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Understanding the relations among adverse childhood experiences (ACE), substance use, and
reoffending among juvenile offenders

by
Shelby Weber

A thesis
Submitted in partial fulfillment
of the requirements for the degree of
Master of Science in the Department of Psychology
Idaho State University
Spring 2020

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To the Graduate Faculty:

The members of the committee appointed to examine the thesis of SHELBY WEBER
find it satisfactory and recommend that it be accepted.

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Human Subjects Committee Approval Page

June 25, 2018

Shannon Lynch
Psychology
MS 8112

RE: regarding study number IRB-FY2018-303 : Trauma exposure, mental health, and substance use as predictors of re-offending in justice involved youth

Dear Dr. Lynch:

Thank you for your responses to a previous full-board review of the study listed above. Your responses are eligible for expedited review under OHRP and FDA guidelines. This is to confirm that I have approved your application.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

You may conduct your study as described in your application effective immediately. The study is subject to renewal on or before June 25, 2019, unless closed before that date.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Tom Bailey (208-282-2179; email humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

May 23, 2019

Shannon Lynch
Psychology
MS 8112

RE: Study number IRB-FY2018-303: Trauma exposure, mental health, and substance use as predictors of re-offending in justice involved youth

Dear Dr. Lynch:

You are granted permission to continue your study as described effective immediately. The study is next subject to continuing review on or before May 22, 2020, unless closed before that date.

As with the initial approval, changes to the study must be promptly reported and approved. Contact Tom Bailey (208-282-2179, humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chair

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Understanding the relations among adverse childhood experiences (ACE), substance use, and
reoffending among juvenile offenders

Thesis Abstract – Idaho State University (2020)

Juvenile offenders experience elevated rates of exposure to adverse childhood experiences (ACE), with the majority reporting exposure to multiple adverse events. These experiences vary by gender, with girls reporting increased rates of interpersonal victimization and cumulative adversities compared to boys. Existing literature suggests that ACEs are related to reentry in the criminal justice system and increased risk of using substances, but there is little research on the indirect role of substance use in the relation between adversity and offending in youth offenders. Moreover, gender differences in ACEs and substance use are understudied in this population. The present study aimed to expand upon current literature by evaluating gender differences in the relationships among cumulative ACEs, substance use severity, and reoffending in a sample of youth offenders (N = 340). Cumulative adversity significantly predicted reoffending among girls and boys. Additionally, there was a significant medium indirect effect of ACEs on reoffending via substance use. Though girls reported higher exposure to adversity and substance use, gender did not interact with ACEs or substance use to predict reoffending. These findings demonstrate the importance of cumulative experiences of adversity in childhood and substance use as predictors of reentry into the criminal justice system. Understanding the role of substance use in the relation between ACEs and reoffending has the potential to contribute to our knowledge of juvenile offenders' treatment needs and reoffending risk.

Keywords: ACE, childhood adversity, substance use, recidivism, juvenile offenders

Introduction

In 2017, 809,700 minors were arrested and detained in state and federal detention centers (Office of Juvenile Justice and Delinquency Prevention [OJJDP], 2018). Currently there are more boys in the juvenile justice system than girls, though girls' incarceration rates are rising. Youth frequently reoffend, with recidivism rates of up to 80% in some samples (Mulder et al., 2011). Youth offenders are at heightened vulnerability of experiencing adversity in childhood, with most youth reporting several traumatic experiences (Abram et al., 2013; Ford et al., 2008). Prevalence of victimization also seems to vary by gender, with girls generally reporting higher rates of exposure and polyvictimization compared to boys (Baglivio et al., 2014; DeHart & Moran, 2015; Ford et al., 2013; Kerig et al., 2018).

Repeated exposure to traumatic stressors negatively contributes to risk-taking behaviors, emotional regulation difficulties, substance use, and reoffending (Evans-Chase, 2014; Ford et al., 2012; Kerig, 2018; Wolff et al., 2015). Using substances is an additional risk factor for arrest and re-arrest (Cottle et al., 2001; Stoolmiller & Blechman, 2005). Though existing research has identified links among these experiences, less is known about the role of substance use subsequent to childhood adversity, and reoffending among juvenile offenders.

Prevalence of Adverse Childhood Experiences

Adverse childhood experiences (ACE) include experiences of childhood neglect (physical, emotional), abuse (physical, sexual), and household dysfunction (family substance use, family violence, family mental illness, family incarceration, parental separation) (Baglivio & Epps, 2016; Felitti et al., 1998). Juvenile offenders report exposure rates as high as 90% for adversity or trauma compared to the rates of about 25% in the general population (Baglivio et al., 2014; Costello et al., 2002; Dierkhising et al., 2013; Evans-Chase, 2014). In a large statewide

study of juveniles affiliated with the justice system, 73.9% reported abuse and 31.3% reported neglect (Baglivio & Epps, 2016). Further, these authors found that once youth reported one ACE, the likelihood of experiencing additional adverse experiences significantly increased across ACE items. The rates identified in this study are consistent with findings in the juvenile offender trauma literature, such that youth report high rates of exposure to trauma and multiple traumatic events (Abram et al., 2013; Ford et al., 2008).

Type of adversity exposures and trajectories differ by gender among justice-involved juveniles (Espinosa et al., 2013; Kerig, 2018). Female juvenile offenders are more likely to experience sexual violence, multiple victimizations, and to subsequently meet criteria for PTSD compared to males (Abram et al., 2013; Conrad et al., 2014; DeHart & Moran, 2015; Ford et al., 2008; Kerig, 2018; Kretschmar et al., 2017). In contrast, male youth report witnessing trauma and community violence as being their most common type of trauma exposure (Jencks & Leibowitz, 2018; Stimmel et al., 2014). Overall, these prevalence rates suggest that youth offenders experience substantial victimization, though varied by gender. Disproportionately high victimization rates may lead to maladaptive coping mechanisms and negative behavioral outcomes.

Childhood Adversity and Offending

There is a growing literature that suggests exposure to childhood adversity is linked with negative health and behavioral outcomes (Bellis et al., 2014; Dube et al., 2003a; Dube et al., 2003b; Felliti et al., 1998). Studies have also indicated that childhood trauma predicts recidivism in adult offenders (English et al., 2002; Lynch et al., 2017). However, less is known about the extent to which adverse experiences are related to youth's reoffending or other maladaptive behaviors across sources. In the existing research, ACEs are associated with increased risk of

delinquent behavior; however, this seems to depend on gender, frequency, type, and age of onset of the adversities (Hawkins et al., 2000).

Baglivio et al. (2014) utilized an actuarial risk/needs assessment to assign youth (N=64,329) into re-offense risk level groups based on criminal and social history scores. In this study, they found that high-risk youth were not only likelier to report multiple ACEs, but also that ACEs predicted reoffending across risk level groups. Though all ACE items were ranked similarly by gender, girls had a significantly higher prevalence of each ACE. Another study found that those who offended earlier reported higher rates of childhood adversity, and that higher ACE counts were associated with greater likelihood of arrests after controlling for several additional risk factors (Baglivio et al., 2015). Using the same archival database, Wolff et al. (2015) found that youth with higher ACEs were more likely to reoffend within one year and had less time between offenses. These studies indicate that youth who have greater cumulative adversities are at increased risk of more serious reoffending trajectories, especially in those who have entered the criminal justice system at a younger age. Additionally, being female may confer additional risk.

Evidence suggests that girls in the justice system are more likely to be exposed to an individual adverse event and to experience multiple ACEs compared to boys. Researchers have consistently found that girls report over twice the proportion of adversity compared to boys (Baglivio & Epps, 2016; Baglivio et al., 2014). This is notable given that increased exposure to traumatic experiences are associated with offending. Research also suggests that the type of adversity matters. In particular, experiences of interpersonal violence such as childhood sexual abuse increase risk of entry in the criminal justice system (Conrad et al., 2014; Herrera & McCloskey, 2003; Kerig, 2018).

Other studies have also broadly measured childhood maltreatment, trauma, and stressful environments as risk factors of offending. In a study of justice-involved boys, childhood neglect, criminal behavior in the family, parental substance use, and lack of parenting skills were associated with recidivism (Mulder, Brand, Bullens, & van Marle, 2011). In addition, Herrera & McCloskey (2001) found that exposure to family violence increased delinquent behavior. These studies suggest that youth who experience household dysfunction are at risk of greater involvement in the criminal justice system.

