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Adverse Childhood Experiences and Sexual Health Outcomes and Risk Behaviors Among a Nationwide Sample of Men Who Have Sex with Men

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Abstract

Background: Adverse Childhood Experiences (ACEs) are associated with a wide range of increased risk behaviors and health consequences, they have not been extensively described in all subpopulations.

Objective: The specific objectives of the study were to describe the prevalence of predefined ACEs among a nationwide sample of men who have sex with men (MSM) and determine associated HIV or sexually transmitted infection (STI) related health outcomes, testing practices, and risk behaviors.

Participants and Setting: Eligible participants were MSM aged 18 years or older who reported male-male sex in the past 12 months.

Methods: Data were obtained from the 2015 cycle of the American Men's Internet Survey, these data were collected between September 2015 and April 2016, and contained questions related to 8 ACE exposure categories. During analyses conducted between September 2017 and April 2018, multiple log-binomial models were fit to assess associations.

Results: Among 2,590 participants, 79.7% reported exposure to one or more ACE category. Participants exposed to any ACE were more likely to report STI testing (adjusted prevalence ratio [aPR]: 1.07; 95% confidence interval [95%-CI]: 1.00, 1.15), illicit substance use (aPR: 1.23, 95%-CI: 1.05, 1.46), and condomless anal intercourse with another man (aPR: 1.13, 95%-CI: 1.03, 1.21).

Conclusions: There is a high overall ACE burden among MSM nationally, with potential influences on key HIV/STI behaviors in later life. ACE exposure should be routinely assessed, prevention is ideal but appropriate measures such as trauma informed care should also be considered for adult MSM accessing HIV and STI-related services.

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Keywords

Adverse Childhood Experiences; ACEs; Childhood Abuse; MSM; Sexual Health; HIV; Sexually Transmitted Infections

Introduction

Adverse Childhood Experiences (ACEs), such as physical abuse or parental incarceration, have been found at a high prevalence in previous studies (Felitti et al., 1998; Hillis, Anda, Felitti, Nordenberg, & Marchbanks, 2000). These exposures are associated with a wide range of increased risk behaviors (e.g., increased number of sexual partners, early age at first sexual intercourse) and health consequences (e.g., sexually transmitted infection, ischemic heart disease) in later life among the general population (Anda, Butchart, Felitti, & Brown, 2010; Felitti et al., 1998). The pervasiveness of these ACEs and their association with health outcomes in adulthood have not been extensively studied in all subpopulations.

Individuals who identify as members of the lesbian, gay, or bisexual community suffer more ACE exposure than their heterosexual counterparts (73.2% vs. 59.6%), this difference may partly explain adulthood disparities in health risk factors and health outcomes for this population (Andersen & Blosnich, 2013; Austin, Herrick, & Proescholdbell, 2016; Corliss, Cochran, & Mays, 2002; McLaughlin, Hatzenbuehler, Xuan, & Conron, 2012). After controlling for ACE exposures, disparities between lesbian, gay, or bisexual individuals and heterosexuals in some health risk factors, such as alcohol abuse, either disappear or decrease (Austin et al., 2016). These findings support ACEs involvement in health disparities between lesbian, gay, or bisexual individuals and heterosexuals in adult life.

One subpopulation in which exposure to ACEs are relatively under-studied is men who have sex with men (MSM). Although there is overlap between MSM and gay and bisexual men, and both populations face disproportionate sexual health burden, they are distinct populations (Centers for Disease Control and Prevention, 2017). Achieving a greater understanding of the relationship between ACEs and sexual health behaviors and outcomes among MSM may contribute to efforts to improve overall population health. Previous studies among adult MSM populations have examined prevalence and correlates of forced sex prior to the age of 18 or parental physical abuse on adult health outcomes (Friedman, Marshal, Stall, Cheong, & Wright, 2008; Lloyd & Operario, 2012; Mimiaga et al., 2009; Paul, Catania, Pollack, & Stall, 2001). These studies have found that exposure to these events in childhood is associated with increased substance use, condomless anal intercourse, prevalence of sexually transmitted infections (STIs), depression, and positive human immunodeficiency virus (HIV) status in adulthood.

The specific objectives of the study were to describe the prevalence of ACEs among a nationwide sample of MSM and determine whether HIV- or STI-related health outcomes, testing practices, and risk behaviors are associated with the defined ACE exposures among the study population. Whereas previous studies have limited their scope of assessed adverse events, we aimed to broaden knowledge across in a diverse array of ACE exposures among MSM in a nation-wide sample. Understanding the relationship between ACE exposure and

sexual health outcomes and risk behaviors among MSM may enhance our prevention efforts and foster greater health equity for this population that experiences a high burden of disease.

