12-18-2020

Association Between Adverse Childhood Experiences and Borderline Personality Disorder: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)-III

Elizabeth A. Fall
Georgia State University

ABSTRACT

ASSOCIATION BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND BORDERLINE PERSONALITY DISORDER: FINDINGS FROM THE NATIONAL EPIDEMIOLOGIC SURVEY ON ALCOHOL AND RELATED CONDITIONS (NESARC)-III

by

ELIZABETH A. FALL

December 11, 2020

INTRODUCTION: Adverse childhood experiences (ACEs) are traumatic events including abuse, neglect, and related stressors that occur before the age of 18. These exposures affect 61 % of adults in the general population. Studies have documented that ACEs contribute to mental illness; however, less is known about its contribution specifically to borderline personality disorder (BPD) and co-morbid substance use disorder (SUD).

AIM: The purpose of this study was to examine the association between each category of 10 ACEs and the total number (ACE score) with borderline personality disorder alone, borderline personality disorder with comorbid substance use disorder, and lifetime substance use disorder alone.

METHODS: We used cross-sectional limited-use data from the National Epidemiologic Survey on Alcohol and Related Conditions Wave III (NESARC-III). Data were collected between April 2012 to June 2013 and included 36,309 adults in the United States. We assessed 10 different types of ACEs that occurred before age 18 years. Exposure categories included: physical, emotional, and sexual abuse; physical and emotional neglect; growing up in a household with substance abuse; criminal activity; mental illness; parental divorce or separation; and violence against maternal figure. The outcome measures were Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) diagnosis of borderline personality disorder alone, borderline personality disorder with comorbid substance use disorder and substance use disorder alone. The NESARC dataset was adjusted for nonresponse and oversampling. Poststratification analyses were used to weight data to represent the United States general population. We extracted weighted prevalence estimates of ACEs for the overall NESARC population, BPD overall and BPD with comorbid SUD. To estimate the association between ACEs and BPD alone, comorbid SUD, and SUD alone we used multiple logistic regression models to calculate adjusted odds ratios and 95% CI's. Analyses were completed using SAS 9.4.

RESULTS: Weighted prevalence estimates of each ACE among adults with BPD (n= 4301) are as follows: sexual abuse (28.1%); physical abuse (40.0%), emotional abuse (55.9%), emotional neglect (21.7%), physical neglect (21.4%), violence against maternal figure (27.6%), household substance use (45.5%), mental illness (17.6%), incarceration (19.3%), and parental separation or divorce (44.1%). Each category of ACE predicted BPD and BPD with comorbid SUD. Emotional abuse in childhood had the strongest association to BPD (aOR = 3.00 [2.59, 3.48]), while childhood sexual abuse had the strongest association to BPD with comorbid SUD (aOR=4.45 [4.03, 4.91]). Additionally, adults who experienced 4 or more ACEs had 4.72 greater odds of being diagnosed with BPD alone, and 10.02 odds of being diagnosed with BPD with comorbid SUD.

CONCLUSION: Exposure to ACEs contributes to the risk of BPD, and BPD with comorbid SUD. Special emphasis on recognizing the occurrence of childhood trauma among persons with BPD and BPD comorbid SUD is paramount in reducing the likelihood of poor health outcomes. Current treatments for BPD and BPD with SUD include psychotherapies such as DBT, but more research is needed to establish the efficacy of these therapies in treating comorbid BPD with SUD.

ASSOCIATION BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND BORDERLINE PERSONALITY DISORDER: FINDINGS FROM THE NATIONAL EPIDEMIOLOGIC SURVEY ON ALCOHOL AND RELATED CONDITIONS (NESARC)-III

by

ELIZABETH A. FALL

B.S., GEORGIA STATE UNIVERSITY

A Thesis Submitted to the Graduate Faculty

of Georgia State University in Partial Fulfillment

of the

Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA

30303

APPROVAL PAGE

ASSOCIATION BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND BORDERLINE PERSONALITY DISORDER: FINDINGS FROM THE NATIONAL EPIDEMIOLOGIC SURVEY ON ALCOHOL AND RELATED CONDITIONS (NESARC)-III

by

ELIZABETH A. FALL

Approved:

Shanta R. Dube, PhD, MPH
Committee Chair

William W. Thompson, PhD
Committee Member

November 20, 2020
Date

ACKNOWLEDGEMENTS

I would like to express my deepest appreciation to my committee chair Dr. Shanta R. Dube for mentoring me throughout this process and providing me with invaluable guidance, support, and expertise. I could not have asked for a better thesis advisor for my MPH study. I would also like to thank my thesis committee member Dr. Bill Thompson for his assistance and for offering his time and critical feedback to this thesis.

I would also like to thank my family and friends for supporting me and always encouraging me on the journey to earning my master's degree. Last but certainly not least, I would like to thank Sean Lachenberg for all his love, reassurance, and support throughout this process!

Author's Statement Page

In presenting this thesis as a partial fulfillment of the requirements for an advanced degree from Georgia State University, I agree that the Library of the University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote from, to copy from, or to publish this thesis may be granted by the author or, in his/her absence, by the professor under whose direction it was written, or in his/her absence, by the Associate Dean, School of Public Health. Such quoting, copying, or publishing must be solely for scholarly purposes and will not involve potential financial gain. It is understood that any copying from or publication of this dissertation which involves potential financial gain will not be allowed without written permission of the author.

Elizabeth Fall
Signature of Author

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

ACEs	Adverse Childhood Experiences
ADHD	Attention Deficit Hyperactivity Disorder
AUDADIS-5	Alcohol Use Disorder and Associated Disabilities Interview Schedule-5
BPD	Borderline Personality Disorder
BRFSS	Behavioral Risk Factor Surveillance System
DBT	Dialectical Behavior Therapy
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th Edition
MDD	Major Depressive Disorder
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
SUD	Substance Use Disorder
PTSD	Post-traumatic Stress Disorder

CHAPTER I - INTRODUCTION

Adverse childhood experiences (ACEs) refer to traumatic events, including abuse, neglect, and related stressors, that occur before the age of 18. ACEs are a significant and widespread public health problem, affecting up to 61 % of adults in the general population and with profound economic and social costs totaling in the billions of dollars each year (CDC, 2019). ACEs can have a long-lasting impact on health outcomes later in life and have been linked to an increased risk of chronic disease, substance abuse, and mental illness.

In the seminal ACE study (Felitti et al., 1998), the Centers for Disease Control and Prevention partnered with Kaiser Permanente in San Diego to conduct a large-scale epidemiological study assessing the impact of ACEs on health outcomes from adolescence into adulthood. Over 17,000 adults were assessed from 1995 to 1997 across two waves. In Wave 1, seven of the eight recognized ACEs at the time were assessed: physical abuse, emotional abuse, sexual abuse, parental mental illness, household substance abuse, maternal battery, and household member incarceration. In Wave 2 of the study, indicators of physical and emotional neglect were included, bringing the total number of ACEs studied to 10 (Dube et al., 2001).

The ACE Study provided strong evidence for the critical need to investigate the association between childhood trauma and mental illness in adulthood. One condition in particular that has been frequently investigated is borderline personality disorder (BPD) (Pietrek et al., 2013, Ball et al., 2009; Battle et al., 2004; Johnson et al., 1999; Laporte & Guttman, 1996, Atlas, 1995, van der Kolk et al., 1994), a severe mental illness characterized by extreme emotional instability, difficulties in maintaining stable relationships and impulsivity. BPD is typically diagnosed in early adulthood. Despite a 1 to 2 % prevalence in adults in the U.S population (Lenzenweger et al., 2007), patients with BPD account for 20% of inpatient

psychiatric visits (Zimmerman et al., 2008). Patients with BPD often come from unsupportive, dysfunctional households, and report high rates of childhood emotional abuse and neglect. It has been hypothesized that primary features of borderline personality disorder may develop as an adaptive response to an unstable home environment (Linehan, 1993). Patients with borderline personality disorder report ACEs at a disproportionately high rate compared to the general population. A recent meta-analysis concluded that patients with BPD are over 13 times more likely to report having experienced ACEs compared to people without BPD (Porter et al., 2020).

As reported previously, substance use is strongly correlated with ACE exposure. Unsurprisingly, borderline personality disorder, and substance use disorder are highly correlated. Almost 50% of those with BPD have at least one current substance use disorder (Trull et al., 2018) compared to just 7.4% of the general population (SAMHSA, 2020). BPD with comorbid SUD is linked to an increased association with adverse health outcomes compared to having BPD alone. As many as 79% of patients with BPD attempt suicide and 8-10% die by suicide, a rate 50 times greater than the general population (SAMHSA, 2014). BPD with comorbid SUD may increase this already disparate statistic, as a 2001 study found that patients with BPD and SUD were four times more likely to have attempted suicide compared to BPD patients without addiction problems(Van Den Bosch et al., 2001).

Prior research on the relationship between ACEs and BPD with SUD has been limited in scope and with conflicting conclusions. Among a sample of primarily male substance users seeking inpatient detoxification and treatment, emotional abuse emerged as a risk factor for several personality disorders, including borderline personality disorder (Bernstein et al., 1998). Conversely, a study of 64 female BPD patients with and without SUD recruited from mental

health services and addiction treatment services, found no association between history of traumatic events and the presence of addiction problems (van den Bosch et al., 2001).

While a few recent studies have broadly investigated the associations of ACEs with both lifetime and past-year psychiatric and substance use disorders among older adults using nationally-representative data from the National Epidemiologic Survey on Alcohol and Related Conditions Wave III (NESARC-III) (Choi et al., 2017; Rhee et al., 2019), these studies did not evaluate borderline personality disorder. Additionally, a 2020 study using NESARC-III data investigated the association between ACEs and comorbid mental health disorders among adults with an opioid use disorder, by gender (Evans et al., 2020). While this study did indeed investigate the prevalence of BPD among adults with lifetime opioid use disorder, the primary analysis failed to elaborate on the association between ACEs and lifetime opioid use disorder with comorbid borderline personality disorder.

Due to inconclusive evidence from older studies, and a lack of focus on borderline personality disorder utilizing existing epidemiologic data, the critical need for a study investigating the association between adverse childhood experiences and borderline personality disorder with and without substance use disorder is well warranted. Greater knowledge of this relationship may allow for the development of trauma-informed interventions aimed at preventing ACEs and promoting resilience in at-risk populations.

The objective of this research is to examine the contribution of each category of ACE and the total number of ACEs (ACE score) to the risk of borderline personality disorder (BPD) with comorbid substance use disorder(s) using cross-sectional data from the National Epidemiologic Survey on Alcohol and Related Conditions(NESARC) Wave-3 (2012-2013) (Grant et al., 2014). The research questions are:

1) What is the contribution of ACEs to Borderline Personality Disorder?
2) What is the contribution of ACEs to Borderline Personality Disorder with comorbid Substance Use Disorder?

Null Hypotheses

1) Adverse childhood experiences will not be associated with borderline personality disorder among adults in the general U.S. population.
2) Adverse childhood experiences will not be associated to borderline personality disorder with comorbid substance use disorder among adults in the general U.S. population.

CHAPTER II - LITERATURE REVIEW

1.1 Adverse Childhood Experiences

1.1.1 ACE Study

The ACE Study provided integral information on the prevalence of each type of ACE in the United States. Substance abuse represented the most common ACE with 25.6% of survey respondents reporting having lived with a household member who was either a problem drinker/alcoholic or used street drugs. Subsequently, the prevalence of sexual abuse was reported at 22.0%, household mental illness at 18.8%, maternal battery at 12.5%, psychological abuse at 11.1%, physical abuse at 10.8% and finally, household incarceration at 3.4% (Felitti et al., 1998). Parental separation/divorce, emotional neglect and physical neglect prevalence were later reported at 23.2 % (Dube et al., 2002), 14.8% and 9.9% respectively, in Wave II of the ACE Study (Dube, Felitti, Dong, Chapman, et al., 2003).

In addition to elucidating on the prevalence of specific adverse events, results from the CDC-Kaiser ACE study demonstrated the ubiquitous nature of childhood adversity in the United States and its deleterious impact on health outcomes into adulthood. Close to two-thirds of the participants reported at least one type of ACE, and approximately 40% reported ≥ 2 ACEs. A dose response relationship was observed between the number of childhood exposures and risk of alcoholism, use of illicit drugs, and injection of illicit drugs. Furthermore, participants who experienced four or more types of childhood adversity compared to those with zero experiences, had 4.6 times the odds of having had two or more weeks of depressed mood in the past year, and 12.2 times the odds of having ever attempted suicide.

Further insight provided by the ACE Study includes information pertaining to the contribution of ACEs across generations of birth cohorts(Dube, Felitti, Dong, Giles, et al., 2003).

A total of 17337 participants were divided into 4 birth cohorts (1900-1931, 1932-1946, 1947-1961, and 1962-1978). The main aim of the study was to assess the relationship between ACE score, and six health behaviors and health outcomes including depressed affect, lifetime suicide attempt, multiple sexual partners, sexually transmitted diseases, ever having been a cigarette smoker, and self-reported alcoholism. The study found no significant difference in the ACE score odds ratios between each birth cohort for any of the six health problems examined. These results provided evidence of the consistent impact of ACEs across generations, irrespective of societal and cultural factors.

1.1.2 Intergenerational Nature of ACEs

As evidenced in the previous section by findings from the landmark CDC-Kaiser ACE Study, the detrimental influence of ACEs on health outcomes transcend generations. This leads to the question about the possible mechanisms relating to familial transmission of childhood adversity. Spearheading the body of work relating to this area of study is the Barker Hypothesis. The Barker Hypothesis emphasizes the importance of programming by the environment in fetal and infant life and its impact on later health outcomes (Barker, 1990). Indeed, a retrospective cohort study from the ACE Study evaluated whether exposure to ACEs increased the risk of fetal death among 9159 women(Hillis et al., 2004). Results demonstrated that as the ACE score increased, so too did the risk of fetal death after the first and second pregnancy. Furthermore, in a separate study, researchers evaluated the association between ACEs and pregnancy outcomes among 2303 pregnant women and found that each additional ACE decreased birth weight by 16.33 g and decreased gestational age by 0.063 (Smith et al., 2016).

Several physiological processes likely contribute to adverse birth outcomes among mothers affected by childhood trauma. For example, a 2013 study found that mothers who

experienced childhood sexual abuse exhibit a higher cortisol awakening response (Bublitz & Stroud, 2013) and this response is further aggravated by current maternal stress (Bublitz et al., 2014). Moreover, pregnant mothers exposed to physical and/or sexual abuse have been reported to have increased cortisol concentrations in the hair (Schreier et al., 2015). Excess stress in intrauterine life has several neurodevelopmental consequences, including changes in cell proliferation, neuronal differentiation, cell survival, synaptogenesis, and neurotransmitter levels (Schuurmans & Kurrasch, 2013). These changes are associated with an increased risk of developing neurodevelopmental, psychiatric disorders and substance use disorders in adulthood (Howerton & Bale, 2012). Indeed, Liotti and Pasquini (2000) reported that serious losses experienced by the mother of a BPD patient within the 2 years preceding and following the patient's birth was a predictive factor in the development of borderline personality disorder. Additionally, a 2013 study (Schwarze et al., 2013) reported that in a sample of 100 patients with borderline personality disorder and 100 age-matched healthy controls, BPD patients were significantly more often exposed to adverse intrauterine conditions including tobacco exposure, medical complications, maternal traumatic stress, familial conflicts, low social support, and partnership problems during pregnancy.