Substance Use and Offending

Rates of substance use are high among youth offenders. In a stratified, multi-site study of juvenile detainees, about 71% of juveniles reported use (Kim & Fendrich, 2002). In 2017, 128,390 juveniles were arrested for drug abuse and liquor law violations, which was the second highest rate of all offenses (OJJDP, 2018). In addition, youth are commonly under the influence of substances before and during committing an offense (White et al., 2002). Researchers have shown that substance use is strongly associated with delinquent behavior, initial entry into the criminal justice system, and reoffending (Cottle et al., 2001; Lipsey & Derzon, 1998; Stoolmiller & Blechman, 2005; Bui, Ellickson, & Bell, 2000; Ford, 2005; Loeber & Farrington, 2000). For example, in a longitudinal study, substance use predicted subsequent interpersonal, property, and drug-related offenses across four time points among juvenile offenders (D'Amico, Edelen, Miles, & Morral, 2007).

Though substance use is associated with delinquency in both boy and girl offenders, the criminal outcomes and severity seem to vary by gender. Bright et al. (2016) generated delinquency classification groups in a longitudinal, stratified probability sample of at-risk youth. In this context, girls were more likely than boys to use substances and have more involvement in

delinquency behaviors at a younger age. Similar in regard to age of onset, Neff & Waite (2007)'s study of youth in corrections found that girls began and continued using substances including cocaine, crack, stimulants, and hallucinogens, significantly earlier in age compared to boys. These findings suggest youth who use substances are at increased risk of delinquent behavior and arrest, but few studies have measured substance use as a predictor of reoffending or examined the unique associations among childhood adversity, substance use, and multiple offenses in youth offenders.

Childhood Adversity and Substance Use

Studies with juvenile offenders have shown that greater exposure to trauma in childhood are associated with increased drug and alcohol use and using multiple substances (Bender, 2009; Ford, et al., 2010; McClelland et al., 2004). Youth offenders who experience polyvictimization and interpersonal violence are at greater risk of using substances (Ford et al., 2008; Moreland et al., 2018). Earlier experiences of trauma are also associated with earlier onset of substance use (Ullman et al., 2013). However, our understanding of juvenile offender substance use is limited given that measurement of substance use is generally dichotomized or controlled for in studies and many studies have not included a strong indicator of substance use severity.

There are gender differences in these substance use pathways which may be related to childhood adversity. Of note, the literature on substance use is mixed among detained youth; some studies indicate that girls' use is higher (Archer et al., 2010; Gilbert et al., 2015; Ford et al., 2008) and some indicate boys' use is higher (Becker et al., 2012; Cauffman et al., 2007; Vincent et al., 2008). Male and female youth offenders report similar rates of marijuana and alcohol use (Lennings et al., 2007; Neff & Waite, 2007). However, girl offenders are significantly more likely to use illicit drugs such as prescription pain relievers, crack, cocaine, amphetamines,

heroin, crystal meth, PCP, and injection drug use compared to boy offenders (Kim & Fendrich, 2002; Smith & Saldana, 2013; McClelland et al., 2004; Neff & Waite, 2007). Girls are also more likely to use multiple substances (Smith & Saldana, 2013) and to use with the intention of self-medicating (Kerig, 2018). Additionally, girls report earlier age-of-onset for substance use (Neff & Waite, 2007; Prinz & Kerns, 2003). Boys' use seems to be higher cross-sectionally, but girls' use of substances begins earlier in age and persists longer than boys' use. These differences in extent and form of substance use may be associated with system-involved girls' increased rate of interpersonal victimizations as well as mental health comorbidities compared to boys, which is especially linked with polysubstance use and substance use disorders (Rich et al., 2016; Teplin et al., 2002). Considering these gender differences may explain the increased risk which may further influence offending trajectories among girls.

While there is growing evidence to suggest childhood adversity increases the risk of delinquency and substance use among youth offenders, less is known about potential explanations for this relation. Prior research has conceptualized substance use as a coping mechanism, such that use inhibits negative psychological symptoms often associated with traumatic experiences (Ford et al., 2008, Ullman et al., 2013). Self-medicating refers to the idea that those who have experienced a traumatic event, particularly interpersonal violence, are coping maladaptively with substances in efforts to reduce associated distressing symptoms and self-regulate emotions (Khantzian, 1997; Ullman et al., 2013). For example, a test of four pathways between PTSD and substance use indicated the self-medication hypothesis had the largest effect in a community sample, demonstrating that traumatic stress symptoms mediated trauma exposure and substance use (Haller & Chassin, 2014).

Though there are established links between trauma and substance use among juvenile offenders, less is known about ACEs and substance use. Literature indicates that increased traumatic experiences are related to higher risk of distress and negative outcomes, but little has examined the range of exposures included as ACEs in youth offenders and how these experiences are related to substance use. Further, gender differences have not been thoroughly investigated in this context. Expanding our understanding of the cumulative impacts of childhood adversity on substance use may shed light on gender differences and the overall impact on pathways to offending.

Purpose of Study

Though there are clear links between exposure to adversities and risk of reoffending among these youth, there is a dearth of literature examining the role of substance use in this relation. In addition, existing literature has not examined these links in a rural sample or have examined gender differences. Given the elevated rates of childhood adversity and the interconnections with delinquent behaviors among youth offenders, it is critical that we identify risk factors for this population that predict reoffending.

This study advances the literature by examining gender differences in adversity and substance use, investigating the effect of substance use, and measuring the cumulative effect of adversity on substance use and total number of offenses over a three year period in a rural geographic region. Specifically, this study extends current knowledge by examining the indirect effect of substance use on the relation between adverse childhood experiences and subsequent reoffending while considering gender differences. Understanding these associations among youth offenders has the potential to inform theory and to provide direction for effective prevention and

intervention services for youth offenders. The following hypotheses were tested in a moderated mediation model (*See Figure 1*).

Hypotheses

1. Hypothesis 1: A higher number of adverse childhood experiences will predict more frequent reoffending (total number of offenses per youth).
2. Hypothesis 2: Substance use will positively mediate the effect of adverse childhood experiences and risk of reoffending (total number of offenses per youth).
3. Hypothesis 3: Gender (girl v. boy) will moderate the direct effect of adverse childhood experiences and rate of reoffending (total number of offenses per youth); such that girls will experience higher levels of childhood adversity and number of offenses compared to boys' level of adversity and reoffending.
 - a. Gender (girl v. boy) will moderate the effect of adverse childhood experiences and substance use; such that girls with higher levels of childhood adversity will report higher levels of substance use compared to boys' level of adversity and substance use.
 - b. Gender (girl v. boy) will moderate the effect of substance use and reoffending; such that girls with higher levels of substance use will reoffend more frequently compared to boys' levels of substance use and reoffending.

Method

Participants

The study utilized existing records from 340 youth detained at a regional detention center in a Northwestern state. Participants were juveniles across six predominantly rural counties who offended at least once between 2016 and 2019. Youth ranged in age from 9 to 17 ($M=14.83$,

SD=1.53). Youth identified as European-American (67.4%, n=229), Hispanic (17.4%, n=59), American Indian/Alaska Native (12.6%, n=43), and African-American (.9%, n=3). The majority (70.6%, n=240) were boys whereas 29.4% (n=100) of youth were girls. (See Table 1).

Measures

Adverse Childhood Experiences (ACE). The ACE is a 10-item measure that assesses the presence or absence of several types of adverse experiences in a child's lifetime in three categories: abuse (sexual, physical), neglect (emotional, physical), and household dysfunction (family or household substance use, mental illness, incarceration, and parental separation) (Felitti et al., 1998). Participants responded to binary items as either 0 ("no") or 1 ("yes"). Total scores on the ACE were summed and ranged from 0-10, with higher scores representing higher exposure to adversity. The ACE is recommended by the Centers for Disease Control (CDC) to assess for mental and behavioral outcomes (CDC, 2019).

