



## THE ASSOCIATION BETWEEN MATERNAL ADVERSE CHILDHOOD EXPERIENCES AND SUBSTANCES ABUSE: A SYSTEMATIC REVIEW

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### ABSTRACT

An increasing number of studies are identifying associations between adverse childhood experiences (ACEs) and substances abuse. We aimed to review the association between multiple types of ACE with different kind of substance abuse among pregnant women. This research aims to determine the relationship between mother children's problems experiences and substance use. Method: We looked through the databases at ProQuest, PubMed, and Science Direct databases were utilized by the authors to do an extensive and methodical search of the English-language literature for studies on adverse childhood events that were published until January 31, 2024. The search phrases used are "adverse childhood experiences", "maternal", and "substances abuse". Results: Most of the article were cohort studies conducted in the USA. All studies assessed ACEs retrospectively. The main conclusions of the studies were that there is a positive association between ACEs with the development and severity of substance use disorder among pregnant women. Conclusions: We found that adverse childhood experiences exposure can result in different kind of substances abuse among pregnant women compared with those without adverse childhood experiences.

Keywords: adverse childhood experiences; maternal; pregnant women; substance abuse

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## INTRODUCTION

According to estimates from throughout the world, 1 billion youngsters between the ages of 2 and 17 experienced violence in the previous year (Hillis et al., 2016). Consequently, ending all forms of violence against children is one of the UN Sustainable Development Goals (16.2). Furthermore, health ministers from WHO member states have pledged to support an international plan of action that will enhance the health system's participation in a national multisectoral response to combat interpersonal violence, particularly that which targets women, girls, and children (WHO, 2016) A vast array of possibly upsetting events that take place during childhood are referred to as adverse childhood experiences (ACEs), also known as childhood adversity. Ten categories covering abuse, neglect, and home problems are included in the most popular ACE scales, sometimes known as the conventional ACEs (Anda et al., 1999; Felitti et al., 1998). A supplementary collection of enlarged ACEs has been incorporated to assess stressors at the community level, like bullying in the school or neighborhood and dangerous neighborhoods. Additionally, it has been observed that a number of novel ACE indicators, such as somatic disease or family member death, are common and should be taken into account in studies pertaining to ACEs (Björkenstam et al., 2017; Cronholm et al., 2015; Rod et al., 2020).

ACEs have been associated with a higher risk of multimorbidity, which can have long-term effects on one's physical and mental health (Antoniou et al., 2023). Multiple types of ACEs can have additive or multiplicative impacts on health-harming behaviors or conditions, significantly increasing the risks for persons who experience them (Hughes et al., 2017). The role of ACEs has been shown by research on the development of substance use disorders (Afifi et al., 2020; Dube et al., 2003, 2006; Leza et al., 2021). According to the ACE study, teenagers who had gone through four or more ACEs were four to twelve times more likely to have issues with alcohol or drug usage (Felitti et al., 1998). They also discovered that for every ACE experienced, there was a 2-to 4-fold increased chance that someone would start using illegal drugs (Dube et al., 2003).

Previous systematic review and meta-analysis study by Leza et al. recently examined twelve retrospective studies that evaluated the relationship between ACEs and substance use disorders and were carried out between 2016 and 2020. Compared to the general population, they discovered that individuals with substance use disorders had a higher prevalence of ACEs. A systematic review on the association between maternal ACEs and substance abuse is crucial for filling a gap in existing literature. While prior reviews exist, none specifically focus on pregnant women. Understanding this link is vital for targeted interventions, improving maternal and child health outcomes, and informing public health policies. Our study's primary goal was to review some observational study to investigate the relationship between ACEs and substance use disorders in relation to the population of pregnant women. This research aims to determine the relationship between mother children's problems experiences and substance use.

## **METHOD**

This systematic review's search approach is summed up in a panel guided by The Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA). The ProQuest, PubMed, and Science Direct databases were utilized by the authors to do an extensive and methodical search of the English-language literature for studies on adverse childhood events that were published until January 31, 2024. The search phrases used are “adverse childhood experiences”, “maternal”, and “substances abuse”. Studies were imported into Mendeley and screened after duplicates were removed. Based on inclusion and exclusion criteria, the author screened each paper at the title, abstract, and full text levels. If one article was left out, the explanation was recorded. We looked through the reference lists of the included studies to find any possibly relevant research, and if any were found, we added them for screening.

Studies were included in the final analysis if they met the following criteria: 1) the study used an observational or experimental design; 2) the exposure was ACE, including the number (eg, one ACE, two ACEs) or types (eg, physical abuse, sexual abuse, neglect) of ACEs; 3) the outcome was substance abuse (ie, alcohol, tobacco, or any kinds of illicit drugs eg, opioid, marijuana, cannabinoids, and etc); 4) results of analysis are provided clearly. Research were eliminated if they lacked appropriate data, could not be contacted the corresponding authors, were conducted on animals, reviews, case reports, in vitro research, or other non-original studies. Information on the study design, setting, sample size, exposure, outcome, analytical method, and study results were gathered from each investigation. The Newcastle-Ottawa Scale (NOS) was used to assess the quality of studies. The eight NOS factors were used to separate the quality criterion into three groups: comparison of groups, choice of research groups, and outcome determination. The lowest possible score was zero, and the maximum score was one point for all items-with the exception of comparability, which was permitted

two points. In NOS, there was a score range of 0-9. Greater scores were indicative of a higher caliber of study design.