Individuals exposed to a stressful prenatal environment are likely to experience an unfavorable postnatal climate, due to higher levels of post-partum depression in the mother, negative parenting, and potentially, separation from the mother. Crawford et al. (2009) sought to better understand the impact of maternal separation on the developmental course of BPD symptoms in a longitudinal study of 766 children and their mothers. Subjects provided data for two or more follow-up interviews over the course of three time points, 1983, 1985-1986 and 2001-2004. Results from the study found that extended maternal separations before age 5 were a

predictor of BPD symptoms in adolescence and adulthood. More broadly, researchers (Johnson et al., 2002) found that parents who are emotionally under involved with their children, impair their children's social skills, thereby increasing the children's likelihood of engaging in suicidal behavior. Indeed, long standing theories of borderline personality disorder hypothesize that parental invalidation coupled with genetic vulnerabilities put children at risk for psychopathologies such as BPD (Linehan, 1993).

1.1.3 Neurologic Effects of ACEs

It has been well established that adverse childhood experiences can negatively affect healthy brain development. Children who experience traumatic events are exposed to abnormally high amounts of stress. A prolonged fight or flight response in childhood can influence genetic dispositions and epigenetic mechanisms (McGowan et al., 2009) during development and contribute to alterations in the autonomic nervous system and hypothalamic-pituitary-adrenal (HPA) axis function (Tarullo & Gunnar, 2006). Stress in the short-term can be an adaptive response to aversive stimuli. Over the long-term, however, elevated cortisol has a negative effect on health and behavioral outcomes (Heim et al., 2010; Whittle et al., 2013).

Chronic stress impairs hippocampal function, the part of the brain responsible for cognitive functions and context-specific fear conditioning. Adults with childhood trauma and PTSD demonstrate reductions in hippocampal volume (Bremner et al., 1997). Hippocampus atrophy and dysfunction are linked to an array of mood problems such as anxiety, panic, depressed affect, hallucinations, and substance abuse (Anda et al., 2006). Additionally, early life stressors are associated with increased locus coeruleus and norepinephrine activity (Abercrombie and Jacobs, 1987). As a result of this increased excitatory neurotransmission, many adolescents

and adults may turn to alcohol and drug use to decrease norepinephrine activity and thereby alleviate unwanted stress.

Indeed, adverse childhood experiences are correlated with neurological abnormalities in BPD patients. Considerable evidence shows that patients with BPD have reductions in amygdala and hippocampus volume (Cattane et al., 2017). Both brain structures are critically involved in emotional regulation and have been identified as areas of the brain that are negatively impacted by abuse (Bremner et al., 2003).

1.1.4 Health Risk Behaviors and ACEs

Research regarding risky behaviors and ACEs has established a strong relationship between both individual types of ACEs and the cumulative ACE exposure with behavioral risks. Data from the 2011 BRFSS indicated that increased odds for binge-drinking were associated with childhood verbal abuse (Campbell et al., 2016). Additionally, data from the same study found that HIV behavioral risks, defined as either using intravenous drugs in the past year, having been treated for an STD in the past year, having been given or received money or drugs in exchange for sex, or having had anal sex without a condom in the past year, was significantly associated with a history of childhood sexual abuse. A dose-response relationship was noted between the ACE score with high-risk behaviors, including binge drinking, heavy drinking, smoking status, and high-risk HIV behavior.

1.2 Borderline Personality Disorder

1.2.1 Diagnosis of Borderline Personality Disorder

The DSM-5 defines borderline personality disorder as a “pervasive pattern of instability of interpersonal relationships, self-image… and marked impulsivity beginning by early adulthood and present in a variety of contexts” (American Psychiatric Association, 2013). To

qualify for a diagnosis of BPD, an individual must display 5 or more out of 9 pre-defined criteria. These include 1) avoidance of abandonment; 2) pattern of unstable relationships; 3) identity disturbance; 4) impulsivity in at least 2 areas that are potentially damaging; 5) recurrent suicidal behavior, gestures or threats; 6) affective instability; 7) chronic feelings of emptiness; 8) inappropriate, intense anger or difficulty controlling anger; and 9) stress-related paranoid ideation.

1.2.2 Prevalence of Borderline Personality Disorder

Borderline personality disorder has been reported to affect 1.4% of the general population in the United States (Lenzenweger et al., 2007), though this number is likely to be higher due to a high rate of undiagnosed or misdiagnosed BPD sufferers (Ruggero et al., 2010). Additionally, while the DSM-5 reports that 75% of diagnosed BPD are females, conflicting numbers have been reported about the disorder's true gender makeup. For example, results from a nationally representative study of 34,643 U.S adults reported a significantly higher prevalence, with 5.9% of subjects reporting a lifetime diagnosis of BPD, with no difference in gender noted (Grant et al., 2008).

Additionally, prevalence rates of BPD tend to show equivalent distribution across race/ethnicity, though a nationally representatively based study indicated a higher rate of BPD in the Native American and African American populations (Tomko et al., 2014).

1.2.3 Parental Invalidation and Borderline Personality Disorder

The exact cause of borderline personality disorder is unknown, though, as mentioned previously, many theories regarding the development of borderline personality disorder emphasize an unstable, invalidating home environment during upbringing. Perhaps the most frequently referenced theory is Linehan’s (1993) Biosocial Theory, which posits that an

emotionally vulnerable child raised in an invalidating home environment, may encourage patterns of emotional dysregulation, that then results in the development of BPD in adulthood. Important to note is that parental invalidation does not necessarily equal abuse in all contexts (Musser et al., 2018). In Linehan's Biosocial theory, she proposed four types of invalidation: inaccuracy of emotion, misattribution of emotional expression, discouragement of negative emotions, and finally, oversimplification of problem solving. Taken together, these types of invalidation may perpetuate a dysfunctional parent-child relationship, whereby the emotionally sensitive child feels they need to display extreme bouts of emotion in order to receive the parental validation they are seeking, and the parent in turn responds by continuing to invalidate the child by claiming the emotion being exhibited is inappropriate, misattributed, should be suppressed, and/or is easily fixable. Conversely, more normative emotions displayed by the child may be ignored by the parent, resulting in the development of emotional dysregulation.

It is important to emphasize that not every child who experiences ACEs goes on to develop borderline personality disorder. While childhood sexual abuse is frequently reported in high rates in the borderline population, most individuals with a history of childhood sexual abuse do not go on to develop BPD (Fruzzetti et al., 2005). The crux of many dominating theories of BPD are that an emotionally vulnerable individual "mismatched" with an invalidating parent, have a higher likelihood of developing the disorder due to a lack of development of appropriate emotional coping skills and positive reinforcement. ACEs, of course, may represent an extreme form of invalidation likely to exacerbate emotional dysregulation in an already generally invalidating environment. As stated previously, patients with BPD report higher rates of ACEs than the general population. Invalidation can be classified as general, meaning it is pervasive and ongoing, or specific invalidation, which is invalidation in response to a disclosure of a specific

event such as an ACE (Ullman & Peter-Hagene, 2014). Studies have found that childhood sexual abuse-specific invalidation predicts borderline symptomatology (Hong et al., 2011).

There have been some studies that have attempted to study the validity of the biosocial model and failed to find evidence that an interaction between childhood emotional vulnerability and invalidating parenting predicts the development of emotional dysregulation or borderline traits (Gill & Warburton, 2014; Gill, Warburton, & Beath, 2018; Reeves, 2007; Sauer & Baer, 2010). For instance, Gill, Warburton and Sweller (2018) studied a sample of 291 students and 148 individuals with a history of borderline traits. Questionnaires assessing borderline traits and emotional dysregulation, measures of invalidating parenting, other forms of poor parenting, childhood emotional vulnerability, and quality of most significant therapeutic relationship were administered. The study reported that the interaction between childhood emotional vulnerability and history of invalidating parenting was not critically important in predicting borderline traits.

Despite this finding, it is important to keep in mind that these studies have a stricter conceptualization of parental invalidation. While Linehan (1993) considered childhood abuse an extreme version of invalidation, Gill and colleagues conceptualize abuse as a form of "poor parenting" that was measured using the Young Parenting Inventory (YPI; Young, 1999). Conversely the researchers used the Recalled Childhood Socialization Scale (RCSES; Krause, Mendelson & Lynch, 2003) to measure invalidating parenting. Using this scale, the subject reports how their parent's would have reacted to the following scenarios when they were a child: being upset at losing a prized possession, being upset at being left at a friend's house and having trouble sleeping after watching a scary TV show. The authors conclude that future research should examine the role of poor parenting (without invalidation) in the development of BPD.

1.2.4 Epigenetics and Borderline Personality Disorder

A genetic predisposition coupled with environmental influences has been frequently studied in the etiology of BPD. A systematic review on the genetics of borderline personality disorder reported a heritability of BPD between 40 and 60% (Amad et al., 2014). Additionally, many studies have implicated the glucocorticoid receptor gene, NR3C1 in BPD. For example, a 2011 study investigated whether childhood maltreatment and its severity were related to increased methylation of the exon 1F of NR3C1 in a sample of 101 borderline personality disorder subjects, 99 major depressive disorder (MDD) subjects, and 15 MDD with comorbid PTSD subjects (Perroud et al., 2011). Results revealed that frequency of abuse and sexual abuse with penetration correlated with a higher methylation percentage of NR3C1 in BPD subjects. Similarly, researchers found that severity of childhood trauma and BPD were associated with higher methylation for NR3C1 (Martín-Blanco et al., 2014).

1.2.5 Comorbid Substance Use Disorder

BPD and SUD are highly correlated. Almost half of those with BPD have at least one current substance use disorder (Trull et al., 2018) compared to just 7.4% of the general population (SAMHSA, 2020). A prospective longitudinal study examined whether BPD patients have a higher rate of new onsets of substance use disorders compared to other personality disorders (Walter et al., 2009). Researchers assessed 175 BPD subjects over a 7-year span. The results revealed that BPD patients demonstrated a shorter time to new onsets of SUD. Additionally, 13% of BPD patients developed a new alcohol use disorder, 11% a drug disorder, compared to just 6% and 4% for other personality disorders. No difference in the rate of onset of new SUD was noted between remitted BPD and non-remitted BPD, reflecting the likely shared etiological factors contributing to both BPD and SUD independent of one another. Additionally,

a study of 117 BPD subjects compared with age and sex-matched controls found that alcohol dependence, daily tobacco use, and use of illicit substances within the past month were between 4 and 9 times higher in the BPD group than the matched control group (Scalzo et al., 2018).

While there is considerable evidence on the highly prevalent use of substances among individuals with BPD, insight into the specific types of substances that are most frequently abused is relatively sparse. A 2016 study using data from Waves 1 and 2 of the National Epidemiologic Survey on Alcohol and Related Conditions attempted to answer this question. The authors created a multivariate model assessing the odds of borderline personality disorder given 9 different types of substance use disorders (inhalant, sedative, opiate, tranquilizer, cocaine, hallucinogen, amphetamine, cannabis, and alcohol). After controlling for age, sex, race, family income, marital status, education urbanicity, region lived in, and other psychiatric diagnoses, opiate, cocaine, and alcohol use disorder most strongly predicted borderline personality disorder diagnosis (Carpenter et al., 2016).

While the relationship between BPD and SUD is well-established, the exact cause of the comorbidity is not known. A 2013 twin study attempted to shed light on the developmental course of this relationship. Bornovalova et al. (2013) examined 1280 female adolescent twins and reported that shared environmental factors accounted for the overlap of substance use and BPD traits at age 14; however, at age 18, genetic factors solely accounted for the association.

Both disorders share common symptoms such as impulsivity and emotional dysregulation. Unstable relationships, manipulation, and risky behavior are additional common features of both disorders. However, it is important to note, after accounting for shared features in both disorders, substantial co-occurrence remains, furthering the argument that comorbidity between BPD and SUDs is not solely due to symptom overlap (Dulit et al., 1990; Grilo et al.,

1997). The primary driver of this co-occurrence may be shared etiologic risk factors such as ACEs.

1.3 ACEs Relationship to Borderline Personality Disorder and Substance Use Disorder

1.3.1 Sexual Abuse and Borderline Personality Disorder

Perhaps the most frequently implicated ACE within studies of borderline personality disorder is sexual abuse. Herman, Perry, and Van Der Kolk (1989) interviewed 55 subjects, 21 of whom were diagnosed as having borderline personality disorder, 11 with borderline traits and 23 nonborderline subjects with closely related diagnoses, about their childhood histories. Interviews were then scored for an indication of physical abuse, sexual abuse, and witnessing domestic violence. Results from the study showed that significantly more borderline subjects reported histories of trauma than subjects with no borderline diagnosis. Specifically, 68% of BPD subjects reported having experienced sexual abuse compared to just 26% of subjects without BPD.

Childhood sexual abuse has been reported to be associated with increased symptom severity of borderline personality disorder. Suicidality, in particular, appears to be predicted by a history of childhood sexual abuse. Suicidal behavior was found to be independently predicted by the occurrence and severity of childhood sexual abuse among a sample of 61 BPD patients (Soloff et al., 2002). A 2013 study of 76 subjects with BPD assessed the association between suicidal behavior and history of childhood sexual abuse (Ferraz et al., 2013). The results revealed that exposure to sexual abuse in childhood significantly predicted the presence, frequency, and severity of previous suicide attempts among BPD individuals.

Childhood sexual abuse is also related to the likelihood of remission in BPD patients. Biskin et al. (2011) studied a sample of 31 female BPD patients and found that those who did not experience remission were more likely to have experienced childhood sexual abuse.

Additionally, among a sample of 290 BPD inpatients, the absence of childhood sexual abuse predicted earlier time to remission (Zanarini et al., 2006).

Prospective studies of adverse childhood experiences are extremely valuable in determining the temporality of ACE exposure and subsequent psychiatric diagnosis. Researchers in Australia reviewed forensic medical records of 2688 sexually abused children assessed between 1964 and 1995. This information was then linked to the Victorian Psychiatric Case Register. Psychiatric records were obtained for all contacts with public mental health services made prior to 2008. Among female victims of childhood sexual abuse, the rate of borderline personality disorder was seven times higher than that of age-matched controls (Cutajar et al., 2010). No relationship was found between male victims of childhood sexual abuse and the rate of borderline personality disorder, though this may be explained by the higher prevalence of childhood sexual abuse among females within the general population (Dube et al., 2005; Finkelhor, 1994).

A systematic review of sexual abuse and borderline personality disorder reported that out of 17 studies assessing risk factors and diagnosis of BPD, only 2 did not find a relationship with BPD diagnosis (de Aquino Ferreira et al., 2018). A limitation of the body of literature reviewed regarding sexual abuse and borderline personality disorder is the lower number of male participants. Although the prevalence of childhood sexual abuse among males has been reported be around 16% (Briere & Elliott, 2003; Dube et al., 2005; Finkelhor et al., 1990; Lisak et al., 1996), the rate may be much higher due to a variety of factors. On average, males are more likely to refrain from reporting instances of childhood sexual abuse (Hébert et al., 2009). Non-disclosure may be related to societal stigma, minimization of the experience, disbelief, among other factors.