Methods

Study Sample

The American Men's Internet Survey (AMIS) is an annual cross-sectional online survey of MSM living in the United States (US) (Zlotorzynska, Sullivan, & Sanchez, 2017). AMIS participants are recruited via convenience sampling through web-based advertisements and email blasts to members of certain websites (subsequently referred to as "ads"). Individuals who click the ads are brought to the survey website, which is hosted on a secure server by SurveyGizmo (Boulder, CO, US). Eligibility criteria for the survey include being 15 years of age or older, male sex at birth and male gender identity, residence in the US and having had oral or anal sex with a man at least once in the past (subsequently referred to as "MSM"). The AMIS questionnaire focuses on HIV- and STI-related behaviors, including increased sexual risk behaviors, illicit substance use, prevention services, and testing practices. Individuals are randomized to complete auxiliary survey sections to decrease response burden. The 2015 AMIS cycle included ACE measures for a randomized subset of participants and ran from September 2015 through April 2016. Analysis was restricted to participants who were eligible, consented, unduplicated, had a successful survey, reported male-male sex in the past 12 months, and provided a valid US ZIP code (Zlotorzynska et al., 2017).

Measures

All questions related to ACEs in the 2015 AMIS cycle pertained to experiences in the first 18 years of life (Table 1). An individual's ACE score was dependent on the 8 subsequently defined ACE categories that were adapted from previous ACE assessments (Table 1) (Felitti et al., 1998). Individuals who had missing information for ACE categories defined by multiple questions were excluded from analysis if they: (1) had all missing data or (2) responded as unexposed for some questions and were missing responses for others. Missing values were assigned to the latter group because a definitive exposure to a given ACE category could not be defined with the available information. Individuals with missing responses were included in analysis if they had an affirmative response for at least one question, as they would have been categorized as exposed regardless of their responses for the missing values. In order to be assigned an ACE score, individuals needed sufficient information to be assigned an exposure status for all ACE categories (Supplemental Table 1). If the ACE score was ≥1, the participants were categorized as exposed to any ACE (Table 1 and Supplemental Table 2). Individuals who reported no ACE category exposures were considered the reference group in our analyses. This approach is similar to previous studies analyzing ACE exposure (Andersen & Blosnich, 2013; Austin et al., 2016; Felitti et al., 1998; Hillis, Anda, Felitti, & Marchbanks, 2001)

Previous ACE research has used similar methodology to assess pre-defined categories of childhood exposure to abuse and household dysfunction (Felitti et al., 1998). The common practice of the summing these exposures to assess childhood trauma has been supported

(Ford et al., 2014). The internal consistency of the ACE exposures measured in AMIS were assessed by Cronbach's coefficient alpha (Table 1). The assessed correlation statistics are not intended to imply that there is a single latent classification, but rather to conform to other prior uses of the scale for comparability. Previous research into the validation of a similar ACE questionnaire standardized Cronbach's coefficient alpha of 0.78 for the overall ACE scale (Ford et al., 2014). The standardized Cronbach's coefficient alpha for ACE categories were all ≥0.70, with the exception of exposure to mental illness (α=0.37) and exposure to substance use (α=0.32). To be consistent with previous studies, the use of these questions in determining ACE exposure was maintained. Low values for Cronbach's coefficient alpha, and variations in exposure to individual ACE items, might have occurred due to lack of exposure, desire to not respond to individual ACE items, or exposure to one ACE item not necessarily meaning exposure occurred for other items in the same ACE category. The Cronbach's coefficient alpha obtained when assessing the overall ACE score (combination of categories) was 0.68. Although less than ideal, all measures were included in the ACE score to maintain similarity with previous studies.