The ACE has demonstrated adequate internal consistency for the overall measure ($\alpha=.78$) in a sample of nonclinical adults (Ford et al., 2014). Cronbach's alpha for the ACE in this study was also .78. Additionally, the three-factor model of the ACE was supported, and internal consistency ranged from $\alpha = 0.61$ to $\alpha = 0.80$ across the three subscales (Ford et al., 2014). The ACE has demonstrated acceptable to moderate test-retest reliability across studies (Dube et al., 2004; Zanotti et al., 2018). The CDC recommends using the total full-scale measure with all items included, which is the most empirically supported method of scoring across disciplines (CDC, 2019). For the current study, ACE total measure score was summed to represent cumulative lifetime adversities.

Massachusetts Youth Screening Inventory-2 (MAYSI-2). The MAYSI-2 is a 52-item self-report measure that assesses a range of current mental health symptoms comprised by seven

scales intended to be scored separately (Grisso & Barnum, 2006). The MAYSI-2 is designed for and validated on youth involved in the criminal legal system. For purposes of this study, only the Alcohol/Drug Use (ADU) scale was utilized to measure substance use.

The ADU is comprised of 8 items that measure frequency and abuse of alcohol or drug use and functional impairment due to alcohol or drugs (Grisso & Barnum, 2006; Grisso et al., 2012; Grisso & Quinlan, 2005). All items are binary, where participants reported 0 (“no, this is not true for me”) or 1 (“yes, this is true for me”). Total scores were calculated by summing the participants’ responses, yielding a total score between 0 and 8. The ADU scale has demonstrated strong internal consistency across studies in juvenile offenders (Archer et al., 2004; Ford et al., 2008). In this study, Cronbach’s alpha for the ADU scale was fair ($\alpha=.79$). The ADU has shown acceptable test-retest correlations in girls ($r=.76$, $p<.001$) and boys ($r=.82$, $p<.001$) over a period of one week (Grisso & Barnum, 2006). The ADU has demonstrated strong convergent validity with a number of assessments of substance use across genders (Archer et al., 2010; Grisso & Barnum, 2006). Additionally, the ADU scale has evidenced strong estimates of specificity (82%) and negative predictive value (99%) (Archer et al., 2004). Taken together, the psychometrics of the Alcohol/Drug Use scale suggests that it effectively discerns substance use risk and consequences among juvenile offenders. The sum of the eight scale items was used to represent current substance use for each participant as suggested by Grisso & Barnum (2006).

Offending History. Offending data was available in a statewide juvenile offending system via a state assigned unique identifier. Subsequent detentions anywhere in the state were included in this dataset until youths turn 18 or left the state. This online system was used to determine the number of detainments per youth during the study period. Additionally, this

system includes all youth's charges and reason for offenses. Demographic data was also accessed through this system, including age, gender (girl/boy), and race/ethnicity.

Procedure

A database was constructed based on paper records and electronic files for all youth detained in District VI between 2012 and 2019. Data for this study was limited to youth who entered the system between August 2016 and August 2019. To provide time for assessment of reoffending over a period of six months, subsequent offenses were recorded through February 1, 2020. At each detention intake, juveniles were administered a structured clinical interview by a staff clinician and asked to complete several self-report measures. For the purpose of this study, only youth who completed the Adverse Childhood Experiences questionnaire were included in the analyses. Data were extracted from the time of each youth's first offense that included the ACE measure and additional offenses subsequent to the ACE administration. Demographic information, intake dates, charges, and offending history were electronically stored in a statewide system accessible only in the detention center. Each youth was assigned a unique case identification number to track and was otherwise de-identified. The Idaho State University Human Subjects Committee approved all methods and materials prior to data entry.

Results

Descriptive Statistics

Youth in this sample reported high rates of childhood adversity. The average number of ACEs was 3.59 (SD = 2.66). Girls (M = 5.21, SD = 2.84) reported significantly higher ACEs compared to boys (M = 2.92, SD = 2.27; $t(153.95) = -7.179, p < .001$).

On the MAYSI-2 ADU scale, scores can range from 0-8; higher scores suggest higher frequency, impairment, and problems related to alcohol and drug use. In the current sample,

youth scored an average of 2.24 (SD = 2.22), with participants reporting the full possible range of scores. Girls reported significantly higher rates of substance use and problems ($M = 3.60$, $SD = 2.46$) compared to boys ($M = 1.69$; $t(331) = -7.76$, $p < .001$). On average, youth offended over three times ($M = 3.37$, $SD = 3.21$), with total offenses ranging from 1 to 24. Girls ($M = 3.44$, $SD = 3.01$) and boys ($M = 3.34$, $SD = 3.29$) did not significantly differ in rates of offending ($t(338) = -.257$, $p < .797$). Most common offenses were drug possession/abuse (26.2%), larceny/theft (20.1%), and status offenses (17.3%) (See Table 1).

Preliminary Analyses

Before addressing the hypotheses of the current study, the identified variables (e.g., ACE, MAYSI-2 ADU, total re-offenses) were assessed for normality. The measure of total offenses was positively skewed and kurtotic, largely due to the wide range of reoffending. Given the robust nature of Poisson (count) regression against non-normal dependent response variables (Coxe et al., 2009), offense frequency was not transformed. All other variables met assumptions of normality. For this reason, original measures were used in all analyses. (See Table 2).

To evaluate inclusion of possible covariates, a Poisson regression was used to assess for demographic differences associated with the outcome variable. Ethnicity and gender were not associated with reoffending. However, age was significantly associated with reoffending (See Table 3) and was included in subsequent analyses as a covariate.

The amount of missing data for study variables ranged from .9% (i.e., age) to 2.1% (i.e., MAYSI-2 ADU). The missing data in the present sample likely reflects detention procedures on administering self-report measures, such that youth are administered measures depending on time between each detention. This potential cause of missing data in the current sample suggest that data was missing at random (i.e., missingness that is conditioned by another observed

variable within the dataset (offending) (Graham, 2009). Full-information maximum likelihood (FIML) is a procedure used to address data that are missing at random. FIML allows for the unbiased estimation of parameters within a model using all available information within a dataset rather than an imputation technique (Graham, 2009). FIML was used to conduct the primary analyses. Further, confidence intervals (CI) were calculated using *Mplus* to determine the significance of the indirect effect. For Poisson regression, the indirect effect is significant if a “1” is not included in the CI and incident rate ratios (IRR) are reported when predicting to a count variable for ease of interpretation rather than Beta coefficients.

With regard to associations among the key study variables, ACEs were significantly positively correlated with substance use (MAYSI-2 ADU) ($r = .729, p < .001$) and reoffending ($r = .573, p < .001$). In addition, substance use was significantly positively correlated with reoffending ($r = .545, p < .001$). These associations are consistent with the hypothesis that childhood adversity, substance use, and reoffending are related, and warranted further investigation into whether substance use may mediate the relation between childhood adversity and reoffending. (See Table 4).

Primary Analyses

Mediated Moderation Analysis

The hypothesized model was evaluated using *Mplus* statistical software version 8.2 (Muthén & Muthén, 2012). Mediation analyses were used to test the hypothesis that substance use severity would mediate the relation between ACEs and reoffending. In addition, this model was used to test whether gender interacted with ACEs and substance use to predict reoffending. Age was controlled for within the model given its significant association with reoffending.

There were no significant gender interactions. Gender did not interact with ACEs to predict substance use ($\beta = .143$, $SE = .089$, $p = .108$) and gender did not interact with substance use to predict reoffending ($\beta = -.092$, $SE = .199$, $p = .645$). In addition, gender did not interact with ACEs to predict reoffending ($\beta = .001$, $SE = .213$, $p = .997$). Therefore, these moderation paths were dropped from the model.

The final model indicated significant main effects of ACEs predicting substance use severity ($\beta = .608$, 95% CI [.664, .794]), and substance use severity predicting reoffending while controlling for ACEs and age (IRR = 1.281, 95% CI [1.124, 1.459]) (See Figure 2). There was a significant indirect effect of substance use severity as a mediator of ACEs and reoffending (IRR = 1.164, 95% CI [1.074, 1.257]). This suggests that for every standard deviation unit increase in ACEs, the risk of reoffending increases 15.2% for detained youth through substance use. The direct effect remained significant (IRR = 1.383, 95% CI [1.234, 1.551]). (See Table 5).