1.3.2 Emotional Abuse and Borderline Personality Disorder

Emotional abuse is thought to play a critical role in the development of emotional dysregulation within adults with borderline personality disorder. A study of 793 mothers and their offspring found that maternal verbal abuse during childhood was associated with increased risk for borderline personality disorder even after controlling for offspring age, sex, temperament, co-occurring psychiatric disorders, and other ACEs (Johnson et al., 2001).

Childhood emotional abuse, like sexual abuse, is associated with increased symptom severity in BPD. A 2003 study evaluated self-reported childhood abuse histories of 182 patients with personality disorders and reported that emotional abuse was associated with clinical severity among patients with BPD and served as a predictor of borderline personality disorder diagnosis among men (Bierer et al., 2003). Additionally, among a sample of 243 undergraduates, the frequency of self-reported childhood emotional abuse was independently associated with BPD feature severity (Kuo et al., 2015). Results from nationally representative data have also provided evidence of this association. Using data from Wave 2 of the NESARC, researchers reported emotional abuse was associated with borderline personality disorder after controlling for demographics, other maltreatment types, parental psychopathology, and co-occurring personality disorders (Waxman et al., 2013).

1.3.3 ACEs and Substance Use Disorder

Problematic substance use has been repeatedly shown to be associated with a history of adverse childhood experiences. To cope with stressful and traumatic situations, adolescents may adopt substance use as a coping mechanism. Many studies have found an association between ACEs and early initiation of substance use (Anda et al., 1999; Dube et al, 2006). Results from the ACE Study found that when compared to adults with no ACEs, those with at least 4 ACEs

have twice the odds of reporting ever heavy drinking and three-time the odds of reporting problems with alcohol in adulthood (Dube et al., 2002). Childhood abuse and exposure to violent crime are associated with an increased risk of substance dependence (Douglas et al., 2010).

1.3.4 ACEs and Borderline Personality Disorder with Substance Use Disorder

Very few studies have assessed the relationship between ACEs and BPD with concurrent SUD, with most studies sampling from treatment-seeking SUD patients. A study in 2008 examined a sample of 76 inpatient residents in a drug and alcohol abuse treatment program in Washington, D.C., to determine factors related to co-occurring borderline personality disorder (Gratz et al., 2008). The study found that past year substance use was significantly related to both emotion dysregulation and BPD diagnosis. Additionally, substance users with BPD reported higher levels of ACE exposure.

A 2015 study of 1205 treatment-seeking patients with a substance use disorder found patients with both SUD and BPD reported higher rates of having experienced emotional and physical abuse, neglect, or family violence compared to patients with only SUD (Wapp et al., 2015). Surprisingly, the number of adverse childhood experiences reported was higher among the SUD only group than the SUD + BPD group. Limitations of the study may explain this peculiar finding. The researchers used the Conners' Adult ADHD Diagnostic Interview for DSM-IV (CAADID) Part I to assess ACEs instead of the more commonly used Childhood Trauma Questionnaire. The CAADID combines physical and emotional neglect into a singular risk factor and leaves out parental incarceration and parental separation/divorce. Additionally, the study recognized that significantly more patients with SUD + BPD had ADHD than individuals with SUD alone. Therefore, patients may have been misdiagnosed with BPD and

only had ADHD. As there was no BPD only comparison group, there was no way to evaluate BPD specific risk factors.

REFERENCES

Abercrombie, E. D., & Jacobs, B. L. (1987). Single-unit response of noradrenergic neurons in the locus coeruleus of freely moving cats. II. Adaptation to chronically presented stressful stimuli. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience*, *7*(9), 2844–2848. https://doi.org/10.1523/jneurosci.07-09-02844.1987

Amad, A., Ramoz, N., Thomas, P., Jardri, R., & Gorwood, P. (2014). Genetics of borderline personality disorder: Systematic review and proposal of an integrative model. In *Neuroscience and Biobehavioral Reviews* (Vol. 40, pp. 6–19). Pergamon. https://doi.org/10.1016/j.neubiorev.2014.01.003

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.

An Introduction to Co-Occurring Borderline Personality Disorder and Substance Use Disorders | Publications and Digital Products. (n.d.). Retrieved November 3, 2020, from https://store.samhsa.gov/product/An-Introduction-to-Co-Occurring-Borderline-Personality-Disorder-and-Substance-Use-Disorders/sma14-4879

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. *Journal of the American Medical Association*, *282*(17), 1652–1658. https://doi.org/10.1001/jama.282.17.1652

Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C., Perry, B. D., Dube, S. R., & Giles, W. H. (2006). The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience*, *256*(3), 174–186.

https://doi.org/10.1007/s00406-005-0624-4

Atlas, J. A. (1995). Association between history of abuse and borderline personality disorder for hospitalized adolescent girls. *Psychological Reports*, *77*(3 Pt 2), 1346. https://doi.org/10.2466/pr0.1995.77.3f.1346

Battle, C. L., Shea, M. T., Johnson, D. M., Yen, S., Zlotnick, C., Zanarini, M. C., Sanislow, C. A., Skodol, A. E., Gunderson, J. G., Grilo, C. M., McGlashan, T. H., & Morey, L. C. (2004). Childhood maltreatment associated with adult personality disorders: Findings from the collaborative longitudinal personality disorders study. *Journal of Personality Disorders*, *18*(2), 193–211. https://doi.org/10.1521/pedi.18.2.193.32777

Ball, J. S., & Links, P. S. (2009). Borderline personality disorder and childhood trauma: Evidence for a causal relationship. In *Current Psychiatry Reports* (Vol. 11, Issue 1, pp. 63–68). https://doi.org/10.1007/s11920-009-0010-4

Barker, D. J. P. (1990). The fetal and infant origins of adult disease. In *British Medical Journal* (Vol. 301, Issue 6761, p. 1111). BMJ Publishing Group. https://doi.org/10.1136/bmj.301.6761.1111

Bernstein, D. P., Stein, J. A., & Handelsman, L. (1998). Predicting personality pathology among adult patients with substance use disorders: Effects of childhood maltreatment. *Addictive Behaviors*, *23*(6), 855–868. https://doi.org/10.1016/S0306-4603(98)00072-0

Bierer, L. M., Yehuda, R., Schmeidler, J., Mitropoulou, V., New, A. S., Silverman, J. M., & Siever, L. J. (2003). Abuse and Neglect in Childhood: Relationship to Personality Disorder Diagnoses. *CNS Spectrums*, *8*(10), 737–754. https://doi.org/10.1017/s1092852900019118

Biskin, R. S., Paris, J., Renaud, J., Raz, A., & Zelkowitz, P. (2011). Outcomes in women diagnosed with borderline personality disorder in adolescence. *Journal of the Canadian*

Academy of Child and Adolescent Psychiatry, *20*(3), 168–174.

Bornovalova, M. A., Hicks, B. M., Iacono, W. G., & McGue, M. (2013). Longitudinal twin study of borderline personality disorder traits and substance use in adolescence: developmental change, reciprocal effects, and genetic and environmental influences. *Personality Disorders*, *4*(1), 23–32. https://doi.org/10.1037/a0027178

Bremner, J. D., Randall, P., Vermetten, E., Staib, L., Bronen, R. A., Mazure, C., Capelli, S., McCarthy, G., Innis, R. B., & Charney, D. S. (1997). Magnetic resonance imaging-based measurement of hippocampal volume in posttraumatic stress disorder related to childhood physical and sexual abuse - A preliminary report. *Biological Psychiatry*, *41*(1), 23–32. https://doi.org/10.1016/S0006-3223(96)00162-X

Bremner, J. D., Vythilingam, M., Vermetten, E., Southwick, S. M., McGlashan, T., Nazeer, A., Khan, S., Vaccarino, L. V., Soufer, R., Garg, P. K., Ng, C. K., Staib, L. H., Duncan, J. S., & Charney, D. S. (2003). MRI and PET study of deficits in hippocampal structure and function in women with childhood sexual abuse and posttraumatic stress disorder. *American Journal of Psychiatry*, *160*(5), 924–932. https://doi.org/10.1176/appi.ajp.160.5.924

Briere, J., & Elliott, D. M. (2003). Prevalence and psychological sequelae of self-reported childhood physical and sexual abuse in a general population sample of men and women. *Child Abuse and Neglect*, *27*(10), 1205–1222. https://doi.org/10.1016/j.chiabu.2003.09.008

Bublitz, M. H., Parade, S., & Stroud, L. R. (2014). The effects of childhood sexual abuse on cortisol trajectories in pregnancy are moderated by current family functioning. *Biological Psychology*, *103*, 152–157. https://doi.org/10.1016/j.biopsycho.2014.08.014

Bublitz, M. H., & Stroud, L. R. (2013). Maternal history of child abuse moderates the association between daily stress and diurnal cortisol in pregnancy: A pilot study. *Stress*, *16*(6), 706–

710. https://doi.org/10.3109/10253890.2013.825768

Campbell, J. A., Walker, R. J., & Egede, L. E. (2016). Associations between Adverse Childhood Experiences, High-Risk Behaviors, and Morbidity in Adulthood. *American Journal of Preventive Medicine*, *50*(3), 344–352. https://doi.org/10.1016/j.amepre.2015.07.022

Carpenter, R. W., Wood, P. K., & Trull, T. J. (2016). Comorbidity of borderline personality disorder and lifetime substance use disorders in a nationally representative sample. *Journal of Personality Disorders*, *30*(3), 336–350. https://doi.org/10.1521/pedi_2015_29_197

Cattane, N., Rossi, R., Lanfredi, M., & Cattaneo, A. (2017). Borderline personality disorder and childhood trauma: Exploring the affected biological systems and mechanisms. *BMC Psychiatry*, *17*(1), 1–14. https://doi.org/10.1186/s12888-017-1383-2

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*(3), 359–372. https://doi.org/10.1017/S1041610216001800

Crawford, T. N., Cohen, P. R., Chen, H., Anglin, D. M., & Ehrensaft, M. (n.d.). *Early maternal separation and the trajectory of borderline personality disorder symptoms*. https://doi.org/10.1017/S0954579409000546

Cutajar, M. C., Mullen, P. E., Ogloff, J. R. P., Thomas, S. D., Wells, D. L., & Spataro, J. (2010). Psychopathology in a large cohort of sexually abused children followed up to 43 years. *Child Abuse and Neglect*, *34*(11), 813–822. https://doi.org/10.1016/j.chiabu.2010.04.004

de Aquino Ferreira, L. F., Queiroz Pereira, F. H., Neri Benevides, A. M. L., & Aguiar Melo, M. C. (2018). Borderline personality disorder and sexual abuse: A systematic review. *Psychiatry Research*, *262*, 70–77. https://doi.org/10.1016/j.psychres.2018.01.043

Douglas, K. R., Chan, G., Gelernter, J., Arias, A. J., Anton, R. F., Weiss, R. D., Brady, K., Poling, J., Farrer, L., & Kranzler, H. R. (2010). Adverse childhood events as risk factors for substance dependence: Partial mediation by mood and anxiety disorders. *Addictive Behaviors*, *35*(1), 7–13. https://doi.org/10.1016/j.addbeh.2009.07.004

Dube, S. R., Anda, R. F., Felitti, V. J., Croft, J. B., Edwards, V. J., & Giles, W. H. (2001). Growing up with parental alcohol abuse: Exposure to childhood abuse, neglect, and household dysfunction. *Child Abuse and Neglect*, *25*(12), 1627–1640. https://doi.org/10.1016/S0145-2134(01)00293-9

Dube, S. R., Anda, R. F., Felitti, V. J., Edwards, V. J., & Croft, J. B. (2002). Adverse childhood experiences and personal alcohol abuse as an adult. *Addictive Behaviors*, *27*(5), 713–725. https://doi.org/10.1016/S0306-4603(01)00204-0

Dube, S. R., Anda, R. F., Whitfield, C. L., Brown, D. W., Felitti, V. J., Dong, M., & Giles, W. H. (2005). Long-term consequences of childhood sexual abuse by gender of victim. *American Journal of Preventive Medicine*, *28*(5), 430–438. https://doi.org/10.1016/j.amepre.2005.01.015

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. *Journal of Adolescent Health*, *38*(4), 444-e1.

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., Felitti, V. J., Dong, M., Giles, W. H., & Anda, R. F. (2003). The impact of adverse

childhood experiences on health problems: Evidence from four birth cohorts dating back to 1900. *Preventive Medicine*, *37*(3), 268–277. https://doi.org/10.1016/S0091-7435(03)00123-3

Dulit, R. A., Fyer, M. R., Haas, G. L., Sullivan, T., & Frances, A. J. (1990). Substance use in borderline personality disorder. *American Journal of Psychiatry*, *147*(8), 1002–1007. https://doi.org/10.1176/ajp.147.8.1002

Evans, E. A., Goff, S. L., Upchurch, D. M., & Grella, C. E. (2020). Childhood adversity and mental health comorbidity in men and women with opioid use disorders. *Addictive Behaviors*, *102*(August 2019), 106149. https://doi.org/10.1016/j.addbeh.2019.106149

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. In *American Journal of Preventive Medicine* (Vol. 14, Issue 4). https://doi.org/10.1016/j.amepre.2019.04.001

Ferraz, L., Portella, M. J., Vállez, M., Gutiérrez, F., Martín-Blanco, A., Martín-Santos, R., & Subirà, S. (2013). Hostility and childhood sexual abuse as predictors of suicidal behaviour in Borderline Personality Disorder. *Psychiatry Research*, *210*(3), 980–985. https://doi.org/10.1016/j.psychres.2013.07.004

Finkelhor, D. (1994). *Current Information on the Scope and Nature of Child Sexual Abuse*. https://www.jstor.org/stable/1602522

Finkelhor, D., Hotaling, G., Lewis, I. A., & Smith, C. (1990). Sexual abuse in a national survey of adult men and women: Prevalence, characteristics, and risk factors. *Child Abuse and Neglect*, *14*(1), 19–28. https://doi.org/10.1016/0145-2134(90)90077-7

Fruzzetti, A. E., Shenk, C., & Hoffman, P. D. (2005). Family interaction and the development of borderline personality disorder: A transactional model. In *Development and Psychopathology* (Vol. 17, Issue 4). https://doi.org/10.1017/S0954579405050479

Gill, D. J., & Warburton, W. A. (2014). An investigation of the biosocial model of borderline personality disorder. *Journal of Clinical Psychology, 70*, 866-873. doi: 10.1002/jclp.22074

Gill, D. J., Warburton, W. A., & Beath, K. (2018). The specificity of the biosocial model to borderline traits. *Clinical Psychologist, 22*, 27-36. doi: 10.1111/cp.12104

Gill, D., Warburton, W., & Sweller, N. (2018). The development of borderline personality disorder: Beyond the biosocial model. *Journal of Evidence-Based Psychotherapies*, *18*(2), 55–76. https://doi.org/10.24193/jebp.2018.2.14

Grant, B. F., Chou, S. P., Goldstein, R. B., Huang, B., Stinson, F. S., Saha, T. D., Smith, S. M., Dawson, D. A., Pulay, A. J., Pickering, R. P., & Ruan, W. J. (2008). Prevalence, correlates, disability, and comorbidity of DSM-IV borderline personality disorder: Results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*, *69*(4), 533–545. https://doi.org/10.4088/JCP.v69n0404

Grant, Chu, A., Sigman, R., Amsbary, M., Kali, Sugawara, J., Jiao, Y., Ren, R., & Goldstein, W. (2004). *National Institute on Alcohol Abuse and Alcoholism National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) Source and Accuracy Statement*.