The following health outcome, testing practices, and risk behavior measures were used in this study and were reported for the previous 12 months: STI diagnoses, STI testing, HIV testing, illicit substance use, and condomless anal intercourse with a male partner. STI diagnosis was measured by asking study participants to indicate which STIs (gonorrhea, chlamydia, and syphilis) a healthcare provider informed them that they had tested positive. Individuals diagnosed with an STI were considered to have been tested for STIs. STI testing was measured by asking individuals who did not indicate a positive STI result if they had received testing for STIs. Illicit substance use was measured by asking study participants about the use of substances, other than those prescribed to them. Condomless anal intercourse with male sex partners was assessed by asking study participants if they engaged in anal sex and, if they had, whether they engaged in anal sex without using a condom. Those who had not engaged in anal sex were also considered to have not engaged in condomless anal intercourse. HIV testing was assessed by asking individuals if they have ever been tested, those who indicated prior testing were asked the month and year of their most recent test. Diagnosed HIV-positive status was assessed by asking the results of a participant's most recent HIV test, if individuals indicated that they had previously tested positive they were asked to provide the month and year of their first positive test result. Participants who did not report that their most recent HIV test was positive (e.g., indeterminate result or result never obtained) were asked if they had ever had a positive HIV test result in order to increase sensitivity around diagnosed HIV-positive status.

Demographic information was collected, including: age, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other/multiple races), highest level of education attained, income per year, and population density of current county of residence. County of residence was determined by the participant's reported ZIP code of residence. Population density (urban, suburban, small/medium metro, or rural) of each county was categorized based on 2010 US Census data and definitions from the National Center for Health Statistics (Ingram & Franco, 2013).

Statistical Analyses

During analyses conducted between September 2017 and April 2018, AMIS participants younger than 18 were excluded from analyses as their ACE exposure could be ongoing, which is not consistent with our study's hypothesis that past ACE exposure may be associated with present behavior or health outcomes. Inclusion of these minors, who still have time at risk for exposure, could have introduced a measurement bias. Descriptive analyses were used to assess the distribution and prevalence of ACE exposures and potential covariates (demographics, health outcomes, and risk behaviors). Chi-square tests were conducted to assess for significant differences in the prevalence of any ACE exposure by demographic characteristics.

Separate log-binomial regression models were fit to analyze the association between ACE exposure and the previously described health outcomes, testing practices, and risk behaviors. ACE exposures in these models were assessed by any ACE exposure and by individual ACE categories. The exposure status of any ACE was assessed to better understand the association between combined ACE measures and health outcomes or risk behaviors. Individual ACE categories were assessed to understand which ACE exposure categories may play a more important role in risk behaviors, testing practices, or health outcomes among MSM. Model findings are presented as the adjusted prevalence ratios (aPR) and 95% confidence intervals (95%-CI). In order to identify independence of effect and address possible confounding in the primary hypothesis due to other important variables, the multivariable models controlled for age (continuous), race/ethnicity, educational attainment, annual income, and population density (Felitti et al., 1998; Mackinnon et al., 2010; Traynor et al, 2018). Models of STI testing, STI diagnosis, HIV testing, illicit substance use, and condomless anal intercourse also controlled for HIV-positive status. A mediation analysis using the Baron and Kenny method and the Sobel test was also conducted to assess whether condomless anal intercourse mediated the association of ACE exposure with STI testing (Baron & Kenny, 1986). This model assumed a single mediator, with ACE exposure leading to condomless anal intercourse, which in turn led to STI testing. Results were considered significant at alpha equal to 0.05. All analyses were conducted in SAS 9.4 (SAS Institute; Cary, NC).

Results

Of the 10,217 AMIS respondents, 3,353 individuals were randomized to receive the ACE questionnaire and were aged 18 years or older, 2,590 (77.2%) completed a sufficient portion of the ACE questionnaire to receive an ACE score (Supplemental Table 1). The most common reasons for insufficient data were missing responses for psychological abuse (n=383) or physical abuse (n=480). Participants included in the analysis were most commonly 40 years of age or older, non-Hispanic white, college graduates, living in urban areas, and made $75,000 or more per year of income (Table 2).

Overall, 79.7% of participants reported any ACE exposure (Table 1). There was wide variation in prevalence by ACE category, ranging from 41.8% reporting psychological abuse to 8.7% reporting familial incarceration. The prevalence of any ACE exposure significantly differed by participant demographics (Table 2). Those who were non-white, had lower

income, or had lower educational attainment were more likely to have reported any ACE exposure. Prevalence of any ACE exposure did not significantly differ by participant age or population density of their county of residence (supplemental table 2).

