



RESEARCH ARTICLES

A Prospective Study of Adverse Childhood Experiences and Illicit Drug Use in Adulthood

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Previous research indicates that adverse childhood experiences (ACEs) increase the risk for illicit drug use. Yet, much of this research relies on retrospective ACE reports and does not consider the wide array of more proximal life experiences that may impact adults' substance use. The present research used two waves of data from the longitudinal Toledo Adolescent Relationships Study (TARS) to examine the impact of ACEs reported during adolescence on illicit drug use frequency in adulthood (average age 32) among 930 (403 men and 527 women) respondents. Findings indicated that ACEs had a cumulative effect on adults' illicit drug use. Each additional ACE increased drug use frequency by 0.087 units ($p < 0.05$). Biological sex ($b = -0.446$, $p < 0.001$), number of biological children ($b = -0.155$, $p < 0.01$), anxiety symptoms, ($b = 0.071$, $p < 0.001$), adolescent drug use ($b = 0.166$, $p < 0.001$), and residing with other substance-using individuals ($b = 1.127$, $p < 0.001$) were also significant correlates of illicit drug use in adulthood. Mediation analyses revealed that respondents' anxiety symptoms and adolescent drug use mediated the total effect of ACEs on adults' drug use frequency. Based on these results, it is argued that clinicians and others working with those who are at risk for or who are presently using illicit substances should consider how early life adversity influences drug use, both directly and indirectly via proximal risks.

Introduction

According to results from the 2021 National Survey on Drug Use and Health, over 40 million Americans have a substance use disorder (SAMHSA, 2022). In the same year, over 107,000 Americans died from overdoses involving illicit drugs or prescription opioids; and drug overdoses have increased significantly in recent years, particularly for adults ages 25 and older (Spencer et al., 2022). One risk factor for drug use throughout the life course is child adversity, which includes but is not limited to violence exposure, parental incarceration, parental mental illness, child abuse and neglect, and poverty (LeTendre & Reed, 2017; Leza et al., 2021; Mersky et al., 2013; Widom et al., 2006). Researchers have found that 85-100% of patients in substance treatment facilities have experienced at least one childhood adversity (Leza et al., 2021).

What is comparatively less clear based on the current literature is whether adverse childhood experiences (ACEs) continue to impact drug use frequency in adulthood when other risk factors are accounted for including sociodemographic background, drug use during adolescence, psychological correlates, and currently living with others who use illicit substances. Although many studies of ACEs and adults' drug use have included at least one of these correlates, few if any have considered all these risk factors. By including this broader range of risk factors, we provided a more in-depth understanding of whether distal child adversity continues to matter net of proximal risk factors. This understanding is essential for intervention and treatment efforts. The recognition that a majority of people who experience substance use disorders (SUDs) have trauma histories, including ACEs (Choi et al., 2017; Khoury et al., 2010), has resulted in many health and human service systems adopting trauma-informed approaches in SUD treatment (SAMHSA, 2014). Yet, research likewise demonstrates health and human service sectors often face a variety of challenges that prevent the successful implementation of trauma-informed care (TIC). These include a lack of interagency collaboration, fear of re-traumatizing clients or an insufficient understanding of how to translate knowledge of TIC into practice among service providers, requiring adherence to strict or coercive policies and procedures rather than promoting flexibility based on individual client needs, and inadequate financial and staffing resources (Chadwick & Billings, 2022; Hales et al., 2017; Mahon, 2022). Continued research demonstrating the importance of addressing childhood adversity in the treatment of SUDs may result in changes to organizational leadership and governance, increased training and education, and greater support from community stakeholders to ensure a more effective and widespread implementation of TIC across different health and human service agencies.

A shortcoming of most prior research exploring ACEs and drug use is an over-reliance on adults' retrospective ACE reports, even in longitudinal studies, although most studies use cross-sectional data (e.g., Dube et al., 2003; LeTendre & Reed, 2017; Leza et al., 2021). Measures are subject to recall bias regarding the types and number of childhood adversities remembered by adults. Moreover, respondents with current or past substance use may selectively recall events and experiences as they want to remember them (Clark et al., 2016; Johnson & Fendrich, 2005).

To overcome these challenges, two waves of data from a population-based longitudinal cohort study is used to prospectively examine the cumulative effects of nine childhood adversities reported during adolescence on drug use frequency nearly twenty years later, net of respondents' sociodemographic characteristics, adolescent drug use, anxious and depressive symptomatology, and currently living with other substance-using individuals.

Background

Adverse Childhood Experiences (ACEs) and Adults' Drug Use

The Adverse Childhood Experiences (ACEs) Study demonstrated that child adversity has long-reaching and long-ranging effects on physical, mental, behavioral, and social health (e.g., Bellis et al., 2014; Grigsby et al., 2020; Kaufman-Parks et al., 2023). Child adversity includes abuse, neglect, and other household challenges, such as parents' substance use, incarceration, domestic violence, and poverty, and parental loss due to abandonment, death, separation, or divorce. One deleterious effect of ACEs is substance use, abuse, and dependence in adolescence and adulthood, although the strength of this relationship varies based on factors such as race-ethnicity and sex (e.g., Grigsby et al., 2020; LeTendre & Reed, 2017; Schilling et al., 2007).

Several mechanisms underlie the connection between childhood adversity and risk for drug use in adulthood, including emotion regulation processes. From an attachment perspective, exposure to early childhood adversity may prevent secure attachment to caregivers by supporting views of the self as unlovable and undeserving of worthwhile and rewarding relationships. If adversity exposure also entails abusive, absent, or otherwise emotionally unavailable caregivers, children's abilities to self-regulate emotions in healthy, adaptive ways may be prevented, disrupted, or otherwise impaired. In turn, when faced with adversity in later life, individuals may engage in substance use or other maladaptive behaviors to cope with trauma (Allem et al., 2015). Similarly, trauma in early life can lead to both structural and functional changes in the brain and the body's stress regulatory systems that affect emotional regulation and fear responses (Bellis et al., 2014). Such changes may predispose adults to engage in health-harming behaviors when faced with adversity as opposed to responding in more functional and adaptive ways, especially given the more immediate pharmacological and psychological benefits that come from health-harming behaviors such as substance use (Costanzo et al., 2023; Grigsby et al., 2020).

From a social learning perspective, the effect of ACE exposure on emotion regulation may lead to youths' aggressive or oppositional behavior, which may increase the difficulty of forming relationships with prosocial peers (Allem et al., 2015). In turn, children and later adolescents and adults may become enmeshed in relationships with other substance-using individuals who influence their own substance use (Allem et al., 2015; Longmore et al., 2022).

Although the association between ACEs and drug use in adulthood generally has been established, this pathway is far from deterministic. According to estimates provided by the CDC from the years 2011-2020, 63.9% of adults reported experiencing at least one ACE (Swedo et al., 2023). However, only 21.9% of individuals ages 12 or older reported illicit drug use in 2021, including prescription medication misuse, and only 7.6% of adults

ages 26 or older reported a drug use disorder (SAMHSA, 2022). Thus, the prevalence of drug use and SUDs would be higher if the association between ACE exposure and drug use was direct and inevitable.

It is essential to assess the more proximal and contextual risks by which ACEs may lead to adults' drug use, and whether ACE exposure continues to emerge as a predictor of drug use when more proximal factors are considered. If the impact of ACEs is attenuated by psychological correlates, adolescent drug use, affiliation with others who use illicit substances, or sociodemographic characteristics that are malleable, such as educational attainment and employment status, these proximal risk factors may provide critical turning points for prevention and intervention. Conversely, it is possible that the impact of ACEs is not attenuated when proximal factors are considered. This would suggest that it is also important for those who work with substance-using individuals or others who may be at risk for drug abuse to address the long-term trauma of early life adversity to ameliorate the continued risk of health-harming behaviors.

Before considering these more proximal risks, however, we hypothesized that:

H1: There would be a positive cumulative effect of number of adverse childhood experiences (ACEs) on drug use frequency in adulthood.

