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Childhood adversity and the presence and persistence of substance use disorders over the life course among a nationally representative sample of adult women

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Childhood adversity and the presence and persistence of substance use disorders over the life course among a nationally representative sample of adult women

A dissertation submitted in partial satisfaction of the

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by

Elizabeth Ayn Evans

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ABSTRACT OF THE DISSERTATION

Childhood adversity and the presence and persistence of substance use disorders over the life course among a nationally representative sample of adult women

by

Elizabeth Ayn Evans

Doctor of Philosophy in Public Health

University of California, Los Angeles, 2015

Professor Dawn M. Upchurch, Chair

Substance use disorders affect a substantial proportion of women in the United States. During the past two decades, women-specific antecedents, correlates, and consequences of substance use disorders have been identified, but because of the limitations of extant knowledge, we still know relatively little about precise determinants. Theoretically guided by a life course (Elder, 1974, 1998, 2002) epidemiological perspective (Braveman & Barclay, 2009; Kuh et al., 2003), a social determinants perspective (Marmot, 1999), the Stress Process Model (Pearlin, 1981, 1989, 2005), and the Theory of Fundamental Causes (Link & Phelan, 1995; Phelan et al., 2010), I examined relationships between experiences of childhood adversity (defined as abuse, neglect, household dysfunction), sociodemographic characteristics, and the presence and persistence of different types of substance use disorders (defined as no disorder, alcohol only, drug only, poly-substance). I utilized data on 19,209 women and 13,898 men who participated in two waves of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), and were White, Black, or Hispanic. I conducted weighted multinomial regression analysis, exploratory factor analysis, and logistic regression analysis.

Findings indicated that more than half of women and men in the United States have experienced some type of childhood adversity. More women than men have experienced three

or more types of childhood adversity. Also, women and men have experienced different types of childhood adversity. Specifically, more women than men have experienced childhood sexual and emotional abuse, and certain types of childhood household dysfunction, specifically parental problematic substance use, having a battered mom, parental mental illness, and parental suicide attempt. In contrast, fewer women than men have experienced childhood physical abuse, childhood physical and emotional neglect, and having a parent who committed suicide. For women only, exploratory factor analysis indicated that type of childhood adversity may be best reduced to two concepts, i.e., childhood household dysfunction and childhood maltreatment (abuse and neglect).

For both women and men, there was a dose-response relationship between number of types of childhood adversity experienced and likelihood for each type of substance use disorder. However, with more experiences of different types of childhood adversity, the gap between women and men in predicted probability for a disorder narrowed in relation to an alcohol use disorder, it converged in relation to a drug use disorder, and it widened in relation to a poly-substance use disorder. These findings suggest that greater exposure to childhood adversity may act as a force that elevates women's odds for an alcohol and drug use disorder to levels that approximate or mirror those that are evident among men, and it increases the odds for a poly-substance use disorder more sharply among men than among women.

Analyses focused on only women revealed complexities in the ways that socioeconomic status moderated the relationship between childhood adversity and the occurrence of each type of substance use disorder. For example, higher socioeconomic status heightened women's odds for an alcohol use disorder in the context of exposure to 1 to 2 types of childhood adversity; but it dampened those odds in the context of exposure to 3 or more types of childhood adversity. In relation to drug use disorders, higher income heightened women's odds for a disorder in the context of childhood adversity; but those odds were dampened by higher educational attainment and certain employment statuses.

In addition, exposure to more types of childhood adversity increased the odds that women would develop a more severe form of a disorder, i.e., a drug use disorder or a poly-substance use disorder (relative to an alcohol use disorder). Furthermore, the presence of a poly-substance use disorder (relative to an alcohol use disorder) predicted persistence of women's substance use disorders over three years, net of experiences of childhood adversity and other factors. These findings suggest that more exposure to childhood adversity may propel women to a more severe substance use disorder, which in turn may heighten women's risk for persistence of that disorder over her life course.

Finally, there were differences by race/ethnicity in the relationship between type of substance use disorder and disorder persistence. White and Black women were each more likely to have a persistent alcohol use disorder than Hispanic women. Black women were more likely to have a persistent drug use disorder than both White women and Hispanic women. Among both Black women and Hispanic women, having a drug use disorder elevated the risk for disorder persistence more than having only an alcohol use disorder; among White women the presence of a drug use disorder did not elevate the risk for disorder persistence more than having only an alcohol use disorder. For White, Black, and Hispanic women, the presence of a poly-substance use disorder was associated with disorder persistence. More research is needed to understand why there are differences by race/ethnicity in the relationship between having an alcohol or drug use disorder and disorder persistence.

Dissertation findings advance understanding of how early life experiences and other social forces act as fundamental causes of different types of substance use disorders among women and men. In relation to women in particular, findings extend current thinking regarding factors that modify the relationship between childhood adversity and different types of substance use disorders. The knowledge gained through identifying and explicating these relationships has the potential to inform evidence-based treatments, but may also be useful for

shaping other types of public health initiatives to ameliorate or prevent the occurrence and persistence of substance use disorders.

The dissertation of Elizabeth Ayn Evans is approved.

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2015

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

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1990-1994	Research Assistant, Criminal Justice Research Division, San Diego Association of Governments (SANDAG), San Diego, CA

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2012	University of California Global Health Day Travel Award

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CHAPTER ONE

INTRODUCTION AND SPECIFIC AIMS

1.1. Introduction

Alcohol and drug use disorders (hereafter referred to as “substance use disorders” or SUD) affect a substantial proportion of women in the United States. During the past two decades, women-specific antecedents, correlates, and consequences have been identified, but because of the reliance on clinical samples and other limitations of extant knowledge, we still know relatively little about the precise determinants of women’s substance use disorders at a population level. A critical but understudied perspective is that women more so than men use substances primarily to alleviate negative feelings and to cope with stress resulting from or exacerbated by traumatic life events.

In this dissertation, I examine relationships between women’s experiences of early life adversity and the presence and persistence of different types of substance use disorders using a nationally representative sample of women. This dissertation is theoretically guided by a life course (Elder, 1974, 1998, 2002) epidemiological perspective (Braveman & Barclay, 2009; Kuh et al., 2003), a social determinants perspective (Marmot, 1999), the Stress Process Model (Pearlin, 1981, 1989, 2005), and the Theory of Fundamental Causes (Link & Phelan, 1995; Phelan et al., 2010). In combination, the life-course epidemiology perspective and the social determinants perspective provide a framework for conceptualizing the links between childhood adversity, adult sociodemographic characteristics, and risk for different types of SUD occurrence and persistence. The life-course epidemiology perspective and the Stress Process Model provide theoretical guidance on how adversities experienced in early childhood can elevate the risk for occurrence and persistence of different types of SUD in adulthood via direct effects. The Fundamental Causes Model provides specific guidance as to whether access to resources (e.g., as provided by adult SES) is used to avoid risks for different types of SUD or to minimize the consequences of childhood adversity once it occurs. The social determinants

perspective provides a rationale for examining whether the cultural meanings and social consequences of different types of SUD that are specific to each racial/ethnic group mean that race/ethnicity functions as a factor that modifies the relationship between SUD type and SUD persistence.

In this chapter, I define the term substance use disorder, then I present my rationale for focusing on women in this dissertation, and finally I present my aims, research questions, and hypotheses.

1.1.1. Definition of substance use disorders (SUD)

In the United States, the standard for defining and diagnosing alcohol and drug addiction are the criteria provided by the Diagnostic and Statistical Manual of Mental Disorders (DSM) (Hasin et al., 2013). First published in 1952, the DSM criteria were revised and released as the DSM-5 in May 2013 (APA, 2013). The DSM-5 uses the term "substance use disorders" (SUD) to describe the presence of at least two of the following symptoms for a year or longer: (1) continued substance use despite personal endangerment; (2) neglect of major roles and responsibilities; (3) physical or psychological problems related to use; (4) social or interpersonal problems related to substance use; (5) needing to use more of the substance to obtain the desired effect (greater tolerance); (6) development of withdrawal symptoms which can be relieved by taking more of the substance; (7) repeated attempts to quit or reduce substance use; (8) spending a lot of time obtaining, using, or recovering from substance use; (9) using a substance in larger amounts or for longer duration than intended; (10) giving up important social, occupational or recreational activities because of substance use; and (11) cravings and urges to use the substance (APA, 2013). In addition to specifying these criteria, the DSM-5 defines SUD as existing on a mild to severe continuum, with two to three criteria indicating a mild disorder, four to five a moderate disorder, and six or more a severe disorder.

Various terminology is used to discuss SUD (Miller, 2006; O'Brien et al., 2006). Most notably, SUD is alternatively referred to as "addiction," "abuse," and "dependence" (Miller, 2006;

O'Brien et al., 2006; IOM, 2005). Also, it is common to use "substance" and "drug" interchangeably to refer to alcohol and other licit (e.g., prescribed opioid misuse) and illicit (e.g., heroin, cocaine) substances (IOM, 2005). In this dissertation I use the term SUD to refer to the use of alcohol or other substances that meets DSM-defined criteria for a disorder; however I occasionally use the other commonly used terms interchangeably with the term SUD.

1.1.2. Prevalence of substance use disorders among women

Substance use disorders are among the most prevalent psychiatric disorders in the United States. In 2013 an estimated 161.5 million persons had used alcohol or illicit drugs in the past month and 21.6 million persons, or about 8.2% of the population aged 12 or older, met diagnostic criteria for a past-year substance use disorder (SAMHSA, 2014). National prevalence data indicate that men are more likely to exhibit past-12 month abuse or dependence on alcohol (9.9% of men) and illicit drugs (11.6% of men), however these problems affect a substantial proportion of women as well (4.6% and 6.9% of women, respectively) (SAMHSA, 2013).

Recent epidemiologic surveys suggest that the gender gap in rates of substance use and abuse is much smaller when other indices are considered. For example, women accounted for 53.7% of the 2.9 million persons who initiated illicit drug use for the first time in 2012 (SAMHSA, 2013). Among youths aged 12 to 17, the rate of substance use is the same for males and females, 6.1% (SAMHSA, 2013). Alcohol use and abuse rates among women are now more similar to those among men than in prior decades (Hasin et al., 2013). Men and women have similar rates of past month use of stimulants, ecstasy, and hallucinogens (Cotto et al., 2010; SAMHSA, 2013). Women have equivalent or higher rates of nonmedical prescription drug abuse than men (Back et al., 2010; Blanco et al., 2007), particularly for narcotic analgesics and tranquilizers (Simon-Wastila et al., 2004) and other opioid pain relievers (Mack, 2013). Taken together, this evidence indicates that a significant number of women struggle with

substance use disorders today. Findings also point to the need to understand the prevalence and course of SUD among women by type of SUD.

1.1.3. Health and social consequences of women's substance use disorders

In the United States, substance use disorders cost an estimated $467.7 billion each year, amounting to 10.7% of federal and state government budgets (NCASA, 2009). Most of these funds - more than 95% - are not used to prevent or treat substance use disorders but are instead mostly used to cover its health consequences (58%), followed by criminal justice costs (13%) (Harwood et al., 1999; NCASA, 2009). The well-established health consequences of substance use disorders for both women and men include heightened risk for morbidity, particularly human immunodeficiency virus (HIV) and hepatitis C virus (HCV) (Degenhardt et al., 2013; Roberts et al., 2010). Health conditions specifically related to excessive alcohol use include cirrhosis, heart disease, pancreatitis, diabetes mellitus, certain cancers, major depression, and a number of other chronic and acute diseases and conditions (O'Keefe et al., 2014; Parry et al., 2011; Rehm et al., 2003, 2010; Shield et al., 2013; Wilsnack et al., 2013). Substance using women are also at heightened risk for premature mortality (Darke et al., 2011; Degenhardt et al., 2013; Hser et al., 2012; Roerecke & Rehm, 2013), primarily resulting from drug overdose and other substance-related unintentional injuries (e.g., motor vehicle accidents) (SAMHSA, 2005, 2013; CDC, 2002, 2013ab; Brady & Li, 2103; Evans et al., 2015; Roberts et al., 2010; Zavala & French, 2003).

From a life course perspective (Elder, 1974, 2002), substance abuse by adolescent girls is related to social consequences that shape key life transitions and subsequent adult health. Substance abuse by adolescent girls has been implicated in low educational attainment by age 23 (Grant et al., 2012; Huang et al., 2011), motherhood before age 15 (Cavazos-Regh et al., 2012; Chapman & Wu, 2013; Mensch & Kandel, 1992), and accrual of criminal convictions by young adulthood (Bloom & Owen, 2003; Covington & Bloom, 2006). Separately or in combination, these events are significant because they alter the usual sequencing of key life

events and can thus interfere with women's ability to obtain the human, social, and economic resources (e.g., education, job skills, work experiences) that are needed to obtain gainful employment and status attainment (Pearlin et al., 2005). These factors also likely explain why women with SUD often have attained little education, lack job skills, demonstrate persistently low levels of employment, and are financially dependent on others (Hogue et al., 2010; Huang et al., 2011; Pollack & Reuter, 2006; SAMHSA, 2009; Schmidt & McCarty, 2000). It is in this way that substance abuse can elevate the risk for women's persistent poverty (Hogue et al., 2010; Pollack & Reuter, 2006; Schmidt & McCarty, 2000). Low educational attainment and other experiences that result in diminished access to resources are also believed to be particularly harmful to health because they inhibit an individual's ability to obtain the resources that can be used to avoid risks or to minimize the consequences of disease once it occurs (Link & Phelan, 1995).

Substance abuse is also a primary risk factor for women's involvement with the criminal justice system. Mandatory sentencing for drug-related offenses has dramatically increased the numbers of incarcerated women, with more than 205,000 women now living in jail or prison and more than 1 million on probation or parole (Austin et al., 2001; Guerino et al., 2011). Approximately 50-60% of women are under the influence of substances when they commit a crime and more than 80% of women offenders have a substance use disorder (Bloom & Owen, 2003; Covington & Bloom, 2006). Among women treated for a substance use disorder, involvement with the criminal justice system appears to be a key factor that explains a return to substance use and other poor outcomes over time (Evans et al., 2013).

Finally, ongoing substance use by pregnant and parenting women can have serious adverse effects on child health and welfare. It is conservatively estimated that between 4% and 15% of pregnant women use alcohol or other substances (Howell et al., 1999; SAMHSA, 2009). The negative physiological effects of prenatal exposure to maternal substance use, particularly alcohol, on child health are well-documented (Johnson & Leff, 1999; Johnson et al., 1990;

Zuckerman et al., 1989). In addition, most women with a substance use disorder are of child-rearing age, two-thirds have dependent children, and most are the primary childcare provider (Brady & Ashley, 2005; SAMHSA, 2009). Women's substance abuse can create a chaotic home environment that negatively impacts child psychological growth and development (Chatterji & Markiwitz, 2001; Johnson & Leff, 1999) and increases the risk for child maltreatment and abuse (Chaffin et al., 1996). An important social consequence of women's SUD that is difficult to quantify in economic terms is that women's experiences of substance use, criminal behavior, violence, and neglectful parenting may be replicated in the lives of their children (Sakai et al., 2011; Sheridan, 1995). Why and how the intergenerational transmission of SUD from mother to child occurs is a critical area for new research.

1.1.4. The occurrence and persistence of SUD involve complex processes

No single factor determines whether SUD will develop or persist (Lettieri et al., 1980; West, 2006). Instead, the course of SUD is thought to be influenced by a combination of many complex factors that include personal choice, individual biology (e.g., genetic composition, neurobiology), psychological factors, and the surrounding social environment (e.g., conditions at home, school or work, and the neighborhood) (Lettieri et al., 1980; Vaillant, 1988; West, 2006). In general, a SUD is more likely to develop when there is: (1) a predisposition, or motive and susceptibility, to use substances; *and* (2) the means to purchase or otherwise obtain substances; *and* (3) an environment that provides the opportunity to use substances. These concepts underscore as a critical role for SUD research the identification of the factors and experiences that contribute to substance use initiation, persistence, and change (Hser et al., 2007).

Many longitudinal studies of substance abuse have focused on the progression from initiation of substance use to abuse and dependence as it occurs among adolescents and young adults (Kandel & Chen, 2000; Schulenberg, 2005; West, 2006). Collectively, these studies have identified an extensive list of risk and protective factors that influence the likelihood

for substance use or for development of substance use disorders during these life stages (see two reviews Hawkins et al., 1992; Wills et al., 2005). Based on this literature, the key factors that protect against substance use and abuse during adolescence include supportive family relationships, academic involvement, and higher self-esteem (Hawkins et al., 1992; Wills et al., 2005). The primary factors that increase the risk for substance use and abuse during this life stage include: (1) family factors such as family history of substance use disorders, parental psychological problems, and poor parental attachment; (2) individual factors such as poor self-control, risk taking tendencies, sensation seeking, life stress, deviant peer affiliations, and genetic factors; and (3) environmental factors such as neighborhood disorganization and availability of substances (Hawkins et al., 1992; Wills et al., 2005).