Gratz, K. L., Tull, M. T., Baruch, D. E., Bornovalova, M. A., & Lejuez, C. W. (2008). Factors associated with co-occurring borderline personality disorder among inner-city substance users: the roles of childhood maltreatment, negative affect intensity/reactivity, and emotion dysregulation. *Comprehensive Psychiatry*, *49*(6), 603–615. https://doi.org/10.1016/j.comppsych.2008.04.005

Grilo, C. M., Walker, M. L., Becker, D. F., Edell, W. S., & McGlashan, T. H. (1997). Personality Disorders in Adolescents With Major Depression, Substance Use Disorders, and Coexisting Major Depression and Substance Use Disorders. *Journal of Consulting and Clinical Psychology*, *65*(2), 328–332. https://doi.org/10.1037/0022-006X.65.2.328

Hébert, M., Tourigny, M., Cyr, M., McDuff, P., & Joly, J. (2009). Prevalence of childhood sexual abuse and timing of disclosure in a representative sample of adults from Quebec. *Canadian Journal of Psychiatry*, *54*(9), 631–636. https://doi.org/10.1177/070674370905400908

Heim, C., Shugart, M., Craighead, W. E., & Nemeroff, C. B. (2010). Neurobiological and psychiatric consequences of child abuse and neglect. *Developmental Psychobiology*, *52*(7), 671–690. https://doi.org/10.1002/dev.20494

Herman, J. L., Perry, J. C., & Van Der Kolk, B. A. (1989). Childhood trauma in borderline personality disorder. *American Journal of Psychiatry*, *146*(4), 490–495. https://doi.org/10.1176/ajp.146.4.490

Hillis, S. D., Robert, Anda, F., Dube, S. R., Felitti, V. J., Marchbanks, P. A., & Marks, J. S. (2004). *The Association Between Adverse Childhood Experiences and Adolescent Pregnancy, Long-Term Psychosocial Consequences, and Fetal Death*. www.aappublications.org/news

Hong, P. Y., Ilardi, S. S., & Lishner, D. A. (2011). The aftermath of trauma: The impact of perceived and anticipated invalidation of childhood sexual abuse on borderline symptomatology. *Psychological Trauma: Theory, Research, Practice, and Policy*, *3*(4), 360–368. https://doi.org/10.1037/a0021261

Howerton, C. L., & Bale, T. L. (2012). Prenatal programing: At the intersection of maternal

stress and immune activation. In *Hormones and Behavior* (Vol. 62, Issue 3, pp. 237–242). Horm Behav. https://doi.org/10.1016/j.yhbeh.2012.03.007

Johnson, J. G., Cohen, P., Brown, J., Smailes, E. M., & Bernstein, D. P. (1999). Childhood maltreatment increases risk for personality disorders during early adulthood. *Archives of General Psychiatry*, *56*(7), 600–608. https://doi.org/10.1001/archpsyc.56.7.600

Johnson, J. G., Cohen, P., Gould, M. S., Kasen, S., Brown, J., & Brook, J. S. (2002). Childhood adversities, interpersonal difficulties, and risk for suicide attempts during late adolescence and early adulthood. *Archives of General Psychiatry*, *59*(8), 741–749. https://doi.org/10.1001/archpsyc.59.8.741

Johnson, J. G., Cohen, P., Smailes, E. M., Skodol, A. E., Brown, J., & Oldham, J. M. (2001). *Childhood Verbal Abuse and Risk for Personality Disorders During Adolescence and Early Adulthood*. https://doi.org/10.1053/comp.2001.19755

Key Substance Use and Mental Health Indicators in the United States: Results from the 2019 National Survey on Drug Use and Health. (2020).

Kuo, J. R., Khoury, J. E., Metcalfe, R., Fitzpatrick, S., & Goodwill, A. (2015). An examination of the relationship between childhood emotional abuse and borderline personality disorder features: The role of difficulties with emotion regulation. *Child Abuse and Neglect*, *39*, 147–155. https://doi.org/10.1016/j.chiabu.2014.08.008

Laporte, L., & Guttman, H. (1996). Traumatic childhood experiences as risk factors for borderline and other personality disorders. *Journal of Personality Disorders*, *10*(3), 247–259. https://doi.org/10.1521/pedi.1996.10.3.247

Lenzenweger, M. F., Lane, M. C., Loranger, A. W., & Kessler, R. C. (2007). DSM-IV Personality Disorders in the National Comorbidity Survey Replication. *Biological*

Psychiatry, *62*(6), 553–564. https://doi.org/10.1016/j.biopsych.2006.09.019

Linehan, M. (1993). Cognitive-behavioral treatment of borderline personality disorder. In *Cognitive-behavioral treatment of borderline personality disorder.* Guilford Press.

Liotti, G., & Pacquini, P. (2000). Predictive factors for borderline personality disorders patients' early traumatic experiences and losses suffered by the attachment figure. *Primary Care Companion to the Journal of Clinical Psychiatry*, *2*(6), 223–224. https://doi.org/10.4088/PCC.v02n0606

Lisak, D., Hopper, J., & Song, P. (1996). Factors in the cycle of violence: Gender rigidity and emotional constriction. *Journal of Traumatic Stress*, *9*(4), 721–743. https://doi.org/10.1007/BF02104099

Martín-Blanco, A., Ferrer, M., Soler, J., Salazar, J., Vega, D., Andión, O., Sanchez-Mora, C., Arranz, M. J., Ribases, M., Feliu-Soler, A., Pérez, V., & Pascual, J. C. (2014). Association between methylation of the glucocorticoid receptor gene, childhood maltreatment, and clinical severity in borderline personality disorder. *Journal of Psychiatric Research*, *57*(1), 34–40. https://doi.org/10.1016/j.jpsychires.2014.06.011

McGowan, P. O., Sasaki, A., D'Alessio, A. C., Dymov, S., Labonté, B., Szyf, M., Turecki, G., & Meaney, M. J. (2009). Epigenetic regulation of the glucocorticoid receptor in human brain associates with childhood abuse. *Nature Neuroscience*, *12*(3), 342–348. https://doi.org/10.1038/nn.2270

Musser, N., Zalewski, M., Stepp, S., & Lewis, J. (2018). A systematic review of negative parenting practices predicting borderline personality disorder: Are we measuring biosocial theory's 'invalidating environment'? In *Clinical Psychology Review* (Vol. 65, pp. 1–16). Elsevier Inc. https://doi.org/10.1016/j.cpr.2018.06.003

Perroud, N., Paoloni-Giacobino, A., Prada, P., Olié, E., Salzmann, A., Nicastro, R., Guillaume, S., Mouthon, D., Stouder, C., Dieben, K., Huguelet, P., Courtet, P., & Malafosse, A. (2011). Increased methylation of glucocorticoid receptor gene (NR3C1) in adults with a history of childhood maltreatment: A link with the severity and type of trauma. *Translational Psychiatry*, *1*(12), e59–e59. https://doi.org/10.1038/tp.2011.60

Pietrek, C., Elbert, T., Weierstall, R., Müller, O., & Rockstroh, B. (2013). Childhood adversities in relation to psychiatric disorders. *Psychiatry Research*, *206*(1), 103–110. https://doi.org/10.1016/j.psychres.2012.11.003

Porter, C., Palmier-Claus, J., Branitsky, A., Mansell, W., Warwick, H., & Varese, F. (2020). Childhood adversity and borderline personality disorder: a meta-analysis. *Acta Psychiatrica Scandinavica*, *141*(1), 6–20. https://doi.org/10.1111/acps.13118

Preventing Adverse Childhood Experiences |Violence Prevention|Injury Center| CDC. (n.d.). Retrieved July 10, 2020, from https://www.cdc.gov/violenceprevention/acestudy/fastfact.html

Reeves, M. D. (2007). *The effect of invalidation on emotion regulation: An empirical investigation of Linehan's biosocial theory* (Doctoral dissertation). Retrieved from http://diginole.lib.fsu.edu/islandora/object/fsu:176376/datastream/PDF/view.

Rhee, T. G., Barry, L. C., Kuchel, G. A., Steffens, D. C., & Wilkinson, S. T. (2019). Associations of Adverse Childhood Experiences with Past-Year DSM-5 Psychiatric and Substance Use Disorders in Older Adults. *Journal of the American Geriatrics Society*, *67*(10), 2085–2093. https://doi.org/10.1111/jgs.16032

Rinne, T., De Kloet, E. R., Wouters, L., Goekoop, J. G., DeRijk, R. H., & Van den Brink, W. (2002). Hyperresponsiveness of hypothalamic-pituitary-adrenal axis to combined

dexamethasone/corticotropin-releasing hormone challenge in female borderline personality disorder subjects with a history of sustained childhood abuse. *Biological Psychiatry*, *52*(11), 1102–1112. https://doi.org/10.1016/S0006-3223(02)01395-1

Ruggero, C. J., Zimmerman, M., Chelminski, I., & Young, D. (2010). Borderline personality disorder and the misdiagnosis of bipolar disorder. *Journal of Psychiatric Research*, *44*(6), 405–408. https://doi.org/10.1016/j.jpsychires.2009.09.011

Sauer, S. E., & Baer, R. A. (2010). Validation of measures of biosocial precursors to borderline personality disorder: Childhood emotional vulnerability and environmental invalidation. *Assessment, 17*, 454-466. doi: 10.1177/1073191110373226

Scalzo, F., Hulbert, C. A., Betts, J. K., Cotton, S. M., & Chanen, A. M. (2018). Substance Use in Youth With Borderline Personality Disorder. *Journal of Personality Disorders*, *32*(5), 603–617. https://doi.org/10.1521/pedi_2017_31_315

Schreier, H. M. C., Enlow, M. B., Ritz, T., Gennings, C., & Wright, R. J. (2015). Childhood abuse is associated with increased hair cortisol levels among urban pregnant women. *Journal of Epidemiology and Community Health*, *69*(12), 1169–1174. https://doi.org/10.1136/jech-2015-205541

Schuurmans, C., & Kurrasch, D. (2013). Neurodevelopmental consequences of maternal distress: what do we really know? *Clinical Genetics*, *83*(2), 108–117. https://doi.org/10.1111/cge.12049

Schwarze, C. E., Mobascher, A., Pallasch, B., Hoppe, G., Kurz, M., Hellhammer, D. H., & Lieb, K. (2013). Prenatal adversity: A risk factor in borderline personality disorder? *Psychological Medicine*, *43*(6), 1279–1291. https://doi.org/10.1017/S0033291712002140

Smith, M. V., Gotman, N., & Yonkers, K. A. (2016). Early Childhood Adversity and Pregnancy

Outcomes. *Maternal and Child Health Journal*, *20*(4), 790–798. https://doi.org/10.1007/s10995-015-1909-5

Soloff, P. H., Lynch, K. G., & Kelly, T. M. (2002). Childhood abuse as a risk factor for suicidal behavior in borderline personality disorder. *Journal of Personality Disorders*, *16*(3), 201–214. https://doi.org/10.1521/pedi.16.3.201.22542

Substance Abuse and Mental Health Services Administration. (2020). *Key substance use and mental health indicators in the United States: Results from the 2019 National Survey on Drug Use and Health* (HHS Publication No. PEP20-07-01-001, NSDUH Series H-55). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Tarullo, A. R., & Gunnar, M. R. (2006). Child maltreatment and the developing HPA axis. *Hormones and Behavior*, *50*(4), 632–639. https://doi.org/10.1016/j.yhbeh.2006.06.010

Tomko, R. L., Trull, T. J., Wood, P. K., & Sher, K. J. (2014). Characteristics of borderline personality disorder in a community sample: Comorbidity, treatment utilization, and general functioning. *Journal of Personality Disorders*, *28*(5), 734–750. https://doi.org/10.1521/pedi_2012_26_093

Trull, T. J., Freeman, L. K., Vebares, T. J., Choate, A. M., Helle, A. C., & Wycoff, A. M. (2018). Borderline personality disorder and substance use disorders: An updated review. In *Borderline Personality Disorder and Emotion Dysregulation* (Vol. 5, Issue 1, pp. 1–12). BioMed Central Ltd. https://doi.org/10.1186/s40479-018-0093-9

Ullman, S. E., & Peter-Hagene, L. (2014). Social reactions to sexual assault disclosure, coping, perceived control, and ptsd symptoms in sexual assault victims. *Journal of Community Psychology*, *42*(4), 495–508. https://doi.org/10.1002/jcop.21624

Van Den Bosch, L. M. C., Verheul, R., & Van Den Brink, W. (2001). Substance abuse in borderline personality disorder: Clinical and etiological correlates. *Journal of Personality Disorders, 15*(5), 416–424. https://doi.org/10.1521/pedi.15.5.416.19201

Van der Kolk, B. A., Hostetler, A., Herron, N., & Fisler, R. E. (1994). Trauma and the development of borderline personality disorder. *Psychiatric Clinics of North America*, *17*(4), 715-730.

Walter, M., Gunderson, J. G., Zanarini, M. C., Sanislow, C. A., Grilo, C. M., McGlashan, T. H., Morey, L. C., Yen, S., Stout, R. L., & Skodol, A. E. (2009). New onsets of substance use disorders in borderline personality disorder over 7 years of follow-ups: findings from the Collaborative Longitudinal Personality Disorders Study. *Addiction*, *104*(1), 97–103. https://doi.org/10.1111/j.1360-0443.2008.02413.x

Wapp, M., Van De Glind, G., Van Emmerik-Van Oortmerssen, K., Dom, G., Verspreet, S., Carpentier, P. J., Ramos-Quiroga, J. A., Skutle, A., Bu, E. T., Franck, J., Konstenius, M., Kaye, S., Demetrovics, Z., Barta, C., Fatséas, M., Auriacombe, M., Johnson, B., Faraone, S. V., Levin, F. R., … Moggi, F. (2015). Risk factors for borderline personality disorder in treatment seeking patients with a substance use disorder: An international multicenter study. *European Addiction Research*, *21*(4), 188–194. https://doi.org/10.1159/000371724

Waxman, R., Fenton, M. C., Skodol, A. E., Grant, B. F., & Hasin, D. (2013). *Childhood maltreatment and personality disorders in the USA: Specificity of effects and the impact of gender*. https://doi.org/10.1002/pmh.1239

Whittle, S., Dennison, M., Vijayakumar, N., Simmons, J. G., Yücel, M., Lubman, D. I., Pantelis, C., & Allen, N. B. (2013). Childhood maltreatment and psychopathology affect brain development during adolescence. *Journal of the American Academy of Child and*

Adolescent Psychiatry, *52*(9), 940-952.e1. https://doi.org/10.1016/j.jaac.2013.06.007

Young, J. E. (1999). *Young Parenting Inventory (YPI)*. New York: Cognitive Therapy Center of New York. Available from: http://www.schematherapy.com.