## RESULTS

### Study Selection

The search resulted in 2311 studies. After removal of duplicates, 1173 studies were screened with 1149 excluded at the title or abstract level and 11 excluded at the full-text level due to not examining the association between ACEs and substances abuse (n=10) and review study (n=1). This left 13 total articles included in this review (Chung et al., 2010; Currie & Tough, 2021; Duka et al., 2023; Foti et al., 2023; Frankenberger et al., 2015; Hemady et al., 2022; Jacobs, Benjamin; Ganson, Kyle; Jackson, Dylan; Nagata, Jason; Testa, Alexander; Zhang, 2023; Jasthi et al., 2022; Leeners et al., 2014; Racine et al., 2021, 2020; Testa et al., 2022; Thomas et al., 2023)(figure 1).

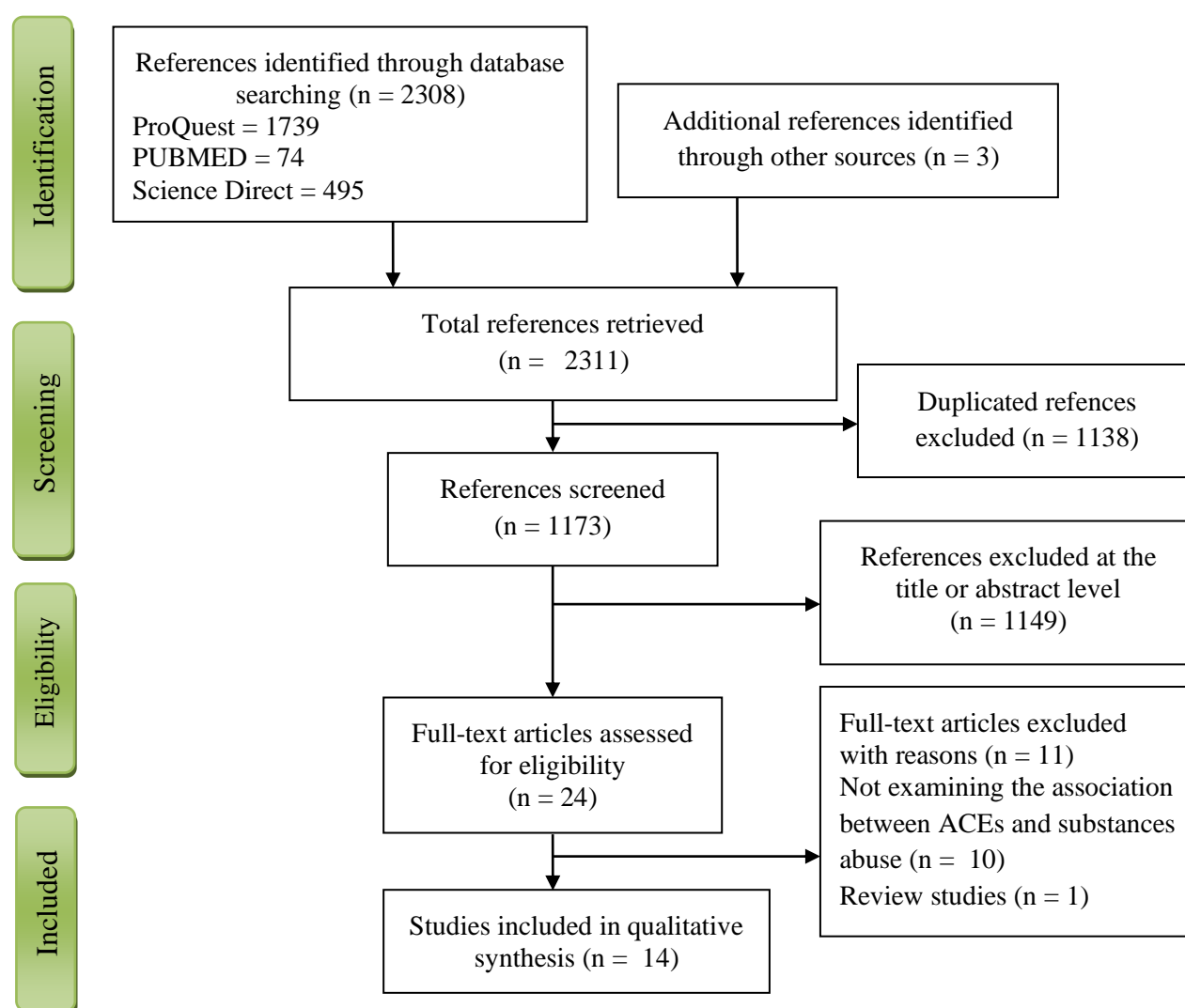


Figure1. PRISMA flow diagram for systematic reviews

### Summary of Study Characteristics

Characteristics and results of individual studies are presented in Table 2. 8 of 13 primary study are retrospective cohort(Chung et al., 2010; Currie & Tough, 2021; Duka et al., 2023; Hemady et al., 2022; Jasthi et al., 2022; Leeners et al., 2014; Racine et al., 2020, 2021) and 5

