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Adverse experiences in childhood and sexually transmitted infection risk from adolescence into adulthood

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Abstract

Background—Childhood maltreatment, particularly sexual abuse, has been found to be associated with sexual risk behaviors later in life. We aimed to evaluate associations between a broad range of childhood traumas and sexual risk behaviors from adolescence into adulthood.

Methods—Using data from Waves I, III and IV of the National Longitudinal Study of Adolescent to Adult Health (Add Health), we used logistic regression to estimate the unadjusted (OR) and adjusted (AOR) odds ratios for associations between nine childhood traumas and a cumulative trauma score and three sexual risk outcomes (multiple partnerships, sex trade involvement, and STI) in adolescence, young adulthood, and adulthood. We also examined modification of these associations by gender.

Results—Associations between cumulative trauma score and sexual risk outcomes existed at all waves, though were strongest during adolescence. Dose response-like relationships were observed during at least one wave of the study for each outcome. Violence exposures were strong independent correlates of adolescent sexual risk outcomes. Parental binge drinking was the only trauma associated with biologically-confirmed infection in young adulthood (AOR=1.46, 95% CI: 1.01, 2.11), while parental incarceration was the trauma most strongly associated with self-reported STI in adulthood (AOR=1.70, 95% CI: 1.11, 2.58). A strong connection was also found between sexual abuse and sex trade in the young adulthood period (AOR=2.17, 95% CI: 1.43, 2.49).

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Conflicts of Interest
The authors declare no conflict of interest

Conclusion—A broad range of traumas are independent correlates of sex risk behavior and STI, with increasing trauma level linked to increasing odds of sexual risk outcomes. The results underscore the need to consider trauma history in STI screening and prevention strategies.

Keywords

Childhood trauma; Sexually Transmitted Infections (STIs); Household Dysfunction; Violence

Introduction

Each year, there are approximately 20 million new cases of sexually transmitted infections (STIs) in the United States.[1] STIs are often asymptomatic or present with mild symptoms, making them difficult to diagnose and treat.[2] The price of these infections is steep; sequelae include pelvic inflammatory disease, infertility and cervical cancer[2]. Health care costs related to STIs and their complications total nearly 16 billion per year.[2] Rates of STI peak in young adulthood, with about one third of reported cases of gonorrhea and chlamydia occurring among those aged 20–24, and over half of infections occurring before the age of 25. [1]

A strong and consistent relationship has been found between childhood sexual abuse and sexual risk behavior including unprotected intercourse, early onset sexual activity, sex trade involvement, sex while using drugs or alcohol, multiple partnerships, and STI.[3–7] While some studies have found similar associations for childhood physical abuse and neglect, this research is far less conclusive.[8–11] These studies are largely cross-sectional and fail to monitor trends over time. Few are nationally representative, but rather examine homogenous groupings by race, class, geography or risk profile.[12–16] Furthermore, males and females are often studied separately, and studies that include both do not necessarily consider gender as a moderator.[17]

A small body of research has linked exposure to direct (experienced or threatened) and indirect (witnessed) violence and sexual risk outcomes. Many of these studies use a single violence variable that does not distinguish between effects of direct and indirect exposures.[18–20] Those that do study these effects separately often use geographically-specific or high-risk population samples that are not generalizable.[21–24]

Two important studies of adverse childhood experiences (ACEs) examined seven ACEs, four of which were indicators of household dysfunction including having a battered mother and household members who abused substances, had mental illness, or were incarcerated.[25,26] Hillis et al found that increasing number of ACEs had a graded relationship with self-reported STI among males and females,[25] and with early first sexual intercourse, self-perceived AIDS risk and number of sexual partners in a female-only study.[26] Each of the seven ACEs tended to be associated with the outcomes, however, models were not adjusted for other ACEs to estimate the independent associations.

The purpose of this study is to examine relationships between multiple forms of childhood maltreatment and STIs using data from The National Longitudinal Study of Adolescent to Adult Health (Add Health) including Wave I (1994–1995; adolescence, grades 7–12), Wave

III (2001–2002; young adulthood, ages 18–26) and Wave IV (2008; adulthood, ages 24–32). We examined the associations of childhood neglect, abuse, household dysfunction and violence with multiple partnerships, sex trade involvement, and STI. We also explored gender as a modifier of these relationships. Since we know traumas often co-occur, we explored the total number of maltreatments as a predictor of STI-related outcomes.

Materials and Methods

Study Population and Design

The Institutional Review Boards at the University of Florida and NYU School of Medicine approved this study. Add Health is a nationally-representative longitudinal study created to better understand factors underlying health outcomes. Participants were enrolled during adolescence and followed into adulthood by means of three in-home interviews, the details of which are described on the Add Health website.[27] During Wave I (1994–1995), 20,745 participants in grades 7–12 were asked about a range of topics including their sexual risk behavior. Of the original cohort, 15,197 were re-interviewed at Wave III (2001–2002, ages 18–26) and 15,701 were re-interviewed at Wave IV (2007–2008, ages 24–32). The Add Health study boasts excellent retention, in which 77.4% and 80.3% of eligible participants of the original cohort were re-interviewed at Waves III and IV, respectively.[28] A total of 12,288 participants provided data for all three waves and had sample weights. Wave II was not included in this study due to its proximity to Wave I.