The prevalence of condomless anal intercourse and illicit substance use significantly differed by any ACE exposure (Table 3). Participants with any ACE exposure were significantly more likely to have used illicit substances (aPR: 1.23, 95% CI: 1.05, 1.46) or engaged in condomless anal intercourse (aPR: 1.12, 95% CI: 1.03, 1.21). The prevalence of health outcomes and testing practices significantly differed by ACE exposure (Tables 4a and 4b). Participants with any ACE exposure were more likely to have received STI testing in the previous 12 months (aPR: 1.07, 95% CI: 1.00, 1.15, p-value: 0.04). When condomless anal intercourse was incorporated into the model as a possible mediating variable (Sobel test statistic: 2.32, p-value: 0.02), the association between any ACE exposure and STI testing was no longer significant (aPR: 1.06, 95% CI: 0.99, 1.13); condomless anal intercourse maintained significance in this model (aPR: 1.14, 95% CI: 1.07, 1.20). There were no significant associations between any ACE exposure and STI diagnosis, HIV testing, or HIV-positive status (Tables 4a and 4b).

When examining individual ACE categories, we found that exposure to a divorced or separated household resulted in a significant difference in all health outcomes, testing practices, and risk behaviors except for HIV-positive status (Tables 3, 4a, and 4b). Exposure to substance use during childhood was also significantly associated with STI diagnosis, illicit substance use, and condomless anal intercourse (Tables 3 and 4a). Exposure to psychological abuse during childhood was significantly associated with substance use and condomless anal intercourse (Table 3). Exposure to mental illness was significantly associated with STI testing and illicit substance use (Tables 3 and 4a). Familial incarceration was the only individual ACE category that was not significantly associated with any risk behavior or health outcome.

Discussion

Among our nationwide sample of MSM, a substantial majority of study participants reported exposure to at least one ACE. The most commonly reported categories of ACEs were psychological abuse and exposure to substance use. We found that ACE exposure is significantly associated with both illicit substance use and condomless anal intercourse in the previous 12 months. We also found a relationship between ACE exposure and STI testing in the previous 12 months that was mediated by condomless anal intercourse. Some individual ACE categories may be particularly important in the formation of these associations, including exposure to: separated or divorced households, substance use, or psychological abuse.

Among the general population, the prevalence of exposure to one or more ACE has been reported to be 61.6% (Merrick, Ford, Ports, & Guinn, 2018). However, the prevalence of ACEs among MSM in this study was 79.7%. The relatively high burden of childhood trauma among other sexual minorities, including members of the lesbian, gay, and bisexual community, has been previously described using a more limited geographic region or

exposure assessment (Andersen & Blosnich, 2013; Austin et al., 2016; Corliss et al., 2002; McLaughlin et al., 2012; Ports et al., 2017). A possible explanation for the increased ACE burden among MSM is engagement in gender nonconforming behavior in early life (Hidalgo, Kuhns, Kwon, Mustanski, & Garofalo, 2015). Individuals who exhibit gender nonconforming behaviors in childhood have been found to suffer significantly more maltreatment in childhood, including: psychological abuse, physical abuse, sexual abuse, and peer-bullying (Roberts, Rosario, Corliss, Koenen, & Austin, 2012; Roberts, Rosario, Slopen, Calzo, & Austin, 2013).

Our results indicate that differences exist in ACE exposure by race, educational attainment, and annual income of MSM. Societal inequities can explain differences in many ACE exposures, such as familial incarceration (Pettit & Western, 2004). All significant associations between ACE exposure and study outcomes are independent of these demographic differences. This means demographic differences do not explain the increased STI testing, condomless anal intercourse, and illicit substance use among those exposed to one or more ACE.

STI testing was significantly associated with ACE exposure but was mediated by engagement in condomless anal intercourse. Previous studies among MSM have found that engagement in increased risk behavior, such as condomless anal intercourse, is associated with increased STI testing (Lehmiller, 2015). The association we observed was driven by increased condomless anal intercourse among individuals exposed to any ACE, and not a direct effect of ACE exposure on STI testing. It is also possible that this association was driven by a more complex set of mediators. For example, increased help-seeking behavior has been previously detected among individuals exposed to ACEs, a more in-depth mediation framework of these health seeking behaviors was not within the scope of this analysis (Karatekin 2019). We found no similar associations between STI or HIV diagnoses and ACE exposure. Among the general population, previous studies found ACE exposure to be a significant predictor of sexual health outcomes, such as STI diagnosis in adulthood (Felitti et al., 1998; Hillis et al., 2000; Hughes et al., 2017). This difference may be due to the high STI burden among MSM, which may mask the impact of ACE exposure (Centers for Disease Control and Prevention, 2017). Another possibility is that campaigns to increase testing, such as the UNAIDS 90/90/90 strategy, have resulted in increased testing and subsequent treatment, which has decreased overall transmission.