are cross-sectionals (Foti et al., 2023; Frankenberger et al., 2015; Freimann et al., 2013; Testa et al., 2022; Thomas et al., 2023). Although the search was not limited by year, all of 13 studies were published since 2010. 7 studies were based in the USA; 4 were based in Canada, one in German, one in Kenya, and one from joined countries of Kingston, Jamaica, Cluj-Napoca, Romania, Koforidua, Ghana, Worcester, South Africa, Tarlai Kalan, Pakistan, Ragama, Sri Lanka, Hue, Vietnam, and Philippines. Sample size ranged from 98 to 5339. Sample characteristic are mostly the same because they include only pregnant women.

Assessment of ACEs and substances addiction varied across studies. Many considered lists of seven or more ACEs, which were then analyzed in one or more ways including individually yes or no (Jacobs, Benjamin; Ganson, Kyle; Jackson, Dylan; Nagata, Jason; Testa, Alexander; Zhang, 2023; Racine et al., 2021) categorized at 0 versus any,  $\geq 2$ ,  $\geq 3$ ,  $\geq 4$  and or or  $\geq 6$  (Chung et al., 2010; Duka et al., 2023; Frankenberger et al., 2015; Racine et al., 2021; Testa et al., 2022; Thomas et al., 2023), other studies focused on significant ACEs (physical, sexual, and or emotional abuse, neglect, and household dysfunction) (Goodman et al., 2017; Hemady et al., 2022; Leeners et al., 2014; Racine et al., 2020), and the rest mention categorized and significant ACEs (Currie & Tough, 2021; Foti et al., 2023; Jasthi et al., 2022). With respect to a kind of substance abused, 5 of the 13 studies reported cases of alcoholism (Chung et al., 2010; Foti et al., 2023; Frankenberger et al., 2015; Goodman et al., 2017; Hemady et al., 2022; Racine et al., 2020), 6 of studies are about tobacco use or smoking (Chung et al., 2010; Duka et al., 2023; Hemady et al., 2022; Jasthi et al., 2022; Leeners et al., 2014; Racine et al., 2020). 6 studies reported unspecified illicit drugs of any kind (Chung et al., 2010; Currie & Tough, 2021; Duka et al., 2023; Foti et al., 2023; Hemady et al., 2022; Leeners et al., 2014; Racine et al., 2020, 2021), and 6 were mention a specific kind of drugs including cannabinoids, heroin, methamphetamine, opioid, and marijuana (Duka et al., 2023; Foti et al., 2023; Jacobs, Benjamin; Ganson, Kyle; Jackson, Dylan; Nagata, Jason; Testa, Alexander; Zhang, 2023; Jasthi et al., 2022; Testa et al., 2022; Thomas et al., 2023).

Most of the studies are reported more than one kinds of substances abused, and only 4 studies mention one specific kind of substance abused (Frankenberger et al., 2015; Jacobs, Benjamin; Ganson, Kyle; Jackson, Dylan; Nagata, Jason; Testa, Alexander; Zhang, 2023; Testa et al., 2022; Thomas et al., 2023). Studies also varied in method of ACEs report. Most assessed ACEs and substance abused via surveys or self report, others used secondary data analysis, or a combination of surveys (self report), laboratory analysis, and medical records. Most of the cohort studies assessed ACEs and substance addiction throughout the study, while two cohort studies do not mention a period of follow up (Jasthi et al., 2022; Racine et al., 2021).

### **Risk of Bias**

Results of risk of bias assessment by study design are presented in Table 1. Regarding selection of the study, all studies included individuals who were representative or somewhat representative of the population of interest (defined as pregnant women who have experienced ACEs and substance abused). Most studies used structured interviews to assess ACE exposure (Chung et al., 2010; Currie & Tough, 2021; Duka et al., 2023; Goodman et al., 2017; Hemady et al., 2022; Jasthi et al., 2022; Leeners et al., 2014; Racine et al., 2021). All studies evaluated the baseline outcome (substance abuse). In terms of comparability, practically all research made sure that critical variables like age, gender, race/ethnicity, and socioeconomic indicators were factored into account when doing analyses. While several retrospective studies lost significant percentages of their sample to follow-up, all had sufficient follow-up periods (defined as  $\geq 6$  months) to show changes in adiposity. When taken

as a whole, study quality was deemed to be moderate, with the highest potential for bias arising from either the ACE assessment—which was frequently determined by looking back at youth—or sample attrition in retrospective research.

### Study Synthesis

Collectively, majority of studies found that ACEs were associated with substance abuse in term of any kind of drugs. However, findings were not completely consistent within or across studies. Differences existed by type of ACE, ACE measurement, and type of drugs. For example, studies found insignificant association between  $\geq 4$  ACEs with heroin and methamphetamine (Duka et al., 2023) and Childhood sexual abuse (CSA) and any drugs (Leeners et al., 2014). In term of smoking or tobacco use, only one study found insignificant relationship between ACEs (physical abuse of mother, substance abuse in family members, mentally handicapped family members, family members with risk for suicide, family members in prison or CSA) with tobacco use (Leeners et al., 2014). Finally, in term of alcohol most of studies also found that ACEs were associated with substance abuse. Except in one study by Foti et al., (2023) in term of emotional abuse and physical abuse (Foti et al., 2023).