Psychological Correlates of ACEs and Substance Use

One well-documented outcome of ACEs is poorer mental health and well-being. In an umbrella review of 68 systematic reviews and meta-analyses, childhood adversity was associated with a two-fold increase in the risk of experiencing anxiety, depression, or other internalizing disorders, as well as suicidal ideation and attempt (Sahle et al., 2021). Other researchers found that the impact of ACEs on mental health generally, including number of self-reported mentally healthy days and fewer negative mental health symptoms, continues for decades even when accounting for indicators of social disadvantage including lower social class and disability status (T. M. Jones et al., 2018; Nurius et al., 2012). In turn, various psychological indicators are associated with adults' drug use frequency. In a meta-analysis of 74 studies including participants from both clinical- and community-based populations, depression was associated with both concurrent alcohol use and impairment and drug use and impairment, although effect sizes were relatively small (Conner et al., 2009). Using nationally representative data, several anxiety disorders, including generalized anxiety disorder, panic disorder, and social phobia, were associated positively with substance use disorders (Marmorstein, 2012). Finally, a systematic review assessing comorbid mental health disorders among substance use treatment clients found mood and anxiety disorders to be particularly prevalent with rates of depression as high as 85% and generalized anxiety disorder as high as 75% (Kingston et al., 2017).

Although most prior studies have assessed the association between mental health and drug use cross-sectionally and causal ordering cannot be illustrated statistically, many scholars and clinicians endorse the self-medication model of substance use. This model rests on the premise that people who experience uncomfortable or negative feelings, such as depression or anxiety, may use substances to cope with these feelings (Ferguson et al., 2021; Sher, 1991). The comparably fewer longitudinal studies assessing the association between mental health diagnoses and substance use support the self-medication model (e.g., Broman et al., 2019; Marmorstein et al., 2010; Wolitzky-Taylor et al., 2012). Relatedly, some prior studies have demonstrated that psychological correlates may mediate the association between childhood adversity and drug use in adulthood. Using data from the seminal Kaiser-Permanente and CDC Adverse Childhood Experiences Study, psychological distress, defined as temporary or permanent maladaptive psychological functioning resulting from stressful life events, mediated the relationship between ACEs and alcohol problems in adulthood (Strine et al., 2012). Likewise, middle-aged adults who were identified as abused and neglected as children in court-documented cases 30 years earlier were more likely to report use of any illicit drug, a greater number of illicit drugs, and more substance use related problems in the past year (Widom et al., 2006). Thus, in the present study, we measured adults' anxious and depressive symptoms to test the following hypotheses:

H2: Anxiety and depression would be associated positively with adults' drug use frequency.

H3: Anxiety and depression would attenuate the effect of ACEs on adults' drug use frequency.

Contextual Risk Factors for Adults' Drug Use

Although ACEs are associated with the likelihood of engaging in several health-harming behaviors throughout the life course, it is important to consider the contexts in which adults' drug use may unfold. Two factors are particularly important to consider: (1) drug use during adolescence, and (2) current exposure to others who use illicit substances. For example, researchers found that earlier onset of alcohol or drug use is associated with drug use and drug dependence in later adolescence, young adulthood, and adulthood (e.g., Nelson et al., 2015; Rioux et al., 2018; Strashny, 2016). Others have suggested that earlier initiation of drug use may lead to a higher prevalence of drug use in adulthood among those with a history of childhood trauma specifically because trauma damages youths' abilities to mature out of various health-harming behaviors (e.g., Scheidell et al., 2018). Likewise, researchers found that early initiation of substance use partially mediated the effects of childhood adversity on the risk of substance use disorder in adulthood (Whitesell et al., 2009). Finally, early substance use likely compels youths to select similar substance-using peers as friends; and friendships with other

substance users increases access to more substances, normalizes substance-using behavior, and prevents or delays the typical aging out process from deviant and criminal behavior that occurs among most individuals from adolescence to adulthood (Longmore et al., 2022; Nelson et al., 2015).

Research on the influence of peers on substance use often is focused on adolescents. Yet, there is evidence that adults' involvement with others who use illicit substances can increase their risk of substance use. In a longitudinal study of young adults, romantic relationship status (i.e., dating, cohabiting, or married), relationship stability and quality, and romantic partners' substance use influenced individuals' own substance use (Fleming et al., 2010). Similarly, the severity of romantic partners' alcohol and drug use explained more variation in military veterans' alcohol and drug use than did psychological correlates, including PTSD, antisocial behavior, and depressive symptoms (Miller et al., 2013). Importantly, behavioral influence is not limited to romantic partners. Previous research using social network analysis has revealed that relationships with family members and friends who provide various kinds of support (e.g., social, material, physical) negatively influence the likelihood of drug use in adulthood (Best et al., 2016; Latkin et al., 2001); and smoking behavior in social networks, especially among household members and friends, is predictive of smoking cessation and smoking relapse among middle-aged adults (Blok et al., 2017). In the present study we measured drug use during adolescence and the current number of household members who used drugs to test the following hypotheses:

H4: Drug use during adolescence and a larger number of current household members who use drugs would be associated positively with adults' drug use frequency.

H5: Drug use during adolescence and a larger number of current household members who use drugs would attenuate the effect of ACEs on adults' drug use frequency.

Sociodemographic Characteristics

Sociodemographic characteristics that influence drug use regardless of ACE history are accounted for including age, biological sex, race/ethnicity, educational attainment, and employment, union, and parenthood statuses. According to the National Comorbidity Survey, which assessed the prevalence of mental health and substance use disorders in the United States, rates of both disorders generally are higher among men, younger individuals, those with lower educational attainment and lower incomes, and those who are unmarried (Swendsen et al., 2009). Similar associations regarding age, biological sex, and educational attainment were found using data from the National Longitudinal Study of Adolescent to Adult Health (LeTendre & Reed, 2017). Studies based on other nationally representative surveys of different populations also generally found that rates of drug use and drug use disorders were higher among non-Hispanic White individuals compared

to individuals identifying as other races/ethnicities (C. M. Jones et al., 2015; LeTendre & Reed, 2017). Finally, researchers found that parents were less likely to use drugs, have a substance use disorder, or engage in the criminal distribution of drugs, compared to those without children, and this relationship is strongest among women and custodial parents (Fergusson et al., 2012; Landers et al., 2015). Moreover, some of these same correlates are associated with ACE exposure (Merrick et al., 2018; Sacks & Murphey, 2018), further emphasizing the importance of their inclusion in assessing ACEs and adults' drug use frequency. Specifically, those identifying as Black or Hispanic compared to White, those with lower education and income, and those who are unemployed have reported higher levels of ACEs. We controlled for age, biological sex, race/ethnicity, educational attainment, employment status, union type, and parenthood in the multivariate analyses.

Methodology

Data

In the current investigation two waves of data from the Toledo Adolescent Relationships Study (TARS) are analyzed. The TARS was based on a stratified random sample of 1,321 adolescents in the 7th, 9th, and 11th grades and their parents/guardians in Lucas County, Ohio. Devised by the National Opinion Research Center, the sampling frame was derived from school enrollment records; however, school attendance was not required for inclusion in the study. The sampling frame included 62 schools and seven school districts, including the city of Toledo, its surrounding suburbs, and rural districts. Early interviews were conducted in-person with computer assisted interviewing with those adolescents and their parents/guardians who agreed to participate in the study. Beginning in 2011, an optional online component for data collection began, and the TARS was converted completely to online surveys in 2019. Data originally were collected to investigate adolescents' romantic, sexual, and other social behaviors, and how these behaviors were influenced by family members, peers, and romantic partners as youths transitioned to adulthood. The first wave of data was collected in 2001, when respondents were, on average, age 15 years. Wave II was collected in 2002 (average age 16), wave III in 2004 (average age 18), wave IV in 2006-2007 (average age 20), wave V in 2011-2012 (average age 25), wave VI in 2018-2020 (average age 32), and wave VII (pandemic survey) in 2020 (average age 34). At wave VI, there were 990 respondents, with a retention rate of 75 percent from wave I.

In assessing factors that influenced drug use frequency in adulthood, respondents who were missing on drug use as either adults ($n = 18$) or adolescents ($n = 13$) were deleted from analyses as were those missing on anxiety or depression symptoms ($n = 9$). Due to the inclusion of race/ethnicity as a potential correlate of drug use, respondents identifying a race/ethnicity other than non-Hispanic White, non-Hispanic Black, or Hispanic

were removed from the analyses due to small sample size ($n = 20$). These restrictions resulted in a final analytic sample of 930 (403 male and 527 female) respondents.

Measures

Dependent Variable

Drug use frequency during adulthood was measured by asking respondents how often in the two years prior to the wave VI (2020) interview they “used drugs to get high (not because you were sick)?” Responses were 1 = “never,” 2 = “once or twice a year,” 3 = “once every 2-3 months,” 4 = “once a month,” 5 = “once every 2-3 weeks,” 6 = “once a week,” 7 = “2-3 times a week,” 8 = “once a day,” and 9 = “more than once a day.”