Several of these factors that precipitate occurrence of substance use and abuse have been shown to predict persistence of substance use at subsequent time-points in the life course, however few studies have had sufficiently lengthy observation periods to adequately characterize persistence of substance use disorders (Wills et al., 2005). The evidence on persistence of substance use disorders that does exist indicates that the most important predictors of persistence are low socioeconomic status, co-occurring psychiatric conditions (e.g., mood disorders, particularly anxiety and depression), and the lack of family and social supports for cessation of substance abuse (Crum et al., 2013; Glass et al., 2013; Hasin et al., 2002; Hser et al., 2007, 2014; McLellan et al., 2000; Tuithof et al., 2013). It is generally thought that there are differences in the factors related to SUD persistence versus occurrence, but these factors are poorly understood (Brady et al., 2009; Greenfield et al., 2007).

1.1.5. Key factors that influence SUD occurrence and persistence among women

The long-held assumption that substance use disorders mostly affect men and rarely occur among women (Brady et al., 1993, 2009; Brady & Randall, 1999; Greenfield et al., 2007; Tuchman, 2010) has contributed to the fact that women are underrepresented in SUD-related studies (Brady et al., 2009; Greenfield et al., 2007). In the 1990s federal guidelines

called for expanded research on women and health (FDA, 1994; Mathias, 1995). Over the past two decades many studies have reported similarities and differences in the ways that women and men experience SUD (Brady et al., 2009; Greenfield et al., 2007; Tuchman, 2010). Among the most robust findings are that there are factors more prevalent among women that heighten the risks and burdens of SUD among women (Greenfield et al., 2007; Haseltine, 2000). In this section, I synthesize a few of the key findings that have emerged from this literature.

Most women with SUD are first introduced to substances during adolescence or young adulthood by a family member, sexual partner, friend, or other trusted individual (Brady & Randall, 1999; Brecht et al., 2004; Greenfield & Grella, 2009; Falkin & Strauss, 2003). Some women report using substances for pleasure, to bond with others, to gain energy, and to lose weight (Brecht et al., 2004). Many other women, however, are believed to initiate substance use to alleviate emotional pain or stress (SAMHSA, 2009). In particular, more women treated for SUD than men report life experiences such as physical or sexual abuse (Boles et al., 2005; Messina et al., 2006; Sacks et al., 2008) and interpersonal violence (Najavits, 2009; Testa et al., 2003). These experiences can generate negative self-emotions such as guilt, shame, and self-devaluation (Najavits, 2009). Negative emotions like these tend to be externalized in the form of aggressive and impulsive behavior, such as substance use, among boys but internalized as anxiety, depression, and social withdrawal among girls (Gjerde et al., 1988; Leadbeater et al., 1999). It is widely recognized that more than twice as many women with SUD as men suffer from depression, anxiety, and other mood disorders (Brady & Randall, 1999; Greenfield et al., 2007; Tuchman, 2010; Fiorentine et al., 1997; SAMHSA, 2009). Furthermore, women initiate substance use at older ages on average than men (Grella et al., 2005; SAMHSA, 2009; Hartel et al., 2006) and women's first use of substances typically occurs after the onset of mental illness, whereas the sequence of these events is more often reversed among men (Kessler, 2004). It is for these reasons that it is generally believed women more so than men use

substances initially to alleviate negative feelings and to cope with stress (Brady & Randall, 1999; Haseltine, 2000; Pettinati & Plebani, 2009; Sun, 2007). This body of research suggests that there are gender differences in the underlying causal pathways to SUD. Therefore, research that is focused on each gender, and women in particular, is needed.

Once a SUD has developed, the SUD itself may exacerbate women's negative self-feelings and become a new source of stress that, in a vicious cycle, contributes to the persistence of women's SUD. This concept originates in studies that have reported that women experience more feelings of shame and guilt related to their SUD than men (Haseltine, 2000; O'Connor et al., 1994). Having a SUD itself along with the behaviors women enact in conjunction with substance use (e.g., neglect of children) or to support substance use (e.g., trading sex for money or drugs) create social stigma that is much harsher for women than men (Haseltine, 2000; Hecksher & Hesse, 2009; Warner et al., 2004). A possible reason for gender differences in substance-related social stigma is that a woman who uses substances has manifested behaviors that set her apart from traditional gender norms (e.g., caregiver, mother, social conformity) more than is experienced by men (Hecksher & Hesse, 2009).

Besides the SUD itself, women more than men encounter a number of other problems that can generate stress and thereby trigger continued substance use or exacerbate the SUD. First, primarily due to financial constraints resulting from early parenthood or low educational attainment, women with SUD often continue to live in substance-using or otherwise disadvantaged environments (Sun, 2007). These contexts may place women at greater risk for substance use because they are environments in which women are exposed to more stressors, substances are more widely available, substance use is normative, and there are few alternative rewards to compete with substance use (Edin & Lein, 1997; Ensminger et al., 1997; Freisthler et al., 2005; Genberg et al., 2011). Additionally, women with SUD are also more likely than men to experience interpersonal conflict, live with a substance user who provides substances, use multiple substances concurrently, suffer from co-occurring mental illness, and be solely

responsible for rearing dependent children (Evans et al., 2015; Falkin & Strauss, 2003; Fiorentine et al., 1997; Greenfield & Grella, 2009; Grella et al., 2005; Hser et al., 2003). These problems and responsibilities may increase women's stress and negative emotions and thereby function as factors that trigger substance use or heighten impulsiveness and susceptibility to environmental substance use cues. Finally, among women but not among men, adverse childhood experiences appear to reduce the threshold for reactions to stress that occurs later in the adult life, thereby increasing women's vulnerability for adult substance use disorders (Myers et al., 2014). Investigators theorize that childhood adversity may act as a factor that sensitizes women to the effects of adult stressors to create poorer health (McLaughlin et al., 2010ab; Myers et al., 2014). This means that even minor stressors can precipitate or exacerbate substance use among women with a history of childhood adversity, whereas these same events generally do not lead to substance use among women without this history.

Clearly, the current research base has been invaluable in revealing the ways in which there are gender differences in the factors associated with SUD. Of most salience for this dissertation is the idea that the occurrence and persistence of SUD among women may be the result of stress processes and coping capabilities that are rooted in adverse childhood experiences. It is important to realize, however, that the aforementioned findings have mostly been generated by study designs that suffer from a number of critical limitations that, as explained in the next section, limit what is known about SUD among women.

1.1.6. Substance use disorders among women are poorly understood

Like most studies of SUD, research on women's SUD is largely derived from non-random convenience samples of patients enrolled in publicly-funded treatment for SUD[1] (Brady et al., 2009). The public SUD treatment system is generally utilized by individuals with a more

[1] In general, publicly-funded facilities receive government funds or licensure to provide treatment for substance use disorders (SAMHSA, 2007, 2009). Public SUD treatment accounts for 77% of all available care for SUD, leaving 23% funded by private insurers, philanthropy, or out-of-pocket payments (Mark et al., 2007).

severe SUD, a lower socioeconomic status, fewer resources (e.g., no health insurance) (White et al., 2012), and other characteristics that differentiate treated and untreated individuals such as a greater readiness to stop abusing substances, a greater perceived need for treatment, greater monitoring by social service agencies, and less concern regarding substance-related social stigma (SAMHSA, 2013). Findings suggest that women who enter public SUD treatment are a distinct subgroup of women who may be motivated to quit abusing substances but because they lack resources to address substance abuse and related problems, these women exhibit SUD that is particularly severe and intractable. Therefore it is inappropriate to presume that findings from studies of women treated in public SUD settings can apply to the privately treated or untreated population of women with SUD at large. This limitation points to the need to generate knowledge that is applicable to broader populations of women at risk for SUD. An aim such as this requires that researchers utilize data from general population surveys, as I do in this dissertation.

Another critical limitation of current knowledge regarding SUD among women is a product of the fact that although there are more than 40 different theories to explain the origins of SUD, the factors that shape its development, and the influences that might ameliorate its course (Lettieri et al., 1980; West, 2006), most SUD research on women is largely conducted within an atheoretical framework (West, 2006). Many SUD scientists, particularly those that focus on studying the health service systems that treat SUD, aim to assess how a particular SUD treatment experience impacts the relatively short-term (i.e., as observed over 6 months to 1 year) progression and resolution of SUD (for a review, see McKay & Weiss, 2001). Research questions often pertain to how SUD treatment effects vary across sub-populations and how differences in the context and content of the treatment itself can influence outcomes. Given this framework and that these study designs generally encompass a restricted range of the SUD continuum, most studies of SUD generally do not consider etiological questions such as the underlying reasons why women develop SUD initially or why and how SUD changes over time.

A major limitation of this approach is that while it has generated knowledge that has been used to improve SUD treatment for women, this design does not recognize the fundamental social circumstances that shape behavior and ultimately influence the health of women at risk for SUD. In contrast to this type of research, in this dissertation I draw on well-established theoretical models to consider a set of broad social forces that are potentially related to women's risk for substance abuse.

A third limitation of current knowledge regarding women's SUD is that the SUD research field has a more than 20-year history of studying alcohol separately from other substances (Johnson et al., 2011). Moreover, in relation to women specifically, most studies of SUD have focused on alcohol only and have not considered the other types of SUD (Brady et al., 2009). Segregations in the knowledge base by substance type and a singular focus on alcohol is increasingly incongruent with current conceptualizations of substance abuse as a disorder that: (1) exists on a continuum (as reflected by the DSM-5) that may begin with alcohol abuse but over time can involve the simultaneous or sequential abuse of multiple substances ("poly-substance" abuse); (2) is driven by underlying mechanisms that are likely more similar than different across substance type (West, 2006); and (3) is shaped by both biological effects and also social forces. Ultimately, this tradition of segregating alcohol from other substances reflects and perpetuates a certain fragmentation of thought that stymies efforts to generate knowledge on the fundamental nature of substance use disorders. To address this gap in knowledge, for this dissertation I consider both alcohol and other substances, and I examine both alcohol and other substances in a common theoretical and analytical framework. This approach has the potential to illuminate how the course of women's alcohol use disorders, and the factors that influence that course, are similar to or different from that of other substances. Therefore, findings from this dissertation have the potential to reveal underlying commonalities in risk factors across SUD type and it can point to the ways in which different types of disorders are socially defined in profoundly differentiated terms.

Finally, although a number of nationally representative surveys have served as a critical foundation for assessing the patterns and prevalence of SUD in the general population of women, most of these surveys have suffered from three critical design limitations that have curtailed the extent to which survey data can be used to advance understanding of the origins and progression of SUD among women. First, general population surveys typically encompass a heterogeneous sample of women, most of whom do not use substances or use substances at levels that do not meet criteria for a disorder (Weisner, 1993). This limitation is due to the fact that the national prevalence rate of women with SUD is relatively low, making it difficult to enroll sufficient numbers of women with a SUD in these surveys, but also because most national surveys by design do not survey women who are living in settings where women who have developed a disorder are likely to be living (e.g., homeless shelters, college campuses). Therefore, surveys like these often provide data on a relatively small sample of women with SUD. Two consequences are that (1) many studies that utilize such data are under-powered and do not have a large enough sample size to compare and contrast sub-groups of women (e.g., by race/ethnicity) and (2) to avoid the problems of low statistical power and to capitalize on the design strengths that are offered by national survey data, analyses tend to examine women's *substance use* but rarely consider women's *substance use disorders*.

A second limitation of most national surveys is that generally they are not designed to collect information on certain factors and experiences that may be especially critical to the occurrence and persistence of SUD among women. As a key example, one of the most important limitations of general population surveys is inadequate or no measurement of the occurrence and timing of physical and sexual abuse and other traumatic life events. This omission is problematic because findings based on samples of women treated for SUD in publicly funded settings indicate that women more so than men use alcohol and drugs not to defy conventional standards but primarily as a means to alleviate negative feelings and to cope with stress (Brady & Randall, 1999; Haseltine, 2000; Pettinati & Plebani, 2009; SAMHSA,

2009; Sun, 2007) resulting from traumatic life events, particularly childhood physical or sexual abuse (Boles et al., 2005; Messina et al., 2006; Sacks et al., 2008) and adult interpersonal violence (Najavits, 2009; Testa et al., 2003), or other causes. Without the measurement of these types of events by general population surveys, it is not possible to discern whether these events are simply related to the reasons that bring women to SUD treatment or in actuality function as causal mechanisms that explain the occurrence and persistence of SUD among women.

A final major limitation of most national surveys is that usually they are cross-sectional, that is, they are confined to surveying individuals at a single point in time. Therefore it is not possible to assess whether or how women exhibit changes in their SUD over time (Fitzmaurice et al., 2011). In contrast, a repeated measures longitudinal study design collects the same measurements of the same group of individuals at each data collection time-point, thereby allowing direct study of precise changes that occur within individuals in the outcome (Fitzmaurice et al., 2011; Weiss, 2005). This study design captures the temporal ordering of events and thus permits examination of how the characteristics of women and their exposures to real-world environments influence changes in SUD. This design demonstrates good internal validity (Fitzmaurice et al., 2011) and is indispensable for advancing knowledge about women's SUD occurrence and course, in addition to understanding the factors that shape this process.

In light of these significant limitations of the extant literature on SUD among women, for this dissertation I use data collected from a large sample of women as provided by a nationally representative longitudinal survey of adults to investigate how childhood adversity and other sociodemographic factors are associated with the presence and persistence of different types of substance use disorders among adult women. Chief among the several strengths of the design of this dissertation is that when complete, the findings advance understanding of how early life experiences and other social forces act as fundamental causes of different types of substance

use disorders among women. Dissertation findings have the potential to inform evidence-based SUD treatments for women, but may also be useful for shaping other types of public health initiatives (besides SUD treatment) to ameliorate or prevent the occurrence and persistence of women's substance use disorders.

1.2. Specific aims for Part One of the dissertation

Using secondary data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a nationally representative longitudinal survey of adults, the overarching goal of this study is to investigate the factors related to the presence and persistence of different types of substance use disorders (SUD) among adult women. In Part One, represented by Aims 1-5, I focus on the presence of different types of substance use disorders (i.e., no disorder, alcohol use disorder only, drug use disorder only, poly-substance use disorder). Specific aims and the respective research questions and hypotheses from which they were generated follow.

Aim 1: To better contextualize the experiences of women with substance use disorders, for the first aim I assess whether there are gender differences in the relationship between childhood adversity and different types of substance use disorders (i.e., no disorder, alcohol only, drug only, poly-substance). I also examine how women are similar to and different from men in the characteristics and experiences that are related to the presence of different types of substance use disorders. For each subsequent aim (Aims 2-6), I focus on women only. The specific research questions for Aim 1 are:

1a. Are there gender differences in any association between the number of different types of childhood adversity that is experienced (i.e., 0, 1-2, $\geq$3) and risk for each type of SUD?

1b. What are the ways in which women are similar to and different from men in the demographic characteristics (e.g., age, race/ethnicity, nativity status), socioeconomic status (household income, educational attainment, employment status), and region of

residence that are related to the presence of different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance)?

1c. Is the effect of childhood adversity on risk for each type of SUD (i.e., no disorder, alcohol only, drug only, poly-substance) moderated by gender? A related question is whether any moderation effects are similar or different by type of SUD.

The life-course epidemiology perspective (Braveman & Barclay, 2009; Elder, 1974, 1998, 2002; Kuh et al., 2003) and the Stress Process Model (Link & Phelan, 1995; Phelan et al., 2010) provide theoretical guidance on how adversities experienced in early childhood can elevate the risk for occurrence and persistence of different types of SUD in adulthood via direct effects. For both women and men, studies have documented a relationship between childhood adversity and increased risk for occurrence of substance use disorders (e.g., Dube et al., 2002; Afifi et al., 2012; Felitti et al., 1998; Fenton et al., 2013; Green et al., 2010; Mersky et al., 2013; Pilowsky et al., 2009). Development of a substance use disorder usually occurs during early to middle-adulthood (e.g., adults aged 20 to 45). The SUD can worsen or dissipate over the subsequent years (Hser et al., 2007ab, 2008ab). In relation to alcohol, a faster age-related decline in the probability of heavy drinking has been observed among women compared to men (Karlamangla et al., 2006). Limited evidence indicates that women are more likely than men to mature out of problematic alcohol use (Jackson et al., 2001) and that the maturing out process occurs at an earlier age for women relative to men (Wells et al., 2006).