Table 1.  
Risk of bias assessment (Newcastle–Ottawa Quality Assessment Scale criteria)

Study	Selection			Demonstration that outcome of interest was not present at start of study	Comparability of study on the basis of the design or analysis	Outcome		
	Representativeness of the exposed study	Selection of the non exposed study	Ascertainment of exposure			Assessment of outcome	Was follow-up long enough for outcomes to occur	Adequacy of follow up of study
Chung et al., (2010)	1	1	1	1	1	1	1	1
Currie and Though (2021)	1	1	1	1	1	1	1	1
Duka et al., (2023)	1	1	1	1	1	1	1	1
Goodman et al., (2017)	1	1	1	1	1	1	-	-
Foti et al., (2023)	1	1	1	1	1	1	-	-
Frankenberger, Clements-Nolle, Yang (2015)	1	1	1	1	1	1	-	-
Hemady et al., (2022)	1	1	1	1	1	1	1	1
Jacob et al., (2023)	1	1	1	1	1	1	-	-
Jasthi et al., (2022)	1	1	1	1	1	1	0	0
Leeners et al., (2014)	1	1	1	1	1	1	1	1
Racine et al., (2021)	1	1	1	1	1	1	1	1
Racine et al., (2020)	1	1	1	1	1	1	1	1
Testa et al., (2022)	1	1	1	1	1	1	-	-
Thomas et al., (2023)	1	1	1	1	1	1	-	-

Table 2.  
Study Characteristics and Results

Author (Year)	Study Location	Study Design	Sample (n)	Exposure	Outcome	Analytic Method and Results	ACEs reports	Duration of follow up
Chung et al., (2010)	Canada	Cohort	1,476	1 ACE	Illicit drugs	Adjusted Odd Ratio (aOR)= 1.88 (0.85-4.14)	Surveys. The first survey was administered to women at their first prenatal care visit (mean gestational age ± standard deviation = 13.8 ± 6.3 weeks), and the second and the third were respectively conducted at 3 ± 1 months and 11 ± 1 months postpartum in their homes.	2000-2002
				2 ACEs				
				≥ 3 ACEs	Smoking	aOR= 3.57 (1.67-7.65)		
				1 ACE		aOR= 6.08 (2.95-12.53)		
				2 ACEs		aOR= 1.37 (0.93-2.01)		
				≥ 3 ACEs	Alcohol	aOR= 1.77 (1.18-2.65)		
				1 ACE		aOR= 2.60 (1.77-3.83)		
2 ACEs	aOR= 1.32 (0.67-2.64)							
≥ 3 ACEs		aOR= 2.55 (1.31-4.97)						
		aOR= 3.67 (1.95-6.91)						
Currie and Though (2021)	Canada	Cohort	1,660	2-3 ACEs ≥ 4 ACEs 1 form of child abuse 2-3 forms of child abuse 1 form of household dysfunction 2-3 forms of household dysfunction	Illicit drugs	aOR= 3.0 (1.5-6.1) aOR= 3.7 (1.7-8.0) aOR= 2.3 (1.1-4.7) aOR= 2.8 (1.3-5.7) aOR= 1.5 (0.7-3.2) aOR= 2.2 (1.1-4.4)	Surveys. The first time point used in this analysis was collected at < 25 weeks gestation. The second timepoint was collected at 34–36 weeks gestation. Data for the third time point were collected 3 years after birth .	36 months
Duka et al., (2023)	USA	Cohort	218	≥ 4 ACEs	Any kind of substance Cannabinoids Heroin Methamphetamine Tobacco	aOR= 1.55 (0.72-3.35) aOR= 3.73 (2.02-6.90) aOR= 0.95 (0.49-1.83) aOR= 1.03 (0.54-1.97) aOR= 0.89 (1.02-3.38)	Surveys and laboratory testing.	September 7, 2017, and November 30, 2020