Adverse Childhood Experiences (ACEs)

The key independent variable, adverse childhood experiences (ACEs), was adapted from the 2011-2014 Behavioral Risk Factor Surveillance System survey (Merrick et al., 2018). The scale consisted of 21 questions recoded into nine dichotomies where 1 = exposure and 0 = no exposure to the ACE category. The nine ACEs were: (1) childhood poverty, (2) parental loss due to divorce/separation, abandonment, or death, (3) parental substance abuse, (4) parental domestic violence, (5) parental imprisonment, (6) childhood emotional abuse, (7) childhood physical abuse, (8) lack of parental affection, and (9) unwanted childhood sex. All but one ACE was assessed through the wave I interview using either adolescents’ reports, parents’ reports, or both. Witnessing parental domestic violence was the exception, which was instead measured retrospectively at the wave V interview. Respondents were asked to recall experiences of parental domestic violence during their childhood. A full list of all items used to assess each ACE is in the Appendix. To create the adverse childhood experiences (ACEs) variable, we summed the dichotomous scores of each ACE, resulting in a possible range of 0-9.

Psychological Correlates

Anxiety and depressive symptoms were assessed at the sixth interview. Anxiety was measured with five items from the Symptom Checklist 90 (Derogatis, 1996). Respondents were asked if in the past week they were distressed or bothered by: (1) “feeling tense or keyed up,” (2) “suddenly feeling scared for no reason,” (3) “feeling so restless you could not sit still,” (4) “spells of terror or panic,” and (5) “feeling nervous or anxious.” Responses ranged from 1 = “never” to 5 = “very often” and were summed for a possible range of 5-25 ($\alpha = .87$).

Depressive symptoms were assessed with eight items from the Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977). Respondents were asked how often in the last seven days was the following statement true: (1) “You felt like you just couldn’t get going,” (2) “You felt that you could not shake off the blues,” (3) “You had trouble keeping your

mind on what you were doing,” (4) “You felt lonely,” (5) “You felt sad,” (6) “You had trouble getting to sleep or staying asleep,” (7) “You felt that everything was an effort,” and (8) “You felt depressed.” Responses ranged from 1 = “never” to 8 = “every day” and were summed for a possible range of 8-64 ($\alpha = .92$).

Contextual Risk Factors

Early drug use was assessed at the first interview (average age 15). Mirroring the measure of drug use during adulthood, respondents were asked how often in the year prior to the wave I interview (2001) they “used drugs to get high (not because you were sick)” with responses ranging from 1 = “never” to 9 = “more than once a day.” Household members’ drug use, measured at the sixth interview, asked respondents, “Thinking about your family and friends who live with you, how many could be described as someone who uses drugs?” Responses were 1 = “none,” 2 = “one,” 3 = “a few,” 4 = “some,” and 5 = “many.”

Sociodemographic Characteristics

Age, biological sex, race/ethnicity, educational attainment, employment status, union status, and number of children were assessed at the sixth interview. Age was measured in years and biological sex was a dichotomous measure with male serving as the contrast category. Two dichotomous variables represented respondents’ race/ethnicity, which included Hispanic, non-Hispanic Black, and non-Hispanic White serving as the contrast category. Educational attainment included less than high school, high school graduate as the contrast category, some college, and college graduate or higher. Employment status was measured with two dichotomous variables, with unemployed serving as the contrast category to employed part-time and full-time. Union status was measured with three dichotomous variables, which included single as the contrast category, dating, cohabiting, and married. Number of children was a continuous measure.

Data Analysis

Ordinary least squares (OLS) regression models were used to examine the influence of ACEs on adults’ drug use frequency. Model 1 showed the bivariate relationship between ACEs and adults’ drug use frequency, and model 2 added the sociodemographic characteristics. To account for the possibility that psychological and contextual correlates attenuated the association between ACEs and adults’ drug use frequency, anxiety and depressive symptoms were entered in model 3, while drug use during adolescence and the current number of household members who use drugs were entered in model 4. Hayes’ PROCESS tests for mediation (Hayes, 2012) were run to test for the potential mediation effects of these psychological and contextual correlates.

Results

Descriptive Statistics

[Table 1](#) presents the means and percentages for the total sample for the dependent and independent variables, and separate descriptive statistics for those respondents who prospectively reported no ACE exposure versus those who were exposed to at least one adverse childhood experience. Drug use frequency for the total sample averaged 1.95 on a possible scale of 1-9 indicating that on average adults used drugs “once or twice a year” in the two years prior to the sixth interview. In assessing the key independent variable, adverse childhood experiences (ACEs), the full sample reported experiencing an average of 1.72 ACEs. Supplemental analyses (available from corresponding author) indicated that, in this study, the most reported ACE was parental loss due to divorce/separation, death, or abandonment (38.06%), followed by physical abuse (29.78%), poverty (29.03%), and emotional abuse (20.54%). Fewer respondents reported a lack of parental affection (14.52%), parental domestic violence (12.90%), parental incarceration (10.32%), parental substance use problems (9.78%), or unwanted sexual intercourse (7.42%) in childhood. A majority of the sample experienced no ACEs (26.02%) or one ACE (26.56%), although substantial portions experienced two (20.54%) or three (12.69%) ACEs. Reports of six or more ACEs were least common and reported by less than three percent of the sample.

Regarding sociodemographic characteristics, respondents’ average age was 32.42 years, and a slight majority (56.67%) of the sample was female. The most common racial/ethnic identification was non-Hispanic White (66.67%), although notable proportions identified as Black (21.61%) and Hispanic (11.72%). The majority of respondents were college graduates (46.77%), followed by high school graduates (24.09%) and those who completed at least some college education (23.87%). Few respondents had less than a high school education (5.27%). Most were employed full-time at the sixth interview (66.99%), although substantial minorities were employed part-time (12.15%) or were unemployed (20.86%). The majority of respondents were married (46.34%), followed by dating (27.20%), cohabiting (21.61%), and single (4.84%). Respondents reported an average of 1.45 children with a range of 0-9.

In examining psychological and contextual factors that may explain the relationship between ACEs and adults’ drug use frequency, respondents in the full sample reported relatively low levels of anxiety and depressive symptoms. The average anxiety score was 8.65 with a possible range of 5-25. The average depressive symptoms score was 17.79 with a possible range of 8-64. Respondents reported low frequency of drug use during adolescence. The mean score was 1.51 on a scale of 1-9, indicating most respondents “never” used drugs or used drugs “once or twice a year” as adolescents. Most

Table 1. Descriptive Statistics for Adults' Drug Use and Independent Variables

	Full Sample		No ACE Exposure		ACE Exposure	
	Mean or %	Range	Mean or %	Range	Mean or %	Range
Drug use	1.95	1-9 (0.07)	1.74	1-8 (0.11)	2.02	1-9 (0.08)
Adverse childhood experiences (ACEs)	1.72	0-8 (0.05)	---	---	2.33	1-8 (0.05)
SOCIODEMOGRAPHIC CHARACTERISTICS						
Age	32.42	29-36 (0.06)	32.25	29-36 (0.12)	32.48	29-36 (0.07)
<i>Biological sex</i>						
Male (<i>reference</i>)	43.33%		46.28%		42.30%	
Female	56.67%		53.72%		57.70%	
<i>Race/ethnicity</i>						
White (<i>reference</i>)	66.67%		84.71%		60.32%	
Black	21.61%		9.92%		25.73%	
Hispanic	11.72%		5.37%		13.95%	
<i>Education</i>						
Less than high school	5.27%		2.07%		6.40%	
High school (<i>reference</i>)	24.09%		11.57%		28.49%	
Some college	23.87%		16.53%		26.45%	
College graduate	46.77%		69.83%		38.66%	
<i>Employment status</i>						
Unemployed (<i>reference</i>)	20.86%		15.70%		22.67%	
Part-time employment	12.15%		7.85%		13.66%	
Full-time employment	66.99%		76.45%		63.66%	
<i>Union status</i>						
Single (<i>reference</i>)	4.84%		3.72%		5.23%	
Dating	27.20%		21.49%		29.22%	
Cohabiting	21.61%		14.88%		23.98%	
Married	46.34%		59.92%		41.57%	
Children	1.45	0-9 (0.05)	1.12	0-5 (0.07)	1.56	0-9 (0.05)
<i>Psychological correlates</i>						
Anxiety symptoms	8.65	5-25 (0.14)	7.98	5-25 (0.23)	8.89	5-25 (0.17)
Depression symptoms	17.79	8-64 (0.40)	15.47	8-64 (0.64)	18.60	8-64 (0.48)
<i>Contextual risk factors</i>						
Adolescent drug use	1.51	1-9 (0.05)	1.31	1-9 (0.07)	1.58	1-9 (0.06)
Household drug use	1.17	1-5 (0.02)	1.13	1-5 (0.03)	1.19	1-5 (0.02)

Full sample = 930 respondents; 242 respondents with no ACE exposure; 688 respondents with ACE exposure

Source: Toledo Adolescent Relationships Study

Note: Standard deviations shown in parentheses

respondents reported that they did not reside with anyone who used drugs at the time of the sixth interview, with an average score of 1.17, indicating “none,” on a possible scale of 1-5.