Discussion

This study examined ACE exposure, substance use severity, reoffending, and gender differences among incarcerated youth in rural geographic regions. Youth involved in the criminal justice system are a vulnerable, understudied, and underserved population with critical treatment needs who report high rates of adversity and substance use. No studies to date have examined the role of substance use in the relation between cumulative childhood adversity and subsequent reoffending. In addition, no studies have evaluated how gender may impact these associations to predict reoffending among these youth.

First, our findings indicated that youth in this sample had elevated rates of exposure to adversity, consistent with past research (Abram et al., 2013; Baglivio & Epps, 2016; Baglivio et al., 2014; Baglivio et al., 2015; Costello, Erkanli, Fiarbank, & Angold, 2002; Dierkhising et al.,

2013; Evans-Chase, 2014). Overall, youth reported an average of approximately three and a half exposures to adversity across their lifetime. Further, girls reported significantly more adversities compared to boys. These exposures to multiple forms of adversity support extant literature's findings that incarcerated girls experience high rates of trauma in comparison to boys (Baglivio et al., 2014; Belknap & Holsinger, 2006; Conrad et al., 2014; DeHart & Moran, 2015; Ford et al., 2008; Kerig, 2018).

Youth also reported high substance use symptoms. On average, youth reported about two substance use-related symptoms. Notably, girls reported about twice as many substance use-related symptoms compared to boys, with an average score that indicates clinical concern (Grisso & Barnum, 2006). These findings replicate previous studies comparing incarcerated girls' and boys' substance use, where girls' use is higher (Archer et al., 2010; Gilbert et al., 2015; Ford et al., 2008).

Rates of reoffending did not differ by gender. Though there are no reported national recidivism rates, previous literature has suggested that risk factors for recidivism include interpersonal violence, mental health distress, substance use, age, gender, and ethnicity (Becker et al., 2012; Conrad et al., 2014). It may be that other risk factors are a stronger predictor of reoffending than gender. Additionally, these data do not identify level of offense. As girls are more likely to enter the system via low-level offenses compared to boys (Hockenberry & Puzzanchera, 2018; Kerig, 2018), examining gender differences in regard to type of offending may detect more differences.

In addition, age was a significant covariate for reoffending, such that younger youth reoffended at a higher rate than older youth. Age of onset of offending has been previously reported as a risk factor across studies examining ACEs, where younger youth were at greater

likelihood of reentry based on risk level groups (Baglivio et al., 2014; Baglivio et al., 2015). In addition, earlier age of onset is related to increased frequency, severity, and chronicity of substance use among delinquent youth (Lipsey & Derzon, 1998; Mulvey et al., 2010; Prinz & Kerns, 2003; Tillson et al., 2019). It may be that youth who have experienced increased adversities are more likely to use substances and enter the criminal justice system at an earlier age.

As hypothesized, cumulative ACEs predicted reoffending among youth. These data build on previous research given the dearth of studies among youth offenders that examine the specific interrelatedness of adversity and negative outcomes using the Adverse Childhood Experiences scale (Felitti et al., 1998) and how ACEs are related to negative outcomes. The majority of prior research on ACEs and reoffending has emerged from one statewide database (Baglivio & Epps, 2016; Baglivio et al., 2014; Baglivio et al., 2015; Perez et al., 2018; Wolff et al., 2015). Though these researchers have modeled these effects, they used risk/needs assessments to calculate probability of reoffending or have captured re-offenses only in the past year. Findings in the current study extend these findings via our inclusion of an actual count of subsequent offenses and allowing for a longer time frame of up to three years for capturing offenses. In addition, research to date has examined these effects among youth in urban regions, whereas this study assessed youth from primarily rural and nonmetro counties.

Gender did not moderate the relation between ACEs and reoffending as hypothesized. In addition, gender did not moderate the relations between ACEs and substance use or substance use and reoffending. This suggests that regardless of gender, youth who have experienced higher levels of childhood adversity are more likely to use substances and reoffend more frequently. It

may be that the effect of exposure to multiple adversities is a stronger risk factor for using substances and reentry into the criminal justice system than gender alone.

The vast majority of youth offenders report substance use (Kim & Fendrich, 2002; Lebeau-Craven et al., 2003; Potter & Jenson, 2003; Vaughn et al., 2015). Further, substance use has been shown to be a strong predictor of reoffending and other subsequent criminal behavior (Bui et al., 2000; Cottle et al., 2001; Ford, 2005; Lipsey & Derzon, 1998; Loeber & Farrington, 2000; Stoolmiller & Blechman, 2005). In addition to substance use being a crime in of itself, oftentimes substance use is implicated in other acts of delinquency (Hartstone & Hansen, 1984; ODJJP, 2018; White, 2016; White et al., 2002). Though childhood adversity, substance use, and reoffending are associated, less work has examined how substance use influences the relation between adversity and reoffending. In the present study, there was a significant medium indirect effect of substance use on the relation between adverse childhood experiences and reoffending. This indicates that youth who experienced more adversity were more likely to use substances and thus at higher risk of reoffending as hypothesized.

There are some important aspects of the nature of the ACE measure we should consider further given the findings of significant associations among the identified variables and the lack of support for gender as a moderator. Household and family characteristics are related to severity of reoffending among justice-involved youth (Baglivio & Epps, 2016; Baglivio et al., 2017; Mulder et al., 2011). Studies have shown that exposure to adverse events such as parental divorce, parental incarceration, or witnessed domestic violence increases the risk of criminality (Herrera & McCloskey, 2001; Murray & Farrington, 2005). No studies to date have examined cumulative household dysfunction variables as they relate to substance use or recidivism among youth offenders. As the majority of items that comprise the ACE assess for household

dysfunction, these results may emphasize the impact of stressful environments in relation to reoffending and may not represent the breadth of adverse experiences among youth.

Notably, the ACE only measures the presence or absence of broad accounts of adversity in a youth's lifetime and does not assess severity or chronicity of the trauma. Prior research has demonstrated that these differences in frequency and severity of exposure to adversity are related to delinquency outcomes. In particular, the association between interpersonal violence (e.g., sexual abuse, physical abuse, witnessed violence) and involvement in the criminal justice system has been widely established among youth (Conrad et al., 2014; Feiring et al., 2007; Kerig, 2018; Kerig & Shindler, 2013). Future research may benefit from examining gender differences in frequency and types of adversities in relation to reoffending. In addition, the ACE does not measure psychological distress or impairment often related to trauma. Studies have suggested that role of trauma-related symptoms are critical in understanding risk or reoffending among youth offenders (Becker et al., 2012; Smith et al., 2006) and adult offenders (Sadeh & McNiel, 2014). However, this relation is significantly understudied and requires additional empirical support.

Girls also reported higher rates of substance use behaviors; however, this not differently related to risk of reoffending in this sample. Evidence has suggested that there are gender differences in substance use and offending among youth offenders, such that system-involved girls are more likely to use illicit drugs, begin use at an earlier age, and use multiple substances (Kim & Fendrich, 2002; Smith & Saldana, 2013; McClelland et al., 2004; Neff & Waite, 2007; Prinz & Kerns, 2003). In contrast, system-involved boys may use substances more frequently, particularly alcohol and marijuana (Kim & Fendrich, 2002; Neff & Waite, 2007). Still, it is difficult to draw conclusions on frequency of use by gender given the inconsistencies among

studies. In the current study, these components (i.e., type of substance, frequency, chronicity) were not measured. Though girls reported increased substance use-related outcomes, we cannot conclude specific differences by gender. It may be advantageous to examine these more nuanced aspects of substance use in future research in regard to reoffending to further our understanding on substance use trajectories among justice-involved youth. In addition, literature has suggested that other gender-specific risk factors (e.g., gang involvement, family variables, polyvictimization) may exacerbate the relations among substance use and reoffending (DeHart & Moran, 2015; Kerig, 2018; Neff & Waite, 2007). Furthermore, as there is evidence to show that girls may use substances with the intention to cope with trauma (Chesney-Lind & Belknap, 2004; Kerig, 2018), future research may need to target gender differences in motives behind use.