We used survey procedures in SAS 9.4 (SAS Institute Inc., Cary, North Carolina, USA) to account for the complex sample survey design. We estimated weighted prevalence of the individual traumas and trauma scores by STI outcomes and the sociodemographic covariates by self-reported STI for descriptive purposes. With logistic regression we estimated unadjusted (OR) and adjusted (AOR) odds ratios and 95% confidence intervals (CI) for associations of covariates and outcomes for each of the nine traumas. We judged the predictive importance of each trauma variable by the magnitude of the OR and AOR and the width of the CI. We used the same method to estimate ORs, AORs and CIs for number of traumas experienced at each outcome and calculated p values for the linear trend test using orthogonal polynomial contrasts. To assess modification by gender, we included interaction terms for gender and trauma variables in multivariable models; only when the p-value for an interaction term coefficient was less than 0.15 did we present the gender-specific estimates in tables.

Independent childhood traumas variables

We created nine dichotomous measures of childhood trauma defined as: neglect (left alone when adult should have been present and/or basic needs unmet ≥six times); emotional abuse (caregiver said hurtful things or made child feel unloved ≥six times); physical abuse (slapped, hit, kicked, or thrown by caregiver ≥six times); sexual abuse (caregiver touched child or forced the child to touch him/her in sexual way); parental incarceration (parent/parent figure spent time in jail or prison); parental binge drinking (≥five drinks on one occasion in past month); witnessed violence (saw someone shot or stabbed); threatened with violence (knife or gun pulled on child); and experienced violence (child shot or cut/stabbed).

We adjusted models for all other traumas to get the independent effect of each. We also created a predictor representing cumulative trauma score that ranged from one to 4+ traumas.

Independent sociodemographic correlate variables

We included the following sociodemographic variables in adjusted models: age in years at Wave IV (24–27, 28–29, ≥30 (referent); gender (male (referent), female), and race/ethnicity (non-Hispanic white (referent), non-Hispanic black, Hispanic, other) at Wave I; concern about paying bills, a measure of functional poverty, at Wave I (parent-reported) and Wave III (referent=no); and education at Wave IV (less than high school, completed high school, greater than high school).

Dependent outcome variables

Multiple Sexual Partnerships—For Wave I, multiple partnerships was defined as having two or more lifetime partners. For Waves III and IV, it was defined as two or more partners in the past year.

Sex Trade—Participants were considered to have been involved in sex trade if they answered yes to either paying someone to have sex or being paid to have sex. The survey measured lifetime occurrence at Waves I and III and past year occurrence at Wave IV.

Self-reported STI—During Wave I, participants were asked if they had ever been told by a health care provider that they had Chlamydia, Gonorrhea or Trichomoniasis. A yes response to at least one infection was considered a positive self-reported STI. At Wave IV, self-reported STI was defined as having been told by a health care provider in the past year they had any of the three STIs.

Test-identified STI—At Wave III, a positive urine test for Chlamydia, Gonorrhea or Trichomoniasis was considered a positive test-identified STI.

Results

Study Population Characteristics

In total, 12,288 participants were interviewed at all three waves. This sample was evenly distributed by gender. Most (66%) were white, followed by African Americans (16%) and Hispanics (12%). Nearly three-quarters were educated beyond high school, while 8% did not complete high school. Self-reported functional poverty was around 15%. Emotional abuse was the most commonly reported trauma (16.1%), followed by neglect (12.4%), threatened violence (12.1%), physical abuse (11.6%), parental binge drinking (11.5%), witnessed violence (10.9%) and parental incarceration (10.2%). Just under 8% of participants reported sexual abuse while only 5% had been shot or stabbed.

STI prevalence

We chose to look at characteristics of participants reporting an STI at Wave IV as it most closely reflects the population at greatest risk at their current age (Table 1). Younger

participants (aged 24–27) were the most likely to report an STI within the last year (4.3%) while their older counterparts (>30) were the least likely (2.7%). Females had more than two-times the odds of self-reported STI compared to males, as did those with less than a high school education compared to high school graduates. Race was also a strong correlate of STI, with blacks having an odds ratio of 4.51 compared to whites (95% CI: 3.35,6.05). Concern about bills during Waves I and III had only modest associations with self-reported STI at Wave IV.

Associations between traumas and multiple partnerships

Adolescence—At Wave I, 37% of participants reported ever having sexual intercourse, while 19.5% of participants reported having 2 or more partners in their lifetime. In unadjusted models, all traumas were significantly associated with this outcome. In fully-adjusted models, the strongest associations were with witnessed violence (AOR=2.20, 95% CI: 1.79,2.71) and threatened violence (AOR=2.19, 95% CI: 1.72,2.79). Neglect, sexual abuse, parental incarceration and parental binge drinking also remained significant predictors, though with only modest associations. Emotional abuse, while not significantly associated in the total population, was weakly predictive for females (AOR=1.41, 95% CI: 1.05,1.90) but the association was null for males. Alternatively, males who witnessed violence had an almost three-fold increase in odds (AOR=2.97, 95% CI: 2.19,4.02), while the association was null for females. The odds of multiple partnerships demonstrated a dose-response relationship to the number of traumas experienced ($p<0.0001$), with the greatest odds among those who experienced 4+ traumas (AOR=4.82, 95% CI: 3.53,6.56).

