and paternal alcohol problems, maternal and paternal education, parental separation prior to age 18, participant age, early sexual debut (<15), early sexual maturation (<12).

* Fully adjusted models include only independent variables significantly associated with outcome in the base models.