In comparing the independent variables between those adults with no ACE history and those who prospectively reported at least one ACE, results revealed a larger percentage of women and non-Hispanic Black and Hispanic respondents in the sample with ACE exposure. ACE-exposed adults reported

lower levels of educational attainment, with almost half as few being college graduates compared to adults with no ACE history; and ACE-exposed adults were also more likely to be unemployed at the time of the sixth interview. Compared to those adults with no ACE exposure, adults with a history of at least one ACE were less likely to be married, had a greater number of children, and reported more anxiety and depressive symptoms at the sixth interview. Finally, ACE-exposed individuals had a greater frequency of drug use during adolescence and were more likely to reside with other drug-using individuals as adults.

Multiple Variable Results

[Table 2](#) presents the results of the OLS regression models of adults' drug use. In the first model, adverse childhood experiences (ACEs) were a significant predictor of drug use frequency during adulthood, providing support for the first hypothesis (H1). For each additional ACE experienced, drug use frequency increased by 0.176 units. Model 2, which added the sociodemographic characteristics showed that women, compared to men, scored 0.460 units lower on drug use frequency. For each additional child reported by respondents, drug use frequency decreased by 0.178 units. Although only marginally significant ($p < 0.10$), respondents who were employed full-time scored 0.291 units lower on drug use compared to respondents who were unemployed. Respondents' age, race/ethnicity, educational attainment, and union status were not significant predictors of drug use in multivariate results.

Model 3 added psychological correlates that may attenuate the relationship between ACEs and adults' drug use frequency. Results demonstrated partial support for the second and third hypotheses (H2 and H3) guiding the study. Consistent with the second hypothesis, for each unit increase in anxiety symptoms, adults' drug use increased by 0.083 units. Yet, inconsistent with this hypothesis, depressive symptoms were not a significant predictor of adults' drug use frequency with the inclusion of other correlates in multivariate analyses. Similarly, results from bootstrapping confidence intervals (CIs = 95%, $n = 5,000$) using Hayes PROCESS tests for mediation, including all model covariates, indicated partial support for the third hypothesis. Respondents' anxiety symptoms mediated the total effect of ACEs on adults' drug use frequency (indirect effect = 0.01, lower-level CI = 0.002, upper-level CI = 0.03). Each additional adversity experienced in childhood led to a 0.131 unit increase in anxiety symptoms; each unit increase in anxiety symptoms led to 0.071 increase in adults' drug use frequency. Conversely, and consistent with the OLS regression analyses presented in [Table 2](#), results of Hayes PROCESS test of mediation for respondents' depression indicated that ACEs were not a significant predictor of depression, nor were depressive symptoms predictive of drug use frequency, when all model covariates were included in the mediation analysis.

Table 2. OLS Regression for the Effect of ACEs on Adults' Drug use

	Model 1 <i>b</i> (SE)	Model 2 <i>b</i> (SE)	Model 3 <i>b</i> (SE)	Model 4 <i>b</i> (SE)
Adverse childhood experiences (ACEs)	0.176*** (0.043)	0.157*** (0.047)	0.120** (0.046)	0.087* (0.044)
SOCIODEMOGRAPHIC CHARACTERISTICS				
Age		0.009 (0.038)	0.017 (0.038)	0.004 (0.036)
Female (<i>reference: male</i>)		-0.460*** (0.143)	-0.529*** (0.141)	-0.446*** (0.133)
<i>Race-ethnicity (reference: White)</i>				
Black		-0.013 (0.183)	0.048 (0.180)	-0.011 (0.170)
Hispanic		0.351 (0.220)	0.381^ (0.216)	0.351^ (0.203)
<i>Education (reference: high school graduate)</i>				
Less than high school		0.182 (0.327)	0.164 (0.322)	-0.042 (0.304)
Some college		0.289 (0.196)	0.242 (0.193)	0.246 (0.181)
College graduate		0.006 (0.187)	0.016 (0.184)	0.036 (0.173)
<i>Employment status (reference group: unemployed)</i>				
Part-time employment		0.204 (0.244)	0.305 (0.241)	0.283 (0.227)
Full-time employment		-0.291^ (0.177)	-0.141 (0.177)	-0.165 (0.167)
<i>Union status (reference group: single)</i>				
Dating		-0.197 (0.332)	-0.110 (0.327)	-0.061 (0.307)
Cohabiting		0.365 (0.337)	0.508 (0.334)	0.446 (0.314)
Married		-0.287 (0.328)	-0.097 (0.325)	-0.046 (0.306)
Children		-0.178*** (0.055)	-0.153** (0.055)	-0.155** (0.051)
PSYCHOLOGICAL CORRELATES				
Anxiety symptoms			0.083*** (0.022)	0.071*** (0.021)
Depression symptoms			0.005 (0.008)	0.002 (0.007)
CONTEXTUAL RISK FACTORS				
Adolescents' drug use				0.166*** (0.044)
Household drug use				1.127*** (0.116)

N = 930 respondents; ^ *p* < 0.10, * *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001

Source: Toledo Adolescent Relationships Study

Model 4 added the contextual risk factors. Consistent with the fourth hypothesis (H4), drug use during adolescence and current number of household members who use drugs were both significant predictors of adults' drug use frequency. For each unit increase in adolescents' drug use frequency, drug use during adulthood increased by 0.166 units. For each unit increase in household drug use, adults' own drug use increased by 1.127 units. With

the inclusion of all model covariates in the OLS regression, number of ACEs, biological sex, number of children, and anxiety symptoms remained significant predictors of adults' drug use frequency.

To test for the potential that contextual risk factors may mediate the relationship between ACEs and adults' drug use frequency, and in line with analyses for psychological correlates, we ran Hayes PROCESS tests for mediation for both adolescent drug use and current household members' drug use. Analyses revealed partial support for the fifth hypothesis (H5). Results from bootstrapping confidence intervals (CIs = 95%, $n = 5,000$) indicated that adolescent drug use mediated the total effect of ACEs on adults' drug use frequency (indirect effect = 0.02, lower-level CI = 0.006, upper-level CI = 0.04). For each additional ACE report, respondents' drug use in adolescence increased by 0.126 units; each unit increase in adolescent drug use frequency led to a 0.167 unit increase in drug use frequency in adulthood. Conversely, results for current household members' drug use indicated that while living with substance-using individuals increased adults' own drug use frequency ($b = 1.13$, $p < 0.001$), ACEs were not a significant predictor of residing with substance users in adulthood ($b = 0.006$, $p < 0.50$).

Discussion

The current research prospectively assessed the influence of adverse childhood experiences (ACEs) on drug use in adulthood while accounting for multiple sociodemographic correlates and psychological and contextual risk factors. Our goal was to assess whether distally experienced childhood adversity continued to impact adults' drug use frequency when more proximal risks were considered. We hypothesized that psychological correlates of anxiety and depression and contextual factors of adolescent drug use and current household members' use of drugs would attenuate the association between ACEs and adults' drug use frequency. Consistent with hypotheses, although anxiety and adolescent drug use mediated some of the relationship between ACEs and adults' drug use frequency, ACEs remained a significant predictor. We also added to existing literature by measuring ACEs prospectively thereby avoiding concerns of recall bias that are common in most previous research that assesses ACEs retrospectively.