Young Adulthood—In young adulthood, 28.4% reported multiple partnerships in the past year, the highest prevalence of multiple partnerships of any wave. By this wave, 86% of participants reported sexual intercourse in their lifetime. Physical abuse, sexual abuse and witnessed violence each showed about a 30% increase in odds in our adjusted analyses. Among those who had witnessed violence, only the association for males was significant (AOR=1.67, 95% CI: 1.25,2.24). In addition, among males, but not females, who were threatened with violence there was a significant association with multiple partnerships (AOR=1.30, 95% CI: 1.00,1.68). Multiple partnerships in young adulthood is associated with an increase in number of traumas experienced, though these associations are weaker than in adolescence and the trend is not statistically significant.

Adulthood—By Wave IV, nearly all participants had had sexual intercourse (93%). The prevalence of multiple partnerships in the past year was 25%. In the unadjusted models, all traumas besides neglect were significantly associated with multiple partnerships. After adjustment, emotional abuse and sexual abuse remained significantly associated, though for sexual abuse, only the association for males was significant (AOR=1.75, 95% CI: 1.18,2.60). Results based on number of traumas experienced were very similar to those for young adulthood, with odds ranging from 1.32 for one trauma to 1.60 for 4+ traumas.

Associations between traumas and sex trade

Adolescence—Lifetime sex trade during adolescence was uncommon (1.2%), but had notable associations with childhood traumas. In unadjusted analyses, being threatened with

violence and witnessing violence were associated with about two and a half times the odds of sex trade and experiencing violence by odds of about three and a half. No other trauma had a significant association. In the adjusted analyses, only experiencing violence was significant in the total population (AOR=2.21, 95% CI: 1.02,4.76), although strong associations were seen among females who reported neglect (AOR=3.46, 95% CI: 1.18,10.13) and females threatened with violence (AOR=5.78, 95% CI: 1.67,20.03). Sex trade had strong associations with number of traumas reported, with adjusted odds ratios as high as 7.28 for those experiencing 4+ traumas.

Young Adulthood—During young adulthood, the prevalence of lifetime sex trade rose to 4.6%. In unadjusted models, all traumas were significantly associated with sex trade, with the exception of emotional abuse. In fully adjusted analyses, we see an over two-fold increase in odds of sex trade for those reporting sexual abuse (AOR=2.17, 95% CI: 1.43,3.29) and witnessed violence (AOR=2.28, 95% CI: 1.54, 3.38), in addition to females reporting neglect (AOR=2.03, 95% CI: 1.04,3.97) and females reporting physical abuse (AOR=2.02, 95% CI: 1.14,3.57) (these associations were null for men). Also of note is the prevalence of sex trade during this time period. Specifically, 10% of those who were sexually abused reported sex trade involvement in young adulthood. The prevalence was even higher for those who had been exposed to violence, with rates of 12.1%, 11.3% and 10.6% for witnessed, threatened and experienced violence, respectively. Number of traumas is also associated with sex trade, with odds increasing in a stepwise pattern with each additional trauma ($p<0.0001$).

Adulthood—In adulthood, 1.9% reported sex trade involvement in the past year. Just as in young adulthood, significant associations in unadjusted models were observed for most traumas, with the exception of emotional abuse and parental binge drinking. In the fully adjusted models, only witnessed violence remained significant (AOR=2.13, 95% CI: 1.27,3.58). We also found a significant association with males reporting physical abuse (AOR=1.97, 95% CI: 1.05,3.69) and parental incarceration (AOR=2.10, 95% CI: 1.15,3.83). Association with number of traumas is similar to that in young adulthood ($p=0.0001$).

Associations between traumas and self-reported STI

Adolescence—In adolescence, the prevalence of self-reported STIs (chlamydia, gonorrhea or trichomoniasis) was 1.7%. The traumas most strongly associated with STI in adjusted models were parental binge drinking (AOR=2.22, 95% CI: 1.31,3.77), witnessed violence (AOR=2.41, 95% CI: 1.28, 4.53) and threatened violence (AOR=1.96, 95% CI: 1.12, 3.43). Females who reported parental incarceration had a 1.64 adjusted odds ratio (95% CI: 0.90,3.00), significantly higher than for men. Those exposed to multiple traumas had an increase in odds that ranged from 1.83 (two traumas) to 3.11 (4+ traumas).

Adulthood—In adulthood, 3.5% reported an STI in the past year. Unadjusted models showed significant associations for sexual abuse, parental incarceration and witnessed violence. After adjustment, only parental incarceration was significantly associated (AOR=1.70, 95% CI: 1.11,2.58). No significant gender differences were noted. Increased odds of STI were associated with having experienced one trauma (AOR=1.92, 95% CI:

1.27,2.89), two traumas (AOR=1.61, 95% CIL: 1.00,2.59) and 4+ traumas (AOR=2.07, 95% CI: 1.27,3.38).