Zanarini, M. C., Frankenburg, F. R., Hennen, J., Reich, D. B., & Silk, K. R. (2006). Prediction of the 10-year course of borderline personality disorder. *American Journal of Psychiatry*, *163*(5), 827–832. https://doi.org/10.1176/ajp.2006.163.5.827

Zimmerman, M., Chelminski, I., & Young, D. (2008). The Frequency of Personality Disorders in Psychiatric Patients. In *Psychiatric Clinics of North America* (Vol. 31, Issue 3, pp. 405–420). Psychiatr Clin North Am. https://doi.org/10.1016/j.psc.2008.03.015

CHAPTER III: Manuscript

ASSOCIATION BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND BORDERLINE PERSONALITY DISORDER: FINDINGS FROM THE NATIONAL EPIDEMIOLOGIC SURVEY ON ALCOHOL AND RELATED CONDITIONS (NESARC)-III

Corresponding Author:

Elizabeth Fall, BS

Affiliation:	Georgia State University School of Public Health
Address:	P.O. Box 3995 Atlanta, GA 30302-3995
E-mail:	liz.fall94@gmail.com
Telephone:	770 265 0620

Co-Authors:

Shanta R. Dube, PhD, MPH

Affiliation:	Georgia State University School of Public Health
Address:	P.O. Box 3995 Atlanta, GA 30302-3995
E-mail:	sdube2@gsu.edu
Telephone:	404 413 9301

William W. Thompson, PhD

Affiliation:	Reproducible Scientific Solutions, LLC
Address:	3962 Briaridge Circle Atlanta, GA, 30340

Abstract

Introduction:
Adverse childhood experiences (ACEs) are traumatic events including abuse, neglect, and related stressors that occur before the age of 18. These exposures affect 61 % of adults in the general population. Studies have documented that ACEs contribute to mental illness; however, less is known about its contribution specifically to borderline personality disorder (BPD) and co-morbid substance use disorder (SUD). The purpose of this study was to examine the association between each category of 10 ACEs and the total number (ACE score) with borderline personality disorder alone, borderline personality disorder with comorbid substance use disorder, and lifetime substance use disorder alone.

Methods:
We used cross-sectional limited-use data from the National Epidemiologic Survey on Alcohol and Related Conditions Wave III (NESARC-III). Data were collected between April 2012 to June 2013 and included 36,309 adults in the United States. We assessed 10 different types of ACEs that occurred before age 18 years. Exposure categories included: physical, emotional, and sexual abuse; physical and emotional neglect; growing up in a household with substance abuse; criminal activity; mental illness; parental divorce or separation; and violence against maternal figure. The outcome measures were DSM-5 diagnosis of borderline personality disorder alone, borderline personality disorder with comorbid substance use disorder and substance use disorder alone. The NESARC dataset was adjusted for nonresponse and oversampling. Poststratification analyses were used to weight data to represent the United States general population. We extracted weighted prevalence estimates of ACEs for the overall NESARC population, BPD overall and BPD with comorbid SUD. To estimate the association between ACEs and BPD alone, comorbid SUD, and SUD alone we used multiple logistic regression models to calculate adjusted odds ratios and 95% CI's. Analyses were completed using SAS 9.4.

Results:
Weighted prevalence estimates of each ACE among adults with BPD (n= 4301) are as follows: sexual abuse (28.1%); physical abuse (40.0%), emotional abuse (55.9%), emotional neglect (21.7%), physical neglect (21.4%), violence against maternal figure (27.6%), household substance use (45.5%), mental illness (17.6%), incarceration (19.3%), and parental separation or divorce (44.1%). Each category of ACE predicted BPD and BPD with comorbid SUD. Emotional abuse in childhood had the strongest association to BPD (aOR = 3.00 [2.59, 3.48]), while childhood sexual abuse had the strongest association to BPD with comorbid SUD (aOR=4.45 [4.03,4.91]). Additionally, adults who experienced 4 or more ACEs had 4.72 greater odds of being diagnosed with BPD alone, and 10.02 odds of being diagnosed with BPD with comorbid SUD.

Conclusion:
Exposure to ACEs contributes to BPD diagnosis, and BPD with comorbid SUD among adults. Special emphasis on recognizing the occurrence of childhood trauma among persons with BPD and BPD comorbid SUD is paramount in reducing the likelihood of poor health outcomes. Current treatments for BPD and BPD with SUD include psychotherapies such as Dialectical Behavior Therapy (DBT), but more research is needed to establish the efficacy of these therapies in treating BPD and comorbid SUD.

CHAPTER III - MANUSCRIPT

1.4 Introduction

Adverse childhood experiences (ACEs) refer to traumatic events including abuse, neglect, and related stressors, that occur before the age of 18. ACEs are a significant and widespread public health problem, affecting up to 61 % of adults in the general population and with profound economic and social costs totaling in the billions of dollars each year (CDC, 2019). ACEs can have a long-lasting impact on health outcomes later in life and have been linked to an increased risk of chronic disease, substance abuse, and mental illness. Many mental health conditions associated with ACEs co-occur with one another. Depression and anxiety have been extensively studied, however, the contribution of ACEs to psychopathologies such as borderline personality disorder (BPD) have not been studied as extensively.

Notably, borderline personality disorder, and substance use disorder (SUD) are highly correlated. Almost 50% of those with BPD have at least one current substance use disorder (Trull et al., 2018) compared to just 7.4% of the general population (SAMHSA, 2020). This comorbidity is also linked to an increased likelihood of adverse health outcomes compared to having BPD alone. As many as 79% of patients with BPD attempt suicide and 8-10% die by suicide, a rate 50 times greater than the general population (SAMHSA, 2014). BPD coupled with SUD may increase this already disparate statistic, as a 2001 study found that patients with BPD and SUD were four times more likely to have attempted suicide compared to patients with BPD without addiction problems (van den Bosch et al., 2001).

While there is a vast array of studies on the relationship between childhood trauma and development of borderline personality disorder, major gaps in the literature remain. For instance, many studies have investigated the contribution of ACE categories individually to BPD

diagnosis: childhood sexual abuse (de Aquino Ferreira et al., 2018; Ogata et al., 1990, Ferraz et al., 2013, McLean & Gallop, 2003; Fossati et al., 1999; Herman, Perry & van der Kolk, 1989), emotional abuse (Battle et al., 2004; Carvalho Fernando et al., 2014), physical abuse (Haller & Miles, 2004; Soloff et al., 2002; Atlas, 1995; Paris & Guzder, 1994) and neglect (Sar et al., 2006; Bierer et al., 2003; Zanarini et al., 1997). Few studies have examined the contribution of the remaining categories of ACEs including household member incarceration, substance use, mental illness, female battery, and parental separation/divorce. Even fewer have investigated the prevalence of all 10 categories of ACE described in the ACE Study (Felitti et al, 1998; Dube et al., 2003) among individuals with BPD. Additionally, little information is known about the association between the number of ACEs experienced and subsequent borderline personality disorder. Finally, no study to our knowledge has examined the contribution of ACEs to BPD with comorbid conditions including SUD using nationally representative data.

Using nationally representative data from the NESARC Wave 2 (2004-2005), Afifi et al., (2011) did evaluate the relationship between ACEs and Axis II personality disorders. They found strong relationships between each type of ACE and borderline personality disorder. We hope to update these findings using Wave 3 (2012-2013) NESARC data, and additionally, we will be evaluating the impact of ACEs, including the cumulative ACE score, to BPD alone, BPD with comorbid SUD, and SUD alone.

It is imperative to understand the impact that common risk factors, such as ACEs, have on borderline personality disorder with substance use disorder, as this comorbidity further increases the risk of early death in an already vulnerable population. Therefore, this study aims to assess the association between adverse childhood experiences and borderline personality disorder with and without comorbid substance use disorder(s).

1.5 Methods

1.5.1 Data and Sample

We used a cross-sectional limited-use dataset from the National Epidemiologic Survey on Alcohol and Related Conditions Wave III (NESARC-III), which was obtained with permission from National Institute of Alcohol Abuse and Alcoholism. NESARC-III is a nationally representative survey of 36,309 adults in the United States conducted between April 2012 to June 2013. Noninstitutionalized U.S residents aged 18 and older were recruited via U.S Census Bureau files. Participants completed an automated computer-assisted interview and a questionnaire on their personal history of alcohol use and related disorders, mood symptomatology, mental health diagnoses, drug and tobacco use, and personality traits (Grant et al., 2014). This study was approved by the Institutional Review Board from Georgia State University.

NESARC-III assessed lifetime diagnosis of DSM-5 psychiatric disorders and substance use disorders using the AUDADIS-5 (Alcohol Use Disorder and Associated Disabilities Interview Schedule-5). AUDADIS-5 was developed by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) for use in epidemiologic surveys on the general population. Interviews were administered in-person and were facilitated using flashcards to help guide respondents through the questions.

1.5.2 Diagnosis of Substance Use Disorder

The DSM-5 diagnoses substance use disorder using the following 11 diagnostic criteria:

1) Substance taken in larger amount or over a longer period than was intended.
2) Persistent or unsuccessful attempts to cut down or eliminate use of the substance.

3) Large amount of time is spent in activities necessary to obtaining the substance, using the substance, or recovering from the effects from the substance.
4) Strong craving or desire to use the substance.
5) Substance use that negatively impacts daily obligations at work, school, or home.
6) Continued substance use despite negative impact on interpersonal relationships due in part to substance use.
7) Important social, occupational, or recreational activities reduced or given up due to substance use.
8) Recurrent substance use in physically hazardous situations.
9) Continued substance use despite knowledge of harmful physical and psychological effects caused or exacerbated by substance use.
10) Tolerance
    a. Increased amounts of substance needed to achieve desired effect
    b. Diminished effect with continued use of the same amount of substance
11) Withdrawal
    a. Characteristic withdrawal syndrome
    b. Same or closely related substance taken to relieve or avoid withdrawal symptoms

Substances evaluated for lifetime substance use disorder in NESARC-III include alcohol, tobacco, and illicit drugs (sedatives, cannabis, opioids, cocaine, stimulants, hallucinogen, heroin, inhalant/solvent, and club drugs).

1.5.3 Diagnosis of Borderline Personality Disorder

Diagnosis of borderline personality disorder using DSM-5 criteria requires the presence of at least 5 or more out of 9 pre-defined criteria. These criteria include 1) avoidance of abandonment; 2) pattern of unstable relationships; 3) identity disturbance; 4) impulsivity in at least 2 areas that are potentially damaging; 5) recurrent suicidal behavior, gestures or threats; 6) affective instability; 7) chronic feelings of emptiness; 8) inappropriate, intense anger or difficulty controlling anger; and 9) stress-related paranoid ideation. The AUDADIS-5 assessed the nine BPD criteria using 30 symptom items. Respondents were instructed to answer, "about how you have felt or acted MOST of the time since early adulthood regardless of the situation or whom you were with." Diagnoses were coded dichotomously (no=0, yes=1).

1.5.4 Adverse Childhood Experiences

NESARC-III assessed adverse childhood experiences using the original ACE Study questionnaire (Felitti et al., 1998; Anda et al., 2008; Anda et al., 1999; Chapman et al., 2004; Dong et al., 2004; Dube et al., 2001; Dube et al., 2003; Dube et al., 2005; Dube at al., 2009; Hillis et al., 2004) that included questions adapted from the Childhood Trauma Questionnaire (Bernstein et al., 1998), the Conflict Tactics Scale (Straus, 1979), and childhood sexual abuse questionnaire (Wyatt, 1985). In this study, we examined ten categories of ACEs including 1) emotional abuse; 2) physical abuse; 3) sexual abuse; 4) emotional neglect; 5) physical neglect; 6) witnessing mother or other adult female treated violently; 7) parent's or other household member's substance abuse; 8) parent's or other household member's severe mental illness; 9) parent or other household member's incarceration; 10) parental separation or divorce.

1.5.5 Operationalization of ACEs

Definitions of each category of ACE was based on the established definitions from the CDC-Kaiser ACE Study.

1. Physical abuse was defined as a response of "sometimes" or greater to either of the following questions: how often a parent or other adult living in the respondent's home pushed, grabbed, shoved, slapped, or hit the respondent; or struck the respondent it left marks or bruises, or caused an injury.

2. Emotional abuse was identified as a response of "sometimes", "fairly often" or "very often" to any of the questions pertaining to how often a parent or other adult living in the participant's home swore at, insulted, or said hurtful things to the respondent; threatened to hit or throw something at the respondent (but did not do it); or acted in any other way that made the respondent afraid he/she would be physically hurt or injured.

3. Sexual abuse was defined using responses to 4 questions that examined how often an adult/other person in the respondent's life touched or fondled the respondent in a sexual way, had the respondent touch their body in a sexual way, attempted intercourse, or actually had intercourse when the respondent did not want the act to occur or was too young to understand what was happening. Any response other than "never" on any of the questions was coded as sexual abuse.

4. Physical neglect was defined as a summed score of >10 to five questions that asked how often the respondent had to do difficult or dangerous chores, was left unsupervised as a young child or went without needed clothing, school supplies, food, or medical treatment.

5. Emotional neglect was defined by five questions asking whether respondents felt a part of a supportive family or whether anyone in the family made the respondent feel special, wanted

them to succeed, believed in them, or provided strength and support. Responses were reverse-coded and summed. A score > 15 was coded as emotional neglect.

6. Parental/other household member substance abuse was defined by a response of “yes” to whether a parent or other adult living in the home had alcohol abuse or substance abuse issues.

7. To characterize the history of witnessing domestic violence against female household member, respondents were asked how often the respondent’s father or other adult male had ever done any of the following to the to the respondent’s mother/other adult female: pushed, grabbed, slapped, or threw something at her; kicked, bit, hit with a fist, or hit her with something hard; repeatedly hit her for at least a few minutes; or threatened to use or actually used a knife or gun on her. Any response of “sometimes” or greater for questions 1 or 2, or any response except “never” for questions 3 or 4, was defined as having a battered mother.

8. Parental/other household member incarceration was defined by a “yes” or “no” whether a parent or other adult in the home went to jail or prison.

9. Parent/other adult with severe mental illness was defined by a “yes” or “no” to the question if the parent or adult was treated or hospitalized for mental illness, attempted, or actually committed suicide.

10. Parental divorce or separation/living with 1 parent was defined by a response of yes when asked if biological or adoptive parents got divorced or permanently stopped living together before the respondent was 18 or a response of no when asked if respondent’s biological father ever lived in the household while growing up, regardless of whether he and the mother were married or not. We decided to include individuals who answered “no” to the question “Did biological father ever live in household before respondent was 18?” (n = 5161) due to a large number of missing observations (n = 5822) labelled as “NA, did not experience or unknown if

experienced divorce of biological/adoptive parents before age 18" to the question "Did biological or adoptive parents get divorced or permanently stop living together before age 18?". Cross-tabulation revealed the majority of these NA values were individuals whose biological father never lived in the household before age 18.

ACE's were dichotomously coded (1 = experienced and 0 = did not experience each ACE). Missing values were coded as having not experienced a particular ACE.

1.5.6 Total Number of ACEs

The number of ACEs were summed for each participant (range: 0-10) to calculate an ACE score. ACE Scores were then classified into 5 categories (0, 1, 2, 3, and 4 or more).