In addition, a social determinants perspective (Marmot, 1999) recognizes there are profound differences in health based on differences in social position (e.g., gender, race/ethnicity, educational attainment, occupational ranking, income, and accumulated wealth). Variation in SUD prevalence according to other demographic characteristics besides age has been documented. In particular, for both women and men, compared to their White counterparts, SUD prevalence is generally lower among Blacks and similar or lower among Hispanics (Alvanzo et al., 2011; Breslau et al., 2005; Huang et al., 2006; Kessler et al., 1994;

Gilman et al., 2008; Grant et al., 2011, 2012; Smith et al., 2006). SUD prevalence is also generally higher among individuals who are US born (Blanco et al., 2013; Grant et al., 2004; Otiniano Verissimo et al., 2014; Ortega et al., 2000). In relation to socioeconomic status, a number of studies have found that the prevalence of SUD is higher among lower SES groups (Goodman & Huang, 2002; Kessler et al., 1994; Lemstra et al., 2008; Reinherz et al., 2000).

Finally, experiences of childhood adversity may have a greater adverse impact in relation to risk for SUD among women than men. Prevalence data indicate that girls are more likely than boys to report having experienced childhood household dysfunction, particularly parental substance use and parental mental illness (Dube et al., 2003). Children exposed to parental mental illness appear to be more likely to drink alcohol to cope with problems rather than for pleasure or to be social (Rothman et al., 2008). Also, parental substance use and its implications regarding the inter-generational transmission of substance use is the primary reason why experts have identified this childhood adversity as the most critical risk factor for initiation of substance use during adolescence (Johnson & Leff, 1999). In addition, family violence (e.g., having a battered mother) and child neglect have been associated with a greater increased SUD risk than other types of childhood adversity (Green et al., 2010). Household dysfunction generally represents factors that may remain in place as girls mature into adulthood. Thus household dysfunction can constitute a continuous source of stress over a woman's life course. Other research has documented how the negative emotions that often stem from childhood adversity tend to be externalized in the form of aggressive and impulsive behavior, such as substance use, among boys but internalized as anxiety, depression, and social withdrawal among girls (Gjerde et al., 1988; Leadbeater et al., 1999). Women more so than men may use substances initially to alleviate negative feelings and to cope with stress resulting from childhood adversity and other traumatic life events (Brady & Randall, 1999; Haseltine, 2000; Pettinati & Plebani, 2009; Sun, 2007). Once a SUD has developed, the SUD itself may exacerbate women's negative self-feelings and become a new source of stress that, in a vicious

cycle, contributes to the persistence of women's SUD (Haseltine, 2000; O'Connor et al., 1994). Having a SUD itself along with the behaviors women enact in conjunction with substance use (e.g., neglect of children) or to support substance use (e.g., trading sex for money or drugs) create social stigma that is much harsher for women than men (Haseltine, 2000; Heckscher & Hesse, 2009; Warner et al., 2004). Therefore, my hypotheses for Aim 1 are:

1a. For both genders, having experienced 1 to 2 or $\geq$3 different types of childhood adversity (relative to having experienced none) will be related to the presence of each type of SUD.

1b. Women and men will be more similar than different in the ways that demographic characteristics, socioeconomic status, and region are related to the presence of different types of SUD, however some meaningful differences will be apparent. Also, gender differences in the effect of sociodemographic characteristics will vary by type of SUD. For example, women will be less likely than men to experience alcohol use disorders at older ages, but there will not be gender differences in the effect of age in relation to drug use disorders. For both genders, a lower risk of each type of SUD will be associated with being a member of a minority racial/ethnic group, being born outside of the US, and higher SES.

1c. The effect of childhood adversity on risk for each type of SUD will be moderated by gender such that experiences of adversity will increase the risk for each type of SUD more so among women than among men. Also, I hypothesize that the moderation of the childhood adversity-SUD relationship by gender will be most evident in relation to drug use disorders and less evident in relation to alcohol use disorders.

Aim 2: The second aim is to determine whether the magnitude of any relationship between childhood adversity and occurrence of each type of SUD is different when I consider simultaneously the type of childhood adversity and the number of different types of childhood

adversity, identify the constructs that are captured by the concept of childhood adversity, and assess the relationship between type of childhood adversity and occurrence of each type of SUD (i.e., no disorder, alcohol only, drug only, poly-substance). The specific research questions are:

2a. Does the nature of any association between childhood adversity and risk for different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance) change when both: (i) type of childhood adversity (e.g., sexual abuse, parental substance use, and so on) and (ii) number of different types of childhood adversity (i.e., 0, 1-2, $\geq$3) are considered simultaneously?

2b. How many and which type of unique constructs are embedded in the construct of childhood adversity?

2c. What is the relationship between type of childhood adversity, per 2b most likely defined as childhood maltreatment (i.e., childhood abuse and neglect) and childhood household dysfunction, with occurrence of each type of SUD?

The Stress Process Model (Pearlin, 1989; Pearlin et al., 2005) proposes that exposure to trauma during childhood can lead to the accumulation of secondary stressors, additional trauma, or chronic strains. Empirical evidence indicates that individuals who experience one type of childhood adversity are often exposed to another type of childhood adversity. It has been argued that consideration of a specific type of childhood adversity in light of the occurrence of other types of childhood adversity generally reduces estimates of individual childhood adversity effects. Furthermore, studies have reported that certain types of adversities - parental substance use, family violence, sexual abuse, child neglect - have a greater effect on SUD risk than others. Finally, conceptually childhood abuse and neglect are commonly categorized together (as maltreatment) and thought of as being related to but nevertheless distinct from childhood household dysfunction. Therefore, my hypotheses for Aim 2 are:

H2a. Any association between childhood adversity and risk for each type of SUD will be attenuated when both type of adversity and the number of different types of adversity are considered simultaneously.

H2b. Most of the childhood adversity concept will be explained by two related but unique constructs: (1) childhood maltreatment (i.e., childhood abuse and neglect) and (2) childhood household dysfunction.

H2c. Childhood maltreatment (i.e., childhood abuse and neglect) and childhood household dysfunction will each be positively associated with occurrence of each type of SUD.

Aim 3: The third research aim is to determine whether a relationship between childhood adversity and different types of substance use disorders (i.e., no disorder, alcohol only, drug only, poly-substance) exists, and whether demographic characteristics (e.g., age, race/ethnicity) and socioeconomic status (household income, educational attainment, employment status) influence the risk for the presence of different types of substance use disorders. The specific research questions are:

3a. Does childhood adversity have a dose-response relationship with women's risk for different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance), such that a greater number of different types of CA (i.e., 0, 1-2, $\geq$3) produces a graded increment in likelihood of the different types of SUD? A related question is the extent to which these effects are different according to type of SUD.

3b. Do demographic characteristics (e.g., age, race/ethnicity, nativity status) and socioeconomic status (household income, educational attainment, employment status) besides childhood adversity have an effect on women's risk for different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance)?

According to the Stress Process Model and the life course epidemiological perspective, childhood stressors can: (1) be a single hardship or factor to which a person becomes sensitive

and experiences persistent and continuous effects over time, or (2) give rise to additional stressors in a process of stress proliferation. Empirical evidence indicates that adverse childhood experiences are associated with different types of SUD and tend to have a dose-response relationship with SUD. Also, the limited number of studies that have examined the potential mechanisms through which CA may lead to SUD among women have reported that the relationship between CA and SUD is only partially mediated by other factors (i.e., using substances to cope with stress; distress symptoms) (Schuck & Widom, 2001; White & Widom, 2008). Findings are congruent with studies of adolescent use of tobacco and other substances which have consistently reported that both distal and proximal adverse life events are significant and independent predictors of risk (Lloyd & Turner, 2008; Turner & Lloyd, 2003; Lloyd & Taylor, 2006). Given this body of evidence, and in light of these theoretical concepts, my hypotheses are rooted in the supposition that although childhood adversity may create additional stressors in the adult life of women, experiences of childhood adversity will nevertheless constitute a factor that exerts persistent and continuous effects on SUD risk.

At the same time, concepts provided by the social determinants of health and the Fundamental Causes Model recognize there are profound differences in health based on differences in social position (e.g., gender, race/ethnicity, educational attainment, occupational ranking, income, and accumulated wealth). Primarily based on data provided by cross-sectional studies and studies of women treated for SUD, a number of sociodemographic factors have been associated with the presence of substance use disorders among women. Therefore, my specific hypotheses for Aim 3 are:

H3a. Childhood adversity will have a dose-response relationship with women's risk for different types of SUD, such that a greater number of different types of adversity will produce a graded increment in the likelihood of each of the different types of SUD. Also, exposure to a greater number of different types of adversity will be associated with occurrence of a more severe form of SUD (e.g., poly-substance).

H3b. Demographic characteristics (e.g., age, race/ethnicity, nativity status) and socioeconomic status (household income, educational attainment, employment status) will have an effect on women's risk for different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance), such that, for example, for each type of SUD, risk will be increased by younger age and lower socioeconomic status (e.g., lower household income, lower educational attainment, being unemployed) and decreased by being Hispanic or Black and non-US born nativity status.

Aim 4: The fourth aim is to determine whether the relationship between childhood adversity and different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance) is moderated by adult socioeconomic status. The specific research question is:

4a. Does any association between the number of different types of childhood adversity that is experienced (i.e., 0, 1-2, $\geq$3) and risk for each type of SUD vary by adult socioeconomic status (i.e., operationalized as household income level, educational attainment, and employment status)? A related question is whether the nature of any moderation effect is similar or different for each type of SUD.

The Fundamental Causes Model stipulates that individuals with high SES possess a superior collection of flexible resources that can be used to avoid risks and adopt protective strategies, thereby producing a health advantage for higher SES individuals. In the face of childhood adversity, higher SES may provide women with the means to purchase substances and thereby increase their risk for SUD. However, given the social stigma that women's substance abuse generally entails, it seems likely that, for example, higher SES women with a history of childhood adversity would use their resources (e.g., more beneficial social contacts, greater exposure to healthy environments) to develop supportive personal relationships or to access treatment to address the consequences of childhood adversity and thereby avoid or reduce their risk for SUD. In contrast, lower SES women with a history of childhood adversity

would not have the benefit of those resources and therefore they would encounter a greater risk for SUD. At the same time, it is critical to recognize that certain drugs (particularly heroin, but also methamphetamine, cocaine, and other drugs) are generally associated with a higher physical addiction liability than alcohol. Therefore, women with experiences of childhood adversity who use heroin or other drugs may use the resources provided by greater SES not to access health care to treat their SUD but instead to purchase drugs. In contrast, women with experiences of childhood adversity who use alcohol may use the resources provided by greater SES to access health care to treat their SUD instead of purchasing alcohol. Therefore, my hypothesis for Aim 4 is:

H4a. Relationships between childhood adversity and risk for different types of SUD will be moderated by adult socioeconomic status, such that exposure to any level of childhood adversity (relative to no exposure) will increase the risk for each type of SUD more so among lower income women than it does among higher income women. However, moderation effects will vary depending on the type of SUD. For example, I hypothesize that among women with three or more experiences of childhood adversity, more annual household income will decrease the risk for an alcohol use disorder but it will increase the risk for a drug use disorder.

Aim 5: The fifth aim is to focus only on women who have a SUD to examine whether the relationships between childhood adversity, sociodemographic characteristics, and SUD risk are different for women who have an alcohol use disorder compared to women who have a drug use disorder (with or without an alcohol use disorder). The specific research question is:

5a. Are the factors (i.e., experiences of childhood adversity, sociodemographic factors) that are related to whether women develop an alcohol use disorder different from those that are related to whether women develop a drug use disorder (either with or without an alcohol use disorder)?

Although there are commonalities across alcohol and other substance types in the biological and social factors that heighten the risk for substance use disorders, significant differences still remain by substance type in relation to whether individuals mature out of the SUD or persist and also in relation to experiences of adverse health and social consequences. For example, because the abuse of stimulants and heroin/opioids generally persists for more years of the life course than the abuse of alcohol and because relative to alcohol, the abuse of these illicit substances can bring about a greater array of detrimental social consequences (e.g., criminal convictions that prevent employment or jeopardize parental rights, social stigma for engaging in illicit behavior) and adverse health consequences (e.g., infectious disease related to injection drug use), the abuse of these substances has the potential to negatively affect more stages and dimensions of the life course than the abuse of alcohol. Therefore, my hypothesis for Aim 5 is:

H5a. There will be differences in the factors that are related to whether women develop an alcohol use disorder versus a drug use disorder (either with or without an alcohol use disorder), such that women who have an alcohol use disorder only, relative to women with a drug use disorder (either with or without an alcohol use disorder) will have had exposure to fewer types of childhood adversity, be older, and have a higher socioeconomic status (as indicated by higher educational attainment, employment, and higher income).

As an additional component of this aim, I will also examine relationships between childhood adversity and sociodemographic characteristics and two specific types of SUD: marijuana use disorders and opioid use disorders.

1.3. Specific aims for Part Two of the dissertation

In Part Two, represented by Aim 6, I focus on the <u>persistence</u> of substance use disorders among women. For this aim, I focus only on women who have developed a SUD.

Specific aims and the respective research questions and hypotheses from which they were generated follow:

Aim 6. The sixth research aim is to assess persistence of substance use disorders among women in relation to type of substance use disorder (i.e., alcohol only, drug only, poly-substance), experiences of childhood adversity, and other sociodemographic factors, and to investigate whether the relationship between SUD type and SUD persistence varies by race/ethnicity. The specific research questions are:

6a. Does type of SUD (i.e., alcohol only, drug only, poly-substance) have a differential effect on women's risk for SUD persistence such that the presence of a drug use disorder (with or without an accompanying alcohol use disorder) increases the likelihood of SUD persistence more than the presence of an alcohol use disorder only?

6b. What other sociodemographic characteristics and social circumstances (e.g., childhood adversity) increase women's risk for SUD persistence?

6c. Does any relationship between type of SUD (i.e., alcohol only, drug only, poly-substance) and SUD persistence differ by race/ethnicity?

Type of substance is a key determinant of whether substance use develops into a disorder or eventually dissipates. Given that the continued use of some of the drug types that are abused by women (e.g., stimulants, opioids) is influenced by processes of tolerance and withdrawal, and that the course of women's drug abuse may be differentially affected by more severe adverse social consequences than that of alcohol abuse, women who have developed a drug use disorder are more likely to exhibit a persistent disorder over time than women who have developed an alcohol use disorder only.

In addition to SUD type, the conceptual models that guide this dissertation suggest that the course of women's SUD is also shaped by a number of other factors and experiences. For example, life course concepts and the empirical literature on SUD-related maturing out

processes suggest that younger women are more likely to exhibit SUD persistence than older women. Ideas provided by the social determinants of health (Marmot, 1999) and by the Fundamental Social Causes (Link & Phelan, 1995; Phelan et al., 2010) model suggest that lower SES women have fewer resources to address their SUD than higher SES women, and therefore lower SES women are more likely to have a persistent SUD over time.

While Hispanics and Blacks generally do not have an increased risk for substance use disorders than Whites, once SUD occurs, some members of these groups do tend to have disorders that are more likely to persist (Breslau et al., 2005) or persist for a longer duration of time (Arndt et al., 2010). Studies generally have not examined these factors among women specifically or by SUD type. As a notable exception, Grant and colleagues reported that among women with alcohol use disorders, risk for persistence of the disorder was found to be greater among older Blacks and US-born Hispanics than among younger Whites (Grant et al., 2012). A possible reason for this difference may be rooted in the reasons why Hispanic and Black women are less likely to abuse substances initially. That is, the abuse of substances by Hispanic and Black women reflects behavior that differentiates them from their peers more than is experienced by White women. Therefore, substance abuse itself creates more added stress for Hispanic and Black women than it does for White women, contributing to an increased risk for SUD persistence among Hispanic and Black women.