Researchers have theorized that substance use may be a coping mechanism for traumatic experiences, in which youth may engage in increased substance use behaviors to alleviate negative psychological distress commonly associated with victimization (Bender, 2009; Ford et al., 2010; Ford et al., 2008; Kerig, 2018). Moreover, youth who have experienced cumulative trauma are more susceptible to using substances (Ford et al., 2008; Moreland et al., 2018) and offending (Ford et al., 2012). Additionally, youth in stressful home environments may also have increased access and exposure to substance use. For instance, Davis & Schlafer (2016) found that youth with incarcerated parents were more likely to use substances, alcohol, and tobacco. Given the youth in the current sample have experienced high rates of cumulative adversity including dysfunctional households, it would make sense these youth are at greater likelihood of substance use and reoffending.

There are several implications of the current study. Given the high rates of adversities and substance use behavior among juvenile offenders, it may be beneficial to screen all youth

entering the justice system for these experiences. This may increase referrals and youth access to resources, including treatment and other relevant services with the goal of decreasing recidivism rates. Further, it might be beneficial for juvenile detention centers to develop partnerships with community agencies to offer broad-based trauma-informed treatment to youth with histories of adversities and substance use. Though evidence-based treatments exist for youth offenders, these often do not target trauma, substance use, or other mental health symptoms and instead focus on mitigating risk factors (e.g., decreasing delinquent social/peer interactions, engagement in criminal activity, addressing environmental stressors) and improving general life skills (Abrams & Snyder, 2010; Underwood et al., 2006). Youth from rural regions may face additional challenges in seeking treatment and services. Implementing programs that address adversity and substance use concurrently may help to decrease rate of reentry.

There are some important limitations of this study. Though the study design did account for temporal order between lifetime exposure to adversity and subsequent reoffending, there was overlap in assessing current substance use, such that youth may have used substances in the month prior to experiencing adversity. However, the proposed mediation model is supported by existing theory and longitudinal research where exposure to trauma precipitated substance use (Chilcoat & Breslau, 1998; Haller & Chassin, 2014; Khantzian, 1997; Ullman et al., 2013). In addition, there is evidence that childhood adversity is predictive of later negative outcomes such as offending (Baglivio et al., 2014; Baglivio et al., 2015; Wolff et al., 2015). However, due to the ACE and substance use measures being administered at the same time in this study, causal relationships cannot be determined by the proposed model. Longitudinal research that utilizes separate times of assessment of ACES and substance use would shed further light on the associations among these variables.

Another limitation of the current study is generalizability. Most data in previous studies have examined associations among these variables in urban settings, however data from this sample may not generalize to youth in urban settings. While this is an important consideration, it should be noted that there are limited studies focused on rural youth in the literature on youth offending and the youth in this sample were representative of the surrounding area in regard to ethnicity (i.e., approximately 17% of the sample identified as Hispanic and 12% identified as American Indian).

This study measured adversity using the ACE, and although recommended by the CDC (CDC, 2019), it is a broad assessment of the presence or absence of events over the lifetime and cannot ascertain type, frequency, or chronicity of adversities and how that might relate to the outcome variables. In addition, substance use was measured using the Alcohol/Drug Use scale of the MAYSI-2 and provides an overall indication of substance abuse and impairment rather than identifying specific areas of substance use that may confer additional risk. Though the MAYSI-2 is the most widely used screener among juvenile detention centers (Grisso & Barnum, 2006), future research may investigate other factors of substance use. Gender was a binary variable in the current study based on coding from the statewide offending system. Future research should include a broader range of gender identities indicated by youth.

Overall, the current study identified several significant relations among adverse childhood experiences, substance use, and reoffending. Data from this study support previous findings that ACEs are associated with higher levels of substance use and reoffending, and further illustrate that substance use has an indirect effect on the relation between cumulative adversity and reoffending. These findings suggest the importance of understanding vulnerabilities that youth offenders experience and which increase the likelihood of reentry into

the criminal justice system. These data may also inform efforts to develop and implement screening processes for at-risk youth with the goal of decreasing recidivism.

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Table 1
Demographics of participants

Variable	Youth N	Percent %
Gender	340	
Male	240	70.6
Female	100	29.4
Ethnicity		
European-American	229	67.4
Hispanic	59	17.4
American Indian/Alaska Native	43	12.6
African-American	3	.9
Offense		
Drug possession/abuse		26.2
Larceny/theft		20.1
Status Offense		17.3
Assault/battery/domestic violence		15.9
Disorderly conduct		13.2
Property damage		11.5
Sexual offense/lewd conduct		7.1
Liquor law violation		5.5
Burglary		4.8
Weapons offense		3.6
Driving violation		3
DUI		1.5
Drug manufacturing/selling		1.2
Fraud/forgery		.6
Murder/manslaughter		.3

Table 2

Descriptive statistics for variables of interest

Variable	Mean	SD	Min-Max	Skewness	Kurtosis
ACE	3.59	2.66	0-10	.63	-.40
MAYSI-2 ADU	2.24	2.22	0-8	.78	-.38
Offenses	3.37	3.21	1-24	2.22	7.27

Note. ACE = Adverse Childhood Experiences questionnaire; MAYSI-2 ADU = Massachusetts Youth Screening Inventory-2, Alcohol and Drug Use scale.

Table 3

Poisson regression examining the association between demographic variables and reoffending

Predictor	Wald χ^2	p-value	df
Ethnicity	7.265	.064	3
Age	59.165	< .001	8
Gender	1.158	.282	1

Table 4

Correlations between identified variables

Measure	1	2	3
1. ACE	-	-	-
2. MAYSI-2 ADU	.729**	-	-
3. Offenses	.573**	.545**	-

**Correlation is significant at the .01 level

Note. ACE = Adverse Childhood Experiences questionnaire; MAYSI-2 ADU = Massachusetts Youth Screening Inventory-2, Alcohol and Drug Use scale.

Table 5
Model Summary
Direct and Indirect Effects on Offending

	Coefficient (<i>IRR</i>)	LLCI	UCLI
ACE (Direct)	1.383	1.234	1.551
MAYSI-2 ADU (Indirect)	1.164	1.074	1.257

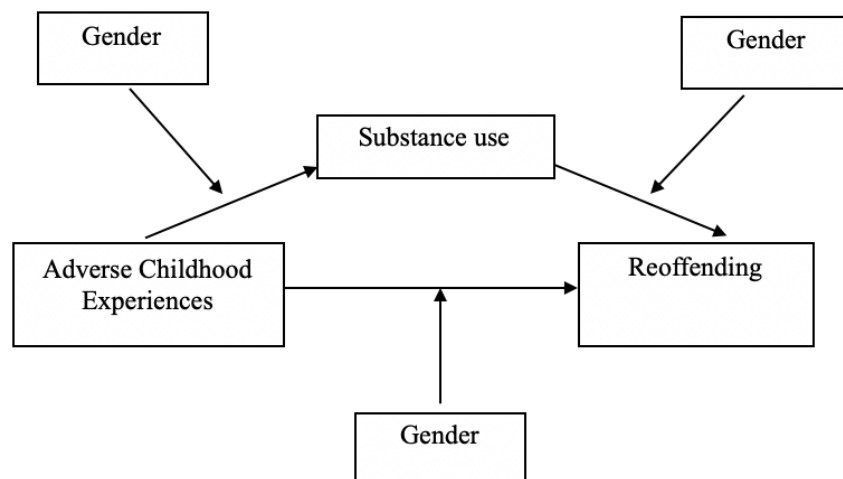


Figure 1. Hypothesized moderated mediation model.

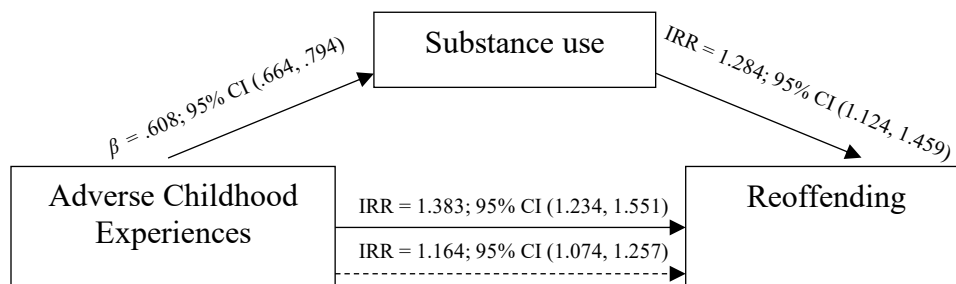


Figure 2. Final mediation model.