Condomless anal intercourse and illicit substance use were significantly associated with ACE exposure, which is consistent with previous research (Brown, Masho, Perera, Mezuk, & Cohen, 2015; Fang, Chuang, & Lee, 2016; Friedman et al., 2008; Hughes et al., 2017; Lloyd & Operario, 2012; Paul et al., 2001). Our large diverse national sample of MSM, from both urban and nonurban settings, bolster these previous results. Previous researchers have hypothesized that the link between ACE exposure and increased risk behavior may be a result of coping mechanisms used by individuals to deal with the stresses associated with ACE exposure (Felitti et al., 1998). Studies have outlined potential biologic changes resulting from childhood trauma, such as long term activation of the body’s stress response system, which may lead to long term physiological and behavioral changes (Oral et al., 2016; Shonkoff et al., 2012).

Our research provides insight on a wide breadth of ACE exposures among MSM, whereas previous efforts either focused on the general population, specific geographic regions, or individual ACE categories and risk behaviors in adulthood (Brown et al., 2015; Hillis et al., 2001; Hillis et al., 2000). Exposure to divorced or separated households, substance abuse, psychological abuse and mental illness may lead to differences in adult sexual health, including illicit substance use and condomless anal intercourse. Establishing which ACE exposures result in differences in adult health outcomes may allow for improvements in interventions targeting populations in childhood and adulthood.

Our findings indicate substantial childhood trauma among MSM. Trauma informed care, which involves screening for trauma and recognizing its potential effects, can be used in healthcare and prevention services to potentially address the long-term consequences of ACE exposure and improve the delivery of patient centered care (Green et al., 2015; Oral et al., 2016; Sales, Swartzendruber, & Phillips, 2016). Expanded ACE measures may be necessary to adequately detect childhood trauma among MSM. Possible expansions in the assessment of past trauma among MSM, and other non-heterosexual populations, includes peer-related bullying, these peer-related forms of early trauma are known to be pervasive and to be associated with negative physical and mental health outcomes (Almeida et al., 2009; Earnshaw et al., 2017; Eisenberg, McMorris, Gower, & Chatterjee, 2016; Hatzenbuehler, Birkett, Wagenen, & Meyer, 2014). The promotion of healthy environments in early life may result in a decrease in disease burden and risk behaviors in adulthood. For those who have already experienced childhood trauma, the implementation of trauma informed care practices in healthcare and prevention service delivery may help mitigate the impact of ACEs in adulthood. Further research should be conducted to better understand the pathways by which ACE exposure could result in higher risk behaviors.

Efforts to decrease the disproportionate sexual health burden experienced by MSM have primarily focused on adult biologic and behavioral interventions. While these efforts are important in improving population health, our data indicate that the prevention of childhood trauma could potentially decrease higher risk behaviors and STI diagnoses among adult MSM. Organizations that aim to improve child welfare should develop action plans around improving childhood environments and detecting early trauma for sexual minority and gender nonconforming youth, including MSM. Strategies could be learned from organizations specialized in fostering supportive environments for these communities, such as the Hetrick-Martin Institute which has historically advocated for MSM and other sexual and gender minorities, and currently provides a trauma-informed youth programming for these communities (Martin & Hetrick, 1988). Medical and mental health professionals should also implement trauma informed care strategies to assess and provide tailored interventions for individuals who have experienced ACE exposures.

Study Limitations

There are several substantial limitations of the study to note. This study did include MSM from across the United States, but results are not generalizable to all MSM (Bornstein, Jager, & Putnick, 2013). AMIS is an online study mainly recruiting through ads; therefore, MSM not exposed to ads had no chance of being sampled. Similarly, individuals who failed to

provide sufficient information to be assigned an ACE score differed significantly from those with complete information by race/ethnicity, which indicates a potential for systematic response bias. Our assessment of some ACE exposures did not obtain information for all possible exposures. For example, in our assessment of sexual abuse we only asked about oral and anal sex but not vaginal sex, additionally, some potential ACE exposures, like neglect, were not assessed at all during data collection. Additionally, we did not take into account the use of pre-exposure prophylaxis or treatment as prevention, both of which may influence adult sexual behavior. Internal consistency of exposure to mental illness and exposure to substance use were below desired levels, indicating potential measurement error in our assessment of some ACEs. Furthermore, factor analyses could uncover more complex correlations between assessed ACE items. Social desirability bias is of concern for the reporting of risk behaviors; however, this bias likely does not systematically differ for prevalent exposures, such as any type of ACE, and therefore bias should be towards the null. Due to the self-reported nature of the study and extended recall periods, recall bias is also of concern in the assessment of both ACE exposure and the analyzed outcomes. The limitations outlined are not unique to our study; they are ubiquitous in the study of exposure to ACEs and their association to adult health outcomes. Our study also had substantial strengths. We used standard ACE and risk and health outcomes measures and applied them through a web-based study that allowed for a geographically diverse sample. Compared to other modes of data collection, the use of web-based surveys might have also resulted in more honest responses, reducing potential social desirability bias (Krumpal, 2013).