Goodman et al., (2017)	Kenya	Cross-sectionals	1,976	Physical abuse Emotional neglect Emotional abuse	Alcohol	OR = 2.04 (1-4.22) OR = 3.15 (1.47-6.91) IRR = 2.34 (1.14-4.79)	Surveys.	-
Foti et al., (2023)	USA	Cross-sectionals	1,164	1-2 ACE ≥ 3 ACEs Loss of parent Emotional abuse Physical abuse Sexual abuse 1-2 ACE ≥ 3 ACEs Loss of parent Emotional abuse Physical abuse Sexual abuse 1-2 ACE ≥ 3 ACEs Loss of parent Emotional abuse Physical abuse Sexual abuse	Alcohol    Cannabis    Any Substance	aOR= 1.43 (0.93-2.21) aOR= 1.13 (0.64-2.01) aOR= 1.49 (0.97-2.28) aOR= 1.04 (0.61-1.76) aOR= 0.98 (0.43-2.24) aOR=1.81 (0.96-3.39) aOR= 1.28 (0.73-2.25) aOR= 1.90 (1.03-3.51) aOR= 0.88 (0.51-1.52) aOR= 1.93 (1.09-3.43) aOR= 1.27 (0.49-3.26) aOR= 2.74 (1.40-5.36) aOR= 1.44 (1.00-2.07) aOR= 1.72 (1.12-2.65) aOR= 1.29 (0.90-1.84) aOR= 1.62 (1.08-2.42) aOR= 1.51 (0.82-2.79) aOR= 2.60 (1.56-4.34)	Secondary data analysis from Kaiser Permanente Northern California pilot study. The survey was administered at second or third prenatal visit (typically between 14–23 weeks gestation).	-
Frankenberger, Clements-Nolle, Yang (2015)	USA	Cross-sectionals	1,987	1 ACE 2-3 ACEs ≥ 4 ACEs	Alcohol	aOR= 2.92 (1.08-7.87) aOR= 3.52 (1.46-8.48) aOR= 4.79 (2.14-10.72)	Secondary data analysis from Nevada’s 2010 Behavioral Risk Factor Surveillance System	-
Hemady et al., (2022)	Kingston, Jamaica, Cluj-Napoca, Romania, Koforidua, Ghana, Worchest	Cohort	1,189	Highly maltreated children  Emotionally and physically abused	Alcohol Tobacco Other drug Alcohol Tobacco Other drug Alcohol	Pairwise comparisons between classes indicate higher probabilities of prenatal drug use in the highly maltreated and emotionally abused	Surveys. Measurements were carried out between 29–40 weeks of gestation (Wave 1), with a	6 months

	er, South Africa, Tarlai Kalan, Pakistan, Ragama, Sri Lanka, Hue, Vietnam, and Philippines.			children with intra-familial violence exposure Emotionally abused children	Tobacco Other drug Alcohol Tobacco Other drug	classes compared with the low household dysfunction and abuse class	follow-up when the offspring was between two to six months (Wave 2).	
Jacob et al., (2023)	USA	Cross-sectionals	2,999	ACE	Opioid	aOR= 2.437 (1.319-4.503)	Secondary data analysis from Pregnancy Risk Assessment Monitoring System	-
Jasthi et al., (2022)	USA	Cohort	98	≥ 4 ACEs ≥ 6 ACEs Abuse Neglect Family dysfunction	Tobacco Marijuana	aOR= 2.4 (0.8-7.2) aOR= 2.3 (0.7-7.4) aOR= 4.7 (1.3-17.6) aOR= 1.5 (0.4-5.1) aOR= 2.1 (0.4-11.1) aOR= 1.3 (0.4-4.0)	Surveys and mental health record.	Not mention.
Leeners et al., (2014)	German	Cohort	255	Childhood sexual abuse (CSA) Physical abuse Physical abuse of mother, substance abuse in family members, mentally handicapped family members, family members with risk for suicide, family members in prison Childhood sexual abuse	Smoking Any drug	aOR= 1.1 (0.929-1.255) aOR= 1.2 (1.025-1.409) aOR= 1.0 (0.926-1.164) aOR= 1.0 (0.892-1.055) aOR= 1.2 (1.069-1.278) aOR= 1.1 (0.995-1.130)	Surveys.	Early time of pregnancy until delivery.



				(CSA) Physical abuse Physical abuse of mother, substance abuse in family members, mentally handicapped family members, family members with risk for suicide, family members in prison				
Racine et al., (2021)	Canada	Cohort	1,994	ACE	Any kind substance	$\beta = 0.22 (0.15-0.29)$	Surveys	Not mention.
Racine et al., (2020)	Canada	Cohort	1,994	Family violence Sexual abuse Household dysfunction	Any alcohol Any drug Smoking	aOR= 2.13 (1.65-2.73) aOR= 1.39 (0.94-2.07) aOR= 6.92 (3.59-13.37)	Secondary data analysis from the All Our Families (AOF) Study, conducted in Calgary, Alberta, Canada. Enrolled prior to 25 weeks of pregnancy, and provided a report of their adverse childhood experiences when their child was 36 months of age.	36 months.
Testa et al., (2022)	USA	Cross-sectionals	5,339	2 ACEs 3 ACEs $\geq 4$ ACEs	Marijuana	b =0.023 (0.003-043) b =0.042 (0.014-069) b =0.053 (0.035-071)	Secondary data analysis from North Dakota and South Dakota Pregnancy Risk Assessment Monitoring System (PRAMS) from years	-

Thomas et al., (2023)	USA	Cross-sectionals	2,483	1 ACE 3 ACEs ≥ 4 ACEs	Marijuana	Adjusted prevalence ratio[aPR] = 1.96 (1.30-2.94) aPR = 3.58 (2.69-4.77) aPR = 3.67 (2.36-5.72)	2017-2019. Secondary data analysis from North Dakota and South Dakota Pregnancy Risk Assessment Monitoring System (PRAMS) from years 2017-2019.	-
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## DISCUSSION