Associations between traumas and test-identified STI

Young Adulthood—Urine samples were taken during young adulthood and 6.6% of participants tested positive for chlamydia, gonorrhea or trichomoniosis. In general, traumas were more weakly associated with this outcome, with a notable exception in the unadjusted analyses being witnessed violence, which was associated with 2.12 times the odds of STI (95% CI: 1.57,2.86). After adjustment, only parental binge drinking was significantly associated (AOR=1.46, 95% CI: 1.01,2.11). No significant gender differences were observed. Unlike for other outcomes, when looking at number of traumas experienced, only reporting 4+ traumas was significantly associated with STI in our adjusted models, though a dose-response relationship was observed ($p<0.03$).

Discussion

Associations were found between trauma score and sexual risk outcomes at all waves, though the highest odds ratios for each outcome occurred in adolescence. We also observed a dose-response relationship between trauma score and each outcome during at least one wave of the study. These findings contribute to literature suggesting that increasing trauma load during the stress-sensitive early years has negative effects on physical and mental well-being[25,26,29] and that these effects may extend into adulthood. In addition, our findings are consistent with data from the CDC[1] demonstrating that STI risk behaviors are highest in young adulthood, and further suggests that this risk is magnified by childhood maltreatment.

Violence exposures were strong independent correlates of adolescent sexual risk outcomes. Witnessing violence, in particular, was correlated with the outcomes to varying degrees of strength at all life stages. Notably, 12% of those who reported witnessing violence tested positive for an STI in young adulthood, which equated to an over two-fold increase in the odds. A number of studies have postulated the mechanism underlying this connection, finding that exposure to violence increased risk of substance abuse, intercourse while using substances, suicidal ideation and inconsistent condom use, all of which may increase chance of STI acquisition.[21,23]

A novel contribution of this analysis was the inclusion of indicators of household dysfunction. Parental binge drinking was the only trauma associated with biologically-confirmed infection in young adulthood, while parental incarceration was the trauma most strongly associated with self-reported STI in adulthood. There is a paucity of research on the effects of these traumas, though measures reflecting household members who abused substances or were incarcerated were included in Hillis et al's ACE and STI study.[25] Children who grow up with parent-related adversity may experience feelings of chaos, fear, helplessness and loneliness and struggle with regulation of affective states and maintaining stable relationships. It is possible they engage in risky sexual behaviors as they seek to form relationships outside their family, and these early-life patterns extend into adulthood.

Sexual abuse had only modest associations with most of our outcomes, despite being the most studied predictor of STI risk behavior.[3–5,7] This is not the first study to cite this inconsistency, and some have speculated that sexual avoidance, common in victims of sexual abuse, may weaken associations.[24]

One notable exception is the strong association between sexual abuse and sex trade. Ten percent of those reporting sexual abuse also reported engaging in sex trade during young adulthood, a two-fold increase compared to those who did not report abuse. The NIMH Multisite HIV Prevention Trial, a large study of high risk women recruited from STD clinics, found a similarly strong association between sex abuse and sex trade. In their study sample, 17.8% of participants who reported sexual abuse in childhood also reported engaging in sex for drugs or money in the past 90 days (OR 2.28, 95% CI: 1.83–2.83). Our study results suggest that this strong link between abuse and sex trade exists in the general population as well.

Finally, we explored modification of all associations by gender. Females with an incarcerated parent had significantly higher odds of testing positive for STI in young adulthood than males. Childhood neglect was far more correlated to sexual risk behavior in females, with significant gender differences in four of the nine studied outcomes. On the other hand, the association between witnessed violence and multiple partnerships was much stronger for males. Little is understood about the role of gender in moderating sexual risk, though there is evidence that males tend to respond to trauma with externalized stress symptoms (i.e. aggression) while females tend to show more internalized stress symptoms (i.e., depression), which may impact sensitivity to certain traumas.[10,30]

These nationally-representative data yielded results that are generalizable to the U.S. population, and the study's large sample size allowed us to examine associations for individual effects, including many that have not been studied in the context of STI. The longitudinal nature of Add Health data and its prospective design allowed us to observe relationships over time. Limitations of this analysis include the use of self-reported data, except for test-identified STIs during young adulthood, which may have introduced bias, likely from underreporting. Also, sexual risk outcomes during adolescence were measured as lifetime values, thus we could not ascertain whether they occurred before or after reported trauma. Additionally, there was some loss to follow up at each wave. Higher response rates were noted among participants who were female, white and native-born, as well as by those with higher parental education and income levels at Wave I. [28] The loss of participants who are more likely to have experienced trauma and STI outcomes would bias our results towards the null. However, Add Health investigated the potential bias due to attrition and found the effect to be negligible. [28]

STIs are prevalent in America, impacting every race, gender and socioeconomic group. They carry the potential to cause life-threatening disease and permanent infertility. Sexual behavior is complex, and as such, STI prevention efforts should be as comprehensive as possible. A broad range of traumas were found to be independent correlates of sexual risk behavior, with increasing trauma score generally correlated with increasing odds of unfavorable outcomes. These findings underscore the need to consider trauma history in STI

screening and prevention strategies. Reproductive health care providers should incorporate trauma screening and provide STI testing and follow up as appropriate. Approaches to care such as those espoused by The Sanctuary Model, which recognizes that certain types of interactions between patients and health professionals can compound the negative effects of past traumas,[31] must also inform treatment for vulnerable populations. Moreover, adolescents exposed to trauma should be identified so that preventive strategies can be implemented prior to young adulthood when risk for infection is highest.