Conclusions

A high prevalence of ACEs has been detected among a nation-wide sample of MSM, with potential influences on adult HIV- and STI-related health outcomes, testing practices, and risk behaviors. Exposure to ACEs should be routinely assessed, prevention is ideal but appropriate measures such as trauma informed care should also be considered for adult MSM accessing HIV and STI-related services. Failure to my act my result in continued health inequities for MSM.

Ethical Approval

All aspects of the American Men’s Internet Survey (AMIS) involving human participants were conducted in accordance with the ethical standards of the Institutional Review Board (IRB) and in compliance with laws dictating the standards of the Emory University Human Research Protection Program (HRPP) in order to safeguard and protect the aforementioned study participants. All participants provided informed consent prior to taking the survey.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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dictating the standards of the Human Research Protection Program in order to safeguard and protect study participants. All participants provided informed consent prior to taking the survey. Daniel Bertolino and Travis Sanchez lead the writing and analyses of this research, with Maria Zlotorzynska and Patrick Sullivan contributing to writing and analyses. Authors of this paper reported no financial disclosures. We thank Cera Cantu for assistance with data analysis.

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Table 1:

Prevalence of Adverse Childhood Experiences and corresponding composite questions reported in the 2015 cycle of the American Men's Internet Survey, Cronbach's coefficient alpha reported when applicable

ACE Questions by Category	Prevalence %
Psychological Abuse (n= 2970, α=0.80)	41.8
How often did a parent, stepparent, or adult living in your home...	
Swear at you, insult you, or put you down?[a] (n= 3329)	24.8
Threaten to hit you or throw something at you, but didn't do it?[b] (n= 2881)	34.7
Physical Abuse (n= 2873, α=0.83)	18.8
How often did a parent, stepparent or adult living in your home:	
Push, grab, slap, or throw something at you? (n= 2897)[a]	11.5
Hit you so hard that you had marks or were injured? (n= 2876)[b]	16.5
Sexual Abuse (n= 3137, α=0.89)	34.2
Did an adult, relative, family friend, or stranger ever:	
Touch or fondle your body in a sexual way?[c] (n= 3323)	30.2
Have you touch their body in a sexual way?[c] (n= 3094)	26.1
Attempt to have sexual intercourse (oral or anal) with you?[c] (n= 3084)	24.8
Actually have sexual intercourse (oral or anal) with you?[c] (n= 3088)	21.8
Violence Towards Mother (n= 3123, α=0.89)	17.6
How often did your father (or stepfather) or mother's boyfriend do any of these things to you mother (or stepmother):	
Push, grab, slap or throw something at her?[b] (n= 3 44)	14.2
Kick, bite, hit her with a fist, or hit her something hard?[b] (n= 3112)	8.5
Repeatedly hit her over at least a few minutes?[d] (n= 3095)	9.4
Threaten her with a knife or gun, or use a knife to hurt her?[d] (n= 3093)	7.1
Exposure to Mental Illness (n= 3135, α=0.37)	35.7
While you were growing up, in your first 18 years of life...	
Was a household member depressed or mentally ill?[c] (n= 3145)	33.4
Did a household member attempt suicide?[c] (n= 3136)	10.8
Exposure to Substance Abuse (n= 3194, α=0.32)	35.8
While you were growing up, in your first 18 years of life...	
Did you live with anyone who was a problem drinker or alcoholic?[c] (n= 3327)	30.0
Did you live with anyone who used street drugs?[c] (n= 3150)	13.8
Divorced or Separated Household (n=3327, α=n/a)	36.9
While you were growing up, in your first 18 years of life...	
Were your parents ever separated or divorced?[c] (n= 3327)	36.9
Familial Incarceration (n=3143, α=n/a)	8.7
While you were growing up, in your first 18 years of life...	