Statistical Analysis

The NESARC dataset was adjusted for nonresponse and oversampling. Poststratification analyses were used to weight data to represent the United States general population based on information from the 2012 American Community Survey (Bureau of the Census, 2013). Weighted prevalence estimates of each ACE and ACE Score were calculated for the general population, overall BPD population, and BPD with comorbid SUD. Adjusted odds ratios and 95% CI's were calculated to estimate the association between ACES and BPD only, ACEs and BPD and comorbid SUD, and SUD only. Full models included covariates that controlled for age, sex (female versus male), race/ethnicity (other versus white, non-Hispanic), and educational level (high school, some college, college graduate versus less than high school). All analyses were done using SAS 9.4.

1.6 Results

1.6.1 Demographics of Study Population

The demographic characteristics of the NESARC population stratified by gender can be found in Table 1. The study population consisted of 36309 participants. Male (n= 15862) participants were 45.9 years old on average. Female participants (n = 20447) were 47.2 years old on average. The average age of the study population was 46.5 (SE=0.19) years old. The majority of the study population was White, non-Hispanic (66.2%), followed by Hispanic, any race (14.7%), Black, non-Hispanic (11.8%), Asian/Native Hawaiian/Other Pacific Islander (5.7%), and American Indian/Alaska Native (1.6%). About 15.1 % of adults had less than a high school degree, 29.9 % had at least a high school degree, 38.4% attended some college, and 16.5% were college graduates.

1.6.2 Estimated Weighted Prevalence of ACEs among NESARC study participants

The estimated weighted prevalence of each category of ACE and ACE Score for the NESARC population, stratified by gender, can be found in Table 3. Overall, about 61.6% of adults in the United States have experienced at least 1 ACE (60.3% of males, 62.7% of females). As shown, about 17.1% of females reported 4 or more ACEs versus 13.1% of males.

In terms of each category of ACE, the gender breakdown of the 10 ACEs is as follows: parental separation/divorce/1 parent household (32.0% of females, 30.1% of males), emotional abuse (27.2% of females, 26.0% of males), parental/other household member substance abuse (26.3% of females, 22.8% of males), physical abuse (18.2% of females, 19.2% of males), sexual abuse (15.9% of females, 6.0% of males), violence against mother/other female household member (13.8% of females, 10.3% of males), emotional neglect (11.0% of females, 8.7% of males), physical neglect (8.6% of females, 8.2% of males), parental/other household member

incarceration (8.1% of females, 7.2% of males), and parental/other household member mental illness (7.8% of females, 5.8% of males). The prevalence of childhood sexual abuse among females was significantly higher than males, with females over twice as likely to report having experienced it as a child ($p < .0001$). For most ACEs, the weighted prevalence was significantly higher among females at a $p<0.05$ significance level, with a few exceptions. No gender difference was observed for the prevalence of childhood physical neglect ($p = 0.27$), and physical abuse ($p = 0.06$).

1.6.3 Demographics of Borderline Personality Disorder

The demographic characteristics of adults with borderline personality disorder can be found in Table 2. The weighted prevalence of borderline personality disorder within the NESARC sample was 11.4% (CI: 10.8 – 12.0). The mean age of participants with borderline personality disorder was 42.3 years old. Sex distribution of adults with BPD was not significantly different, with females representing 52.7% of adults with BPD ($p=0.63$). Out of 4301 individuals with borderline personality disorder, the estimated weighted prevalence of lifetime substance use disorder was 76.6% (CI: 74.9-78.3). A significant difference was noted in the sex distribution of lifetime substance use disorder among adults with BPD ($p < .0001$). Approximately 83.3% percent of male adults with BPD had a lifetime substance use disorder versus approximately 70.5% of females.

1.6.4 Estimated Weighted Prevalence of ACEs among adults with BPD

The estimated weighted prevalence of ACEs among adults with BPD, stratified by gender, can be found in Table 4. Overall, about 44.9% of female adults with BPD reported 4 or more ACEs. Among males with BPD, 37.8% reported 4 or more ACEs. Including both sexes, about 41.6% reported 4 or more ACEs.

In terms of each category of ACE, the gender breakdown of the 10 ACEs is as follows: sexual abuse (38.6% of females, 16.4% of males), physical abuse (39.3% of females, 40.7% of males), emotional abuse (58.2% of females, 53.3% of males), emotional neglect (24.4% of females, 18.7% of males), physical neglect (22.7% of females, 20.0% of males), violence against mother/other female household member (30.1% of females, 24.8% of males), parental/other household member substance abuse (46.6% of females, 44.2% of males), parental/other household member mental illness (20.4% of females, 14.5% of males), parental/other household member incarceration (19.0% of females, 19.6% of males), and parental separation/divorce/1 parent household (45.9% of females, 42.1% of males).

1.6.5 Adjusted Odds Ratios of ACEs among adults with BPD only

Overall, every category of ACE was associated with a higher likelihood of borderline personality disorder diagnosis alone, even after controlling for age, sex, race/ethnicity, and educational level (see Table 5). The category of ACE with the highest association was emotional abuse, with those who experienced it having a 3 times higher odds of borderline personality disorder diagnosis alone than those who did not. Additionally, those who experienced emotional neglect (aOR = 2.77 [2.29, 3.36]), sexual abuse (aOR = 2.50 [2.12, 2.96]), physical neglect (aOR = 2.43 [2.04, 2.88]), physical abuse (aOR = 2.23 [1.90, 2.63]), witnessing violence against mother/other female household member (aOR = 2.19 [1.85, 2.60]), parental/other household member mental illness (aOR = 1.89 [1.51, 2.36)], parental/other household member incarceration (aOR = 1.88 [1.52, 2.31]), parental/other household member substance abuse [aOR = 1.49 [1.26, 1.75]), parental divorce/separation or 1 parent household (aOR = 1.26 [1.07, 1.50]) had a higher likelihood of being diagnosed with borderline personality disorder alone. Individuals with 4 or

more ACEs, had 4.72 higher odds of being diagnosed with borderline personality disorder compared to those who experienced 0 ACEs.

1.6.6 Adjusted Odds Ratios of ACEs among adults with BPD and comorbid SUD

Each category of ACE assessed was significantly associated with the presence of borderline personality disorder with comorbid substance used disorder among NESARC participants after controlling for age, sex, race/ethnicity, and education (see Table 5). Sexual abuse had the largest association (aOR = 4.45 [4.03, 4.91]), followed by emotional abuse (aOR = 4.29 [3.84, 4.79]), physical abuse (aOR = 3.79 [3.42, 4.19]), physical neglect (aOR = 3.78 [3.36, 4.25]), parental/other household member mental illness (aOR = 3.73 [3.36, 4.15]), witnessing violence against mother/other female household member (aOR = 3.29 [2.96, 3.64]), parental/other household member incarceration (aOR = 3.16 [2.78, 3.58]), parental/other household member substance abuse (aOR = 3.12 [2.84, 3.41]), emotional neglect (aOR = 2.75 [2.43, 3.11]), and parental divorce/separation or 1 parent household (aOR = 1.66 [1.48, 1.86]). In terms of ACE score, adults who reported 4 or more adverse childhood experiences (aOR = 10.02 [8.63, 11.64]) were significantly more likely to be diagnosed with borderline personality disorder with comorbid lifetime substance use disorder compared to adults who reported 0 ACEs.

1.6.7 Adjusted Odds Ratios of ACEs among adults with Lifetime Substance Use Disorder only

Table 5 shows the adjusted odds ratios for each category of ACE and their association with the presence of a lifetime substance use disorder. Emotional abuse (aOR = 1.23 [1.14, 1.32]), physical abuse (aOR = 1.23 [1.15, 1.33]), parental divorce/separation or 1 parent household (aOR = 1.39 [1.30, 1.50]), parental/other household member substance abuse (aOR =

1.34 [1.25, 1.44]), parental/other household member incarceration (aOR = 1.18 [1.06, 1.31]), and violence against mother/other female household member (aOR = 1.16 [1.06, 1.26]) were all significantly associated with the likelihood of being diagnosed with a lifetime substance use disorder. Interestingly, sexual abuse (aOR = 1.08 [0.99, 1.19]), physical neglect (aOR=1.06 [0.96, 1.17]), emotional neglect (aOR = 1.02 [0.92, 1.13]), and parental/other household member severe mental illness (aOR = 0.95 [0.83, 1.10]), were not associated with lifetime substance use disorder. Additionally, individuals who experience 4 or more ACEs were not significantly more likely to have a lifetime substance use disorder (aOR = 1.49 [1.35, 1.64]). However, individuals who experienced 2 ACEs (aOR = 1.61 [1.47, 1.76]), and 3 ACEs (aOR = 1.64 [1.43, 1.87]), had a significantly higher likelihood of lifetime substance use disorder.

1.7 Discussion

To our knowledge, this is the first study to investigate the role of multiple, interrelated ACEs in predicting borderline personality disorder with comorbid substance use disorder using a nationally representative sample. As hypothesized, this study's results provide additional support for evidence of the significantly higher prevalence of ACEs among individuals with BPD. Each category of ACE was significantly related to borderline personality disorder diagnosis alone, and comorbid SUD among NESARC participants. Emotional abuse before the age of 18 had the highest association with BPD, while childhood sexual abuse had the strongest association with BPD with SUD. Additionally, adults who experienced 4 or more ACEs were significantly more likely to be diagnosed with borderline personality disorder alone and borderline personality disorder and comorbid substance use disorder.

Interestingly, adults who experienced 4 or more ACEs were not significantly more likely to be diagnosed with a lifetime substance use disorder. The reason for this is not entirely clear,

though because tobacco use disorder made up 27.9% of the 43.1% weighted prevalence for lifetime substance use disorder, future study may benefit from further breakdown of lifetime substance use disorder into distinct categories i.e., lifetime alcohol use disorder, tobacco use disorder, and illicit drug use disorder.

Our weighted prevalence estimates of ACEs in the general population match up with recent population-based data. While we observed that 26.5% of the United States general population had experienced childhood emotional abuse, the 2011-2014 BRFSS reported 34.4% of Americans had experienced childhood emotional abuse (Merrick et al., 2018). The rate of household mental illness reported in our study (6.9%) was significantly lower than that reported in the BRFSS (16.5%). The reason for this is likely due in part to the questions used to ascertain this ACE in the NESARC. More specifically, three of the questions used by NESARC are as follows “Before you were 18, was a parent/other adult living at home treated/hospitalized for a mental illness?”, “Before you were 18, did a parent/other adult living at home attempt suicide?”, and finally “Before you were 18, did a parent/other adult living at home actually commit suicide?”. These questions imply a much more severe form of mental illness. It is likely that a significant percentage of individuals had a parent/other adult living at home with a mental illness who was never treated/hospitalized for their illness, never attempted suicide, and never committed suicide, suggesting that there is likely underreporting of other less severe forms of mental illness, that may still be detrimental exposure for young children.

Our weighted prevalence estimate of parental separation/divorce (31.1%) for NESARC respondents was only slightly higher than the BRFSS results (27.6%). This may be due in part because of the inclusion of respondents who indicated that before age 18 years, their biological father did not ever live in the household. Other estimates of parental divorce/separation using the

ACEs measures in BRFSS, have ranged from 31% in 2014 among North Carolina adults (NCSCHS, 2014), to 32% in 2016-2018 among Georgia adults (Davis et al., 2018). Our weighted prevalence of violence against mother/female household member was lower (12.2%) compared to results from the BRFSS (17.5%). It is important to note that while the BRFSS is conducted over the telephone, NESARC-III participants were interviewed in person. This difference in survey modality may lead to response bias on the part of participants. Individuals may feel more comfortable divulging difficult childhood experiences over the phone versus in person.

We found no gender-specific differences in the prevalence of BPD in the NESARC-III. Our findings are similar to Grant et al. (2008) where no gender-specific differences were observed in the NESARC Wave II data (Grant et al., 2008). This is contrary to the gender specific-rates reported in the DSM-5. According to Busch et al., (2016), the prevalence rates of BPD reported by the DSM-5 are based on the results of a meta-analysis of 75 studies conducted close to 30 years ago (Widiger & Trull, 1993). Many of the studies included in this meta-analysis purportedly used clinical samples, which largely skew female and do not represent the population. Women generally seek treatment more frequently than men (Möller-Leimkühler, 2002), therefore the rates reported by the DSM-5 represent the clinical population more so than the general population.

We observed similar rates of physical abuse (~40%) and emotional neglect (~21%) among adults with BPD as Afifi et al. (2011) who used NESARC Wave-II data to study the rate of ACEs in adults with personality disorders. However, we reported significantly higher rates of emotional abuse (55.9% versus 28.6%), significantly lower rates of physical neglect (21.4% versus 45.2%) and slightly lower rates of sexual abuse (28.1% versus 33.6%). While Afifi et al.

(2011) defined physical neglect as any response other than never to 4 relevant questions, we defined the presence of physical neglect as observations with summed scores of 10 or greater to 5 relevant questions. According to the researchers, NESARC-II lacked one of the 5 original physical neglect questions used in the ACE Study (Felitti et al., 1998; Dube et al., 2003); therefore, an alternative definition was developed. The disparity in emotional abuse can also be explained by differences in definition. While Afifi and colleagues, (2011) defined emotional abuse according to the ACE study (response of fairly often or often to 3 relevant questions), we used a less strict definition of a response of sometimes or greater to any of the relevant questions. After adjusting our definition of emotional abuse for comparison purposes, we observed a weighted prevalence of 30.1%, which was only slightly higher than the observed rate of 28.6% reported by Afifi et al. (2011).

To date, dialectical behavior therapy (DBT) remains the most effective therapeutic approach in treating BPD. Furthermore, an extension of DBT dubbed DBT-SUD, was established to treat substance users with borderline personality disorder (Rosenthal, Lynch, & Linehan, 2005). DBT is a type of cognitive-behavioral therapy that emphasizes problem-solving, and acceptance-based practices. DBT-SUD expands on DBT alone with an emphasis on simultaneous treatment of both disorders; including the potential need for pharmacotherapy to treat drug dependence, dialectical abstinence; which involves helping a patient achieve abstinence but supporting a harm-reduction approach when/if relapse occurs, attachment strategies to help facilitate a strong therapeutic relationship, and finally skills training to cope with addictive behavior. Several small, randomized control trials have been conducted assessing the efficacy of DBT-SUD. In a sample of 28 female BPD patients with addiction of various substances, subjects assigned to DBT had greater reductions in drug abuse compared with the

treatment-as-usual (TAU) group (Linehan et al., 1999). Additionally, subjects in the DBT group experienced better improvement in global and social adjustment, and fewer dropouts at follow-up than the TAU group. In a separate randomized control trial (Linehan et al., 2002), a sample of 23 female BPD patients with opioid dependence were randomly assigned to either 1 year of DBT or comprehensive validation therapy (CVT) with a 12-step intervention. At the 8-month assessment point, subjects in the CVT group increased their opiate use whereas subjects in the DBT group maintained their reductions in use. However, there were major differences in treatment retention. All 12 of the subjects in the CVT group remained in treatment while 4 out of the 11 DBT subjects dropped out of treatment. While these studies demonstrate the potential of DBT-SUD, the need for larger, more diverse, male samples are warranted to establish the true efficacy of this treatment among patients with BPD and SUD. This is especially true given our finding that males with BPD have a higher prevalence of lifetime substance use disorder than females with BPD.