Consistent with prior research (e.g., Bellis et al., 2014; Leza et al., 2021; Mersky et al., 2013) and this study's first hypothesis, childhood adversity was a significant predictor of drug use frequency in adulthood. We found a cumulative effect of ACEs, whereby the frequency of adults' illicit drug use increased for each additional ACE experienced. Childhood adversity continued to remain a significant predictor of engaging in illicit drug use almost twenty years later, even when accounting for more proximal risk factors, including psychological correlates, educational attainment, employment status, and adolescent drug use that were found to be both influenced by ACEs and predictive of substance-using behaviors in adulthood (e.g., Marmorstein et al., 2010; Merrick et al., 2018; Rioux et al., 2018; Sahle et al., 2021; Swendsen et al., 2009). This finding is noteworthy because few

studies to our knowledge have included such a wide range of more proximal correlates when assessing the relationship between ACEs and adult drug use. This study thus demonstrated the long-lasting impacts that childhood adversity may have on individuals' participation in health-harming behaviors.

In addition to psychological and neurobiological explanations for the impact of ACEs on adults' drug use, social learning processes help in understanding this connection. Exposure to ACEs may increase youths' proneness to aggression, which in turn decreases involvement with prosocial peers and increases the likelihood of turning to deviant and outcasted peers for affiliation. Deviant and outcasted peers are also more likely to be substance users, leading to the normalization and perhaps even commendation of illicit drug use (Allem et al., 2015; Longmore et al., 2022). While peer influence on drug-using behavior is thought to be confined to or at least most prominent during adolescence, researchers found that both platonic and romantic relationships with other substance users continues to influence substance-using behaviors in adulthood (e.g., Blok et al., 2017; Miller et al., 2013). Moreover, drug use that continues from adolescence to adulthood via associations with substance-using peers has been posited in the literature. Specifically, associations with peers who use substances normalizes substance use during adolescence; these associations may delay or prevent the typical aging out process from deviant and criminal behavior, including drug use, by blocking off opportunities to engage with prosocial others and in prosocial institutions (Nelson et al., 2015). All these propositions are in line with the present study's findings, including that adolescent drug use and currently residing with individuals who use drugs were significant predictors of adult drug use, as well as adolescent drug use frequency mediating the relationship between ACEs and adult drug use.

Conclusions and Future Implications

The findings presented here suggest that clinicians, human service professionals, and other service providers working with those who are at risk for or who are presently using illicit substances should not just focus on proximal influences on drug use, such as unemployment or exposure to other substance-using individuals. It is also important to examine how earlier childhood adversity may be contributing to these more proximal risk factors, in addition to how such adversity contributes to substance use directly despite the presence or absence of adult risk factors. This suggestion is consistent with the present study's finding of the mediation effect of anxiety in the relationship between ACEs and adults' drug use frequency, as well as previous work finding that ACE exposure often leads to poorer mental health (Sahle et al., 2021), with some individuals attempting to alleviate the negative feelings associated with poor mental health by self-medicating with illicit substances (Broman et al., 2019; Strine et al., 2012). Finally, the importance of attending to childhood adversity when explicating risk for adults' drug use is in line with suggestions made by previous researchers citing both psychological and neurobiological reasons for this connection,

which emphasize that ACEs prevent or disrupt healthy, adaptive emotional responses to trauma and other life stressors. Consequently, the effects of ACEs often remain through the life course (Allem et al., 2015; Bellis et al., 2014).

Although many psychosocially trained human service professionals currently follow the trauma-informed care (TIC) guidelines provided by the Substance Abuse and Mental Health Services Administration (SAMHSA, 2014) when working with clients dealing with SUDs, current research indicates there is still considerable room for improvement in implementing TIC both generally and with specific reference to ACE experiences (e.g., Chadwick & Billings, 2022; Gabrielli et al., 2023). Some human service providers are hesitant to question clients about trauma experiences due to fear of re-traumatizing clients. Other providers who have their own trauma histories worry about experiencing vicarious trauma reactions when discussing trauma with clients, especially when employed in an organization that may not provide employees with adequate supports for self-care purposes (Chadwick & Billings, 2022). When it comes to ACE screening and assessment specifically, not only do health and human service providers fear the negative impacts of the screening process on their clients but they have also been found to cite a lack of knowledge about and training in ACEs, limited access to appropriate referral sources, and both time and staffing challenges (Gabrielli et al., 2023). To overcome these barriers to effective implementation of TIC, health and human service organizations should provide an initial training to all service providers or implement a train the trainer model in larger- or multi-site organizations, with follow-up coaching, supervision, and refresher training where needed (Chadwick & Billings, 2022). Organizations should likewise establish guidelines for ACE assessment procedures, including which ACEs should be followed-up on in the event of a positive screen and what treatment modalities or referral sources are most appropriate for each particular ACE. Implementing triangulation of reporting sources for ACE exposure may also help to produce more accurate ACE assessments within the organization (Gabrielli et al., 2023). Finally, in order to effectively support human service providers in avoiding experiences of vicarious trauma, compassion fatigue, and burnout, employers should establish clarity in roles and responsibilities; avoid high client caseloads; increase opportunities for supervision and constructive feedback; provide mental health resources and flexible working arrangements to support providers' self-care; and establish an environment characterized by shared decision-making power, including flexibility in organizational policies and procedures to allow for variation across providers' clients' experiences (Kulkarni et al., 2013; Shiri et al., 2022).

Equipping practitioners with the skills, resources, and workplace supports to best practice TIC with ACE-survivors at risk for substance use may also aid clients in experiencing post-traumatic growth (PTG), or positive life changes resulting from stressful life events, from previous ACE exposure, thereby

reducing the risk for substance use and other health-harming behaviors. Specifically, since TIC principles focus on client agency by bringing together trauma, empowerment, and relational theories, there is a higher likelihood of clients experiencing PTG and a lower likelihood of revictimization experiences (Wekerle, 2020). Prior research demonstrates that having emotional awareness and the ability to self-regulate emotions; possessing senses of purpose, compassion, and endurance; having the ability to both seek and receive social support from others; and finding positive meaning in stressful life events may be central to the development of PTG (Tranter et al., 2021; Wekerle, 2020). There are likewise several existing models of care that incorporate ACEs and resiliency-building that human services organizations may consider adopting in whole or in part to best meet their clients' needs. As one example, the Restorative Integral Support (RIS) model prioritizes developing a culture of recovery that fosters resilience and empowerment of clients through community integration, in recognizing that both initial experiences of trauma and the process of recovering from that trauma take place within observable systemic and environmental contexts (Larkin et al., 2012; Larkin & Records, 2011). Key to this culture and further reinforcing the importance of workplace supports for human services employees, the RIS model places emphasis on the attitudes and behaviors of agency leaders and staff members in taking a comprehensive approach to client care, which includes agency leaders supporting self-care by staff members so as to prevent experiences of vicarious traumatization and to support staff serving as role models for clients in areas of appropriate self-care and relationship-building (Larkin & Records, 2011).

The significant effects of using drugs in adolescence and residing with drug users in adulthood on adults' illicit drug use may provide key insights for practitioners and others who work with substance-using adults, as well as those who interact with adolescents most at risk for initiating drug use. From an intervention perspective, clinicians and other practitioners should take care to do a full assessment with clients on their exposure to other substance-using individuals, particularly those who reside in the household. If other household members are using illicit drugs or have alcohol dependency issues, it may be necessary to involve both the primary client and their household members in behavioral therapy, family-based therapy, or other forms of small group counseling, depending on the relationships between household members (Miller et al., 2013). Practitioners can then determine how or why interactions with substance-using household members influences individuals' own substance use (e.g., simple access and exposure, or a shared activity that enhances relationship satisfaction) (Cooper et al., 2021) and provide appropriate treatment accordingly.

From a prevention perspective and following the findings of the present research and those of previous studies (e.g., Longmore et al., 2022; Nelson et al., 2015; Scheidell et al., 2018), reducing substance use in adulthood may be best accomplished by preventing substance use initiation earlier in

the life course. The prevention of drug use initiation during adolescence, in turn, may be partially achieved by identifying those ACE-exposed youths who are at greater risk of drug use. This can be accomplished by training teachers, guidance counselors, coaches, and other individuals who interact with adolescents on a regular basis to identify youths in their care who are facing adversity and how to respond appropriately. Prevention and intervention also can be accomplished by encouraging healthcare providers, including pediatricians, to screen patients for ACEs using validated ACE assessment tools. This is important because researchers found that 30-80 percent, depending on the sample and setting, of physicians do not ask patients about any ACE experiences, and these rates are even higher when physicians are asked if they do a full ACE assessment (e.g., Kerker et al., 2016; Maunder et al., 2020; Stork et al., 2020).