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Summary

A nationally representative study found a broad range of childhood traumas are associated with sexual risk behavior and STI from adolescence into adulthood.

Table 1

Respondent characteristics for participants reporting past year STI in Wave IV

	N (%) in Total Sample	% with STI	OR (95% CI)
Age at Wave IV			
24–27	3848 (36.8)	4.3	1.61 (1.10, 2.35)
28–29	4527 (33.0)	3.1	1.15 (0.81, 1.63)
≥30	3876 (29.7)	2.7	Referent
Gender			
Male	5604 (50.6)	2.3	Referent
Female	6684 (49.4)	4.7	2.10 (1.67, 2.63)
Race			
White	6597 (65.6)	2.2	Referent
Black	2609 (16.0)	9.1	4.51 (3.35, 6.05)
Hispanic	1913 (11.9)	3.4	1.59 (0.99, 2.54)
Other	1162 (6.5)	2.9	1.35 (0.76, 2.42)
Concerned about Bills at Wave I			
No	8570 (71.6)	3.2	Referent
Yes	1849 (14.7)	4.5	1.42 (1.04, 1.95)
Concerned about Bills at Wave III			
No	10464 (85.0)	3.2	Referent
Yes	1720 (14.0)	5.0	1.59 (1.20, 2.09)
Education			
Less than High School	896 (8.5)	6.2	2.24 (1.41, 3.57)
Completed High School	1934 (17.5)	4.8	1.71 (1.26, 2.32)
Greater than High School	9458 (74.0)	2.9	Referent

Abbreviations: OR=Odds Ratio; CI=Confidence Interval; STI=Sexually Transmitted Infection.

Table 2

Unadjusted and adjusted odds ratios with 95% confidence intervals for the associations of childhood traumas and multiple partnerships in Waves I, III and IV

	Wave I			Wave III			Wave IV		
Trauma	**% with Outcome**	**OR (95% CI)**	**AOR[a] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**
Neglect									
No	18.7	1.00	1.00	27.8	1.00	1.00	24.7	1.00	1.00
Yes	23.5	1.34 (1.15–1.55) *F:* 1.49 (1.22–1.84) *M:* 1.20 (0.97–1.49)	1.25 (1.03–1.53)	30.8	1.15 (1.01–1.33)	0.99 (0.83–1.18)	26.3	1.08 (0.91–1.29) *F*: 1.26 (1.01–1.58) *M:* 0.94 (0.74–1.20)	0.91 (0.73–1.14) *F:* 1.11 (0.84–1.48) *M:* 0.79 (0.57–1.08)
Emotional Abuse									
No	18.8	1.00	1.00	28.3	1.00	1.00	24.1	1.00	1.00
Yes	23.5	1.33 (1.14–1.56) *F:* 1.65 (1.33–2.04) *M:* 1.14 (0.91–1.41)	1.16 (0.91–1.49) *F:* 1.41 (1.05–1.90) *M:* 0.92 (0.67–1.25)	29.5	1.06 (0.91–1.23)	0.96 (0.79–1.16)	29.3	1.30 (1.13–1.50)	1.29 (1.06–1.57)
Physical Abuse									
No	18.8	1.00	1.00	27.5	1.00	1.00	24.1	1.00	1.00
Yes	24.6	1.41 (1.22–1.63)	0.91 (0.72–1.16)	32.3	1.26 (1.07–1.48)	1.25 (1.02–1.54)	29.5	1.32 (1.11–1.55)	1.17 (0.94–1.46)
Sexual Abuse									
No	18.7	1.00	1.00	27.5	1.00	1.00	24.3	1.00	1.00
Yes	27.4	1.64 (1.33–2.01)	1.46 (1.13–1.88)	36.0	1.48 (1.26–1.75)	1.35 (1.09–1.67)	31.4	1.43 (1.17–1.75) *F*: 1.31 (0.99–1.74) *M:* 1.80 (1.33–2.45)	1.38 (1.07–1.78) *F:* 1.10 (0.78–1.57) *M*: 1.75 (1.18–2.60)
Parental Incarceration									
No	18.7	1.00	1.00	28.2	1.00	1.00	24.4	1.00	1.00
Yes	26.7	1.59 (1.32–1.91)	1.33 (1.06–1.67)	29.4	1.06 (0.91–1.25)	0.89 (0.73–1.09)	29.1	1.28 (1.08–1.52) *F:* 1.53 (1.24–1.90) *M:* 1.11 (0.84–1.47)	1.08 (0.86–1.35)
Parental Binge									
No	18.3	1.00	1.00	27.8	1.00	1.00	24.6	1.00	1.00