Findings from this study can help shed light on the necessity of trauma-informed care approach especially among persons with BPD. In terms of primary prevention, results from this study can help promote the development of programs that aim to prevent child abuse and neglect and promote resilience within at-risk communities. An emphasis on the benefits of positive parenting should be made in carrying out these programs as there is a plethora of evidence about the intergenerational effect of ACEs. From a secondary prevention perspective, interventions should be developed to reduce the severity and acute consequences of adverse childhood experiences, reducing the incidence of adverse outcomes and health risk behaviors linked to these traumatic events. Finally, tertiary prevention strategies should attempt to treat and reduce the long-term consequences of ACEs via the implementation of trauma-informed care in health

care and service agencies to avoid re-traumatization of patients. Trauma-informed practices serve to provide a safe and secure environment for individuals with histories of trauma to avoid exacerbating existing emotional wounds through unempathetic methods. Given the exorbitant amount of stigma experienced by patients with borderline personality disorder in healthcare settings and the even higher likelihood a patient with BPD and SUD will drop out of treatment (Tull et al., 2012), approaches to address these disparities are necessary to prevent trauma within the next generation and to provide healing for those vulnerable to the long-term harmful psychological and physical effects of ACEs.

REFERENCES

An Introduction to Co-Occurring Borderline Personality Disorder and Substance Use Disorders | Publications and Digital Products. (2014). Retrieved November 3, 2020, from https://store.samhsa.gov/product/An-Introduction-to-Co-Occurring-Borderline-Personality-Disorder-and-Substance-Use-Disorders/sma14-4879

Afifi, T. O., Mather, A., Boman, J., Fleisher, W., Enns, M. W., MacMillan, H., & Sareen, J. (2011). Childhood adversity and personality disorders: Results from a nationally representative population-based study. *Journal of Psychiatric Research*, *45*(6), 814–822. https://doi.org/10.1016/j.jpsychires.2010.11.008

Anda, R. F., Brown, D. W., Felitti, V. J., Dube, S. R., & Giles, W. H. (2008). Adverse childhood experiences and prescription drug use in a cohort study of adult HMO patients. *BMC Public Health*, *8*(1), 198. https://doi.org/10.1186/1471-2458-8-198

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. *Journal of the American Medical Association*, *282*(17), 1652–1658. https://doi.org/10.1001/jama.282.17.1652

Atlas, J. A. (1995). Association between history of abuse and borderline personality disorder for hospitalized adolescent girls. *Psychological Reports*, *77*(3 Pt 2), 1346. https://doi.org/10.2466/pr0.1995.77.3f.1346

Battle, C. L., Shea, M. T., Johnson, D. M., Yen, S., Zlotnick, C., Zanarini, M. C., Sanislow, C. A., Skodol, A. E., Gunderson, J. G., Grilo, C. M., McGlashan, T. H., & Morey, L. C. (2004). Childhood maltreatment associated with adult personality disorders: Findings from the collaborative longitudinal personality disorders study. *Journal of Personality Disorders*, *18*(2), 193–211. https://doi.org/10.1521/pedi.18.2.193.32777

Bierer, L. M., Yehuda, R., Schmeidler, J., Mitropoulou, V., New, A. S., Silverman, J. M., & Siever, L. J. (2003). Abuse and Neglect in Childhood: Relationship to Personality Disorder Diagnoses. *CNS Spectrums*, *8*(10), 737–754. https://doi.org/10.1017/s1092852900019118

Bureau of the Census, 2013. American Community Survey, 2012. Bureau of the Census, Suitland, MD.

Busch, A. J., Balsis, S., Morey, L. C., & Oltmanns, T. F. (2016). Gender differences in borderline personality disorder features in an epidemiological sample of adults age 55–64: Self versus informant report. *Journal of personality disorders*, *30*(3), 419-432.

Carvalho Fernando, S., Beblo, T., Schlosser, N., Terfehr, K., Otte, C., Löwe, B., Wolf, O. T., Spitzer, C., Driessen, M., & Wingenfeld, K. (2014). The Impact of Self-Reported Childhood Trauma on Emotion Regulation in Borderline Personality Disorder and Major Depression. *Journal of Trauma & Dissociation*, *15*(4), 384–401. https://doi.org/10.1080/15299732.2013.863262

Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *Journal of Affective Disorders*, *82*(2), 217–225. https://doi.org/10.1016/j.jad.2003.12.013

Davis, V.N., Bayakly, A.R., Chosewood, D., Drenzek, C. 2018 Data Summary: Adverse Childhood Experiences. Georgia Department of Public Health, Epidemiology Section, Chronic Disease, Healthy Behaviors, and Injury Epidemiology Unit

de Aquino Ferreira, L. F., Queiroz Pereira, F. H., Neri Benevides, A. M. L., & Aguiar Melo, M. C. (2018). Borderline personality disorder and sexual abuse: A systematic review. *Psychiatry Research*, *262*, 70–77. https://doi.org/10.1016/j.psychres.2018.01.043

Dong, M., Anda, R. F., Felitti, V. J., Dube, S. R., Williamson, D. F., Thompson, T. J., Loo, C. M., & Giles, W. H. (2004). The interrelatedness of multiple forms of childhood abuse, neglect, and household dysfunction. *Child Abuse and Neglect*, *28*(7), 771–784. https://doi.org/10.1016/j.chiabu.2004.01.008

Dube, S. R., Anda, R. F., Felitti, V. J., Croft, J. B., Edwards, V. J., & Giles, W. H. (2001). Growing up with parental alcohol abuse: Exposure to childhood abuse, neglect, and household dysfunction. *Child Abuse and Neglect*, *25*(12), 1627–1640. https://doi.org/10.1016/S0145-2134(01)00293-9

Dube, S. R., Anda, R. F., Felitti, V. J., Edwards, V. J., & Croft, J. B. (2002). Adverse childhood experiences and personal alcohol abuse as an adult. *Addictive Behaviors*, *27*(5), 713–725. https://doi.org/10.1016/S0306-4603(01)00204-0

Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B. (2009). Cumulative childhood stress and autoimmune diseases in adults. *Psychosomatic Medicine*, *71*(2), 243–250. https://doi.org/10.1097/PSY.0b013e3181907888

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., Felitti, V. J., Dong, M., Giles, W. H., & Anda, R. F. (2003). The impact of adverse childhood experiences on health problems: Evidence from four birth cohorts dating back to 1900. *Preventive Medicine*, *37*(3), 268–277. https://doi.org/10.1016/S0091-7435(03)00123-3

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. In *American Journal of Preventive Medicine* (Vol. 14, Issue 4). https://doi.org/10.1016/j.amepre.2019.04.001

Ferraz, L., Portella, M. J., Vállez, M., Gutiérrez, F., Martín-Blanco, A., Martín-Santos, R., & Subirà, S. (2013). Hostility and childhood sexual abuse as predictors of suicidal behaviour in Borderline Personality Disorder. *Psychiatry Research*, *210*(3), 980–985. https://doi.org/10.1016/j.psychres.2013.07.004

Fossati, A., Madeddu, F., & Maffei, C. (1999). BORDERLINE PERSONALITY DISORDER AND CHILDHOOD SEXUAL ABUSE: A META-ANALYTIC STUDY. In *Journal of Personality Disorders* (Vol. 13).

Grant, B. F., Chou, S. P., Goldstein, R. B., Huang, B., Stinson, F. S., Saha, T. D., Smith, S. M., Dawson, D. A., Pulay, A. J., Pickering, R. P., & Ruan, W. J. (2008). Prevalence, correlates, disability, and comorbidity of DSM-IV borderline personality disorder: Results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*, *69*(4), 533–545. https://doi.org/10.4088/JCP.v69n0404

Grant, Chu, A., Sigman, R., Amsbary, M., Kali, Sugawara, J., Jiao, Y., Ren, R., & Goldstein, W. (n.d.). *National Institute on Alcohol Abuse and Alcoholism National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) Source and Accuracy Statement*.

Haller, D. L., & Miles, D. R. (2004). Personality disturbances in drug-dependent women: Relationship to childhood abuse. *American Journal of Drug and Alcohol Abuse*, *30*(2), 269–286. https://doi.org/10.1081/ADA-120037378

Herman, J. L., Perry, J. C., & Van Der Kolk, B. A. (1989). Childhood trauma in borderline personality disorder. *American Journal of Psychiatry*, *146*(4), 490–495. https://doi.org/10.1176/ajp.146.4.490

Hillis, S. D., Robert, Anda, F., Dube, S. R., Felitti, V. J., Marchbanks, P. A., & Marks, J. S. (2004). *The Association Between Adverse Childhood Experiences and Adolescent Pregnancy, Long-Term Psychosocial Consequences, and Fetal Death*. www.aappublications.org/news

Key Substance Use and Mental Health Indicators in the United States: Results from the 2019 National Survey on Drug Use and Health. (2020).

Linehan, M. M., Schmidt, H., Dimeff, L. A., Craft, J. C., Kanter, J., & Comtois, K. A. (1999). Dialectical behavior therapy for patients with borderline personality disorder and drug-dependence. *American Journal on Addictions*, *8*(4), 279-292.

Linehan, M. M., Dimeff, L. A., Reynolds, S. K., Comtois, K. A., Welch, S. S., Heagerty, P., & Kivlahan, D. R. (2002). Dialectical behavior therapy versus comprehensive validation therapy plus 12-step for the treatment of opioid dependent women meeting criteria for borderline personality disorder. *Drug and alcohol dependence*, *67*(1), 13–26. https://doi.org/10.1016/s0376-8716(02)00011-x

McLean, L. M., & Gallop, R. (2003). Implications of childhood sexual abuse for adult borderline personality disorder and complex posttraumatic stress disorder. *American Journal of Psychiatry*, *160*(2), 369–371. https://doi.org/10.1176/appi.ajp.160.2.369

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*(11), 1038–1044. https://doi.org/10.1001/jamapediatrics.2018.2537

Möller-Leimkühler, A. M. (2002). Barriers to help-seeking by men: a review of sociocultural and clinical literature with particular reference to depression. *Journal of affective disorders*, *71*(1-3), 1-9.

North Carolina Center for Health Statistics (2014)

Ogata, S. N., Silk, K. R., Goodrich, S., Lohr, N. E., & Westen. (1990). Childhood Sexual and Physical Abuse in Adult Patients with Borderline Persona. In *The American Journal of Psychiatry* (Vol. 147, Issue 8).

Paris, J., Zweig-Frank, H., & Guzder, J. (1994). Risk factors for borderline personality in male outpatients. *Journal of Nervous and Mental Disease*, *182*(7), 375–380. https://doi.org/10.1097/00005053-199407000-00002

Preventing Adverse Childhood Experiences |Violence Prevention|Injury Center|CDC. (n.d.). Retrieved July 10, 2020, from https://www.cdc.gov/violenceprevention/acestudy/fastfact.html

Rosenthal, M. Z., Lynch, T. R., Linehan, M. M. (2005) Dialectical Behavior Therapy for Individuals with Borderline Personality Disorder and Substance Use Disorders. In Frances, R., Miller, S., Mack, A., (Eds) *Clinical Textbook of Addictive Disorders*. Guilford Press, NY, 615- 636.

Sar, V., Akyuz, G., Kugu, N., Ozturk, E., & Ertem-Vehid, H. (2006). Axis I dissociative disorder comorbidity in borderline personality disorder and reports of childhood trauma. *Journal of Clinical Psychiatry*, *67*(10), 1583–1590. https://doi.org/10.4088/JCP.v67n1014

Soloff, P. H., Lynch, K. G., & Kelly, T. M. (2002). Childhood abuse as a risk factor for suicidal behavior in borderline personality disorder. *Journal of Personality Disorders*, *16*(3), 201–214. https://doi.org/10.1521/pedi.16.3.201.22542

Straus, M. A. (1979). Measuring Intrafamily Conflict and Violence: The Conflict Tactics (CT) Scales. *Journal of Marriage and the Family*, *41*(1), 75. https://doi.org/10.2307/351733

Trull, T. J., Freeman, L. K., Vebares, T. J., Choate, A. M., Helle, A. C., & Wycoff, A. M. (2018). Borderline personality disorder and substance use disorders: An updated review. *Borderline Personality Disorder and Emotion Dysregulation*, *5*(1), 1–12. https://doi.org/10.1186/s40479-018-0093-9

Tull, M. T., & Gratz, K. L. (2012). The impact of borderline personality disorder on residential substance abuse treatment dropout among men. *Drug and Alcohol Dependence*, *121*(1–2), 97–102. https://doi.org/10.1016/j.drugalcdep.2011.08.014

Van Den Bosch, L. M. C., Verheul, R., & Van Den Brink, W. (2001). Substance abuse in borderline personality disorder: Clinical and etiological correlates. *Journal of Personality Disorders*, *15*(5), 416–424. https://doi.org/10.1521/pedi.15.5.416.19201

Wyatt, G. E. (1985). The sexual abuse of Afro-American and White-American women in childhood. *Child Abuse and Neglect*, *9*(4), 507–519. https://doi.org/10.1016/0145-2134(85)90060-2

Zanarini, M. C., Williams, A. A., Lewis, R. E., Bradford Reich, R., Vera, S. C., Marino, M. F., Levin, A., Yong, L., & Frankenburg, F. R. (1997). Reported Pathological Childhood Experiences Associated With the Development of Borderline Personality Disorder. In *Am J Psychiatry* (Vol. 154, Issue 8).

TABLES

Table 1: Demographic Characteristics of NESARC-III, 2014, United States. Stratified by Gender.

	Male (n = 15862)		Female (n=20447)		Total (N = 36309)	
Characteristic	n	(%, 95% CI)	n	(%, 95% CI)	n	(%, 95% CI)
Age Range						
18-34	5196	31.2 (30.1, 32.2)	6559	29.5 (28.5, 30.4)	11755	30.3 (29.4, 31.1)
35-54	5820	36.2 (35.0, 37.3)	7330	35.3 (34.5, 36.2)	13150	35.7 (35.0, 36.5)
55-74	3915	26.4 (25.4, 27.5)	5041	27.3 (26.3, 28.2)	8956	26.9 (26.1, 27.6)
75+	931	6.3 (5.7, 6.8)	1517	7.9 (7.4, 8.5)	2448	7.1 (6.7, 7.6)
Total	15862		20447		36309	
Ethnicity						
White, non-Hispanic	8555	66.7 (65.1, 68.2)	10639	65.7 (64.1, 67.4)	19194	66.2 (64.7, 67.7)
Black, non-Hispanic	3153	11.0 (9.8, 12.2)	4613	12.5 (11.0, 14.0)	7766	11.8 (10.5, 13.1)
American Indian/Alaska Native, non-Hispanic	210	1.3 (1.1, 1.5)	301	1.8 (1.4, 2.1)	511	1.6 (1.3, 1.8)
Asian/Native Hawaiian/Other Pacific Islander, non-Hispanic	851	5.7 (4.8, 6.7)	950	5.7 (4.7, 6.7)	1801	5.7 (4.8, 6.7)
Hispanic, any race	3093	15.2 (13.8, 16.6)	3944	14.3 (12.9, 15.6)	7037	14.7 (13.4, 16.1)
Total	15862		20447		36309	
Education						
< High School	2456	15.5 (14.5, 16.6)	3034	14.7 (13.8, 15.7)	5490	15.1 (14.2, 16.0)
High School	4466	31.2 (30.0, 32.3)	5333	28.8 (27.6, 30.0)	9799	29.9 (28.9, 31.0)
Some college	4981	36.2 (35.0, 37.5)	7124	40.4 (39.4, 41.5)	12105	38.4 (37.4, 39.4)
College Graduate	1933	17.1 (15.7, 18.4)	2417	16.0 (14.8, 17.2)	4350	16.5 (15.4, 17.6)
Total	13836		17908		31744	

Note. Percentages are weighted. Frequencies are non-weighted. Some observations for educational level were missing from the dataset. Males were 45.9 years old on average (SE=0.2). Females were 47.2 years old on average (SE=0.2). Average age for all participants = 46.5 (SE=0.2).