ACE Questions by Category	Prevalence %
Did a household member go to prison?[c] (n= 3143)	8.7
Overall Exposure to Any ACE Category (n= 2590, α=0.68))	79.7

[a] Responses of “often” or “very often” were considered as exposure

[b] Responses of “sometimes,” “often,” or “very often” were considered as exposure

[c] Assessed dichotomously, “yes” responses considered as exposure

[d] Any response except “never” considered as exposure

Table 2:

Demographic characteristics by Adverse Childhood Experience (ACE) exposure in the 2015 American Men's Internet Survey

	N	ACE Exposure ≥ 1 (N= 2,063) % (*n*)	No ACE Exposure (N= 527) % (*n*)	*P*[1]
Age at Survey				0.54
18–24	889	79.6 (576)	20.4 (148)	
25–29	529	77.1 (313)	22.9 (93)	
30–39	467	80.5 (281)	19.5 (68)	
≥40	1468	80.4 (893)	19.6 (218)	
Race/ethnicity				**<.0001**
Black	221	87.0 (140)	13.0 (21)	
Hispanic/Latino	436	87.9 (270)	12.1 (37)	
White	2408	76.9 (1467)	23.1 (440)	
Other/Multiple	229	86.9 (152)	13.1 (23)	
Education				**<.0001**
≤High School Diploma or Equivalent	377	88.9 (263)	11.1 (33)	
Some College of Technical Degree	1159	82.8 (733)	17.2 (152)	
College Degree or Postgraduate	1778	75.5 (1046)	24.5 (340)	
Education				
Income				**0.04**
$0–19,999	440	83.8 (295)	16.2 (57)	
$20,000–39,999	569	82.3 (372)	17.7 (80)	
$40,000–74,999	779	79.8 (506)	20.2 (128)	
≥$75,000	995	77.2 (606)	22.8 (179)	
NCHS Rural/Urban Classification				0.12
Urban	1376	79.5 (843)	20.5 (217)	
Suburban	658	77.5 (393)	22.5 (114)	
Small/medium metropo\tan	990	82.3 (626)	17.7 (135)	
Rural	326	76.9 (200)	23.1 (60)	

[1]Chi-square test for difference in demographic characteristics between ACE exposure groups

Table 3:

Risk behaviors by Adverse Childhood Experience (ACE) exposure in the 2015 American Men's Internet Survey

	Illicit Substance Use		Condomless Anal Intercourse	
ACE Category	**Unadjusted PR (95% CI)**	**Adjusted PR[1] (95% CI)**	**Unadjusted PR (95% CI)**	**Adjusted PR[1] (95% CI)**
Any ACE Exposure	1.28 (1.09, 1.49)[2]	1.23 (1.05, 1.46)[2]	1.09 (1.01, 1.18)[2]	1.12 (1.03, 1.21)[2]
Psychological Abuse	1.16 (1.05, 1.29)[2]	1.14 (1.02, 1.28)[2]	1.07 (1.01, 1.13)[2]	1.06 (1.00, 1.12)[2]
Physical Abuse	1.08 (0.95, 1.23)	1.17 (1.02, 1.35)[2]	1.00 (0.94, 1.07)	1.01 (0.94, 1.08)
Sexual Abuse	1.02 (0.92, 1.14)	1.04 (0.92, 1.17)	1.05 (1.00, 1.11)[2]	1.09 (1.03, 1.16)[2]
Violence Towards Mother	1.07 (0.94, 1.22)	1.11 (0.96, 1.28)	1.08 (1.02, 1.15)[2]	1.09 (1.02, 1.17)[2]
Exposure to Mental Illness	1.35 (1.22, 1.50)[2]	1.24 (1.11, 1.39)[2]	1.05 (1.00, 1.11)[2]	1.05 (0.99, 1.11)
Exposure to Substance Abuse	1.28 (1.16, 1.42)[2]	1.27 (1.14, 1.42)[2]	1.06 (1.00, 1.11)[2]	1.07 (1.01, 1.13)[2]
Divorced or Separated Household	1.29 (1.17, 1.43)[2]	1.17 (1.05, 1.31)[2]	1.08 (1.03, 1.14)[2]	1.07 (1.01, 1.14)[2]
Familial Incarceration	1.14 (0.96, 1.35)	1.01 (0.84, 1.23)	1.09 (1.01, 1.19)[2]	1.07 (0.98, 1.18)

[1] Adjusted for age, race/ethnicity, education, income, HIV-positive status, and current rural/urban population density

[2] p-value < 0.05

Table 4a:

Health outcomes by Adverse Childhood Experience (ACE) exposure in the 2015 American Men's Internet Survey