	Wave I			Wave III			Wave IV		
Trauma	**% with Outcome**	**OR (95% CI)**	**AOR[a] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**
Yes	24.1	1.42 (1.21–1.67)	1.41 (1.17–1.71)	33.1	1.28 (1.07–1.55) *F:* 1.44 (1.14–1.83) *M:* 1.15 (0.92–1.43)	1.15 (0.95–1.40)	29.5	1.29 (1.08–1.53)	1.07 (0.88–1.29)
Witness Violence									
No	17.0	1.00	1.00	27.4	1.00	1.00	24.1	1.00	1.00
Yes	41.0	3.40 (2.81–4.10) *F:* 2.06 (1.55–2.74) *M:* 4.43 (3.49–5.63)	2.20 (1.79–2.71) *F:* 1.41 (0.98–2.03) *M:* 2.97 (2.19–4.02)	37.6	1.60 (1.34–1.91) *F:* 1.30 (1.02–1.66) *M:* 1.68 (1.33–2.11)	1.34 (1.06–1.69) *F:* 0.95 (0.69–1.31) *M:* 1.67 (1.25–2.24)	32.8	1.54 (1.29–1.83) *F:* 1.25 (0.97–1.62) *M:* 1.59 (1.28–1.98)	1.21 (0.96–1.51)
Threat w/ Violence									
No	16.4	1.00	1.00	27.4	1.00	1.00	24.0	1.00	1.00
Yes	42.8	3.82 (3.20–4.56)	2.19 (1.72–2.79)	36.4	1.52 (1.29–1.79)	1.16 (0.94–1.43) *F:* 0.84 (0.60–1.18) *M:* 1.30 (1.00–1.68)	32.7	1.54 (1.29–1.83)	1.15 (0.90–1.46)
Experienced Violence									
No	18.4	1.00	1.00	28.0	1.00	1.00	24.8	1.00	1.00
Yes	42.1	3.23 (2.54–4.12)	1.39 (0.95–2.03)	37.0	1.51 (1.17–1.94)	1.12 (0.83–1.51)	29.4	1.26 (1.00–1.60) *F:* 1.55 (1.06–2.27) *M:* 1.01 (0.76–1.33)	0.91 (0.64–1.28) *F:* 1.38 (0.86–2.23) *M:* 0.77 (0.53–1.12)
Cumulative Number of Traumas[a]									
No Trauma	12.8	1.00	1.00	24.5	1.00	1.00	20.7	1.00	1.00
One Trauma	19.5	1.65 (1.39–1.96)	1.64 (1.36–1.98)	31.2	1.40 (1.22–1.61)	1.31 (1.14–1.52)	27.1	1.42 (1.21–1.67)	1.32 (1.12–1.56)
Two Traumas	26.6	2.48 (2.00–3.06)	2.51 (2.02–3.12)	28.5	1.23 (1.03–1.47)	1.18 (0.98–1.42)	28.2	1.51 (1.24–1.83)	1.42 (1.16–1.73)
Three Traumas	30.3	2.97 (2.32–3.81)	3.01 (2.34–3.89)	34.4	1.62 (1.28–2.04)	1.46 (1.14–1.87)	31.8	1.78 (1.41–2.26)	1.59 (1.24–2.05)
4+ Traumas	40.9	4.73 (3.59–6.24)	4.82 (3.53–6.56)	36.3	1.76 (1.32–2.35)	1.67 (1.24–2.25)	31.2	1.74 (1.31–2.31)	1.60 (1.19–2.14)
p for trend		<0.0001	<0.0001		0.1709	0.1583		0.4015	0.4415

Abbreviations: OR=Odds Ratio; AOR=Adjusted Odds Ratio; CI=Confidence Interval; STI=Sexually Transmitted Infection; F=Females; M=Males.

[a]Cumulative trauma only includes cases with no missing data

Table 3

Unadjusted and adjusted odds ratios with 95% confidence intervals for the associations of childhood traumas and sex trade in Waves I, III and IV

	Wave I			Wave III			Wave IV		
Trauma	**% with Outcome**	**OR (95% CI)**	**AOR[a] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**
Neglect									
No	1.1	1.00	1.00	4.2	1.00	1.00	1.7	1.00	1.00
Yes	1.8	1.71 (0.98–2.98) *F:* 3.65 (1.61–8.28) *M:* 1.08 (0.46–2.51)	1.22 (0.61–2.46) *F:* 3.46 (1.18–10.13) *M:* 0.62 (0.22–1.72)	6.5	1.60 (1.21–2.11) *F:* 2.51 (1.45–4.36) *M:* 1.27 (0.88–1.82)	1.26 (0.83–1.91) *F:* 2.03 (1.04–3.97) *M:* 0.96 (0.56–1.64)	2.9	1.76 (1.11–2.79)	1.29 (0.74–2.24)
Emotional Abuse									
No	1.1	1.00	1.00	4.5	1.00	1.00	1.7	1.00	1.00
Yes	1.5	1.32 (0.73–2.38)	1.14 (0.47–2.74)	5.3	1.20 (0.87–1.64)	1.15 (0.82–1.61)	2.6	1.48 (0.94–2.34)	1.59 (0.83–3.04)
Physical Abuse									
No	1.1	1.00	1.00	4.2	1.00	1.00	1.6	1.00	1.00
Yes	1.4	1.31 (0.73–2.35)	0.89 (0.42–1.90) *F:* 2.02 (0.75–5.47) *M:* 0.57 (0.20–1.65)	5.9	1.44 (1.01–2.04) *F:* 2.62 (1.62–4.23) *M:* 1.05 (0.66–1.68)	1.15 (0.78–1.69) *F:* 2.02 (1.14–3.57) *M:* 0.84 (0.49–1.41)	3.4	2.10 (1.35–3.26) *F:* 0.74 (0.19–2.84) *M:* 2.47 (1.57–3.90)	1.48 (0.82–2.70) *F:* 0.26 (0.04–1.69) *M:* 1.97 (1.05–3.69)
Sexual Abuse									
No	1.1	1.00	1.00	3.9	1.00	1.00	1.6	1.00	1.00
Yes	1.7	1.63 (0.83–3.20)	1.66 (0.71–3.87)	10.1	2.81 (2.00–3.94)	2.17 (1.43–3.29)	3.6	2.26 (1.31–3.92)	1.93 (0.97–3.86)
Parental Incarceration									
No	1.1	1.00	1.00	4.1	1.00	1.00	1.7	1.00	1.00
Yes	2.1	1.88 (0.91–3.87)	1.66 (0.54–5.11)	7.2	1.81 (1.27–2.59) *F:* 2.65 (1.59–4.42) *M:* 1.55 (0.98–2.44)	1.20 (0.76–1.91)	3.2	1.93 (1.15–3.24)	1.60 (0.90–2.87) *F:* 0.34 (0.05–2.49) *M:* 2.10 (1.15–3.83)
Parental Binge									
No	1.0	1.00	1.00	4.2	1.00	1.00	1.8	1.00	1.00
Yes	1.5	1.40 (0.75–2.64)	1.11 (0.53–2.33)	5.8	1.41 (1.00–1.99)	1.09 (0.75–1.91)	2.1	1.14 (0.70–1.87)	0.95 (0.52–1.74)
Witness Violence									
No	1.0	1.00	1.00	3.7	1.00	1.00	1.5	1.00	1.00