This systematic review aimed to investigate the effects and associations of different types of ACEs on alcohol, smoking, and drug use among pregnant women. The majority of the included studies were of acceptable or exceptional quality, despite difference in the measurement instruments. In summary, the findings showed a strong correlation between pregnant women who were exposed to ACEs before the age of 18 and their later use of alcohol, tobacco, or other illegal drugs. Child abuse, household dysfunction, sexual abuse, loss of parent, emotional abuse, highly maltreated children, emotionally and physically abused children with intra-familial violence exposure, and physical abuse were all found to be significant predictors of substance misuse in retrospective cohort studies. Fortunately the majority of cross-sectional studies' findings supported the results of retrospective cohort studies, indicating that numerous ACEs had a lasting effect. Polyvictimization during childhood is likely to result in higher substance use during adulthood. This results is supported by the results of study by Lee et al., (2023) that the majority of trauma exposure types were linked to the severity of drug abuse, whereas the severity of alcohol abuse was linked to interpersonal stress and dissociative symptoms, even after accounting for a range of demographic and health factors and general psychopathology (K. Lee et al., 2023)

The degree of psychological distress was correlated with the quantity of ACEs (Bruskas & Tessin, 2013). Addict mothers are more likely to engage in dysfunctional parenting techniques and to have personally faced difficulty in their youth (Håkansson et al., 2018). The phase of self-reorganization that comes with becoming a parent is said to bring back memories and experiences from childhood (Fraiberg et al., 1975; Lieberman et al., 2011). The development of proper emotion management abilities and interpersonal skills required for parenting may be hampered by repeated adversities, which could make the child's cues and demands potentially too much for the parent to handle (Burns et al., 2010; Cicchetti & Rogosch, 2009). Numerous undesirable consequences resulted from the substance-abusing mother. Lee et al., (2021) stated that having several ( $\geq 3$ ) ACEs, being a woman, and using methamphetamine were found to be connected with an increased risk of suicide attempt (W.-C. Lee et al., 2021). Some of the factors that are linked to mothers who use drugs losing custody of their kids are: psychological factors (mental health co-morbidity, early age of first child, low socioeconomic status); patterns of substance use (injecting drugs, using cocaine during pregnancy); and formal and informal support (not receiving treatment for substance use, fewer prenatal care visits, lack of social support) (Canfield et al., 2017). Study by Mardigan et al., (2016) reported that the results of multiple linear regression studies showed a correlation between mother ACEs and higher levels of marital conflict (Madigan et al., 2016). Examining individual ACEs showed slightly different trends since not all negative events

were highly correlated with substance use. This discrepancy could be the result of unique child characteristics that influence how stressful it is to watch dysfunctional families. To verify this premise, nevertheless, more investigation is required.

## **CONCLUSION**

Our research revealed that pregnant women with a history of ACEs exhibit diverse patterns of substance abuse, distinct from those without such experiences. The intricate interplay between ACEs and substance abuse underscores the need for a nuanced examination, shedding light on specific substances involved and enabling tailored interventions to address the complex dynamics impacting the health of both mothers and their unborn children.

## **REFERENCES**

- Afifi, T. O., Taillieu, T., Salmon, S., Davila, I. G., Stewart-Tufescu, A., Fortier, J., Struck, S., Asmundson, G. J. G., Sareen, J., & MacMillan, H. L. (2020). Adverse childhood experiences (ACEs), peer victimization, and substance use among adolescents. *Child Abuse & Neglect*, 106, 104504. <https://doi.org/10.1016/j.chiabu.2020.104504>
- Anda, R. F., Croft, J. B., Felitti, V. J., Nordenberg, D., Giles, W. H., Williamson, D. F., & Giovino, G. A. (1999). Adverse childhood experiences and smoking during adolescence and adulthood. *JAMA*, 282(17), 1652–1658. <https://doi.org/10.1001/jama.282.17.1652>
- Antoniou, G., Lambourg, E., Steele, J. D., & Colvin, L. A. (2023). The effect of adverse childhood experiences on chronic pain and major depression in adulthood: a systematic review and meta-analysis. *British Journal of Anaesthesia*, 130(6), 729–746. <https://doi.org/10.1016/j.bja.2023.03.008>
- Björkenstam, C., Kosidou, K., & Björkenstam, E. (2017). Childhood adversity and risk of suicide: cohort study of 548 721 adolescents and young adults in Sweden. *BMJ (Clinical Research Ed.)*, 357, j1334. <https://doi.org/10.1136/bmj.j1334>
- Bruskas, D., & Tessin, D. H. (2013). Adverse childhood experiences and psychosocial well-being of women who were in foster care as children. *The Permanente Journal*, 17(3), e131-41. <https://doi.org/10.7812/TPP/12-121>
- Burns, E., Jackson, J., & Harding, H. (2010). Child Maltreatment, Emotion Regulation, and Posttraumatic Stress: The Impact of Emotional Abuse. *Journal of Aggression Maltreatment & Trauma*, 19, 801–819. <https://doi.org/10.1080/10926771.2010.522947>
- Canfield, M., Radcliffe, P., Marlow, S., Boreham, M., & Gilchrist, G. (2017). Maternal substance use and child protection: a rapid evidence assessment of factors associated with loss of child care. *Child Abuse & Neglect*, 70, 11–27. <https://doi.org/10.1016/j.chiabu.2017.05.005>
- Chung, E. K., Nurmohamed, L., Mathew, L., Elo, I. T., Coyne, J. C., & Culhane, J. F. (2010). Risky health behaviors among mothers-to-be: the impact of adverse childhood experiences. *Academic Pediatrics*, 10(4), 245–251. <https://doi.org/10.1016/j.acap.2010.04.003>
- Cicchetti, D., & Rogosch, F. A. (2009). Adaptive coping under conditions of extreme stress: Multilevel influences on the determinants of resilience in maltreated children. *New Directions for Child and Adolescent Development*, 2009(124), 47–59. <https://doi.org/10.1002/cd.242>