APPENDIX A

Extended Literature Review

Introduction

In 2017, 809,700 minors were arrested and detained in state and federal detention centers (Office of Juvenile Justice and Delinquency Prevention [OJJDP], 2018). The rate of incarceration for juveniles is expected to increase by 2% within the next decade (OJJDP, 2018). Currently there are more males in the juvenile justice system than females, though female incarceration rates are rising, with about a third of detained juveniles being girls (Kerig, 2018; OJJDP, 2018). Youth frequently reoffend, with recidivism rates of up to 80% in some samples (Mulder, Brand, Bullens, & van Marle, 2011). Youth offenders are at heightened vulnerability of experiencing adversity in childhood, including interpersonal violence such as physical and sexual abuse. Juveniles involved in the justice system are also at increased risk of multiple trauma exposures, with most youth reporting several adverse events (Abram et al., 2013; Ford, Hartman, Hawke, & Chapman, 2008). Prevalence of victimization also seems to vary by gender, with girls generally reporting higher rates of exposure than boys, and higher prevalence of polyvictimization (Baglivio et al., 2014; DeHart & Moran, 2015; Ford, Grasso, Hawke, & Chapman, 2013; Kerig et al., 2018). In particular, girls indicate consistently higher rates of rape, sexual assault, and nonconsensual sexual contact compared to boys (Abram et al., 2013; Dierkhising et al., 2013).

Repeated exposure to traumatic stressors negatively contributes to risk-taking behaviors, emotional regulation difficulties, and reoffending (Ford, Chapman, Connor, & Cruise, 2012; Kerig, 2018). Namely, childhood exposure to adversity is related to subsequent deleterious outcomes including substance use (Baglivio et al., 2014; Evans-Chase, 2014; Kerig, 2018;

Wolff, Baglivio, & Piquero, 2015). Those who experience traumatic events such as interpersonal violence are likely to emotionally detach with substances as a method of coping with negative symptoms associated with trauma, and this is a common pattern among youth offenders (Dube et al., 2003a; Dube et al., 2006; Ford, Hartman, Hawke, & Chapman, 2008; Ullman, Relyea, Peter-Hagene, & Vasquez, 2013). Using substances is an additional risk factor for arrest and re-arrest (Cottle, Lee, & Heilbrun, 2001; Lipsey and Derzon, 1998; Stoolmiller & Blechman, 2005). Evidence also suggests that childhood adversity is related to recidivism in justice-involved youth, such that increased adversity is related to higher risk of reoffending (Baglivio et al., 2014). Though existing research has identified links among these experiences, less is known about the role of substance use subsequent to childhood adversity, and reoffending among juvenile offenders.

Prevalence of Adverse Childhood Experiences

Adverse childhood experiences (ACE) include experiences of childhood neglect (physical, emotional), abuse (physical, sexual), and household dysfunction (family substance use, family violence, family mental illness, family incarceration, parental separation) (Baglivio & Epps, 2016; Felitti et al., 1998). Juvenile offenders report exposure rates as high as 90% for adversity and trauma compared to the rates of about 25% in the general population (Baglivio et al., 2014; Costello, Erkanli, Fiarbank, & Angold, 2002; Dierkhising et al., 2013; Evans-Chase, 2014). In a large statewide study (N=64,329) of juveniles affiliated with the justice system, 73.9% reported abuse and 31.3% reported neglect (Baglivio & Epps, 2016). Further, these authors found that once youth reported one ACE, the likelihood of experiencing additional adverse experiences significantly increased across ACE items. The rates identified in this large study are consistent with findings in the juvenile offender trauma literature, such that youth

report high rates of exposure to trauma and multiple traumatic events (Abram et al., 2004; Abram et al., 2013; Kerig, 2018). In a large, longitudinal study (N=1,829) of juveniles in detention, the overwhelming majority (92%) reported experiencing at least one traumatic event and 84% had experienced more than one (Abram et al., 2013). Similarly, in another study with youth offenders, 89% reported a traumatic event in their lifetime and two thirds of the sample (67%) reported multiple traumatic events (Ford, Hartman, Hawke, & Chapman, 2008).

General childhood adversity is overrepresented in justice-involved juveniles. Further, the type of adversity exposures and trajectories differ by gender (Espinosa, Sorensen, & Lopez, 2013; Kerig, 2018). Female juvenile offenders experience sexual violence at higher rates than males (Abram et al., 2013; Conrad, Tolou-Shams, Rizzo, Placella, & Brown, 2014; Ford, Hartman, Hawke, & Chapman, 2008). For example, a study with a stratified, random sample of juveniles in detention found that 4.4% had reported an unwanted sexual experience which broke down into reports by 29.6% of girls and 2.2% of boys (Abram et al., 2013). In contrast, males report witnessing trauma and community violence as being their most common type of trauma exposure (Jencks & Leibowitz, 2018; Stimmel, Cruise, Ford & Weiss, 2014). Girls are likelier to experience multiple victimizations and to subsequently meet criteria for PTSD (Kretschmar, Tossone, Butcher, & Flannery, 2017). Further, justice-involved girls are at increased likelihood of polyvictimization (Belknap & Holsinger, 2006; DeHart & Moran, 2015; Kerig, 2018). Overall, the prevalence of adverse experiences in childhood, though varied by gender, are significantly elevated among juvenile offenders. These prevalence rates suggest that youth offenders experience substantial victimization. Disproportionately high victimization rates may lead to maladaptive coping mechanisms and negative behavioral outcomes.

Childhood Adversity and Offending

Though there is a growing literature that suggests exposure to childhood adversity is linked with negative health and behavioral outcomes (Baglivio et al., 2014; Bellis, Lowey, Leckenby, Hughes, & Harrison, 2014; Dube et al., 2003a; Dube et al., 2003b; Felitti et al., 1998), less is known about the extent to which youth adverse experiences are related to reoffending in this population. Moreover, limited research has investigated the extent to which youths' ACEs are risk factors for other maladaptive behaviors among incarcerated juveniles. In the existing research, ACEs are associated with increased risk of delinquent behavior; however, this seems to depend on gender, frequency, and the age of onset of the adversities (Hawkins et al., 2000).

Baglivio et al. (2014) utilized an actuarial risk/needs assessment to assign youth (N=64,329) into re-offense risk level groups based on criminal and social history scores. This model is used in the majority of his group's work. In this study, they found that high-risk youth were not only likelier to report multiple ACEs, but also that ACEs predicted reoffending across risk level groups. Though all ACE items were ranked similarly by gender, females had a significantly higher prevalence of each ACE. Another study using the same statewide archival database examined offending trajectories based on age-of-onset of offending, with groups ranging from youth with high- and low-occurring ACEs. Here, Baglivio and colleagues (2015) found that those who offended earlier reported higher rates of childhood adversity, and that higher ACE counts were associated with greater likelihood of arrests after controlling for several additional risk factors. Another study using this sample measured reoffending within one year of original arrest as a function of ACEs (Wolff, Baglivio, & Piquero, 2015). These researchers found that youth with higher ACEs were likelier to reoffend within one year and had less time between offenses. These studies indicate that youth who have greater cumulative adversities are

at increased risk of more serious reoffending trajectories, especially in those who have entered the criminal justice system at a younger age. Additionally, being female may confer additional risk. However, it is important to note all of these studies have utilized the same archival dataset.

Evidence suggests that females in the justice system are not only more likely to be exposed to an individual adverse event, but also more likely to experience multiple ACEs. For example, researchers utilizing a large dataset of youth offenders (Baglivio & Epps, 2016; Baglivio et al., 2014) consistently found that girls reported over twice the proportion of adversity compared to boys. Though literature suggests that females experience adversities at higher rates compared to males, and additionally that traumatic experiences are associated with offending, little research has investigated the extent to which gender interacts with ACE exposure to predict reoffending. In addition to the number of adversities youth have experienced being related to offending, research also suggests that the type of adversity matters. In particular, experiences of interpersonal violence such as childhood sexual abuse increase risk of entry in the criminal justice system (Conrad, Tolou-Shams, Rizzo, Placella, & Brown, 2014; Feiring, Miller-Johnson, & Cleland, 2007; Kerig, 2018; Kerig & Shindler, 2013). For instance, in a longitudinal study on childhood victimization and self-reported delinquency, sexual abuse was the strongest predictor of all types of delinquency (Herrera & McCloskey, 2003). Understanding the extent to which gender is associated with offending may help to explain the growing female youth offender population.