Although the present study has contributed in several ways to the current literature on the impact of ACEs on adults' drug use, it does have limitations worth noting and which may provide direction for future researchers. First, although the TARS sample provides estimates for sociodemographic characteristics similar to the national population on income, race/ethnicity, and family structure, it is a regional sample and poses limits to generalizability. Future research efforts should replicate these findings with nationally representative data. Second, self-reports were used for adults' drug use. Although issues of under- or overreporting are possible with any self-reported data, this may be especially the case when the potential for social desirability bias is high (Latkin et al., 2017; Zemore, 2012). Third, although the measure of drug use is consistent with other well-known studies (e.g., Merrick et al., 2018; Schilling et al., 2007) and may be particularly appropriate when examining community samples where illicit drug use is lower than that of treatment-based or other clinical populations, it is nevertheless broad in nature and does not specify types of drugs used, concurrent use of multiple drugs, the potential lethality of the drugs used, nor the quantity of each drug used per session. Future researchers might consider asking more specific questions to assess whether ACEs impact use of certain illicit drugs more than others, including the misuse and abuse of prescription medication and associated drug-seeking behaviors (e.g., physician shopping). Relatedly, because the present study utilized a population-based and not a clinical sample, the prevalence of ACEs as reported here may be different than that of a clinical population.

Given that anxious and depressive symptoms were measured at the same point in time as adults' drug use, we also cannot discount the possibility that drug use contributed to symptoms of anxiety and depression rather than the reverse causal ordering as is conceptualized here. It is however notable that much prior research has contended that poorer mental health generally precedes illicit drug use (e.g., Broman et al., 2019; Marmorstein et al., 2010; Wolitzky-Taylor et al., 2012). Finally, the exact processes by which ACEs contributed to adults' drug use were not examined in the present

analyses. For instance, emotional and behavioral dysregulation and insecure attachment styles resulting from ACE exposure were not directly assessed. Future research including these measures and perhaps utilizing pathway analysis would illustrate more explicitly how ACEs contribute to drug use in adulthood.

Despite limitations, this study added to the literature by using a prospective measure of ACEs, thereby avoiding issues of recall common in studies of ACEs that are perhaps even more prevalent when assessing substance use outcomes. We also included a range of concurrent or more proximal risks for engaging in drug use in adulthood, including drug use during adolescence, living with drug-using individuals in adulthood, psychological correlates, and sociodemographic characteristics. That childhood adversity continued to matter when proximal risks were considered supports the continued exploration of the impact of ACEs on a variety of social and behavioral health indicators throughout the life course. One implication of the findings is that a potential way to intervene and prevent illicit drug use is to not only focus on concurrent risk but also ensure attention is directed toward resolving trauma linked to childhood adversity.

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References

- Allem, J., Soto, D. W., Baezconde-Garbanati, L., & Unger, J. B. (2015). Adverse childhood experiences and substance use among Hispanic emerging adults in Southern California. *Addictive Behaviors, 50*, 199–204. <https://doi.org/10.1016/j.addbeh.2015.06.038>
- Bellis, M. A., Hughes, K., Leckenby, N., Perkins, C., & Lowey, H. (2014). National household survey of adverse childhood experiences and their relationship with resilience to health-harming behaviors in England. *BMC Medicine, 12*, 1–10. <https://doi.org/10.1186/1741-7015-12-72>
- Best, D., Beckwith, M., Haslam, C., Alexander Haslam, S., Jetten, J., Mawson, E., & Lubman, D. I. (2016). Overcoming alcohol and other drug addiction as a process of social identity transition: The social identity model of recovery (SIMOR). *Addiction Research & Theory, 24*, 111–123. <https://doi.org/10.3109/16066359.2015.1075980>
- Blok, D. J., de Vlas, S. J., van Empelen, P., & van Lenthe, F. J. (2017). The role of smoking in social networks on smoking cessation and relapse among adults: A longitudinal study. *Preventive Medicine, 99*, 105–110. <https://doi.org/10.1016/j.ypmed.2017.02.012>
- Broman, C. L., Wright, M. K., Broman, M. J., & Bista, S. (2019). Self-medication and substance use: A test of the hypothesis. *Journal of Child & Adolescent Substance Abuse, 28*, 494–504. <https://doi.org/10.1080/1067828X.2020.1789526>
- Chadwick, E., & Billings, J. (2022). Barriers to delivering trauma-focused interventions for people with psychosis and post-traumatic stress disorder: A qualitative study of health care. *Psychology and Psychotherapy: Theory, Research and Practice, 95*, 541–560. <https://doi.org/10.1111/papt.12387>
- Choi, N. G., DiNitto, D. M., Marti, C. N., & Choi, B. Y. (2017). Association of adverse childhood experiences with lifetime mental and substance use disorders among men and women aged 50+ years. *International Psychogeriatrics, 29*, 359–372. <https://doi.org/10.1017/S1041610216001800>
- Clark, C. B., Zyambo, C. M., Li, Y., & Cropsey, K. L. (2016). The impact of non-concordant self-report of substance use in clinical trials research. *Addictive Behaviors, 58*, 74–79. <https://doi.org/10.1016/j.addbeh.2016.02.023>
- Conner, K. R., Piquart, M., & Gamble, S. A. (2009). Meta-analysis of depression and substance use among individuals with alcohol use disorders. *Journal of Substance Abuse Treatment, 37*, 127–137. <https://doi.org/10.1016/j.jsat.2008.11.007>
- Cooper, L. M., Longmore, M. A., Manning, W. D., & Giordano, P. C. (2021). The influence of demographic, relational, and risk asymmetries on the frequency of intimate partner violence in young adulthood. *Journal of Family Issues, 42*, 136–155. <https://doi.org/10.1177/0192513X20916205>
- Costanzo, A., Santoro, G., & Schimmenti, A. (2023). Self-medication, traumatic reenactments, and dissociation: A psychoanalytic perspective on the relationship between childhood trauma and substance use. *Psychoanalytic Psychotherapy, 1*–24. <https://doi.org/10.1080/02668734.2023.2272761>
- Derogatis, L. R. (1996). *SCL-90-R: Symptom Checklist-90-R: Administration, scoring, and procedures manual*. NCS Pearson.
- Dube, S. R., Felitti, V. J., Dong, M., Chapman, D. P., Giles, W. H., & Anda, R. F. (2003). Childhood abuse, neglect, household dysfunction and the risk of illicit drug use: The Adverse Childhood Experiences Study. *Pediatrics, 111*, 564–572. <https://doi.org/10.1542/peds.111.3.564>
- Ferguson, E., Zale, E., Ditte, J., Westowicz, D., Stennet, B., Robinson, M., & Boissoneault, J. (2021). CANUE: A theoretical model of pain as an antecedent for substance use. *Annals of Behavioral Medicine, 55*, 489–502. <https://doi.org/10.1093/abm/kaaa072>

- Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2012). Transition to parenthood and substance use disorders: Findings from a 30-year longitudinal study. *Drug and Alcohol Dependence*, 125, 295–300. <https://doi.org/10.1016/j.drugalcdep.2012.03.003>
- Fleming, C. B., White, H. R., & Catalano, R. F. (2010). Romantic relationships and substance use in early adulthood: An examination of the influences of relationship type, partner substance use, and relationship quality. *Journal of Health and Social Behavior*, 51, 153–167. <https://doi.org/10.1177/0022146510368930>
- Gabrielli, J., Bennett, A., Clement, A., Corcoran, E., & Nelapati, S. (2023). Adverse childhood experiences (ACEs) screening and assessment in health and human service settings. In S. G. Portwood, M. J. Lawler, & M. C. Roberts (Eds.), *Handbook of adverse childhood experiences: Issues in clinical child psychology*. Springer, Cham.
- Grigsby, T. J., Rogers, C. J., Albers, L. D., Benjamin, S. M., Lust, K., Eisenberg, M. E., & Forster, M. (2020). Adverse childhood experiences and health indicators in a young adult, college student sample: Differences by gender. *International Journal of Behavioral Medicine*, 27, 660–667. <https://doi.org/10.1007/s12529-020-09913-5>
- Hales, T., Kusmaul, N., & Nochajski, T. (2017). Exploring the dimensionality of trauma-informed care: Implications for theory and practice. *Human Service Organizations: Management, Leadership & Governance*, 41, 317–325. <https://doi.org/10.1080/23303131.2016.1268988>
- Hayes, A. F. (2012). *PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling* [White paper]. <http://www.afhayes.com/public/process2012.pdf>
- Johnson, T., & Fendrich, M. (2005). Modeling sources of self-report bias in a survey of drug use epidemiology. *Annals of Epidemiology*, 15, 381–389. <https://doi.org/10.1016/j.annepidem.2004.09.004>
- Jones, C. M., Logan, J., Gladden, M., & Bohm, M. K. (2015). Vital signs: Demographic and substance use trends among heroin users – United States, 2002–2013. *Morbidity and Mortality Weekly Report*, 64, 719–725.
- Jones, T. M., Nurius, P., Song, C., & Fleming, C. M. (2018). Modeling life course pathways from adverse childhood experiences to adult mental health. *Child Abuse & Neglect*, 80, 32–40. <https://doi.org/10.1016/j.chiabu.2018.03.005>
- Kaufman-Parks, A. M., Longmore, M. A., Manning, W. D., & Giordano, P. C. (2023). Understanding the effect of adverse childhood experiences on the risk of engaging in physical violence toward an intimate partner: The influence of relationship, social psychological, and sociodemographic contextual risk factors. *Child Abuse & Neglect*, 144, 106381. <https://doi.org/10.1016/j.chiabu.2023.106381>
- Kerker, B. D., Storfer-Isser, A., Szilagyi, M., Stein, R. E. K., Garner, A. S., O'Connor, K. G., & Horwitz, S. M. (2016). Do pediatricians ask about adverse childhood experiences in pediatric primary care? *Academic Pediatrics*, 16, 154–160. <https://doi.org/10.1016/j.acap.2015.08.002>
- Khoury, L., Tang, Y. L., Bradley, B., Cubells, J. F., & Ressler, K. J. (2010). Substance use, childhood traumatic experience, and posttraumatic stress disorder in an urban civilian population. *Depression and Anxiety*, 27, 1077–1086. <https://doi.org/10.1002/da.20751>
- Kingston, R. E., Marel, C., & Millis, K. L. (2017). A systematic review of the prevalence of comorbid mental health disorders in people presenting for substance use treatment in Australia. *Drug and Alcohol Review*, 36, 527–539. <https://doi.org/10.1111/dar.12448>

- Kulkarni, S., Bell, H., Hartman, J. L., & Herman-Smith, R. L. (2013). Exploring individual and organizational factors contributing to compassion satisfaction, secondary traumatic stress, and burnout in domestic violence service providers. *Journal of the Society for Social Work and Research*, 4, 114–130. <https://doi.org/10.5243/jsswr.2013.8>
- Landers, M. D., Mitchell, O., & Coates, E. E. (2015). Teenage fatherhood as a potential turning point in the lives of delinquent youth. *Journal of Child and Family Studies*, 24, 1685–1696. <https://doi.org/10.1007/s10826-014-9971-y>
- Larkin, H., Beckos, B. A., & Shields, J. J. (2012). Mobilizing resilience and recovery in response to adverse childhood experiences (ACE): A restorative integral support (RIS) case study. *Journal of Prevention & Intervention in the Community*, 40, 335–346. <https://doi.org/10.1080/10852352.2012.707466>
- Larkin, H., & Records, J. (2011). *Restorative integral support (RIS) for post-trauma wellness*. <https://www.iowaaces360.org/uploads/1/0/9/2/10925571/restorativeintegralsupport.pdf>
- Latkin, C. A., Edwards, C., Davey-Rothwell, M. A., & Tobin, K. E. (2017). The relationship between social desirability bias and self-reports of health, substance use, and social network factors among urban substance users in Baltimore, Maryland. *Addictive Behaviors*, 73, 133–136. <https://doi.org/10.1016/j.addbeh.2017.05.005>
- Latkin, C. A., Knowlton, A. R., & Sherman, S. (2001). Routes of drug administration, differential affiliation, and lifestyle stability among cocaine and opiate users: Implications to HIV prevention. *Journal of Substance Abuse*, 13, 89–102. [https://doi.org/10.1016/S0899-3289\(01\)00070-0](https://doi.org/10.1016/S0899-3289(01)00070-0)
- LeTendre, M. L., & Reed, M. B. (2017). The effect of adverse childhood experiences on clinical diagnosis of a substance use disorder: Results of a nationally representative study. *Substance Use & Misuse*, 52, 689–697. <https://doi.org/10.1080/10826084.2016.1253746>
- Leza, L., Siria, S., López-Goñi, J. J., & Fernández-Montalvo, J. (2021). Adverse childhood experiences (ACEs) and substance use disorder (SUD): A scoping review. *Drug and Alcohol Dependence*, 221, 108563. <https://doi.org/10.1016/j.drugalcdep.2021.108563>
- Longmore, M. A., Severeid, E. E., Manning, W. D., Giordano, P. C., Clemens, W., & Taylor, H. (2022). Adolescents' frequency of alcohol use and problems from alcohol abuse: Integrating dating partners with parent and peer influences. *Journal of Youth and Adolescence*, 1–15. <https://doi.org/10.1007/s10964-021-01486-0>
- Mahon, D. (2022). Implementing trauma informed care in human services: An ecological scoping review. *Behavioral Sciences*, 12, 431. <https://doi.org/10.3390/bs12110431>
- Marmorstein, N. R. (2012). Anxiety disorders and substance use disorders: Different associations by anxiety disorder. *Journal of Anxiety Disorders*, 26, 88–94. <https://doi.org/10.1016/j.janxdis.2011.09.005>
- Marmorstein, N. R., White, H. R., Loeber, R., & Stouthamer-Loeber, M. (2010). Anxiety as a predictor of age at first use of substances and progression to substance use problems among boys. *Journal of Abnormal Child Psychology*, 38, 211–224. <https://doi.org/10.1007/s10802-009-9360-y>
- Maunder, R. G., Hunter, J. J., Tannenbaum, D. W., Le, T. L., & Lay, C. (2020). Physicians' knowledge and practices regarding screening adult patients for adverse childhood experiences: A survey. *BMC Health Services Research*, 20, 314. <https://doi.org/10.1186/s12913-020-05124-6>
- Merrick, M. T., Ford, D. C., Ports, K. A., & Guinn, A. S. (2018). Prevalence of adverse childhood experiences from the 2011-2014 behavioral risk factor surveillance system in 23 states. *JAMA Pediatrics*, 172, 1038–1044. <https://doi.org/10.1001/jamapediatrics.2018.2537>