However, it is also the case that the liability for developing a persistent disorder varies by substance type. Therefore, given (1) that Hispanic women generally face strict cultural sanctions against alcohol use (Canino, 1994; Zemore, 2007) and (2) that an alcohol use disorder generally reflects maturing out processes (Brennan et al., 2011; Breslow & Smothers, 2004; Moos et al., 2004; Epstein et al., 2007; Keyes et al., 2011b; Wilsnack et al., 2013), then among women who have an alcohol use disorder, Hispanic women may be less likely than both Black and White women to exhibit a persistent SUD over time. In contrast, limited evidence suggests that Black women are more likely than their Hispanic and White counterparts to

believe that a SUD will resolve on its own without medical treatment (Anglin et al., 2008; Ward et al., 2009). It is also the case that Black women avoid seeking help for their SUD more than other racial/ethnic groups of women because of the real or perceived disproportionate likelihood that the parental rights of Black women will be terminated once substance abuse is detected by medical personnel or others (Roberts & Nuru-Jeter, 2012). When combined with the presence of a drug use disorder (e.g., stimulants, heroin/opioids), i.e., a disorder that has a greater addiction liability and generally requires some form of SUD treatment or social support to resolve (Brecht et al., 2008; Grella & Lovinger, 2011; Hall et al., 1999; Hser et al., 2008ab; West, 2006), these beliefs may create circumstances in which Black women are less able than White or Hispanic women to avoid a persistent SUD. Finally, among treated samples the presence of a substance use disorder that involves multiple substances has been observed to endure for more years of the life course than a single-substance use disorder (Moss et al., 2014; Nosyk et al., 2014). Therefore, my hypotheses for Aim 6 are:

H6a. Type of SUD (i.e., alcohol only, drug only, poly-substance) will have a differential effect on women's risk for SUD persistence such that a drug use disorder (either with or without an accompanying alcohol use disorder) will increase the likelihood of SUD persistence more than an alcohol use disorder only.

H6b. Other factors (childhood adversity, sociodemographic characteristics) will increase women's risk for SUD persistence, such that, for example, the risk for persistence will be increased by experiences of childhood adversity and by Hispanic or Black race/ethnicity and decreased by older age and higher socioeconomic status (as indicated by higher educational attainment, higher income, being employed).

H6c. Any relationship between type of SUD (i.e., alcohol only, drug only, poly-substance) and SUD persistence will differ by race/ethnicity such that (i) among women with an alcohol use disorder only, Blacks and Whites will each be more likely to persist than Hispanics, (ii) among women with a drug use disorder only, Blacks will be more likely to persist than

Whites and Hispanics, and (iii) among women with both an alcohol and a drug use disorder, there will not be differences by race/ethnicity in the likelihood of persistence.

1.4. Dissertation overview

The overarching goal of this study is to investigate relationships between women's experiences of early life adversity and the presence and persistence of different types of substance use disorders. The dissertation is organized according to the following plan for each chapter. In Chapter 2, I describe the background and significance of the current study with evidence supporting the burden of different types of substance use disorders among women in the United States, and I present hypothesized associations with childhood adversity and other factors. I also introduce the theories that inform the conceptual model that guides this dissertation: a life course (Elder, 1974, 1998, 2002) epidemiological perspective (Braveman & Barclay, 2009; Kuh et al., 2003), a social determinants perspective (Marmot, 1999), the Stress Process Model (Pearlin, 1981, 1989, 2005), and the Theory of Fundamental Causes (Link & Phelan, 1995; Phelan et al., 2010).

Data for this dissertation come from individuals who participated in two waves of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). In Chapter 3, I review the research design and analytic methods that I apply to NESARC data to examine and describe relationships. In Chapters 4 through 9, I detail the results of analyses of the hypothesized relationships. Analyses and results are presented in two parts.

In Part One I use multinomial regression analysis to assess lifetime substance use disorders by type (no disorder, alcohol only, drug only, poly-substance). First, in Chapter 4, I examine how 19,209 women are similar to and different from 13,898 men in the characteristics and experiences that are related to the presence of different types of substance use disorders and I assess whether there are gender differences in the relationship between childhood adversity and different types of substance use disorders (Aim 1). Next, in Chapters 5 and 6, I focus on only the sample of 19,209 women to more closely examine the occurrence of different

types of SUD in relation to experiences of childhood adversity and sociodemographic factors (Aims 2, 3). In Chapter 7, I determine whether the relationship between women's experiences of childhood adversity and substance use disorders is moderated by adult socioeconomic status (Aim 4). In Chapter 8, I focus only on the women who have a SUD to examine whether there are differences in the factors that are related to whether women develop an alcohol use disorder versus a drug use disorder (either with or without an alcohol use disorder) (Aim 5).

In Part Two, Chapter 9, I use binary logistic regression to assess persistence of 12-month substance use disorders as observed over a three year period among 1,025 women in relation to type of substance use disorder (alcohol only, drug only, poly-substance), experiences of childhood adversity, and sociodemographic factors (Aim 6). I also determine whether race/ethnicity moderates the relationship between type of substance use disorder and persistence of substance use disorders.

The final chapter, Chapter 10, consists of an interpretation of the research findings, including strengths and limitations, as well as public health implications and suggestions for future research.

CHAPTER TWO

BACKGROUND AND SIGNIFICANCE AND CONCEPTUAL FRAMEWORK

2.1. Introduction

In this chapter, I critique the literature that pertains to this dissertation, noting the gaps in knowledge that this dissertation addresses and I present my conceptual framework. The chapter is divided into four sections. In the first section, I synthesize what is known about the course of different types of substance use disorders among women. In the second section, I focus on childhood adversity. I discuss the definitions of this concept, its relationship with substance use disorders, and limitations of current knowledge. In the third section, I consider the influence on SUD risk of socioeconomic status and other key sociodemographic factors. In the fourth, and final section, I present my conceptual framework.

2.1.1. Type of substance is a key determinant of the course of women's SUD

It is a generally accepted idea that substance use disorders involve several heterogeneous and often inter-related behaviors and symptoms that can change in nature and severity over time (Goodman, 1990; Hatterer, 1982; Sussman & Sussman, 2011; West, 2006). Individuals typically initiate substance *use* in adolescence or early adulthood (SAMHSA, 2013). Development of a *substance use disorder* usually occurs during early to middle-adulthood (e.g., adults aged 20 to 45) and can worsen or dissipate over the subsequent years (Hser et al., 2007ab, 2008ab). Those who go on to develop a disorder are of concern because they tend to persist in their use, often for substantial periods of their life (Dennis et al., 2007; Grella & Lovinger, 2011; Hser et al., 1997; Hser, 2007ab; Nosyk et al., 2014; Scott et al., 2005ab). Therefore, an important implication for SUD research is the need to differentiate the many people who experiment with alcohol or drugs but do not develop a disorder from those whose substance use becomes problematic. Moreover, that fluctuations can occur in substance use onset and progression over time suggests there are factors and experiences that influence whether SUD occurs, worsens, or dissipates.

Substance type is a key determinant of whether substance use develops into a disorder or eventually dissipates (McGlothlin et al., 1976; Brecht et al., 2008; Evans et al., 2013; Hser et al., 2008ab; Dennis et al., 2007; Scott et al., 2005ab). Because of the greater prevalence of alcohol use and abuse, most knowledge regarding substance use disorders among women have been provided by studies of alcohol (SAMHSA, 2009). Therefore, in this section I begin by focusing on alcohol. I summarize the most commonly theorized reasons regarding why and how alcohol use develops into a disorder and changes over time. In the latter part of this section I address this topic in relation to marijuana, other substances, and poly-substance abuse. For each substance, I draw upon the literature to delineate a rationale for how I operationalize these concepts as a key variable for my dissertation.

2.1.1.1. Alcohol

Initially alcohol acts as a stimulant, and women who drink may feel upbeat and excited, but as more alcohol is absorbed by the body, effects include reduced inhibitions and memory problems (Inaba & Cohen, 2011). Therefore, women commonly drink alcohol to socialize, celebrate, and relax (Brady et al., 2009). Once alcohol use has begun, however, women are at greater risk for developing a disorder than men in a well-established but poorly understood process referred to as "telescoping." Telescoping describes how women progress more rapidly than men from alcohol use to a disorder and suffer more serious medical and social consequences despite lower levels of use and for shorter durations (Brady & Randall, 1999; Hernandez-Avila et al., 2004; Piazza et al., 1989). Telescoping has been documented most often in treated samples and in relation to alcohol (Brady et al., 2009), but the phenomenon has also been observed for marijuana (Khan et al., 2013), specific stimulants (Sofuoglu et al., 1999), and opioids (Hernandez-Avila et al., 2004; Lewis et al., 2014). It is often attributed to sex differences in biology (i.e., women's smaller body size, higher blood alcohol concentration levels, how alcohol is metabolized) (Devane, 2009; Elton & Kilts, 2009; Fox & Sinha, 2009) however, psychological and social factors are probably involved as well. For example,

problematic alcohol use among women is more commonly related to attempts to cope with depression and post-traumatic stress disorder whereas among men, it is more typically motivated by peer pressure and to enhance positive moods (Stewart et al., 2009). One potential implication of the telescoping phenomenon is that some women who consume alcohol may not recognize their drinking practices to be problematic and therefore inadvertently continue to drink alcohol at a high level or engage in binge drinking (four or more drinks on a drinking occasion), both of which are known to heighten the risk for a disorder (Wilsnack et al., 2013).

That women may progress more rapidly than men from alcohol use to a disorder is of particular concern given than women's alcohol consumption patterns and related problems have steadily increased in the decades following the changes in gender roles and concurrent loosening of the societal constraints on substance use that began in the 1970s (Greenfield & Room, 1997; Stewart et al., 2009). Alcohol use and abuse rates among women are now more similar to those among men than in prior decades (Hasin et al., 2013). The narrowing gender gap in alcohol consumption has been attributed to greater social acceptability of drinking by women, women's greater exposure to drinking contexts outside the home, and women's increased socialization to traditional male gender roles (Stewart et al., 2009). These concepts underscore the role that sociocultural forces may play in shaping the course of alcohol use disorders among women.

Finally, numerous cross-sectional and longitudinal studies of alcohol use have reported that although there is significant variation in the long-term patterns of alcohol use, problematic alcohol consumption generally tends to decline with age (Brennan et al., 2011; Breslow & Smothers, 2004; Moos et al., 2004; Epstein et al., 2007; Keyes et al., 2011b; Wilsnack et al., 2013). Some researchers consider this decline, which has been studied for more than 50 years, a "maturing out" (Winick, 1962) of problem use (Kandel & Chen, 2000; Kandel & Yamaguchi, 1985; Yamaguchi & Kandel 1984). This maturing out process is believed to result when people

enter their early twenties and take on the roles and responsibilities of adulthood (e.g., marriage, parenthood, labor market entry) (Bogart et al., 2005; Chan et al., 2007; Dawson et al., 2006; Yamaguchi & Kandel 1985; Verges et al., 2012). The maturing out phenomenon can be attributed partly to the limitations these events place on social activities in general and also to changes in attitudes toward substance use and decreases in impulsive behaviors (Kandel & Chen, 2000; Littlefield et al., 2009; Winograd et al., 2012; Yamaguchi & Kandel, 1985). Limited evidence indicates that women are more likely than men to mature out of problematic alcohol use (Jackson et al., 2001) and that the maturing out process occurs at an earlier age for women relative to men (Wells et al., 2006). These findings have contribute to my development of the research questions and hypotheses that related to Aim 1 of this dissertation.

In addition, for this dissertation I consider alcohol separately from the others types of substance use disorders. Unlike most other substances, alcohol is a legal substance and therefore it is more readily available, subject to less social stigma, and perceived to be less harmful than other substances (Ahern et al., 2015; Inaba & Cohen, 2011). Also, in recent decades alcohol consumption has become a more prevalent activity for women (Brady et al., 2009). For these reasons, evidence-based knowledge is needed on the factors and experiences that contribute to the occurrence and persistence of women's alcohol use disorders.

In the next section, I consider the substances besides alcohol that are most prevalent or are responsible for a disproportionate proportion of adverse health and social consequences. It is important to recognize that poly-substance use and the inadequate samples of women who use only one substance has contributed to the fact that little is known about the effects of specific drugs among women (SAMHSA, 2009). For the purposes of this dissertation, I classify together those substances with similar physiological effects, thereby creating three categories: marijuana, stimulants (cocaine, amphetamine, methamphetamine), and heroin/other opioids.

2.1.1.2. Marijuana

After alcohol, marijuana is one of the most commonly abused substances in the United States (SAMHSA, 2014). National prevalence data indicate that in 2014, about 39.2% of women and 49.5% of men had ever used marijuana in their lifetime (SAMHSA, 2015) and nationwide, about 5.4% of women and 11.8% of men have a current marijuana use disorder (Stinson et al., 2006). Marijuana is used primarily because it induces euphoria, drowsiness, an increase in appetite, and feelings of relaxation (Inaba & Cohen, 2011). Physical withdrawal symptoms are mild relative to those of heroin and other substances, and include irritability, difficulty sleeping, strange nightmares, craving, and anxiety (Volkow et al., 2014). Longitudinal studies have documented that while marijuana use can extend over many years of the life course, for most individuals *problematic marijuana use* is generally limited to young adulthood (Chen & Jacobsen, 2012; Dewitt et al., 1997; Schulenberg et al., 2005). About 9% of marijuana users remain dependent on the substance over the long-term (Hall & Degenhardt, 2009).

In general, studies on the effects and course of marijuana have not focused specifically on gender differences (Khan et al., 2013). Recent findings from a general population survey indicate that women compared with men experience a marijuana disorder for a shorter duration of the life course and women achieve remission from the disorder at a younger age (Khan et al., 2013). Findings are significant in that they suggest that for most women the disorder tends to resolve by the mid-20s, a phenomenon that is most likely explained by maturing out processes. However, it must be remembered that like most studies of marijuana (Hall & Degenhardt, 2009), this study focuses on the occurrence and persistence of marijuana use disorders *only* and it does not consider the course of other types of substance use disorders that women may have had. The co-occurring abuse of marijuana and other substances (particularly marijuana with alcohol or stimulants) during adolescence and adulthood is well-established (Fergusson et al., 2006; McCabe et al., 2014; Swift et al., 2012; Tzilos et al., 2014).

The recent decriminalization and legalization of marijuana in some states has contributed to an increase in the proportion of the general public who view marijuana use as a

normal activity that is not unlike alcohol use (Pew Research, 2014). Despite these changes in the public perception of marijuana and its legal consequences, for this dissertation I consider marijuana as one of several other types of drug use disorders for these reasons: (1) some women may mature out of their marijuana use disorder but develop or persist in other types of substance use disorders and (2) given the era in which the data for this dissertation were collected (2001-2005 for Wave 1 and 2004-2005 for Wave 2), in most locales marijuana use was defined as an illicit activity and therefore like other illicit substances (and unlike alcohol) its abuse potentially involved harsher social stigma and criminal justice consequences.

In contrast to the idea that marijuana use disorders are generally limited to women's adolescence and young adulthood, a growing amount of evidence indicates that individuals who engage in problematic use of methamphetamine, cocaine, and particularly heroin, tend to persist in their use over many years of the adult life course (Brecht et al., 2008; Grella & Lovinger, 2011; Hser et al., 2008ab). Explanations for the life-course persistent patterns of these latter substances are underdeveloped but, as explained further in the next section, include the enduring psychological distress that generally accompanies the use of these substances (Hser, 2007; Hser et al., 2014); feelings of being unable to quit the use of these substances (low self-efficacy for abstinence) (Hser, 2007, Hser et al., 2008); and the greater physical or psychological addiction liability that has been documented for these substances (West, 2006; Hall et al., 1999).

2.1.1.3. Stimulants: cocaine, methamphetamine, amphetamine

Stimulants are one of the few substances that are used by similar numbers of women and men. National prevalence data indicate that in 2014, 7.3% of women and 9.8% of men had used stimultants in their lifetime (SAMHSA, 2015). The acute effect of stimulants is varied and includes increased energy, alertness, euphoria, enhanced mood, decreased appetite and sleep, and increased sexuality (Inaba & Cohen, 2011). More than men, women reportedly use stimulants to lose weight and to improve daily functioning (e.g., to gain energy or to focus their

attention) (Brecht et al., 2004). However, the beneficial effects of stimulants are short-term, lasting no more than 10 to 30 minutes (Inaba & Cohen, 2011). Withdrawal symptoms are generally unpleasant and can include dysphoria, depression, irritability, anxiety, poor concentration, hypersomnia, fatigue, paranoia, akathisia (restlessness), and drug craving (Scott et al., 2007). Therefore, in order to sustain the beneficial effects of stimulants and to avoid the disagreeable withdrawal symptoms, some individuals take stimulants repeatedly within a relatively short period of time and at increasingly higher doses. This pattern of chronic "binge and crash" stimulant use is thought to be a key mechanism though which use progresses to a stimulant use disorder (West, 2006). Congruent with observed patterns of binge stimulant use, neurobiological studies conducted in the past decade have found that some stimulants, especially methamphetamine, cause an increased release of dopamine and other neurotransmitters in the brain (for a critical review, see Scott et al., 2007). Dopamine is involved in reward, motivation, the experience of pleasure, and motor function. Repeated and long-term stimulant use can eventually "usurp" the brain's normal reward circuitry, creating a situation in which individuals have "learned" to engage in stimulant use in order to activate pleasurable feelings (Kalivas & O'Brien, 2008).