	STI[1] Testing		Any STI[1] Diagnosis	
ACE Category	**Unadjusted PR (95% CI)**	**Adjusted PR[2] (95% CI)**	**Un adjusted PR (95% CI)**	**Adjusted PR[2] (95% CI)**
Any ACE Exposure	1.16 (1.03, 1.31)[4]	1.06 (0.99, 1.13)[3,4]	1.31 (0.96, 1.78)	1.42 (0.99, 2.04)
Psychological Abuse	1.04 (0.96, 1.14)	1.01 (0.96, 1.06)	1.19 (0.97, 1.47)	1.10 (0.87, 1.39)
Physical Abuse	1.05 (0.94, 1.16)	1.00 (0.94, 1.07)	1.01 (0.77, 1.32)	0.96 (0.70, 1.31)
Sexual Abuse	0.96 (0.88, 1.05)	0.99 (0.94, 1.04)	1.10 (0.90, 1.36)	1.04 (0.82, 1.33)
Violence Towards Mother	1.08 (0.98, 1.20)	1.00 (0.94, 1.07)	1.25 (0.99, 1.60)	1.06 (0.79, 1.42)
Exposure to Mental Illness	1.17 (1.08, 1.27)[4]	1.05 (1.01, 1.10)[4]	1.22 (0.99, 1.50)	1.21 (0.96, 1.53)
Exposure to Substance Abuse	1.09 (1.00, 1.18)[4]	1.04 (0.99, 1.08)	1.22 (0.99, 1.49)	1.26 (1.01, 1.58)[4]
Divorced or Separated Household	1.20 (1.11, 1.30)[4]	1.06 (1.01, 1.11)[4]	1.56 (1.28, 1.87)[4]	1.29 (1.03, 1.61)[4]
Familial Incarceration	1.21 (1.07, 1.37)[4]	1.03 (0.95, 1.11)	1.49 (1.10, 2.01)[4]	0.99 (0.66, 1.47)

[1] STIs limited to chlamydia, gonorrhea, or syphilis

[2] Adjusted for age, race/ethnicity, education, income, HIV-positive status, and current rural/urban population density

[3] Adjusted model includes the mediating variable condomless anal intercourse

[4] p-value < 0.05

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Table 4b:

Health outcomes by Adverse Childhood Experience (ACE) exposure in the 2015

	HIV Testing[1]		HIV-Positive Status	
ACE Category	**Unadjusted PR (95% CI)**	**Adjusted PR[2] (95% CI)**	**Unadjusted PR (95% CI)**	**Adjusted PR[3] (95% CI)**
Any ACE Exposure	1.00 (0.93, 1.08)	1.01 (0.93, 1.09)	1.20 (0.87, 1.66)	1.16 (0.81, 1.66)
Psychological Abuse	1.02 (0.96, 1.08)	1.02 (0.96, 1.09)	1.11 (0.88, 1.39)	0.99 (0.77, 1.26)
Physical Abuse	1.05 (0.98, 1.13)	1.06 (0.98, 1.15)	1.39 (1.07, 1.82)[4]	1.14 (0.85, 1.52)
Sexual Abuse	1.03 (0.97, 1.09)	1.05 (0.98, 1.12)	1.58 (1.27, 1.95)[4]	1.24 (0.97, 1.58)
Violence Towards Mother	0.99 (0.92, 1.06)	0.96 (0.88, 1.04)	1.58 (1.23, 2.02)[4]	1.32 (1.00, 1.75)
Exposure to Mental Illness	1.02 (0.96, 1.08)	1.02 (0.96, 1.09)	0.93 (0.74, 1.17)	1.05 (0.82, 1.35)
Exposure to Substance Abuse	0.99 (0.94, 1.05)	0.99 (0.93, 1.06)	1.10 (0.88, 1.37)	0.92 (0.71, 1.17)
Divorced or Separated Household	1.03 (0.97, 1.09)	1.07 (1.00, 1.13)[4]	1.16 (0.93, 1.43)	1.22 (0.95, 1.56)
Familial Incarceration	0.94 (0.85, 1.05)	0.94 (0.83, 1.07)	1.33 (0.95, 1.88)	1.23 (0.83, 1.83)

[1] HIV testing in the previous 12 months among individuals not living with HIV one year prior to survey completion

[2] Adjusted for age, race/ethnicity, education, income, HIV-positive status, and current rural/urban population density

[3] Adjusted for age, race/ethnicity, education, income and current rural/urban population density

[4] p-value<0.05