- Mersky, J. P., Topitzes, J., & Reynolds, A. J. (2013). Impacts of adverse childhood experiences on health, mental health, and substance use in early adulthood: A cohort study of an urban, minority sample in the U.S. *Child Abuse & Neglect*, 37, 917–925. <https://doi.org/10.1016/j.chiabu.2013.07.011>
- Miller, M. W., Reardon, A. F., Wolf, E. J., Prince, L. B., & Hein, C. L. (2013). Alcohol and drug abuse among U.S. veterans: Comparing associations with intimate partner substance abuse and veteran psychopathology. *Journal of Traumatic Stress*, 26, 71–76. <https://doi.org/10.1002/jts.21773>
- Nelson, S. E., Van Ryzin, M. J., & Dishion, T. (2015). Alcohol, marijuana, and tobacco use trajectories from age 12 to 24 years: Demographic correlates and young adult substance use problems. *Development and Psychopathology*, 27, 253–277. <https://doi.org/10.1017/S0954579414000650>
- Nurius, P. S., Logan-Greene, P., & Green, S. (2012). Adverse childhood experiences (ACE) within a social disadvantage framework: Distinguishing unique, cumulative, and moderated contributions to adult mental health. *Journal of Prevention & Intervention in the Community*, 40, 278–290. <https://doi.org/10.1080/10852352.2012.707443>
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401. <https://doi.org/10.1177/014662167700100306>
- Rioux, C., Castellanos-Ryan, N., Parent, S., Vitaro, F., Tremblay, R. E., & Séguin, J. R. (2018). Age of cannabis use onset and adult drug abuse symptoms: A prospective study of common risk factors and indirect effects. *The Canadian Journal of Psychiatry*, 63, 457–464. <https://doi.org/10.1177/0706743718760289>
- Sacks, V., & Murphey, D. (2018, February 12). The prevalence of adverse childhood experiences nationally, by state, and by race or ethnicity. *Child Trends*. <https://www.childtrends.org/publications/prevalence-adverse-childhood-experiences-nationally-state-race-ethnicity>
- Sahle, B. W., Reavley, N. J., Li, W., Morgan, A. J., Yap, M. B. H., Reupert, A., & Jorm, A. F. (2021). The association between adverse childhood experiences and common mental disorders and suicidality: An umbrella review of systematic reviews and meta-analyses. *European Child & Adolescent Psychiatry*, 1–11.
- Scheidell, J. D., Quinn, K., McGorray, S. P., Frueh, B. C., Beharie, N. N., Cottler, L. B., & Khan, M. R. (2018). Childhood traumatic experiences and the association with marijuana and cocaine use in adolescence through adulthood. *Addiction*, 113, 44–56. <https://doi.org/10.1111/add.13921>
- Schilling, E. A., Aseltine Jr., R. H., & Gore, S. (2007). Adverse childhood experiences and mental health in young adults: A longitudinal survey. *BMC Public Health*, 7, 1–10. <https://doi.org/10.1186/1471-2458-7-30>
- Sher, K. (1991). *Children of alcoholics: A critical appraisal of theory and research*. University of Chicago Press.
- Shiri, R., Turunen, J., Kausto, J., Leino-Arjas, P., Varje, P., Väänänen, A., & Ervasti, J. (2022). The effect of employee-oriented flexible work on mental health: A systematic review. *Healthcare*, 10, 883. <https://doi.org/10.3390/healthcare10050883>
- Spencer, M. R., Miniño, A. M., & Warner, M. (2022). Drug overdose deaths in the United States, 2001-2021. *NCHS Data Brief*, No. 457. <https://doi.org/10.15620/cdc:122556>
- Stork, B. R., Akselberg, N. J., Qin, Y., & Miller, D. C. (2020). Adverse childhood experiences(ACEs) and community physicians: What we've learned. *The Permanente Journal*, 24, 19.099. <https://doi.org/10.7812/TPP/19.099>

- Strashny, A. (2016). Age of substance use initiation among treatment admissions aged 18 to 30. *Europe PMC*.
- Strine, T. W., Dube, S. R., Edwards, V. J., Prehn, A. W., Rasmussen, S., Wagenfeld, M., & Croft, J. B. (2012). Associations between adverse childhood experiences, psychological distress, and adult alcohol problems. *American Journal of Health Behavior*, 36, 408–423. <https://doi.org/10.5993/AJHB.36.3.11>
- Substance Abuse and Mental Health Services Administration. (2022). *Key substance use and mental health indicators in the United States: Results from the 2021 National Survey on Drug Use and Health* (No. HHS Publication No. PEP22-07-01-005, NSDUH Series H-57). Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. <https://www.samhsa.gov/data/report/2021-nsduh-annual-national-report>
- Substance Abuse and Mental Health Services Administration (SAMHSA). (2014). *Trauma-informed care in behavioral health services* (No. HHS Publication No. (SMA) 13-4801; Treatment Improvement Protocol (TIP) Series 57). Substance Abuse and Mental Health Services Administration. <https://store.samhsa.gov/sites/default/files/sma14-4816.pdf>
- Swedo, E. A., Aslam, M. V., Dahlberg, L. L., Niolon, P. H., Guinn, A. S., Simon, T. R., & Mercy, J. A. (2023). Prevalence of adverse childhood experiences among U.S. adults – Behavioral Risk Factor Surveillance System, 2011–2020. *Morbidity and Mortality Weekly Report*, 72, 707–715. <https://doi.org/10.15585/mmwr.mm7226a2>
- Swendsen, J., Conway, K. P., Degenhardt, L., Dierker, L., Glantz, M., Jin, R., ... Kessler, R. C. (2009). Socio-demographic risk factors for alcohol and drug dependence: The 10-year follow-up of the national comorbidity survey. *Addiction*, 104, 1346–1355. <https://doi.org/10.1111/j.1360-0443.2009.02622.x>
- Tranter, H., Brooks, M., & Khan, R. (2021). Emotional resilience and event centrality mediate posttraumatic growth following adverse childhood experiences. *Psychological Trauma: Theory, Research, Practice, and Policy*, 13, 165–173. <https://doi.org/10.1037/tra0000953>
- Wekerle, C. (2020). From adverse childhood experiences to wellbeing: Portfolios of resilience. *International Journal of Child and Adolescent Resilience*, 7, 32–38. <https://doi.org/10.7202/1072586ar>
- Whitesell, N. R., Beals, J., Mitchell, C. M., Manson, S. M., Turner, R. J., & AI-SUPERPFP Team. (2009). Childhood exposure to adversity and risk of substance-use disorder in two American Indian populations: The mediational role of early substance-use initiation. *Journal of Studies on Alcohol and Drugs*, 70, 971–981. <https://doi.org/10.15288/jsad.2009.70.971>
- Widom, C. S., Marmorstein, N. R., & White, H. R. (2006). Childhood victimization and illicit drug use in middle adulthood. *Psychology of Addictive Behaviors*, 20, 394–403. <https://doi.org/10.1037/0893-164X.20.4.394>
- Wolitzky-Taylor, K., Bobova, L., Zinbarg, R. E., Mineka, S., & Craske, M. G. (2012). Longitudinal investigation of the impact of anxiety and mood disorders in adolescence on subsequent substance use disorder onset and vice versa. *Addictive Behaviors*, 37, 982–985. <https://doi.org/10.1016/j.addbeh.2012.03.026>
- Zemore, S. E. (2012). The effect of social desirability on reported motivation, substance use severity, and treatment attendance. *Journal of Substance Abuse Treatment*, 42, 400–412. <https://doi.org/10.1016/j.jsat.2011.09.013>

Appendix: Items used for measurement of ACEs

1. **Childhood poverty:** Wave I parent report ($\alpha = .88$)

How often in the past year the parent: (1) Found it a stretch to cover the month's bills; (2) Did not have enough money for unexpected bills; (3) Did not have enough money to buy food

Responses range from 1-never to 5 - very often; coded 1 if responded "often" or "very often" to any item

2. **Parental loss:** Wave I parent report ($\alpha = .69$)

(1) Whether child is living with both parents; (2) Marital status of the reporting parent; (3) Whether the child has seen or communicated with their other biological parent in the last 12 months

Coded 1 if parents are divorced or child has not seen or communicated with a biological parent in the last 12 months

3. **Parental substance use:** Wave I parent report ($\alpha = .65$)

How often in the past year the parent: (1) Used alcohol to get drunk; (2) Used drugs to get high

Responses range from 1 - never to 8 - almost daily; coded 1 if parent used alcohol at least once per week to get drunk or ever used drugs to get high

4. **Parental domestic violence:** Wave V respondent report ($\alpha = .91$)

How often during their childhood did the respondent's parents: (1) Throw something at each other; (2) Push, shove, or grab each other; (3) Slap each other in the face or head; (4) Hit each other

Responses range from 1 - never to 5 - very often; coded 1 if respondents reported their parent sometimes, often, or very often engaged in these behaviors during their childhood

5. **Parental imprisonment:** Wave I parent report

If one of the child's parents was ever sent to prison

Coded 1 if parent reports yes

6. **Childhood emotional abuse:** Wave I respondent report ($\alpha = .83$)

How often parents: (1) Call you names or insult you; (2) Put you down in front of other people

Responses range from 1 - never to 5 - very often; coded 1 if reports sometimes, often, or very often

7. **Childhood physical abuse:** Wave I parent and respondent report

How often (1) the parent reports they have pushed, slapped, or hit their child; (2) the child reports their parent has pushed, grabbed, slapped, or hit them

Responses range 1 - never to 6 - two or more times per week; coded 1 if either the parent or child reports any physical abuse

8. **Lack of parental affection:** Wave I respondent report ($\alpha = .69$)

Respondent's level of agreement with: (1) My parents give me the right amount of affection; (2) My parents seem to wish I were a different type of person; (3) I feel close to my parents

Responses range from 1 - strongly disagree to 5 - strongly agree; coded 1 if the respondent disagrees or strongly disagrees with items 1 and 3, or agrees or strongly agrees with item 2

9. **Unwanted childhood sex:** Wave I respondent report

Asks the respondent if they have ever had sexual intercourse when they did not want to

Coded 1 if the respondent reports yes