Furthermore, sex-specific physiological effects of some types of stimulants have been documented, suggesting that the aforementioned reinforcing effects of stimulants may also be influenced by women's hormone levels. Specifically, women who use cocaine and amphetamines experience a greater euphoria and an increased desire to use during the follicular phase of the menstrual cycle (the earliest phase of menstruation) when estrogen is high but progesterone is low (see review, Terner & de Wit, 2006). Researchers believe that progesterone is a clear mechanism specific to women that plays a significant role in influencing women's physical reaction to stimulants (Evans et al., 2007). These findings suggest that the social and neurobiological reasons for women's compulsive stimulant use may be further enhanced by women's hormonal milieu. When considered together, these findings indicate that

although women may initially use stimulants to improve daily functioning or for other reasons, women's repeated use can produce effects that are highly induced by neurobiological and hormonal influences. These mechanisms likely provide an explanation for why some women continue to abuse stimulants over many years of the life course. These findings provide one rationale for the research questions and hypotheses that are related to Aim 6 of this dissertation.

2.1.1.4. Heroin and prescribed opioids[2]

A relatively small proportion of individuals nationwide have ever used heroin in their lifetime (in 2014, 1.0% of women and 2.7% of men) and few people develop a past-year heroin use disorder (in 2013, about 517,000 people), however rates of prescribed opioid use disorders have escalated dramatically in the past decade, affecting approximately 1.9 million people in 2013 (SAMHSA, 2014; 2015). Increases in the past decade in the use of heroin and in the misuse of prescribed opioids have been greatest among women (CDC, 2013; 2015). Heroin and other opioids induce euphoria, pain relief, relaxation, and drowsy states (Inaba & Cohen, 2011). These substances are highly addictive, primarily because greater doses are required to achieve the same physiological effect (tolerance). Also, once a disorder has developed, cessation of daily use is generally followed by both strong physical and psychological cravings for the substance along with unpleasant physical withdrawal symptoms such as muscle and bone pain, insomnia, diarrhea, vomiting, and cold flashes (Inaba & Cohen, 2011). Women with a heroin use disorder often continue to abuse the substance even though their abuse can cause reduced sexual desire (Smith et al., 1982) and infertility via amenorrhea and other menstrual abnormalities (Abs et al., 2000).

[2] Prescribed opioids are medications that relieve pain. These medications reduce the intensity of pain signals reaching the brain and affect those brain areas controlling emotion, which diminishes the effects of a painful stimulus. Common prescribed opioid medications include hydrocodone (e.g., Vicodin), oxycodone (e.g., OxyContin, Percocet), morphine (e.g., Kadian, Avinza), codeine, and related drugs (NIDA, 2012).

Several major longitudinal studies of heroin abusers, with assessments spanning 10 to 33 years, have been conducted in the United States and elsewhere (for review, see Hser et al., 2014). Most such studies have recruited all- or mostly male samples, precluding examination of gender differences (Grella & Lovinger, 2011). A recent review of these studies (Hser et al., 2014) determined that mortality rates among individuals with opioid use disorders are about 6 to 20 times higher than the rates among the general population. These findings led the authors to observe that premature "dying out" is a more appropriate term than "maturing out" to describe the usual long-term course of heroin use disorders (Hser et al., 2014). In addition, the review reported that among individuals who remain alive, prevalence of stable abstinence from opioid use is low (less than 30%) and even when individuals achieve cessation from opioid abuse many continue abusing alcohol and other substances (Hser et al., 2014). Finally, this review determined that opioid abuse persistence is associated with histories of sexual and physical abuse (particularly among women) and co-morbid mental health disorders (anxiety, depression), while eventual abstinence is facilitated by being employed, family support for abstinence, and other forms of social support (Hser et al., 2014).

2.1.1.5. Poly-substance abuse

It is well-recognized that a considerable number of individuals with substance use disorders tend to abuse multiple substances simultaneously (Booth et al., 2006; Brecht et al., 2008; Medina & Shear, 2007; Nosyk et al., 2014; Sumnall et al., 2004). For two reasons, poly-substance abuse is generally interpreted by SUD researchers as an indicator of the presence of a severe SUD. First, poly-substance abuse substantially increases the risk for substance-related morbidity and mortality mostly because the practice of combining substances can magnify their adverse physiological effects. For example, mixing alcohol with heroin, opioids, or other depressants can cause an individual's breathing and heart rate to decrease dangerously, increasing the chance of a fatal overdose; mixing alcohol and stimulants can mask the effects of alcohol, and lead to alcohol-related harms, especially alcohol poisoning (Inaba & Cohen, 2011).

In addition to its ability to heighten the risk for morbidity and mortality, poly-substance abuse is also considered to be a marker for the presence of a more severe SUD because it has been associated with continued substance abuse (Moss et al., 2014; Nosyk et al., 2014). The reasons why are poorly understood but are likely due to the fact that poly-substance abusers are more likely than single-substance abusers to have a multitude of risk factors for SUD persistence such as a history of physical or sexual abuse (Armour et al., 2014) and a co-occurring depression, anxiety, or antisocial personality disorder (Agrawal et al., 2007). At the same time, it has also been noted that poly-substance abusers have greater difficulty than single-substance abusers in engaging in or completing SUD treatment (Brecht et al., 2005), partly because the psychological and physiological effects of different combinations of substances makes it challenging to develop effective treatment approaches (Kenna et al., 2007).

Poly-substance abuse can denote any combination of substances, but adverse morbidity and mortality outcomes have most commonly been documented among individuals who abuse alcohol in combination with heroin or other drugs. Therefore, for this dissertation I operationalize a poly-substance use disorder as the presence of both an alcohol use disorder and a drug use disorder.

2.2. Influences of childhood adversity on women's SUD

Childhood adversity is an explanatory variable that is of focal interest in this dissertation. Therefore, I discuss the potential role of childhood adversity in some depth before briefly addressing the influences of socioeconomic status, followed by race/ethnicity and other key sociodemographic factors.

2.2.1. Definition of childhood adversity

For more than two decades, interest has proliferated in the prevalence of childhood adversity and the relationship between childhood adversity and adult health (Felitti et al., 1998). Childhood adversity is a broad concept that is generally used by a number of social and

epidemiological studies to encompass many social and material exposures during the first 18 years of life (Afifi et al., 2011ab; Dube et al., 2003; Keyes et al., 2011ab). These adverse childhood experiences typically include childhood experiences of: (1) *physical, sexual, or emotional abuse*, commonly defined as deliberate or intentional words or overt actions a by a parent or other caregiver that cause harm, potential harm, or threat of harm to a child; (2) *physical or emotional neglect*, commonly defined as the failure of a parent or other caregiver to provide for a child's basic physical, emotional, or educational needs or to protect a child from harm or potential harm; and (3) *household dysfunction*, commonly defined as living with a battered mother; parental problematic substance use; parental mental illness; parental suicide attempt or completion; and parental incarceration (Afifi et al., 2011ab; Dube et al., 2003; Keyes et al., 2011a; Leeb et al., 2008). In this dissertation, I focus on these three types of adversity, which I refer to as "childhood adversity" (CA).

It is important to recognize that in other research, a major focus is understanding how experiences of *material or economic* adversity during childhood, and the social disadvantages and biological effects that often accompany it, shape adult chronic disease and its risk factors and consequences (Braverman & Barclay, 2009; Conroy et al., 2010; Melchior et al., 2007; Poulton et al., 2002). A child born into a poor family might be exposed to an adverse social environment (e.g., characterized by neighborhood violence, family conflict, attenuated educational attainment, limited preventive health care access) that can lead to larger disparities in health across time (Halfon et al., 2010; Larson et al., 2008). Children with low-socioeconomic status also experience poorer neurocognitive development and functioning in childhood (Luby et al., 2013; Noble & Norman, 2005) and, in this way, aspects of childhood poverty become "biologically embedded" (Hertzman, 1999; Nelson, 2013), leading to poor health outcomes as adults (Conroy et al., 2010; Galobardes et al., 2006; Raphael, 2011). This type of childhood adversity was poorly measured with a single item by the study that provides that dataset that I use for this dissertation. Therefore, although it is a factor that likely has critical implications for

the occurrence and persistence of women's SUD, in this dissertation I do not consider this type of childhood adversity further.

2.2.2. Childhood adversity affects a significant proportion of the US population

Experiences of childhood adversity are prevalent in the US general population. Childhood adversity prevalence rates as provided by clinic-based samples and nationally representative data indicate that significant proportions of adults report a childhood history of physical abuse (18-26%), sexual abuse (11-21%), emotional abuse (8-10%), physical neglect (10-24%), emotional neglect (9-15%), and household dysfunction (40%) (Afifi et al., 2011; Dube et al., 2003). Among categories of household dysfunction, parental substance use is most prevalent (26-28%), followed by parental mental illness (11-20%), living with a battered mother (13-14%), and parental incarceration (3-6%) (Dube et al., 2003; Felitti et al., 1998; Green et al., 2010).

These data indicate that many more people experience some form of childhood adversity than develop a SUD or other adverse health outcome. In her work on resilience in the context of childhood adversity, Luthar and colleagues propose that vulnerability and protective factors might modify the negative effects of adverse life circumstances (Luthar, 1991; Luthar et al., 2000; Luthar et al., 2006). Luthar conceptualizes resilience as a process, rather than a fixed set of traits, that involves the development of supportive personal relationships or other resources that enable individuals to exert positive adaptation in response to threats despite experiences of significant early life adversity (Luthar, 1991; Luthar et al., 2000; Luthar et al., 2006). It may be that some individuals who are exposed to childhood adversity are able to avoid SUD because they are better equipped to adapt to adversity (for example via coping strategies) and overcome it.

2.2.3. Childhood adversity is associated with multiple adverse health outcomes including SUD

Adverse childhood experiences are associated with poorer consequences during adulthood in multiple domains of physical and mental health (Fergusson et al., 2013).

Experience of any childhood adversity increases the risk for a number of physical health conditions, including heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease (Felitti et al., 1998). Childhood adversity also negatively affects well-being and mental health (Afifi et al., 2011ab; Mersky et al., 2013; Mullen et al., 1996). Any experience of childhood adversity is associated with poorer self-rated health and life satisfaction (Mersky et al., 2013) and maladaptive coping strategies such as avoidance and distraction (Bal et al., 2003). Childhood adversity also increases emotional reactivity, defined as an involuntary and usually overly intense reaction to an external emotional stimulus which often leads to feeling victimized (Glaser et al., 2006; Wichers et al., 2009), and it is associated with more frequent depressive symptoms (Felitti et al., 1998; Hammen et al., 2000; Mersky et al., 2013), a heightened risk for anxiety (Mersky et al., 2013) and suicide attempts (Felitti et al., 1998), and several types of adult personality disorders (e.g., schizotypal, antisocial, borderline, narcissistic) (Afifi et al., 2011a).

Equally well-established by epidemiological studies (Dube et al., 2003, 2005; Green et al., 2010; Lo & Cheng, 2007; Mersky et al., 2013; Patterson et al., 2014; Schilling et al., 2007, 2008) and several literature reviews (Enoch, 2010; Keyes et al., 2011; Maniglio, 2011) is the significant relationship between childhood adversity and increased risk for substance *use*. Studies have also documented a relationship between childhood adversity and increased risk for occurrence of substance use *disorders* (e.g., Dube et al., 2002; Afifi et al., 2012; Felitti et al., 1998; Fenton et al., 2013; Green et al., 2010; Mersky et al., 2013; Pilowsky et al., 2009). When considered together, this body of evidence indicates that childhood adversity increases the risk for several different types of diseases and health problems.

2.2.4. Childhood maltreatment is a key risk factor for SUD among women

Over the past two decades, epidemiological studies and studies based on samples drawn from clinic settings have documented that girls are at greater risk for certain childhood adversities compared with boys, notably childhood sexual abuse (Costello et al., 2002; Dong et al., 2003; Dube et al., 2001, 2005; Schilling et al., 2007) and emotional abuse and neglect

(Dong et al., 2003; Dube et al., 2001, 2003). This explains why most studies of women regarding the relationship between childhood adversity and substance-related conditions have focused on childhood sexual abuse (e.g., Fleming et al., 1999; Wilsnack et al., 1997; Dube et al., 2005; Dong et al., 2003) or other forms of maltreatment (i.e., childhood abuse or neglect) (e.g., Afifi et al., 2012; LaFlair et al., 2013; Mullen et al., 1996).

Women who experience any childhood sexual abuse are more likely than non-abused women to report problematic alcohol and drug use during adulthood. For example, girls' experiences of any childhood sexual abuse increases the risk for SUD by an estimated 60-70% (Dube et al., 2005). When any form of maltreatment is considered, women with this history, relative to women without this history, are more likely to transition from alcohol use to alcohol abuse or dependence (LaFlair et al., 2013). Besides alcohol, any childhood maltreatment has been shown to increase women's risk for each of ten other types of SUD (e.g., marijuana, heroin, amphetamines, cocaine, and so on) (Afifi et al., 2012).

This body of evidence indicates that childhood adversity is a critical factor that heightens women's risk for adult substance use disorders. Despite the advancements in knowledge that these studies represent, current understanding of the relationship between childhood adversity and SUD among women is limited in that the literature has mostly focused on the effects of childhood maltreatment and has not considered the effects of another type of childhood adversity that may be particularly salient for women - household dysfunction.

2.2.5. Childhood household dysfunction may also increase women's SUD risk

Nationally representative cross-sectional surveys have documented that some types of adversity are more prevalent than others. When analyzed by gender, prevalence data indicate that girls are more likely than boys to report having experienced childhood household dysfunction, particularly parental substance use and parental mental illness (Dube et al., 2003). It is not clear whether girls are more likely than boys to be exposed to these types of adversity or are more vulnerable to the effects of these experiences and are therefore more likely to

report their occurrence. In any case, children exposed to parental mental illness appear to be more likely to drink alcohol to cope with problems rather than for pleasure or to be social (Rothman et al., 2008). This finding is consistent with the idea that women more so than men use substances to cope with stressful life events.

Moreover, parental substance use and its implications regarding the inter-generational transmission of substance use is the primary reason why experts have identified this childhood adversity as the most critical risk factor for initiation of substance use during adolescence (Johnson & Leff, 1999). It is widely recognized that children exposed to parental substance use initiate substance use earlier than their peers (Enoch, 2010; Green et al., 2010; Rothman et al., 2008). According to concepts provided by social learning theory (Bandura, 1977), it is likely that parents who use substances function as role models who create social environments in which children observe that substances can be used to relax, socialize, or accrue other benefits. Substance-using parents show their children how to be a substance user by providing substances, showing where to acquire substances, and modeling how to consume, smoke, or otherwise administer substances, in what quantity and how frequently (Akers et al., 1979, 1992). Once a child learns from parents why and how to acquire and use substances, whether substance use continues depends on the extent that others provide social reinforcement for use, whether deterrence for use occurs in the form of adverse effects or negative sanctions from other family members, peers, or society, and the continued expectation that use will result in desirable consequences (Akers et al., 1979, 1992). That children of substance users initiate substance use earlier than others is especially significant because earlier onset, particularly first use before age 15, is a robust risk factor for continued substance use at higher levels of use and for more years of the life course (Brecht et al., 2008; Grant & Dawson, 1998; Hser et al., 2008).

Family violence (e.g., having a battered mother) and child neglect have been associated with a greater increased SUD risk than other types of childhood adversity (Green et al., 2010).

These experiences are among several types of household dysfunction (along with parental substance abuse, parental mental illness, parental incarceration) that have been implicated in child exposure to detrimental parenting styles, poor emotional parent-child attachment, parental loss or separation, inadequate parental monitoring of child behavior, poor child self-esteem, and a lasting chaotic home environment (Johnson & Leff, 1999). These factors can expose children to more opportunities to use substances and also undermine a child's ability to develop supportive personal relationships and other resources that enable individuals to exert positive adaptation in response to threats (resilience) despite experiences of significant adversity (Luthar, 1991; Luthar et al., 2000; Luthar et al., 2006).

Finally, household dysfunction generally represents factors that may remain in place as girls mature into adulthood. Thus household dysfunction can constitute a continuous source of stress over a woman's life course. It is for these reasons that household dysfunction may be particularly important in the lives of women, yet with a few exceptions (e.g., Myers et al., 2014), the effect of this factor on women's SUD risk has been relatively little examined.

2.2.6. Effects of childhood adversity may be different by adult socioeconomic status

A critical limitation of general population studies of childhood adversity and SUD is that most have been epidemiological in nature and thus have focused on establishing childhood adversity prevalence rates and whether a CA-SUD relationship exists (Keyes et al., 2011). Given the concepts provided by my theoretical framework, there are social circumstances that may modify the CA-SUD relationship but these have been little examined among women with SUD and therefore are poorly understood. In particular, socioeconomic status is theorized to be fundamental factor that underlies the relation between other social factors and health. In Aim 4 of this dissertation, I examine whether adult socioeconomic status moderates the CA-SUD relationship among women.