- Cronholm, P. F., Forke, C. M., Wade, R., Bair-Merritt, M. H., Davis, M., Harkins-Schwarz, M., Pachter, L. M., & Fein, J. A. (2015). Adverse Childhood Experiences: Expanding the Concept of Adversity. *American Journal of Preventive Medicine*, 49(3), 354–361. <https://doi.org/10.1016/j.amepre.2015.02.001>
- Currie, C. L., & Tough, S. C. (2021). Adverse childhood experiences are associated with illicit drug use among pregnant women with middle to high socioeconomic status: findings from the All Our Families Cohort. *BMC Pregnancy and Childbirth*, 21(1), 133. <https://doi.org/10.1186/s12884-021-03591-1>
- Dube, S. R., Felitti, V. J., Dong, M., Chapman, D. P., Giles, W. H., & Anda, R. F. (2003). Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: the adverse childhood experiences study. *Pediatrics*, 111(3), 564–572. <https://doi.org/10.1542/peds.111.3.564>
- Dube, S. R., Miller, J. W., Brown, D. W., Giles, W. H., Felitti, V. J., Dong, M., & Anda, R. F. (2006). Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. *The Journal of Adolescent Health : Official Publication of the Society for Adolescent Medicine*, 38(4), 444.e1-10. <https://doi.org/10.1016/j.jadohealth.2005.06.006>
- Duka, S., Rahman, S., Hansen, S. E., & Esernio-Jenssen, D. (2023). The Effect of Maternal Adverse Childhood Experiences (ACEs) on Substance Use During Pregnancy. *Maternal and Child Health Journal*, 27(Suppl 1), 153–165. <https://doi.org/10.1007/s10995-023-03768-4>
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, 14(4), 245–258. [https://doi.org/10.1016/s0749-3797\(98\)00017-8](https://doi.org/10.1016/s0749-3797(98)00017-8)
- Foti, T. R., Watson, C., Adams, S. R., Rios, N., Staunton, M., Wei, J., Sterling, S. A., Ridout, K. K., & Young-Wolff, K. C. (2023). Associations between Adverse Childhood Experiences (ACEs) and Prenatal Mental Health and Substance Use. *International Journal of Environmental Research and Public Health*, 20(13). <https://doi.org/10.3390/ijerph20136289>
- Fraiberg, S., Adelson, E., & Shapiro, V. (1975). Ghosts in the Nursery: A Psychoanalytic Approach to the Problems of Impaired Infant-Mother Relationships. *Journal of the American Academy of Child Psychiatry*, 14(3), 387–421. [https://doi.org/https://doi.org/10.1016/S0002-7138\(09\)61442-4](https://doi.org/https://doi.org/10.1016/S0002-7138(09)61442-4)
- Frankenberger, D. J., Clements-Nolle, K., & Yang, W. (2015). The Association between Adverse Childhood Experiences and Alcohol Use during Pregnancy in a Representative Sample of Adult Women. *Women's Health Issues : Official Publication of the Jacobs Institute of Women's Health*, 25(6), 688–695. <https://doi.org/10.1016/j.whi.2015.06.007>
- Freimann, T., Coggon, D., Merisalu, E., Animägi, L., & Pääsuke, M. (2013). Risk factors for musculoskeletal pain amongst nurses in Estonia: a cross-sectional study. *BMC Musculoskeletal Disorders*, 14, 334. <https://doi.org/10.1186/1471-2474-14-334>