Other studies have also broadly measured childhood maltreatment, trauma, and stressful environments as risk factors of offending, providing increased support for the association between childhood adversities and offending. In another large cross-sectional study (N=34,222), Espinosa and colleagues (2013) found that trauma exposure, offense severity, probation history,

and younger age were the strongest predictors of level of placement severity for youthful offenders. In another study of male justice-involved juveniles, childhood neglect, criminal behavior in the family, parental substance use, and lack of parenting skills were associated with recidivism, suggesting that household dysfunction is related to reoffending (Mulder, Brand, Bullens, & van Marle, 2011). Consistent with previous work, these studies suggest that youth with increased adversity are at risk of greater involvement in the criminal justice system. However, these samples are from limited sources and do not include actual frequency of detainments. Further, studies with youth offenders including the Adverse Childhood Experiences scale (Felitti et al., 1998) that measure specific types and interrelatedness of adversity and other negative outcomes are rare in the literature. Additionally, much of the literature surrounding childhood adversity and juvenile offending is specific to violent or sexual crimes.

Childhood abuse has also been found to predict offending in adults. Childhood physical abuse predicted total reoffending even after controlling for offending in youth (Teague, Mazerolle, Logosz, & Sanderson, 2008). Additionally, in a randomly selected sample of 491 adult female offenders, childhood and adult traumatic exposure and mental health severity both were significantly associated with reoffending (Lynch et al., 2017). In a key longitudinal study, English, Widom, & Brandford (2002) reported that abused children were significantly more likely to be arrested as juveniles and adults compared to a matched control group of non-abused children. These findings were consistent across males and females. Collectively, these results clearly indicate that abuse and broader adversity in childhood, among other social and developmental factors, may increase the risk of recidivism and long-term negative outcomes such as substance use (Evans-Chase, 2014; Kerig, 2018).

Substance Use and Offending

Substance use related offenses include possession or use of drugs or alcohol. In 2017, 128,390 juveniles were arrested for drug abuse and liquor law violations, which was the second highest rate of all offenses (OJJDP, 2018). In addition, there is empirical support showing that youth are commonly under the influence of substances before and during committing an offense (Hartstone & Hansen, 1984; White, 2016; White, Tice, Loeber, & Loeber, 2002). There is also some research to suggest that substance use increases across detentions in this population (Becker, Kerig, Lim, & Ezechukwu, 2012). Offenders generally report earlier age of onset of using substances compared to the general youth population. Younger age of onset of use is also related to substance use frequency, severity, and chronicity, which confers additional risk of arrest (Lipsey & Derzon, 1998; Mulvey, Schubert, & Chassin, 2010; Prinz & Kerns, 2003; Substance Abuse and Mental Health Services Administration [SAMHSA], 2003; Tillson, Staton, Stricklan, & Pangburn, 2019).

Researchers have established that justice-involved youth use substances at heightened rates compared to the general population (Cauffman, Lexcen, Goldweber, Shulman, & Grisso, 2007; SAMHSA, 2004). In a review of predictors of serious delinquent youth, Lipsey & Derzon (1998) found that substance use was the second strongest predictor of offending. Additional evidence suggests that substance use also is strongly associated with other delinquent behavior, increasing risk of initial entry into the criminal justice system as well as reoffending (Cottle, Lee, & Heilbrun, 2001; Stoolmiller & Blechman, 2005). For example, in a longitudinal study of juvenile offenders found that substance use predicted subsequent interpersonal, property, and drug-related offenses across four time points. Further, this association was significant in both directions, indicating a bidirectional relation between offending and substance use (D'Amico,

Edelen, Miles, & Morral, 2007). Several other studies have shown consistent findings of substance use leading to subsequent delinquency in adolescents (Bui, Ellickson, & Bell, 2000; Ford, 2005; Loeber & Farrington, 2000).

Gender differences arise when investigating substance use and offending in juvenile offenders. Though substance use is associated with delinquency in both boys and girls, the criminal outcomes and severity seem to vary. Bright et al. (2016) generated delinquency classification groups in a longitudinal, stratified probability sample of at-risk youth. In this context, girls were more likely than boys to use substances and have more involvement in delinquency behaviors (the higher risk class) at a younger age. Similar in regard to age of onset, Neff & Waite (2007)'s study of youth in corrections found that girls began and continued using substances including cocaine, crack, stimulants, and hallucinogens, significantly earlier in age compared to boys.

These findings suggest that there is an association between substance use and offending in youth. Youth who use substances are at increased risk of delinquent behavior and arrest. Male use seems to be higher cross-sectionally, but female juvenile offenders' use of substances begins earlier in age and persists longer than males' use. Considering the elevated rates of illicit drug use in girls, this may explain the increased risk which may further influence offending trajectories. There is robust evidence supporting the overall relation between substance use and offending, but few studies have measured substance use as a predictor of reoffending or examined the unique associations among childhood adversity, substance use, and multiple offenses in youth offenders.

Childhood Adversity and Substance Use

Rates of substance use are high among youth offenders. Researchers measured the prevalence of drug use of seven common substances in a stratified, multi-site study of juvenile detainees ($N=4,644$) and found that about 71% of juveniles reported use (Kim & Fendrich, 2002). Additionally, about 29% of incarcerated juveniles from a large, nationally representative survey met DSM-IV criteria for a substance use disorder (Vaughn, Salas-Wright, DeLisi, Maynard, & Boutwell, 2015). Other studies of adjudicated youth have cited lifetime substance use prevalence as high as 90% (Lebeau-Craven et al., 2003; Potter & Jenson, 2003). Childhood adverse events are also significantly related to increased substance use in the general population, and those with more cumulative adverse experiences are more likely to use drugs and alcohol (Dube et al., 2003a; Dube et al., 2006).

While there is growing evidence to suggest childhood adversity increases the risk of offending, less is known about potential explanations for this relation. Prior research has conceptualized substance use as a coping mechanism, such that use inhibits negative psychological symptoms often associated with traumatic experiences. Self-medicating refers to the idea that those who have experienced a traumatic event are coping maladaptively with substances in efforts to reduce associated distressing symptoms and self-regulate emotions (Chilcoat & Breslau, 1998; Khantzian, 1997; Ullman et al., 2005; Ullman et al., 2013). For example, a test of four pathways between PTSD and substance use indicated the self-medication hypothesis had the largest effect in a community sample, demonstrating that traumatic stress symptoms mediated trauma exposure and substance use (Haller & Chassin, 2014).

Studies with juvenile offenders have shown that greater exposure to trauma in childhood are associated with increased drug and alcohol use and polysubstance use or using multiple

substances (Becker, Kerig, Lim, & Ezechukwu, 2012; Bender, 2009; Ford, Elhai, Connor, & Freuh, 2010; Ford, Hartman, Hawke, & Chapman, 2008; McClelland, Elkington, Teplin, & Abram, 2004; Perez, Jennings, & Baglivio, 2018; Vitopoulos, Peterson-Badali, Brown, & Skilling, 2018). Youth offenders who experience polyvictimization are also at greater risk of using substances (Ford, Hartman, Hawke, & Chapman, 2008), and youth with experiences of child sexual abuse follow the same pattern (Moreland et al., 2018). Next, earlier experiences of trauma are also associated with earlier onset of substance use (Ullman, Relyea, Peter-Hagene, & Vasquez, 2013). Though the literature has shown that substance use is prevalent among youth offenders, and additionally is a common outcome of maltreatment, abuse, and dysfunctional environments, there is little research on the cumulative effect of ACEs on substance use in this population. Further, richness in substance use data is lacking; this variable is generally dichotomized in studies or controlled for but does not include frequency of use or impairment related to using.