2.2.7. Effects of childhood adversity may be different for SUD persistence

Much of the CA-SUD research has examined the effect of childhood adversity on *onset* of SUD. With some exceptions (e.g., McLaughlin et al., 2010), studies have not considered childhood adversity in relation to whether the SUD continues over time (SUD persistence). This gap in knowledge is especially critical because emerging evidence indicates that the type of childhood adversity that is associated with the greatest increase in risk for SUD persistence (i.e., sexual abuse) (McLaughlin et al., 2010) is different from the type of childhood adversity that is associated with the greatest increase in the risk for SUD onset (i.e., parental substance use) (Green et al., 2010). This last finding suggests that certain types of childhood adversity may be long-lasting and predictive of sustained SUD. If valid, a central implication of this idea is that the strategies for curtailing SUD persistence are likely to be different from the strategies for preventing SUD occurrence. For these reasons, for this dissertation I examine the effect of childhood adversity on SUD persistence, in addition to its effect on SUD occurrence.

2.2.8. Childhood adversity is challenging to measure

Individuals who experience one type of childhood adversity are often exposed to another type of childhood adversity (Felitti et al., 1998; Dong et al., 2003; Dube et al., 2001). For example, women's experiences of childhood sexual abuse or childhood parental alcohol abuse are each strongly correlated with experiencing multiple forms of childhood adversity (Dong et al., 2003; Dube et al., 2001). Because childhood adversity tends to cluster or co-occur and experiences of multiple types of childhood adversity increases risk relative to experiences of one type of childhood adversity, it is critical that studies do not focus on a single childhood adversity without considering the occurrence of different types of childhood adversity; doing otherwise would artificially inflate estimates of individual childhood adversity effects (Green et al., 2010). To account for this complexity, most studies have followed the influential work of Turner and colleagues on the effects of cumulative adversity (Lloyd & Taylor, 2006; Lloyd & Turner, 2008; Turner et al., 1995; Turner & Lloyd, 2003) and created a summative measure of

childhood adversity by summing the different types of childhood adversity that have been experienced.

Childhood adversity is most commonly operationalized as the total number of different types of adversities experienced (i.e., as a count variable) (e.g., Dube et al., 2003; Mersky et al., 2013; Patterson et al., 2014; Schilling et al., 2007). When treated as a summative count variable, studies generally report that each increase in the number of childhood adversity types increases the risk for substance use and dependence (Dube et al., 2003; Mersky et al., 2013; Patterson et al., 2014), for example by as much as 30-40% (Dube et al., 2003). When the count variable is categorized to better examine whether outcomes are worsened by increasing gradations in the number of different types of childhood adversity (e.g., Dube et al., 2001, 2003; Mersky et al., 2013; Myers et al., 2014; McLaughlin et al., 2010), each incremental increase in the number of different childhood adversity types is associated with an increase the risk of substance use or SUD. Findings have led investigators to conclude that the number of childhood adversities has a strong, positive, and dose-response effect on risk for SUD (Dube et al., 2003; Mersky et al., 2013; Patterson et al., 2014; Turner & Lloyd, 2008).

One limitation of this literature, however, is that it has neglected to consider threshold effects and whether the impact of childhood adversity depends on the type of substance that is used. For example, it may be that women who use alcohol face a higher risk for developing a SUD than women who use drugs because alcohol is generally more readily available and subject to less social stigma than drugs. Furthermore, due to threshold effects, these differences may be more apparent in the context of having experienced three or more types of childhood adversity, as opposed to having experienced one such event. These are gaps in the current knowledge that I address with Part One of this dissertation.

Also, an important potential limitation of a summative variable is that it implicitly assumes that each childhood adversity has the same effect on outcomes and that the joint effects are additive (Green et al., 2010). These assumptions may be erroneous. Some types of childhood

adversity such as sexual abuse and parental substance abuse increase the risk for SUD onset or persistence more than others (Green et al., 2010; McLaughlin et al., 2010) and the impact of each type of childhood adversity may vary by age (Green et al., 2010; Kessler et al., 1997; McLaughlin et al., 2010; Schilling et al., 2008; Turner & Lloyd, 2003). Studies that have disaggregated the CA-SUD relationship by age of respondent at the time of interview report that many but not all types of adversities are salient at each age, however age-related declines in the CA-SUD relationship occur for the effects of certain types of childhood adversity, specifically parental death, physical abuse, and sexual abuse (Green et al., 2010). This evidence suggests that the meaning that childhood adversity has in the lives of individuals may decline as an individual ages.

Furthermore, recent studies have concluded that the joint associations of multiple childhood adversities can have nonadditive effects (Green et al., 2010; Schilling et al., 2008). For example, Schilling and colleagues concluded that low-impact childhood adversities (for example, parents separated or divorced) did not present a cumulative hazard to outcomes (Schilling et al., 2008). Therefore, low-impact events functioned as suppressors in the total sum score and decreased the influence that high impact and medium impact events (such as sex abuse, physical abuse, serious neglect, parent death, parent has problem with alcohol or drugs) had on outcomes (Schilling et al., 2008). Thus, research on the impact of childhood adversity is advised to consider the interrelatedness, type, and severity of childhood adversity, in addition to their cumulative effect (Green et al., 2010; Schilling et al., 2008). These concepts inform the focus of Aim 2 of this dissertation in which I examine the influence of both number of and type of childhood adversity on occurrence of different types of SUD.

2.3. Influences of adult socioeconomic status on women's SUD

2.3.1. Socioeconomic status - income

The empirical evidence regarding the relationship between adult socioeconomic status (SES) and substance use disorders is mixed. A number of studies have found that the

prevalence of substance use disorders is higher among lower SES groups (Goodman & Huang, 2002; Kessler et al., 1994; Lemstra et al., 2008; Reinherz et al., 2000). Most commonly operationalized as income, it may be that SES enables individuals to purchase access to: (1) recreational pursuits other than substance use to address life stress, (2) SUD treatment, and (3) other resources that can be used to avoid or address SUD (Moos & Moos, 2007; Moos, 2007).

In contrast, other studies mostly based on non-probability samples have reported that substance use increases with increases in income, a pattern that is commonly attributed to the idea that consumption of substances is sensitive to price and the individual's ability to purchase substances (Cook & Moore, 2002; Farrell et al., 2003; Humensky, 2010; Patrick et al., 2012). This latter finding highlights a key uncertainty regarding the relationship between SES and SUD. That is, because substances are a commodity that generally requires disposable income to obtain, the poorest segments of the population are usually the least likely to consume them.

It is also important to recognize that relationships between SES and SUD may vary depending on the type of substance that is used. For example, in the context of childhood adversity, more income (relative to less income) may actually exacerbate the risk for a disorder among women who use alcohol, because alcohol is a legal substance and therefore it is more readily available, subject to less social stigma, and perceived to be less harmful than other substances (Ahern et al., 2015; Inaba & Cohen, 2011). In contrast, among women who use drugs and who have also experienced childhood adversity, more income (relative to less income) may reduce the risk for a disorder because women recognize drugs to be harmful and therefore higher income is used to access health care or otherwise avoid a SUD. These ideas specifically inform Aim 4 of this dissertation, but they are also relevant to the other Aims that I examine in Part One. As explained in the following sections, other potential complexities of the SES-SUD relationship emerge when other indicators of SES besides income are considered.

2.3.2. Socioeconomic status - educational attainment

Educational attainment may be predictive of different types of SUD independent of income. Reports of SUD in relation to educational attainment based on national survey data focus on adults aged 26 or older (SAMHSA, 2014).[3] These data indicate there are discrepancies by SUD type in associations with educational attainment. For example, in 2013, rates of past-12 month alcohol use disorders among adults aged 26 or older were not different by levels of educational attainment (rates ranged from 5.4% to 6.6%), but, in contrast, the rates of drug use disorders were different. Specifically, in 2013, adults aged 26 or older who were college graduates had a lower rate of drug use disorders (0.9%) than those who did not graduate from high school (2.5%), those who graduated from high school but had no further education (1.9 %), and those with some college education but no degree (2.1%). Young adults who abuse drugs may be more likely to drop-out of school or be expelled from school settings than peers who abuse alcohol (Arria et al., 2013; Briere et al., 2014; O'Malley & Johnston, 2002). In other words, these data may attest to how the social consequences of different types of SUD are socially defined in differentiated terms.

The lower drug use disorder rates among college graduates and high school graduates have been attributed to the age-graded changes in social roles and associated normative behavior that generally accompany the life transitions that those events signify (Kandel & Chen, 2000; Kandel & Yamaguchi, 1985; Yamaguchi & Kandel 1984). Although poorly understood, the increased risk for drug abuse among college students has been attributed to a diverse set of factors that include: overestimation among college students regarding how often the average student uses drugs (McCabe, 2008); perceptions among college students that drug use during their college years is normative (Cook et al., 2013; Pischke et al., 2012); the expectation among college students that drugs will reduce social anxiety and facilitate the formation of new peer

[3] SAMHSA (2014) notes that age is associated with both educational attainment and substance use disorders among adults aged 18 to 25. Many 18 year olds are still in high school, many 18 to 22 year olds have some college education but have not yet received a college degree, and college graduates generally are aged 22 or older. Moreover, in the United States, it is illegal to drink alcohol before age 21.

friendships (Buckner, 2013); and greater exposure to drug-using opportunities that exist on college campuses (Arria et al., 2008).

2.3.3. Socioeconomic status - employment status

Employment is critical to identity formation (Leufstadius et al., 2009; Luyckx et al., 2008), women's physical and mental well-being, and their overall quality of life (Falba et al., 2009; Mossakowski, 2008; Silver, 2010; Zabkiewicz, 2010). Therefore, it may be that the lack of employment itself increases women's risk for substance abuse. Considerable research, predominately conducted on male samples, has shown that substance abuse has a negative impact on labor force participation, work performance, job retention, and earnings (for reviews, see Henkel, 2011; Huang et al., 2011). Women who have been treated for SUD report low income levels, low educational attainment, and chronic unemployment. National survey data indicate that in 2008, about twice as many women aged 18 to 49 who were unemployed had a current substance use disorder than women who were employed full-time (SAMHSA, 2009). Despite this evidence, the temporal relationship between unemployment and the development of substance use disorders is complex and poorly understood (Henkel, 2011).

At the same time, women's participation in the labor force is shaped by enduring gendered social roles, particularly related to childrearing. Childcare responsibilities, especially for preschool-aged children, impact women's employment status (Drobnic et al., 1999; Rindfuss et al., 1996; Sharpiro & Mott, 1994; Stewart, 2008). Throughout early parenthood, women exhibit significant movement into and out of the labor force (Hynes & Clarkberg, 2005). A woman's decision to stay at home versus work across births is shaped by short-term family financial realities and other unfolding circumstances such as child temperament, satisfaction with child care, and re-evaluations of the importance of work relative to family life (Hynes & Clarkberg, 2005). Therefore when considering women's employment status, as I do in this dissertation it is important to distinguish those women who are unemployed and seeking work

from those women who are unemployed and not seeking work (i.e., women who are not in the labor force because they are childrearing or for other reasons).

2.4. Influences of key sociodemographic factors on women's SUD

2.4.1. Race/ethnicity

The role of social determinants is particularly salient to understanding the health of women with substance use disorders who are members of a racial/ethnic minority group. [4] Race/ethnic differences in the prevalence of SUD have been well documented over the last three decades, with findings from epidemiological and clinic-based studies indicating that compared to their White counterparts, SUD prevalence is generally lower among Blacks and Asians, higher among Native Americans, and similar or lower among Hispanics (Alvanzo et al., 2011; Breslau et al., 2005; Huang et al., 2006; Kessler et al., 1994; Gilman et al., 2008; Grant et al., 2011, 2012; Smith et al., 2006). Findings are paradoxical in that SUD prevalence rates among several minority racial/ethnic groups are better than what might be expected based on the hypothesized effects on health of discrimination and other unique stressors associated with minority racial/ethnic group status (Gee et al., 2012; Paradies et al., 2015; Williams, 1999). The mechanisms that might explain this paradox are poorly understood. In general, social stigma and social consequences for alcohol and drug abuse is more severe for Black women and Hispanic women than it is for White women (Keyes et al., 2010; Mulia et al., 2009). Women who face greater stigma for substance abuse may be less likely to initiate substance use or repeatedly use substances and therefore they may also be less likely to develop a substance use disorder. As discussed below, other mechanisms that are specific to each racial/ethnic

[4] It is well-established that classification systems for race and ethnicity are socially constructed (Williams & Collins, 2001; Williams & Mohammed, 2009). Currently, the U.S. Government's Office of Management and Budget (OMB) recognizes five racial categories (White, Black or African American, American Indian or Alaskan Native, Asian, and Native Hawaiian and other Pacific Islander) and one ethnic category, Hispanic or Latino/a (Office of Management and Budget, 1997). In this dissertation, I use the term "race/ethnicity" to refer to the OMB racial and ethnic categories. For parsimony, I use the term "Hispanic" to refer to both Hispanic and Latina, the term "Black" to refer to non-Hispanic Black/African American women and the term "White" to refer to non-Hispanic white women.

group have been attributed to differences in the cultural meaning of substances and also to variation by race/ethnicity in coping styles and coping resources (Hwang et al., 2008; Myers & Hwang, 2004).

Hispanic women are known to be particularly less likely than women of other racial/ethnic groups (and also relative to Hispanic men) to abuse alcohol or drugs (SAMHSA, 2001). A commonly cited reason for this difference is the strict cultural sanctions against drinking by women among Hispanic cultures. Among Hispanic women, drinking and drunkenness, and "excessive drinking," is viewed as a predominantly male activity (Canino, 1994; Zemore, 2007). Hispanic women who view substance abuse as contradicting their gender roles may be less likely to use substances for pleasure or in response to stress. It has also been noted that Hispanics have stronger family ties than other racial/ethnic groups (Hummer & Hamilton, 2010) and they are more likely than other groups to cope with stress by accessing their familial social support networks (Hwang et al., 2008). Social ties and other forms of social support promote approach oriented coping and other adaptive coping styles that can be used in lieu of alcohol and drug use or other avoidant/escape coping styles (Moos & Moos, 2007; Moos, 2007).

In contrast to Hispanic women and other racial/ethnic groups, Black women may be more likely to cope with stress by engaging in other behaviors besides alcohol and drug use. Overeating of “comfort foods” by Black women is one theorized reason why the effects of stress among Blacks more commonly manifest as physical ailments and not as substance use disorders (Jackson et al., 2010). As for sources of social support, family ties are weaker among Black women (Hummer & Hamilton, 2010) and can be a source of negative emotional support (Cichy et al., 2014; Lincoln & Chae, 2012). Therefore, Black women may rely more on social support from extended family networks and other social ties, particularly as provided by religious institutions (SAMHSA, 2009). Among Black women, as religious social support increases, the positive norms for drinking decrease (Herd & Grube, 1996). A spiritual orientation and religious

coping may be a form of social support that reduces the risk for substance use disorders among Black women (Franklin, 2011; Hamilton et al., 2013; Staton-Tindall, 2013; West et al., 2011).

2.4.1.1. Potential variation by race/ethnicity in the SUD type-SUD persistence relationship

While Hispanics and Blacks generally do not have an increased risk for substance use disorders than Whites, once SUD occurs, some members of these groups do tend to have disorders that are more likely to persist (Breslau et al., 2005) or persist for a longer duration of time (Arndt et al., 2010). For example, among women with alcohol use disorders, risk for persistence of the disorder has been found to be greater among older Blacks and US-born Hispanics than it is among younger Whites (Grant et al., 2012). A possible reason for this difference may be rooted in the reasons why Hispanic and Black women are less likely to abuse substances initially. That is, the abuse of substances by Hispanic and Black women reflects behavior that differentiates them from their peers more than is experienced by White women. Therefore, substance abuse itself creates more added stress for Hispanic and Black women than it does for White women, contributing to an increased risk for SUD persistence among Hispanic and Black women.

However, it is also the case that the liability for developing a persistent disorder varies by substance type. Therefore, given (1) that Hispanic women face cultural sanctions against alcohol use and (2) that an alcohol use disorder generally reflects maturing out processes, then among women who have an alcohol use disorder, Hispanic women may be less likely than both Black and White women to exhibit a persistent SUD over time. As another example, Black women are more likely than their Hispanic and White counterparts to believe that a SUD will resolve on its own without medical treatment (Anglin et al., 2008; Ward et al., 2009). It is also the case that Black women avoid seeking help for their SUD more than other racial/ethnic groups of women because of the real or perceived disproportionate likelihood that the parental rights of Black women will be terminated once substance abuse is detected by medical personnel or others (Roberts & Nuru-Jeter, 2012). When combined with the presence of a drug

use disorder (e.g., stimulants, heroin/opioids), i.e., a disorder that has a greater addiction liability and generally requires some form of SUD treatment or social support to resolve, these beliefs may create circumstances in which Black women are less able than White or Hispanic women to avoid a persistent SUD. These concepts inform my conceptualization of race/ethnicity as a potential moderator of the relationship between SUD type (alcohol only, drug only, poly-substance) and SUD persistence that I examine as a part of Aim 6 of this dissertation.