- Goodman, M. L., Grouls, A., Chen, C. X., Keiser, P. H., & Gitari, S. (2017). Adverse Childhood Experiences Predict Alcohol Consumption Patterns Among Kenyan Mothers. *Substance Use & Misuse*, 52(5), 632–638. <https://doi.org/10.1080/10826084.2016.1245748>
- Håkansson, U., Watten, R., Söderström, K., Skårderud, F., & Øie, M. G. (2018). Adverse and adaptive childhood experiences are associated with parental reflective functioning in mothers with substance use disorder. *Child Abuse & Neglect*, 81, 259–273. <https://doi.org/10.1016/j.chiabu.2018.05.007>
- Hemady, C. L., Speyer, L. G., Murray, A. L., Brown, R. H., Meinck, F., Fry, D., Do, H., Sikander, S., Madrid, B., Fernando, A., Walker, S., Dunne, M., Foley, S., Hughes, C., Osafo, J., Baban, A., Taut, D., Ward, C. L., Van Thang, V., ... Eisner, M. (2022). Patterns of adverse childhood experiences and associations with prenatal substance use and poor infant outcomes in a multi-country cohort of mothers: a latent class analysis. *BMC Pregnancy and Childbirth*, 22(1), 505. <https://doi.org/10.1186/s12884-022-04839-0>
- Hillis, S., Mercy, J., Amobi, A., & Kress, H. (2016). Global Prevalence of Past-year Violence Against Children: A Systematic Review and Minimum Estimates. *Pediatrics*, 137(3), e20154079. <https://doi.org/10.1542/peds.2015-4079>
- Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., Jones, L., & Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: a systematic review and meta-analysis. *The Lancet. Public Health*, 2(8), e356–e366. [https://doi.org/10.1016/S2468-2667\(17\)30118-4](https://doi.org/10.1016/S2468-2667(17)30118-4)
- Jacobs, Benjamin; Ganson, Kyle; Jackson, Dylan; Nagata, Jason; Testa, Alexander; Zhang, L. (2023). Maternal Adverse Childhood Experiences (ACEs) Increase Opioid Use During Pregnancy. *Obstetrics & Gynecology*, 141(178S-78S). <https://doi.org/https://doi.org/10.1097/01.AOG.0000930924.62657.65>
- Jasthi, D. L., Nagle-Yang, S., Frank, S., Masotya, M., & Huth-Bocks, A. (2022). Associations Between Adverse Childhood Experiences and Prenatal Mental Health and Substance Use Among Urban, Low-Income Women. *Community Mental Health Journal*, 58(3), 595–605. <https://doi.org/10.1007/s10597-021-00862-1>
- Lee, K., Lam, S. K. K., Hung, S. L., & Fung, H. W. (2023). Substance abuse among mothers in Taiwan: Investigating its prevalence and testing the trauma model. *Asian Journal of Psychiatry*, 90, 103805. <https://doi.org/10.1016/j.ajp.2023.103805>
- Lee, W.-C., Fang, S.-C., Chen, Y.-Y., Liu, H.-C., Huang, M.-C., & McKetin, R. (2021). Exploring the mediating role of methamphetamine use in the relationship between adverse childhood experiences and attempted suicide. *Addictive Behaviors*, 123, 107060. <https://doi.org/10.1016/j.addbeh.2021.107060>
- Leeners, B., Rath, W., Block, E., Görres, G., & Tschudin, S. (2014). Risk factors for unfavorable pregnancy outcome in women with adverse childhood experiences. *Journal of Perinatal Medicine*, 42(2), 171–178. <https://doi.org/10.1515/jpm-2013-0003>
- 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>

- Lieberman, A. F., Chu, A., Van Horn, P., & Harris, W. W. (2011). Trauma in early childhood: empirical evidence and clinical implications. *Development and Psychopathology*, 23(2), 397–410. <https://doi.org/10.1017/S0954579411000137>
- Madigan, S., Wade, M., Plamondon, A., & Jenkins, J. M. (2016). Neighborhood Collective Efficacy Moderates the Association between Maternal Adverse Childhood Experiences and Marital Conflict. *American Journal of Community Psychology*, 57(3–4), 437–447. <https://doi.org/10.1002/ajcp.12053>
- Racine, N., McDonald, S., Chaput, K., Tough, S., & Madigan, S. (2020). Maternal substance use in pregnancy: Differential prediction by childhood adversity subtypes. *Preventive Medicine*, 141(May), 106303. <https://doi.org/10.1016/j.ypmed.2020.106303>
- Racine, N., McDonald, S., Chaput, K., Tough, S., & Madigan, S. (2021). Pathways from Maternal Adverse Childhood Experiences to Substance Use in Pregnancy: Findings from the All Our Families Cohort. *Journal of Women's Health* (2002), 30(12), 1795–1803. <https://doi.org/10.1089/jwh.2020.8632>
- Rod, N. H., Bengtsson, J., Budtz-Jørgensen, E., Clipet-Jensen, C., Taylor-Robinson, D., Andersen, A.-M. N., Dich, N., & Rieckmann, A. (2020). Trajectories of childhood adversity and mortality in early adulthood: a population-based cohort study. *Lancet* (London, England), 396(10249), 489–497. [https://doi.org/10.1016/S0140-6736\(20\)30621-8](https://doi.org/10.1016/S0140-6736(20)30621-8)
- Testa, A., Jackson, D. B., Boccio, C., Ganson, K. T., & Nagata, J. M. (2022). Adverse childhood experiences and marijuana use during pregnancy: Findings from the North Dakota and South Dakota PRAMS, 2017-2019. *Drug and Alcohol Dependence*, 230, 109197. <https://doi.org/10.1016/j.drugalcdep.2021.109197>
- Thomas, S. A., Clements-Nolle, K. D., Wagner, K. D., Omaye, S., Lu, M., & Yang, W. (2023). Adverse childhood experiences, antenatal stressful life events, and marijuana use during pregnancy: A population-based study. *Preventive Medicine*, 174, 107656. <https://doi.org/10.1016/j.ypmed.2023.107656>
- WHO. (2016). WHO Global plan of action to strengthen the role of the health system within a national multisectoral response to address interpersonal violence, in particular against women and girls, and against children.