	Wave I			Wave III			Wave IV		
Trauma	**% with Outcome**	**OR (95% CI)**	**AOR[a] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**
Yes	2.5	2.57 (1.53–4.32)	1.21 (0.44–3.30)	12.1	3.62 (2.70–4.86)	2.28 (1.54–3.38)	4.8	3.26 (2.16–4.92)	2.13 (1.27–3.58)
Threat w/ Violence									
No	1.0	1.00	1.00	3.6	1.00	1.00	1.6	1.00	1.00
Yes	2.4	2.52 (1.41–4.51) *F:* 6.69 (2.88–15.56) *M:* 1.43 (0.72–2.85)	1.34 (0.48–3.78) *F:* 5.78 (1.67–20.03) *M:* 0.81 (0.30–2.19)	11.3	3.39 (2.52–4.55) *F:* 4.14 (2.52–6.81) *M:* 2.51 (1.75–3.58)	1.32 (0.87–1.99)	4.1	2.68 (1.77–4.06) *F:* 4.38 (1.73–11.08) *M:* 1.78 (1.10–2.88)	1.08 (0.53–2.19)
Experienced Violence									
No	1.0	1.00	1.00	4.3	1.00	1.00	1.8	1.00	1.00
Yes	3.4	3.44 (1.82–6.49)	2.21 (1.02–4.76)	10.6	2.66 (1.76–4.00)	1.13 (0.67–1.92)	4.0	2.35 (1.27–4.38) *F:* 1.97 (0.50–7.70) *M:* 0.60 (0.19–1.87)	0.73 (0.26–1.99)
Cumulative Number of Traumas[a]									
No Trauma	0.4	1.00	1.00	2.2	1.00	1.00	1.1	1.00	1.00
One Trauma	1.6	4.10 (1.83–9.20)	3.83 (1.72–8.52)	4.6	2.10 (1.49–2.96)	1.87 (1.34–2.61)	1.4	1.33 (0.79–2.22)	1.22 (0.73–2.03)
Two Traumas	1.3	3.37 (1.31–8.65)	3.19 (1.24–8.20)	4.8	2.17 (1.42–3.33)	1.84 (1.19–2.87)	2.9	2.78 (1.52–5.12)	2.42 (1.27–4.61)
Three Traumas	1.1	2.73 (0.89–8.43)	2.48 (0.80–7.73)	6.2	2.86 (1.74–4.69)	2.25 (1.34–3.80)	3.5	3.43 (1.67–7.03)	2.79 (1.35–5.78)
4+ Traumas	3.1	8.03 (3.08–20.92)	7.28 (2.76–19.19)	14.4	7.35 (4.31–12.56)	5.82 (3.43–9.88)	5.7	5.69 (2.98–10.86)	4.93 (2.49–9.77)
p for trend		0.6048	0.6601		<0.0001	<0.0001		<0.0001	0.0001

Abbreviations: OR=Odds Ratio; AOR=Adjusted Odds Ratio; CI=Confidence Interval; STI=Sexually Transmitted Infection; F=Females; M=Males.