Table 2: Demographic Characteristics of Adults with Borderline Personality Disorder. Stratified by Gender.

	Male (n = 1827)		Female (n =2474)		Total (n = 4301)	
Characteristic	n	(%, 95% CI)	n	(%, 95 CI)	n	(%, 95% CI)
Age Range						
18-34	651	34.9 (31.5, 38.3)	968	39.3 (36.8, 41.7)	1619	37.2 (35.4, 39.0)
35-54	752	40.3 (37.2, 43.3)	946	37.3 (34.9, 39.6)	1698	38.7 (36.8, 40.6)
55-74	375	21.6 (18.9, 24.4)	505	21.2 (18.9, 23.4)	880	21.4 (19.8, 23.0)
75+	49	3.2 (2.0, 4.4)	55	2.3 (1.6, 3.0)	104	2.7 (2.0, 3.4)
Total	1827		2474		4301	
Ethnicity White, non-Hispanic	1072	70.7 (67.9, 73.6)	1362	67.8 (65.2, 70.3)	2434	69.2 (66.9, 71.4)
Black, non-Hispanic	369	12.1 (10.0, 14.2)	537	12.4 (10.3, 14.5)	906	12.3 (10.5, 14.0)
American Indian/Alaska Native, non-Hispanic	39	2.1 (1.3, 2.9)	69	3.5 (2.4, 4.6)	108	2.8 (2.1, 3.5)
Asian/Native Hawaiian/Other Pacific Islander, non-Hispanic	50	2.7 (1.4, 4.0)	66	3.3 (2.1, 4.4)	116	3.0 (1.9, 4.1)
Hispanic, any race	297	12.3 (10.3, 14.3)	440	13.1 (11.3, 15.0)	737	12.8 (11.1, 14.4)
Total	1827		2474		4301	
*Education**						
< High School	314	17.9 (15.6, 20.3)	407	17.2 (15.0, 19.4)	721	17.5 (15.8, 19.3)
High School	643	39.4 (36.2, 42.5)	723	31.4 (29.1, 33.6)	1366	35.2 (33.3, 37.1)
Some college	596	35.2 (32.1, 38.2)	972	43.9 (41.4, 46.3)	1568	39.7 (37.7, 41.7)
College Graduate	118	7.5 (6.1, 9.0)	165	7.6 (6.0, 9.2)	283	7.6 (6.5, 8.6)
Total	1671		2267		3938	
Diagnosis Lifetime Substance Use Disorder						
Yes	1508	83.3 (81.3, 85.3)	1693	70.5 (67.9, 73.2)	3201	76.6 (74.9, 78.3)
No	319	16.7 (14.7, 18.7)	781	29.5 (26.8, 32.1)	1100	23.4 (21.7, 25.1)

Note. Average age of adults with BPD = 42.3 (SE = 0.3). Average age of females = 41.7(SE = 0.5). Average age of males = 43.0 (SE = 0.6). CI = confidence interval. Percentages are weighted. Frequencies are non-weighted. *363 subjects missing education information. Lifetime substance use disorder (0 = lifetime substance use disorder absent, 1= lifetime substance use disorder present).

Table 3: Definition and estimated weighted prevalence (%) of each category of adverse childhood experience (ACE) by sex for NESARC-III subjects

	Women (n=20447)	Men (n=15862)	Total (n=36309)
Exposure Before Age 18	% (95% CI)	% (95 CI%)	% (95% CI)
Sexual Abuse (How often did an adult/other person…) 1) Touch or fondle you in a sexual way 2) Have you touch their body in sexual way 3) Attempt to have sexual intercourse 4) Actually have sexual intercourse with you	15.9 (15.2, 16.7)	6.0 (5.4,6.6)	11.1 (10.6, 11.6)
Physical Abuse (How often did an adult/other adult living in your home…) 1) Push, grab, shove, slap, or hit you 2) Hit you so hard that you had marks or bruises or were injured	18.2 (17.3-19.2)	19.2 (18.2, 20.1)	18.7 (17.9, 19.5)
Emotional Abuse (How often did a parent/other adult living in your home…) 1) Swear at or insult you or say hurtful things 2) Threaten to hit or throw something at you but didn't do it 3) Act in any other way that made you afraid that you would be physically hurt	27.2 (26.1, 28.2)	26.0 (25.0, 27.0)	26.6 (25.7, 27.4)
Emotional Neglect (Family…) 1) Wanted me to be a success 2) Helped me feel I was important or special 3) Was a source of strength and support 4) Was part of a close-knit family 5) Someone believed in me	11.0 (10.3, 11.6)	8.7 (8.1, 9.3)	9.8 (9.4, 10.4)
Physical Neglect (How often were you…) 1) Made to do chores that were too difficult or dangerous for someone your age 2) Left alone or unsupervised when you were too young to be alone 3) Go without thing you needed like clothes, shoes, or school supplies 4) Make you go hungry or not prepare regular meals 5) Ignore or fail to get you medical treatment when you were sick or hurt	8.6 (8.1, 9.1)	8.2 (7.6, 8.8)	8.4 (8.0, 8.8)

Table 3 Continued:

	Women (n=20447)	Men (n=15862)	Total (n=36309)
Exposure Before Age 18	% (95% CI)	% (95 CI%)	% (95% CI)
Battered Mother (How often did your father/other adult male…) 1) Push, grab, slap or throw something at your mother/other adult female 2) Kick, bite, hit your mother/other adult female with a fist or something hard 3) Repeatedly hit your mother/other adult female for at least a few minutes 4) Threaten your mother/other adult female with a knife/gun to hurt her	13.8 (13.1, 14.5)	10.3 (9.7, 11.0)	12.2 (11.6, 12.7)
Parental/other household member substance use (Parent/other adult in home…) 1) Was a problem drinker/alcoholic 2) Had similar problems with drugs	26.3 (25.3, 27.3)	22.8 (22.0, 23.7)	24.6 (23.9, 25.4)
Parental/Other Household Member Mental Illness (Parent/other adult in home…) 1) Was treated/hospitalized for a mental illness 2) Attempted suicide 3) Actually committed suicide	7.8 (7.3, 8.3)	5.8 (5.4, 6.2)	6.9 (6.5, 7.2)
Parental/other household member incarceration (Parent/other adult in home…) 1) Went to jail or prison	8.1 (7.6, 8.6)	7.2 (6.7, 6.7)	7.6 (7.2, 8.0)
Parental Separation/Divorce / 1 Parent Household 1) Did biological or adoptive parents get divorced or permanently stop living together before respondent was 18 2) Biological father ever live in household before respondent was 18	32.0 (31.0, 32.8)	30.1 (29.0, 31.3)	31.1 (30.2, 32.0)
ACE Score			
0	37.3 (36.1, 38.3)	39.6 (38.3, 40.8)	38.3 (37.4, 39.3)
1	23.8 (23.0, 24.7)	25.9 (25.0, 26.9)	24.8 (24.1, 25.5)
2	13.2 (12.7, 13.8)	13.6 (13.0, 14.2)	13.4 (13.0, 13.8)
3	8.6 (8.0, 9.2)	7.7 (7.3, 8.2)	8.2 (7.8, 8.6)
4 +	17.1 (16.4, 17.9)	13.1 (12.4, 13.9)	15.2 (14.6, 15.9)

Note. Missing values for all necessary questions for a particular experience were coded as not having experienced that ACE.

Table 4: Definition and estimated weighted prevalence (%) of each category of adverse childhood experience (ACE) by sex for Adults with Borderline Personality Disorder

	Women (n=2474)	Men (n=1827)	Total (n=4301)
Exposure Before Age 18	% (95% CI)	% (95 CI%)	% (95% CI)
Sexual Abuse (How often did an adult/other person…) 1) Touch or fondle you in a sexual way 2) Have you touch their body in sexual way 3) Attempt to have sexual intercourse 4) Actually have sexual intercourse with you	38.6 (36.5, 40.7)	16.4 (14.5, 18.3)	28.1 (26.5, 29.7)
Physical Abuse (How often did an adult/other adult living in your home…) 1) Push, grab, shove, slap, or hit you 2) Hit you so hard that you had marks or bruises or were injured	39.3 (36.6, 42.0)	40.7 (38.0,43.3)	40.0 (37.8, 42.1)
Emotional Abuse (How often did a parent/other adult living in your home…) 1) Swear at or insult you or say hurtful things 2) Threaten to hit or throw something at you but didn't do it 3) Act in any other way that made you afraid that you would be physically hurt	58.2 (55.8, 60.7)	53.3 (50.2, 56.4)	55.9 (53.8, 58.1)
Emotional Neglect (Family…) 1) Wanted me to be a success 2) Helped me feel I was important or special 3) Was a source of strength and support 4) Was part of a close-knit family 5) Someone believed in me	24.4 (22.1, 26.7)	18.7 (16.6, 20.7)	21.7 (20.0, 23.4)
Physical Neglect (How often were you…) 1) Made to do chores that were too difficult or dangerous for someone your age 2) Left alone or unsupervised when you were too young to be alone 3) Go without thing you needed like clothes, shoes, or school supplies 4) Make you go hungry or not prepare regular meals 5) Ignore or fail to get you medical treatment when you were sick or hurt	22.7 (20.7, 24.7)	20.0 (17.8, 22.1)	21.4 (20.0, 22.8)

Table 4 Continued:

	Women (n=2474)	Men (n=1827)	Total (n=4301)
Exposure Before Age 18	% (95% CI)	% (95 CI%)	% (95% CI)
Battered Mother (How often did your father/other adult male…) 1) Push, grab, slap or throw something at your mother/other adult female 2) Kick, bite, hit your mother/other adult female with a fist or something hard 3) Repeatedly hit your mother/other adult female for at least a few minutes 4) Threaten your mother/other adult female with a knife/gun to hurt her	30.1 (28.2, 32.0)	24.8 (22.4, 27.2)	27.6 (26.0, 29.2)
Parental substance use (Parent/other adult in home…) 1) Was a problem drinker/alcoholic 2) Had similar problems with drugs	46.6 (44.0, 49.2)	44.2 (41.9, 46.5)	45.5 (43.7, 47.2)
Severe Parental Mental Illness (Parent/other adult in home…) 1) Was treated/hospitalized for a mental illness 2) Attempted suicide 3) Actually committed suicide	20.4 (18.4, 22.3)	14.5 (12.8, 16.3)	17.6 (16.3, 18.9)
Parental Incarceration (Parent/other adult in home…) 1) Went to jail or prison	19.0 (17.0, 20.9)	19.6 (17.4, 21.8)	19.3 (17.8, 20.8)
Parental Separation/Divorce / 1 Parent Household 1) Did biological or adoptive parents get divorced or permanently stop living together before respondent was 18 2) Biological father ever live in household before respondent was 18	45.9 (43.3, 48.4)	42.1 (38.8, 45.3)	44.1 (41.9, 46.2)
ACE Score			
0	12.8 (11.0, 14.5)	15.4 (13.2, 17.6)	14.0 (12.6, 15.5)
1	15.1 (13.4, 16.7)	19.0 (16.7, 21.3)	16.9 (15.5, 18.3)
2	13.5 (11.9, 15.1)	15.3 (13.7, 17.0)	14.4 (13.2, 15.5)
3	13.8 (12.0, 15.6)	12.4 (10.6, 14.2)	13.1 (11.7, 14.6)
4 +	44.9 (42.6, 47.2)	37.8 (35.3, 40.3)	41.6 (39.8, 43.3)

Note. Missing values for all necessary questions for a particular experience were coded as not having experienced that ACE.

Table 5: Adjusted Odds-Ratios for Adverse Childhood Experiences among Adults with BPD Only, BPD+SUD, and SUD only

Adverse Childhood Experience Before Age 18	BPD Only			BPD + SUD			SUD Only		
	aOR	95% CI	P-value	aOR	95% CI	P-value	aOR	95% CI	P-value
Abuse									
Emotional Abuse	3.00	(2.59, 3.48)	<.0001	4.29	(3.84, 4.79)	<.0001	1.23	(1.14, 1.32)	<.0001
Physical Abuse	2.23	(1.90, 2.63)	<.0001	3.79	(3.42, 4.19)	<.0001	1.23	(1.15, 1.33)	<.0001
Sexual Abuse	2.50	(2.12, 2.96)	<.0001	4.45	(4.03,4.91)	<.0001	1.08	(0.99,1.19)	0.0661
Neglect									
Emotional Neglect	2.77	(2.29, 3.36)	<.0001	2.75	(2.43, 3.11)	<.0001	1.02	(0.92, 1.13)	0.7106
Physical Neglect	2.43	(2.04, 2.88)	<.0001	3.78	(3.36, 4.25)	<.0001	1.06	(0.96, 1.17)	0.2243
Related Issues									
Violence against Mother/Other Female Household Member	2.19	(1.85, 2.60)	<.0001	3.29	(2.96, 3.64)	<.0001	1.16	(1.06, 1.26)	0.0011
Parental/Other Household Member Substance Abuse	1.49	(1.26, 1.75)	<.0001	3.12	(2.84, 3.41)	<.0001	1.34	(1.25, 1.44)	<.0001
Parental/Other Household Member Severe Mental Illness	1.89	(1.51, 2.36)	<.0001	3.73	(3.36, 4.15)	<.0001	0.95	(0.83, 1.10)	0.4942
Parental/Other Household Member Incarceration	1.88	(1.52, 2.31)	<.0001	3.16	(2.78, 3.58)	<.0001	1.18	(1.06, 1.31)	0.0018
Parental Divorce/Separation or 1 Parent Household	1.26	(1.07, 1.50)	0.0076	1.66	(1.48, 1.86)	<.0001	1.39	(1.30, 1.50)	<.0001
Total number of ACEs									
0 (reference)									
1	1.62	(1.21, 2.16)	<.0001	1.82	(1.52, 2.18)	<.0001	1.40	(1.29, 1.50)	0.7864
2	2.81	(2.16, 3.66)	0.0318	2.97	(2.48, 3.55)	0.5409	1.61	(1.47, 1.76)	<.0001
3	3.19	(2.38, 4.29)	0.0025	4.95	(4.01, 6.10)	<.0001	1.64	(1.43, 1.87)	0.0008
4+	4.72	(3.78, 5.89)	<.0001	10.02	(8.63, 11.64)	<.0001	1.49	(1.35, 1.64)	0.0864

Note. Covariates included age, sex, race/ethnicity, and educational attainment. SUD = Lifetime substance use disorder. BPD = Borderline personality disorder. aOR = adjusted odds ratio. CI = confidence interval.