2.4.2. Nativity status

In addition to race/ethnicity, differential risk for SUD has also been associated with nativity status, particularly among Hispanics. The likelihood for substance use is generally greater among individuals who are US born or who demonstrate greater acculturation[5] (as indicated by factors such as time spent in the US, language preference, ethnic identification, social network composition) than among individuals who are born elsewhere or are less acculturated (Blanco et al., 2013; Grant et al., 2004; Otiniano Verissimo et al., 2014; Ortega et al., 2000). It may be that the cultural features and values of immigrant groups – such as strong social networks, cohesive families, and negative cultural meanings attached to substance abuse - exert a protective effect on risk of SUD (Gloria & Peregoy, 1996; Ojeda et al., 2008). Other studies have hypothesized that acculturation involves dynamic adaptive processes – such as disconnection with parents, intergenerational conflict, uncertain cultural identity, and feelings of grief and loss related to the culture that was left behind - that can create "acculturative stress" (Berry & Sam, 1997) and thereby put individuals who are less acculturated at greater risk for substance abuse (Alegria et al., 2007).

2.5. Theoretical framework and conceptual model

2.5.1. Theoretical framework

[5] Acculturation is defined as the process of social and psychological exchanges that take place when there are ongoing encounters between individuals of different cultures, with subsequent changes in either or both groups (Redfield et al., 1936).

The literature describes the role of adverse childhood experiences among women and its relationship with the occurrence and persistence of different types of substance use disorders. It also describes the role of sociodemographic characteristics as potential factors that may serve to protect women from the negative consequences of childhood adversity. These are variables that are included in the conceptual model for this dissertation. The following section describes the theoretical framework in which this dissertation research is grounded. Variables included in the conceptual model are highlighted along with theoretical support for their inclusion.

2.5.1.1. A life course perspective

Given that substance use generally begins in adolescence and that the occurrence and persistence of a disorder can extend well into adulthood, to understand the course of SUD and the factors that can alter it requires the observation of individuals for many years of the life course (Hser et al., 2007). Life-course epidemiology draws on the life course perspective of early human development (Elder, 1974, 1998, 2002) to focus on understanding how early life experiences shape physical and mental health across an entire lifetime (Braverman & Barclay, 2009; Kuh et al., 2003). A *life course perspective* (Elder, 1998, 2002) conceptualizes human development as a lifelong process in which individual lives are influenced by their ever-changing historical context. Individuals construct their own life course through their choices and actions within the opportunities and constraints of history and social circumstance (Elder, 1998). Embeddedness in a particular place and time shapes the way in which individual lives are lived (Elder, 1998). Behavioral patterns are dynamic and interactive, changing and influencing one another over time, and they are impacted by age differentiated, socially marked sequences of transitions (Elder, 1998, 2002). The developmental antecedents and consequences of life transitions, events, and behavioral patterns vary according to their timing in a person's life (Elder, 1998).

A major focus of a *life course epidemiology perspective* is the application of life course concepts to understand health. This perspective explicitly considers the social and physical environment, along with biological and psychosocial factors, as potential influences on child development and adult health (Braverman & Barclay, 2009; Conroy et al., 2010; Hertzman & Power, 2003; Wise, 2009). Life course epidemiology recognizes that chronic exposure to stressful conditions, particularly during critical or sensitive periods[6] of human growth and development, may have long term cumulative effects[7] on adult disease risk (Braverman & Barclay, 2009; Kuh et al., 2003). Early childhood (usually defined as birth to year 8), middle childhood (usually defined as ages 6 to 12), and adolescence (usually defined as ages 10 to 19) are recognized as important stages in the life course (Eccles, 1999). These are life stages in which: (1) great physical, cognitive, and socio-emotional development occur; (2) children develop skills for building healthy social relationships and learn roles that will lay the foundation for lifelong health; and (3) individuals are particularly sensitive to environmental influences (including family, peer group, school, neighborhood, policies, and societal cues) that can either support or challenge health and well-being (Eccles, 1999; Halfon & Hochstein, 2002; Halfon et al., 2010; Mulye et al., 2009).

2.5.1.2. Stress process model

The Stress Process Model developed by Pearlin and colleagues (Pearlin, 1985; Pearlin et al., 2005) focuses on early life circumstances and how this produces health disparities later in life by functioning as both the source and distributor of social stressors and coping resources. The model describes how stressors can be a single hardship or factor to which a person becomes sensitive and experiences persistent and continuous effects over time (Pearlin et al., 2005). Aligned with these concepts, accumulating evidence demonstrates that early life chronic

[6] The term "critical period" generally refers to a period of the life course during which exposures result in unalterable changes whereas the term "sensitive period" describes a period during which exposures have large effects that might be modified by later experiences (Braverman & Barclay, 2009; Kuh et al., 2003).
[7] Cumulative effects describe the accumulation of risk or protection over time in additive or synergistic ways (Kuh et al., 2003).

stress can result in long-term damage in multiple body organs and systems and it can affect the ability to respond to stress, impairing the body's ability to "switch off" the physiologic response to even minor stress later in life (Cohen et al., 2007; McEwen, 1998, 2001; Miller et al., 2007; Taylor et al., 2004, 2011). This evidence indicates that adverse experiences in childhood can have long-lasting detrimental effects on physical and mental health.

The Stress Process Model also describes how stressors can proliferate, that is function as a process in which one eventful or chronic stressor begets other stressors in a serial unfolding of stressors (Pearlin, 1985; Pearlin et al., 2005). As a person progresses through the life course, they may accrue more stressors and suffer more adverse consequences, collectively creating circumstances that worsen stress and challenge capacities to avoid adverse health. For example, childhood factors that limit education may accelerate stress proliferation primarily because low educational attainment interferes with stable and financially rewarding employment and thus it begets poverty, persistent unemployment, positioning in unsatisfactory work conditions, low mastery or control, and economic hardship and strain (Hatch, 2005). In effect, childhood adversity can channel people to lower strata of occupational and economic systems, thereby placing them at greater risk of exposure to a future stressor (Pearlin et al., 2005). Thus by mid- to late-adulthood, the disparities that originated in childhood may be exacerbated by a multiplicity of stressors that collectively impose a formidable stress burden (Braveman & Barclay, 2009; Pearlin et al., 2005). It is in this way that early adverse life experiences may play a key role in generating social stratification - widening health inequalities - over the lifetime of an individual (Braveman & Barclay, 2009; Pearlin et al., 2005).

In addition, the Stress Process Model describes a set of relationships that includes social and personal resources—for example, educational attainment, coping, mastery, self-esteem, social support—that function as moderators and/or mediators that can alter or explain the relationship between early life stressors and later health outcomes (Pearlin, 1985; Pearlin et al., 2005). The model also incorporates the role of social hierarchies based on socioeconomic

status but also gender, race/ethnicity, and age, for example, in affecting stress and health. Similar to Fundamental Causes theory, the Stress Process Model theorizes that higher status social groups (i.e., individuals with the most privilege, power, and prestige) generally are exposed to fewer or less severe stressors, compared to lower status social groups, and they often have greater access to the resources needed to cope with these stressors (Pearlin et al., 2005).

2.5.1.3. Theory of fundamental causes

It is well-recognized that profound differences exist in health and life expectancy based on differences in social position, as reflected by factors such as gender, race/ethnicity, educational attainment, occupational ranking, income, and accumulated wealth (Adler & Rehkopf, 2008; Braveman et al., 2010; Marmot et al., 1991). These differences exhibit a stepwise pattern, such that health improves incrementally with increasing levels of social and economic advantage (Marmot et al., 1991). Some models suggest that socioeconomic status (SES) (generally operationalized as educational level, income, or employment status) is a fundamental factor that underlies the relation between other social factors and health (Link & Phelan, 1995; Phelan et al., 2010).

Originating in sociological traditions, the theory of fundamental causes was developed to explain why the association between socioeconomic status and mortality persists despite changes over time in the diseases and risk factors that elevate mortality risk (Link & Phelan, 1995; Phelan et al., 2010). The theory's basic principle is that "flexible resources" (e.g., money, knowledge, prestige, power) and social connections shape individual health behaviors by influencing whether people know about, have access to, can afford, and receive social support to avoid health risks or to minimize the consequences of disease once it occurs (Link & Phelan, 1995; Phelan et al., 2010). These resources also operate at a broader level by shaping access to neighborhood environments and other social contexts that vary substantially in exposure to risks and protective factors (Phelan et al., 2010).

The theory stipulates that individuals and groups with high SES possess a superior collection of resources and beneficial social connections that can be deployed to avoid risks and adopt protective strategies, thereby producing a health advantage for higher SES individuals (Link & Phelan, 1995; Phelan et al., 2010). Moreover, the theory explains how these resources are "flexible" - that is, they can be used in different ways in different situations and no matter what the risk and protective factors are in a given circumstance. Therefore, they produce a persistent association of SES with overall health despite dramatic changes over time in the explanatory mechanisms linking SES and health (Link & Phelan, 1995; Phelan et al., 2010). It is this last observation that led Link and Phelan to conceptualize SES as a "fundamental" cause of health inequalities (Phelan et al., 2010).

2.5.1.4. A social determinants perspective

The term "social determinants of health" describes the idea that health and well-being are influenced by the circumstances[8] in which people are born, grow up, live, work and age, and the systems put in place to address illness, and that these circumstances are in turn shaped by a wider set of macro-level forces: economics, social policies, and politics (Marmot, 1999). In relation to social determinants and substance use disorders, recent advancements in knowledge have revealed there are commonalities across alcohol and other substance types in the biological factors that heighten the risk for substance use disorders (NIDA, 2012), yet the social consequences of substance use disorders nevertheless remain socially defined in differentiated terms that can worsen the course of some disorder types more than others (Nadelmann, 1989, 2014).

One of the best known examples of how the course of women's SUD is socially determined is provided by the social response to alcohol and other substances by pregnant

[8] The social circumstances that shape health include factors such as social hierarchy (income distribution, workplace control), public policies (housing, education), cultural norms, and social relationships (social networks, social exclusion, discrimination) (Marmot, 1999).

women. Crack cocaine abuse is more common among women who are members of a racial/ethnic minority group and poor whereas abuse of alcohol is more prevalent among women who are White and affluent (Hans, 1999; Ondersma et al., 2000; Vega et al., 1997). Alcohol abuse during pregnancy is well-known to have detrimental impacts on fetal development (Lester et al., 2004). In contrast, after two decades of research the claims that cocaine abuse during pregnancy could lead to birth defects and developmental disorders remain largely unfounded (Akyuz et al., 2014; Lester et al., 2002). Despite this evidence, pregnant women are much more likely to be tested by medical professionals for crack cocaine use than they are for use of alcohol or other types of substances, and crack cocaine using pregnant women are more likely to be criminally prosecuted or reported to child protective services for their substance abuse (Annas, 2001; Bornstein, 2003). Not unlike the different social responses to men's abuse of crack cocaine relative to powder cocaine,[9] this discrepancy suggests that the criminalizing of certain types of perinatal substance abuse by women is in actuality a discriminatory social response that disproportionately impacts impoverished women and/or women who are members of a racial/ethnic minority group (Lester et al., 2004). This example suggests the need to recognize that in addition to childhood circumstances and adult socioeconomic status, there are a number of other aspects of women's social environment and demographic characteristics that may affect whether a SUD occurs or persists.

2.5.2. Overview of the concepts that guide this dissertation

[9] Studies that have examined the sociodemographic characteristics and health and social consequences of crack cocaine relative to powder cocaine have been critical in revealing how the past three decades of US criminal justice policies regarding different types of substances have disproportionately affected the health and well being of racial and ethnic minority communities. These two substances are pharmacologically indistinct (Hatsukami & Fischman, 1996), but crack cocaine, which is most often used by poor Black men, has much higher criminal conviction rates and longer incarceration sentences than powder cocaine, which is typically used by affluent white men (Fellner, 2009). The disproportionate incarceration of racial/ethnic for drug-related offenses has increased the risk for HIV and other infectious diseases among these groups (Hammett, 2006; Spaulding et al., 2009) and it has decreased their ability to achieve a higher socioeconomic status via "zero tolerance" public policies that prohibit felony drug offenders from employment opportunities and federal public assistance programs (Moore & Elkavich, 2008; Galea & Vlahov, 2002).

This dissertation is theoretically guided by a life course (Elder, 1974, 1998, 2002) epidemiological perspective (Braveman & Barclay, 2009; Kuh et al., 2003), a social determinants perspective (Marmot, 1999), the Stress Process Model (Pearlin, 1981, 1989, 2005), and the Theory of Fundamental Causes (Link & Phelan, 1995; Phelan et al., 2010).

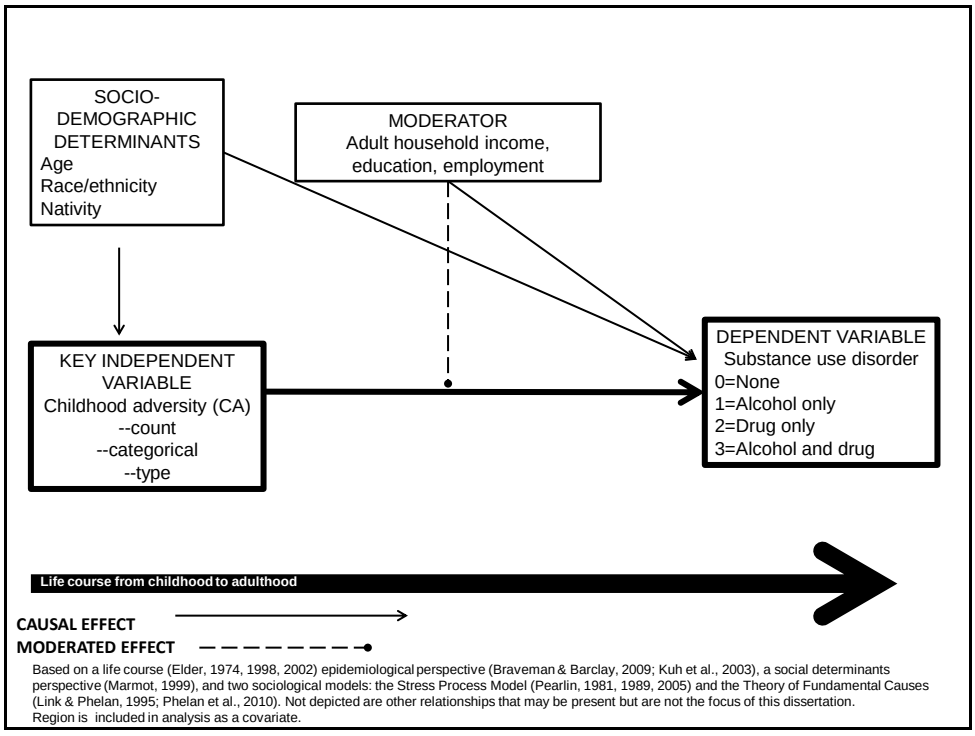
In combination, the life-course epidemiology perspective and the social determinants perspective provide for this dissertation the overarching framework for conceptualizing the links between childhood adversity, adult sociodemographic characteristics, and risk for SUD occurrence and persistence. The life-course epidemiology perspective and the Stress Process Model provides theoretical guidance on how adversities experienced in early childhood can elevate the risk for adult SUD occurrence and persistence via direct effects. That is, the ideas provided by these perspectives suggest that although early life inequalities may begin with inherited (e.g., genetic) or in utero vulnerabilities, those inequalities widen as a result of differential exposure to environmental hazards including exposures to childhood abuse and neglect, and family distress. Thus, the developing child is embedded in an early social environment that, most likely in combination with biological vulnerabilities, establishes an underlying condition that has persistent and lifelong implications for women's SUD risk.

The social determinants perspective and the Fundamental Causes Model provide guidance for examining the impact of adult socioeconomic status and other sociodemographic factors on SUD risk. The Fundamental Causes Model provides specific guidance as to whether access to resources (e.g., as provided by adult SES) is used to avoid SUD risks or to minimize the consequences of childhood adversity once it occurs. The social determinants perspective provides a rationale for examining whether the cultural meanings and social consequences of different types of SUD that are specific to each racial/ethnic group mean that race/ethnicity functions as a factor that modifies the relationship between SUD type and SUD persistence.