[a]Cumulative trauma only includes cases with no missing data

Table 4

Unadjusted and adjusted odds ratios with 95% confidence intervals for the associations of childhood traumas and STIs in Waves I, III and IV

	Wave I			Wave III			Wave IV		
Trauma	**% with Outcome**	**OR (95% CI)**	**AOR[a] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**
Neglect									
No	1.5	1.00	1.00	6.6	1.00	1.00	3.5	1.00	1.00
Yes	2.9	1.91 (1.23–2.96)	1.83 (0.99–3.37)	6.4	0.97 (0.72–1.31) *F:* 1.24 (0.87–1.76) *M:* 0.69 (0.39–1.24)	0.95 (0.63–1.43) *F:* 1.26 (0.81–1.94) *M:* 0.60 (0.30–1.19)	3.5	1.00 (0.70–1.42)	0.97 (0.63–1.47)
Emotional Abuse									
No	1.6	1.00	1.00	6.9	1.00	1.00	3.6	1.00	1.00
Yes	2.1	1.27 (0.87–1.86)	0.79 (0.43–1.45)	5.2	0.75 (0.56–0.99)	0.98 (0.70–1.37)	3.2	0.90 (0.63–1.28)	0.89 (0.57–1.38)
Physical Abuse									
No	1.7	1.00	1.00	6.6	1.00	1.00	3.4	1.00	1.00
Yes	1.6	0.95 (0.58–1.54)	0.42 (0.17–1.02)	5.8	0.87 (0.63–1.20)	0.78 (0.54–1.13)	4.5	1.36 (0.91–2.02)	1.54 (0.92–2.56)
Sexual Abuse									
No	1.6	1.00	1.00	6.4	1.00	1.00	3.3	1.00	1.00
Yes	3.2	2.04 (1.22–3.40) *F:* 1.50 (0.83–2.62) *M:* 3.36 (1.31–8.58)	1.10 (0.57–2.11)	8.7	1.38 (1.00–1.92)	1.20 (0.80–1.78)	5.9	1.85 (1.25–2.75) *F:* 1.35 (0.88–2.06) *M:* 2.89 (1.41–5.92)	1.35 (0.78–2.32)
Parental Incarceration									
No	1.6	1.00	1.00	6.2	1.00	1.00	2.9	1.00	1.00
Yes	2.8	1.80 (1.21–2.67)	1.27 (0.70–2.29) *F:* 1.64 (0.90–3.00) *M:* 0.50 (0.11–2.34)	9.9	1.66 (1.31–2.11) *F:* 2.06 (1.54–2.76) *M:* 1.18 (0.73–1.90)	1.27 (0.92–1.76)	7.1	2.56 (1.82–3.61)	1.70 (1.11–2.58)
Parental Binge									
No	1.3	1.00	1.00	6.0	1.00	1.00	3.3	1.00	1.00
Yes	2.4	1.83 (1.13–2.95)	2.22 (1.31–3.77)	9.7	1.69 (1.20–2.37)	1.46 (1.01–2.11)	4.4	1.35 (0.81–2.28)	1.10 (0.64–1.92)
Witness Violence									
No	1.4	1.00	1.00	6.0	1.00	1.00	3.2	1.00	1.00

	Wave I			Wave III			Wave IV		
Trauma	**% with Outcome**	**OR (95% CI)**	**AOR[a] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**	**% with Outcome**	**OR (95% CI)**	**AOR[b] (95% CI)**
Yes	4.3	3.17 (2.08–4.82)	2.41 (1.28–4.53)	12.0	2.12 (1.57–2.86)	1.39 (0.93–2.09)	5.6	1.78 (1.25–2.53)	1.32 (0.76–2.31)
Threat w/ Violence									
No	1.5	1.00	1.00	6.4	1.00	1.00	3.5	1.00	1.00
Yes	3.1	2.09 (1.42–3.09)	1.96 (1.12–3.43)	8.8	1.41 (1.11–1.79)	1.04 (0.71–1.52)	3.4	0.96 (0.68–1.35)	0.96 (0.60–1.55)
Experienced Violence									
No	1.7	1.00	1.00	6.5	1.00	1.00	3.5	1.00	1.00
Yes	1.8	1.06 (0.51–2.20)	0.49 (0.16–1.54)	9.0	1.42 (0.94–2.12)	1.03 (0.58–1.81)	2.8	0.79 (0.45–1.38)	0.63 (0.26–1.53)
Cumulative Number of Traumas[a]									
No Trauma	0.8	1.00	1.00	5.3	1.00	1.00	2.1	1.00	1.00
One Trauma	2.2	2.71 (1.56–4.72)	2.40 (1.40–4.12)	6.5	1.23 (0.92–1.64)	1.02 (0.76–1.35)	4.7	2.23 (1.45–3.44)	1.92 (1.27–2.89)
Two Traumas	1.7	2.15 (1.09–4.24)	1.83 (0.91–3.68)	7.5	1.43 (1.00–2.04)	1.09 (0.76–1.56)	3.9	1.86 (1.14–3.01)	1.61 (1.00–2.59)
Three Traumas	2.4	3.07 (1.63–5.76)	2.90 (1.51–5.59)	8.8	1.72 (1.15–2.58)	1.26 (0.86–1.87)	3.7	1.74 (0.96–3.17)	1.59 (0.88–2.89)
4+ Traumas	3.1	3.87 (1.72–8.69)	3.11 (1.25–7.74)	11.5	2.30 (1.54–3.43)	1.81 (1.14–2.88)	4.8	2.29 (1.34–3.91)	2.07 (1.27–3.38)
p for trend		0.6287	0.7037		0.0122	0.0267		0.4704	0.7629

Abbreviations: OR=Odds Ratio; AOR=Adjusted Odds Ratio; CI=Confidence Interval; STI=Sexually Transmitted Infection; F=Females; M=Males.

[a]Cumulative trauma only includes cases with no missing data