Though rates are high overall, there are gender differences in these substance use pathways which may be related to childhood adversity. Among adolescents in the general population, evidence suggests that male substance use is higher overall, particularly for alcohol and marijuana use compared to females (SAMHSA, 2014). However, evidence indicates that the gap between substance use frequency between justice involved boys and girls is narrower (Cauffman, Lexcen, Goldweber, Shulman, & Grisso, 2007; Kim & Fendrich, 2002; Wasserman, McReynolds, Ko, Katz, & Carpenter, 2005).

Of note, the literature on substance use is mixed among detained youth; some studies indicate that female use is higher (Archer et al., 2010; Gilbert, Grand, Hallman, & Underwood, 2015; Ford, Hartman, Hawke, & Chapman, 2008) and some indicate male use is higher (Becker,

Kerig, Lim, & Ezechukwu, 2012; Cauffman, Lexcen, Goldweber, Shulman, & Grisso, 2007; Vincent, Grisso, Terry, & Banks, 2008). Male and female youth offenders report similar rates of marijuana and alcohol use (Lennings, Kenny, Howard, Arcuri, & Mackdacy, 2007; Neff & Waite, 2007). However, female youth offenders are significantly more likely to use illicit drugs such as prescription pain relievers, crack, cocaine, amphetamines, heroin, crystal meth, PCP, and injection drug use compared to boys (Kim & Fendrich, 2002; Smith & Saldana, 2013; McClelland, Elkington, Teplin, & Abram, 2004; Neff & Waite, 2007). Girls are also more likely to use multiple substances (Smith & Saldana, 2013) and to use with the intention of self-medicating (Kerig, 2018). Additionally, girls report earlier age-of-onset for substance use (Neff & Waite, 2007; Prinz & Kerns, 2003). These findings are consistent with gender differences in incarcerated adults (Fazel, Bains, & Doll, 2005; Fazel, Yoon, & Hayes, 2017; Mannerfelt & Hakansson, 2018). These differences in extent and form of substance use may be associated with girl's increased rate of interpersonal victimizations as well as mental health comorbidities compared to boys, which is especially linked with polysubstance use and substance use disorders (Rich, Wilson, & Robertson, 2016; Teplin, Abram, McClelland, Dulcan, & Mericle, 2002).

Though there are established links between trauma and substance use among juvenile offenders, less is known about ACEs and substance use severity or chronicity. Further, gender differences have not been thoroughly investigated in this context. The literature indicates that increased distress and negative outcomes are related to increased traumatic experiences, but there is less research that examines the range of exposures included as ACEs in youth offenders and how these experiences are related to substance use. Expanding our understanding of the cumulative impacts of childhood adversity on substance use may shed light on gender differences and the overall impact on pathways to offending.

APPENDIX B

ACE Questionnaire

Adverse Childhood Experience (ACE) Questionnaire

Finding your ACE Score ra hbr 10 24 06

While you were growing up, during your first 18 years of life:

1. Did a parent or other adult in the household **often** ...
Swear at you, insult you, put you down, or humiliate you?
or
Act in a way that made you afraid that you might be physically hurt?
Yes No If yes enter 1 _____
2. Did a parent or other adult in the household **often** ...
Push, grab, slap, or throw something at you?
or
Ever hit you so hard that you had marks or were injured?
Yes No If yes enter 1 _____
3. Did an adult or person at least 5 years older than you **ever**...
Touch or fondle you or have you touch their body in a sexual way?
or
Try to or actually have oral, anal, or vaginal sex with you?
Yes No If yes enter 1 _____
4. Did you **often** feel that ...
No one in your family loved you or thought you were important or special?
or
Your family didn't look out for each other, feel close to each other, or support each other?
Yes No If yes enter 1 _____
5. Did you **often** feel that ...
You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?
or
Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
Yes No If yes enter 1 _____
6. Were your parents **ever** separated or divorced?
Yes No If yes enter 1 _____
7. Was your mother or stepmother:
Often pushed, grabbed, slapped, or had something thrown at her?
or
Sometimes or often kicked, bitten, hit with a fist, or hit with something hard?
or
Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
Yes No If yes enter 1 _____
8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
Yes No If yes enter 1 _____
9. Was a household member depressed or mentally ill or did a household member attempt suicide?
Yes No If yes enter 1 _____
10. Did a household member go to prison?
Yes No If yes enter 1 _____

Now add up your "Yes" answers: _____ This is your ACE Score

APPENDIX C

MAYSI-2

MAYSI QUESTIONNAIRE

Name _____

Male ☐Female ☐

Date of Birth _____

Today's Date _____

These are some questions about things that sometime happen to people. For each question, please circle YES or NO to answer whether that question has been true for you IN THE PAST FEW MONTHS.

Please answer these questions as well as you can.

Circle Y (yes) or N (no)

1	Have you had a lot of trouble falling asleep or staying asleep?	Y	N	1
2	Have you lost your temper easily, or had a "short fuse?"	Y	N	2
3	Have nervous or worried feelings kept you from doing things you want to do?	Y	N	3
4	Have you had a lot of problems concentrating or paying attention?	Y	N	4
5	Have you enjoyed fighting, or been "turned on" by fighting?	Y	N	5
6	Have you been easily upset?	Y	N	6
7	Have you thought a lot about getting back at someone you have been angry at?	Y	N	7
8	Have you been really jumpy or hyper?	Y	N	8
9	Have you seen things other people say are not really there?	Y	N	9
10	Have you done anything you wish you hadn't, when you were drunk or high?	Y	N	10
11	Have you wished you were dead?	Y	N	11
12	Have you been daydreaming too much in school?	Y	N	12
13	Have you had too many bad moods?	Y	N	13
14	Have you had nightmares that are bad enough to make you afraid to go to sleep?	Y	N	14
15	Have you felt too tired to have a good time?	Y	N	15
16	Have you felt like life was not worth living?	Y	N	16
17	Have you felt lonely too much of the time?	Y	N	17
18	Have you felt like hurting yourself?	Y	N	18
19	Have your parents or friends thought you drink too much?	Y	N	19
20	Have you heard voices other people can't hear?	Y	N	20
21	Has it seemed like some part of your body always hurts you?	Y	N	21
22	Have you felt like killing yourself?	Y	N	22
23	Have you gotten in trouble when you've been high or have been drinking?	Y	N	23
24	If yes, is this fighting?	Y	N	24

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		Circle Y or N	
25	Have other people been able to control your brain or your thoughts?	Y	N 25
26	Have you had a bad feeling that things don't seem real, like you're in a dream?	Y	N 26
When you have felt nervous or anxious:			
27	have you felt shaky?	Y	N 27
28	has your heart beat very fast?	Y	N 28
29	have you felt short of breath?	Y	N 29
30	have your hands felt clammy?	Y	N 30
31	has your stomach been upset?	Y	N 31
32	Have you been able to make other people do things just by thinking about it?	Y	N 32
33	Have you used alcohol or drugs to help you feel better?	Y	N 33
34	Have you felt that you don't have fun with your friends anymore?	Y	N 34
35	Have you felt angry a lot?	Y	N 35
36	Have you felt like you don't want to go to school any more?	Y	N 36
37	Have you been drunk or high at school?	Y	N 37
38	Have you felt that you can't do anything right?	Y	N 38
39	Have you gotten frustrated a lot?	Y	N 39
40	Have you used alcohol and drugs at the same time?	Y	N 40
41	Has it been hard for you to feel close to people outside your family?	Y	N 41
42	When you have been mad, have you stayed mad for a long time?	Y	N 42
43	Have you had bad headaches?	Y	N 43
44	Have you hurt or broken something on purpose, just because you were mad?	Y	N 44
45	Have you been so drunk or high that you couldn't remember what happened?	Y	N 45
46	Have people talked about you a lot when you're not there?	Y	N 46
47	Have you given up hope for your life?	Y	N 47
48	Have you EVER IN YOUR WHOLE LIFE had something very bad or terrifying happen to you?	Y	N 48
49	Have you ever been badly hurt, or been in danger of getting badly hurt or killed?	Y	N 49
50	Have you ever been raped, or been in danger of getting raped?	Y	N 50
51	Have you had a lot of bad thoughts or dreams about a bad or scary event that happened to you?	Y	N 51
52	Have you ever seen someone severely injured or killed (in person - not in movies or on TV)?	Y	N 52