2.5.2.1. Integrated conceptual framework that guides Part One of this dissertation

Informed by these theoretical concepts and the literature synthesized previously, the conceptual model for Part One of this dissertation is depicted in Figure 2.1.

Figure 2.1. Conceptual Model of the Relationship between Childhood Adversity, Socio-demographic Characteristics, and Occurrence of Substance Use Disorders Over the Life Course (Part One)



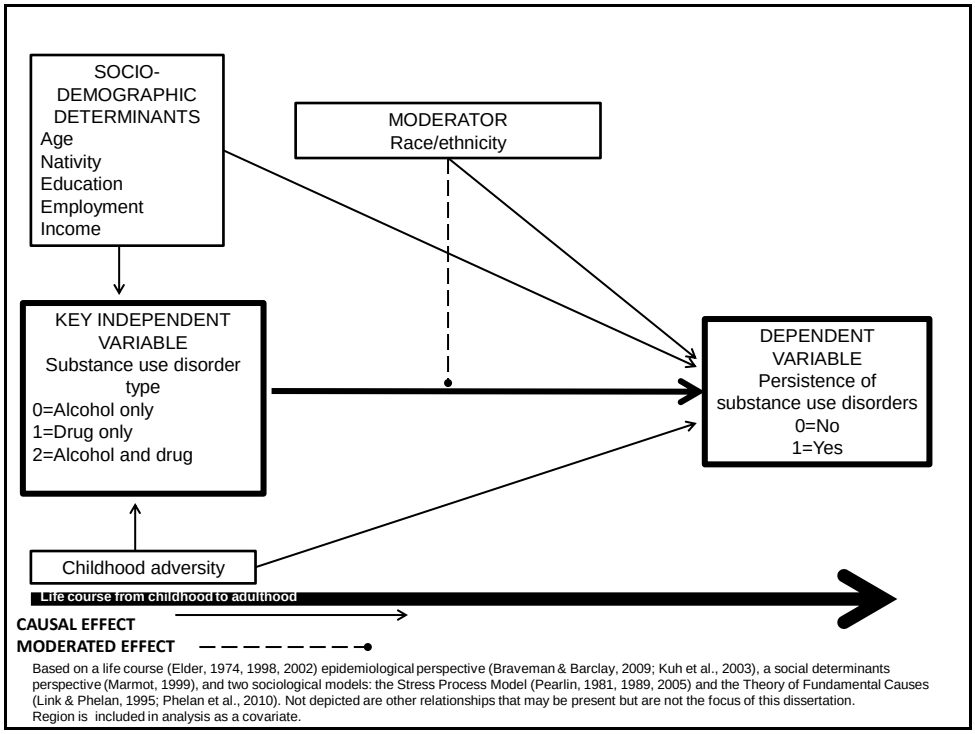
Moving from left to right, the figure depicts the occurrence of substance use disorders over the life course. The focal independent variable is childhood adversity (CA) and the focal dependent variable is presence of a substance use disorder by type (i.e., none, alcohol only, drug only, poly-substance). For Aim 1, I consider relationships as they occur among both men and women. Thereafter, however, I focus only on women. Therefore, the figure depicts the relationships that pertain to Aims 2-6. Childhood adversity is depicted in a manner to account for my intent to operationalize it in different ways (for Aim 2). I include age for these two reasons: (1) the effects of childhood adversity may be stronger among younger women, who are living closer in time to when childhood adversity occurred, than among older women and (2) according to maturing out processes, patterns of substance abuse generally change with age. To examine the effects of adult socioeconomic status, I include household income, educational

attainment, and employment status. I include race/ethnicity and nativity status because risk for SUD is known to vary by these characteristics. In addition to these sociodemographic characteristics, I include region as a covariate to control for whether the place in which women live influences SUD risk. The figure also depicts my expectation that the relationship between childhood adversity and presence of each type of SUD will be moderated by adult socioeconomic status (as indicated by adult household income, education level, and employment status). The figure does not depict other relationships that may be present but are not the focus of this dissertation. For example, experiences of childhood adversity may explain adult socioeconomic status level, which in turn may be related to risk for the presence of a substance use disorder. I do not examine the possible role that socioeconomic status may play in mediating the CA-SUD relationship and therefore I do not show this relationship on the figure.

2.5.2.2. Integrated conceptual framework that guides Part Two of this dissertation

The conceptual model for Part Two (Aim 6) of this dissertation is depicted in Figure 2. Moving from left to right, the figure depicts the persistence of women's substance use disorders over the life course. The focal independent variable is type of SUD (i.e., alcohol only, drug only, poly-substance) and the focal dependent variable is persistence of SUD (yes versus no). The other variables that are shown in the figure have been included to examine other possible demographic and social determinants of SUD persistence. Also, the figure depicts my expectation that the relationship between SUD type and SUD persistence will be moderated by race/ethnicity. As is the case for Part One, the figure for Part Two does not depict other relationships that may be present but are not the focus of this dissertation.

Figure 2.2. Conceptual Model of the Relationship between Type of Substance Use Disorder, Socio-demographic Characteristics, and Persistence of Substance Use Disorders Over the Life Course (Part Two)



In the next chapter of this dissertation I describe each of these variables in more detail and I outline how they are incorporated into the statistical analysis procedures. First, however, is a description of the data set that I use and the data collection procedures.

CHAPTER THREE

RESEARCH DESIGN AND METHODS

In this chapter, I describe the study that provides the data for the dissertation.

3.1. NESARC study design

Data for the proposed dissertation are provided by the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). NESARC is a nationally representative longitudinal survey of adults (18 years of age or older). Conducted by the National Institute on Alcohol Abuse and Alcoholism (NIAAA), NESARC was designed to determine the magnitude of alcohol and other use disorders and their associated disabilities in the general population and in subgroups of the population and to examine changes over time in alcohol and other drug use disorders and their associated disabilities. Data were collected at two time-points: Wave 1 was conducted in 2001-2002. Wave 2 was conducted in 2004-2005. Wave 2 included measurement of childhood adversity.

NESARC data are uniquely well-suited for the investigating the aims of this dissertation primarily for the following three reasons. First, these data include valid and reliable measurement of the key constructs, enabling investigation of the relationship between childhood adversity and substance use disorders. Second, NESARC collected information from a large and diverse sample of women. This strength permits investigation of potential differences in the risk for SUD among sub-groups of women. Finally, NESARC offers repeated measurement of SUD as collected over a three year interval, permitting examination of SUD persistence.

NESARC used a three-stage sampling design (Grant et al., 2003, 2004, 2005; Ruan et al., 2008). The sampling frame for the NESARC sample of housing units is the Census 2000/2001 Supplementary Survey (C2SS), a national survey of 78,300 households per month. A group quarters frame was also used.[10] Stage 1 was primary sampling unit (PSU) selection

[10] Unlike many surveys, NESARC estimates include people living both in housing units (HU) and group quarters (GQ). A HU may be a house, an apartment, a mobile home, a group of rooms or a single room

using the C2SS PSUs. Of the approximately 2,000 C2SS primary sampling units (PSUs), which represented all 3,142 counties and county equivalents in the United States, 655 PSUs were selected with certainty because of their size (a population of 250,000 or more in 1996). These were designated as self-representing (SR) PSUs. The remaining PSUs were stratified within each state by sociodemographic characteristics. Two PSUs were selected from each stratum with probability proportional to size, yielding 254 additional PSUs that were designated as non-self-representing (NSR).[11] To prevent possible respondent disclosure, the resulting 401 SR and 254 NSR PSUs were subsequently collapsed into 305 SR and 130 NSR PSUs. Stage 2 was household selection from the sampled PSUs. In Stage 3, one adult respondent age 18 or older was selected at random from each sample household. To ensure that the study included racial/ethnic groups that had historically been underrepresented in prior research, NESARC oversampled Blacks and Hispanics at the design phase of the survey, increasing the representation of Black households from 12.3% to 19.1% and the representation of Hispanic households from 12.5% to 19.3%. In addition, to ensure that the study included a greater proportion of ages in which substance use prevalence peaks, NESARC oversampled young adults ages 18–24 at the household level at a rate of 2.25 to 1. Again, one sample adult was randomly selected for interview in each household. The weighted data were then adjusted to represent the U.S. civilian population based on the 2000 Census.

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that is occupied (or, if vacant, intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live separately from any other individuals in the building and which have direct access from outside the building or through a common hall. A GQ is a place where people live or stay in a group living arrangement that is normally owned or managed by an entity or organization providing housing and/or services for the residents. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. GQs include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, and workers' dormitories. For additional details on the NESARC sampling frame, see http://www.amstat.org/sections/srms/Proceedings/y2002/Files/JSM2002-000531.pdf.

[11] There are two types of PSUs: self representing and non-self representing. Self representing PSUs are selected with certainty. Non-self representing PSUs are grouped into a stratification PSU and one PSU is randomly selected to represent the stratification PSU. Each PSU's probability of selection is based on size, the ratio of an individual PSU's population to its total cluster population. The objective is to form homogeneous stratification PSUs and each stratification PSU should have approximately the same population to minimize the within stratum portion of the total survey variance (King et al., 2011).

The NESARC target population was the civilian, non-institutional adult population of the United States residing in households. It includes persons living in households, military personnel living off-base, and persons residing in boarding or rooming houses, nontransient hotels and motels, shelters, college quarters, and group homes.[12] These are settings where people with substance use disorders are likely to live but they are also settings that are not typically targeted by general population surveys. Therefore, that individuals living in these settings were included in data collection represents a significant strength of the NESARC study design. Data were collected at two time-points using face-to-face computer-assisted personal interviews (CAPI) conducted by trained lay interviewers. Participants who completed the survey were paid $80.

At Wave 1, interviews were conducted with 43,093 respondents (response rate = 81%). Among the 43,093 Wave 1 respondents, 39,959 persons were eligible for a Wave 2 interview. The remainder were classified as ineligible for a Wave 2 interview because they were institutionalized, mentally or physically impaired, or on active duty in the armed forces throughout the Wave 2 interview period (n=1,731), or deceased, permanently moved (e.g., out of the country) or deported (n=1,403). Among the eligible individuals, 34,653 completed a Wave 2 interview, reflecting a response rate of 86.7%. The mean interval between Wave 1 and Wave 2 interviews was 36.6 (SD=2.6) months. The Wave 2 interview contains parallel items to the Wave 1 interview, as well as several additional modules including assessment of childhood adversities.

Wave 2 NESARC data were weighted to reflect design characteristics of the NESARC and account for non-response and sample attrition. The final Wave 2 weight is the product of the Wave 1 final weight and 3 weighting adjustment factors. The first factor adjusts for Wave 2

[12] The NESARC dataset does not include a variable indicating these home types. Instead, the dataset includes a variable that captures type of residence as defined according to these categories: house (attached, detached); apartment; mobile home; and other (boat, recreational vehicle).

non-response across sociodemographic characteristics and the presence of any Wave 1 lifetime substance use disorder or other psychiatric disorder and was performed at the household and person levels. The second factor adjusts the weighted data to agree with independent estimates of the civilian non-institutional population of the United States by region, age, sex, race, and race/ethnicity. The third factor removes those households in which an interview was obtained in Wave 1, but the sample persons became ineligible for a Wave 2 interview owing to reasons described earlier (Grant & Kaplan, 2005).

3.2. Data permissions and human subjects approval

The research protocol for NESARC Wave 1 and Wave 2, including informed consent procedures, received full ethical review and approval from the U.S. Census Bureau and the U.S. Office of Management and Budget. NESARC data are archived at the UCLA Integrated Substance Abuse Programs (ISAP). To access the data, I submitted a data analysis proposal and data use agreement to ISAP Co-Director, Christine Grella, PhD. My use of the NESARC data for this dissertation is covered by Dr. Grella's regulatory approvals.

3.3. Study variables

The variables that are used in this dissertation measure the key constructs in my conceptual models, as illustrated by Figure 1 and Figure 2. All the variables are derived from Wave 1 or Wave 2 NESARC data.

3.3.1. Variables for Part One of the dissertation

Variables for Part One of the dissertation include the independent and dependent variables, sociodemographic characteristics, and a control variable.

3.3.1.1. Independent and dependent variables

The focal dependent variable is the *presence of a lifetime substance use disorder (SUD)* as measured at Wave 1. The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS-IV) uses criteria for lifetime and past-year alcohol and other drug use disorders based on the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition

(DSM-IV) (Grant & Hasin, 1991). Administered at both Waves 1 and 2, the AUDADIS-IV includes an extensive list of symptom questions that separately operationalizes DSM-IV criteria for abuse and dependence on alcohol and 10 classes of illicit drugs or prescription drugs, including cannabis, hallucinogens, opiates, heroin, amphetamines, cocaine, sedatives, tranquilizers, and solvents. Consistent with the DSM-IV, AUDADIS-IV diagnoses of SUD required at least 3 of the 7 DSM-IV criteria for SUD to be met. Numerous studies conducted with clinical and general population samples have demonstrated good-to-excellent reliability and validity of the AUDADIS-IV diagnoses for alcohol and drug use disorders (test-retest reliability kappa = 0.66–0.91) (Grant et al., 1995, 2003; Ruan et al., 2008). I created a 4-level categorical variable: no substance use disorders (0); alcohol-only abuse or dependence, which I refer to as alcohol use disorders (AUD) only (1); drug abuse or dependence without AUD, which I refer to as drug use disorders (DUD) only (2); drug abuse or dependence with AUD, which I refer to as co-occurring AUD and DUD (3).

The focal independent variable for Aims 1-5 is *childhood adversity*. NESARC assessed adverse childhood events occurring before age 18 using questions that were a subset of items from the Conflict Tactics Scale (Straus, 1979 and Straus et al., 1996) and the Childhood Trauma Questionnaire (Bernstein et al., 1994). Table 3.1 provides more detail for each item of the assessment questions. Respondents were asked to respond to all questions pertaining to abuse, neglect (except emotional neglect), and having a battered mother on a five-point scale (never, almost never, sometimes, fairly often, or very often). Emotional neglect questions employed an alternative five-point scale of never true, rarely true, sometimes true, often true, or very often true. All questions pertaining to general household dysfunction required yes/no responding (except questions regarding having a battered mother, as mentioned above). I defined each variable to be consistent with definitions employed in the Adverse Childhood Experiences study (Dube et al., 2003; Dong et al., 2003). These definitions are commonly used

by epidemiological research on childhood adversity (e.g., Afifi et al., 2011; Dube et al., 2003; Dong et al., 2003).

Table 3.1. Childhood adversity

Event	# of items	Wording of each item	Response categories	Occurrence of childhood adversity is indicated by…
Abuse				
Physical abuse	2	how often a parent or other adult living in the respondent's home (1) pushed, grabbed, shoved, slapped, or hit the respondent; or (2) hit the respondent so hard it left marks or bruises, or caused an injury.	5-point scale: 1=never, 2=almost never, 3=sometimes, 4=fairly often, 5=very often	"sometimes" or greater to either item
Sexual abuse	4	occurrence of (1) sexual touching or fondling, (2) attempted intercourse, or (3) actual intercourse by any adult or (4) other person when the respondent did not want the act to occur or was too young to understand what was happening.	5-point scale: 1=never, 2=almost never, 3=sometimes, 4=fairly often, 5=very often	any response other than "never" on any item
Emotional abuse	3	how often a parent or other adult living in the respondent's home (1) swore at, insulted, or said hurtful things to the respondent; (2) threatened to hit or throw something at the respondent (but did not do it); or (3) acted in any other way that made the respondent afraid he/she would be physically hurt or injured.	5-point scale: 1=never, 2=almost never, 3=sometimes, 4=fairly often, 5=very often	a response of "fairly often" or "very often" to any item
Neglect				
Physical neglect	4	respondents' experiences of (1) being left unsupervised when too young to care for themselves or (2-4) going without needed clothing, school supplies, food, or medical treatment.	5-point scale: 1=never, 2=almost never, 3=sometimes, 4=fairly often, 5=very often	any response other than "never" to any item
Emotional neglect	5	whether the respondent (1) felt a part of a close-knit family or whether anyone in the respondent's family of origin (2) made the respondent feel special, (3) wanted the respondent to succeed, (4) believed in the respondent, or (5) provided strength and support	5 point scale: 1=never, 2=rarely, 3=sometimes, 4=often, 5=very often	reverse-scored and summed; indicated by scores $\geq$15 (Dube et al., 2003; Dong et al., 2003; Afifi et al., 2011)

Continued on next page

Table 3.1. (continued) Childhood adversity

Household dysfunction				
Battered mom	4	whether the respondent's father, stepfather, foster/adoptive father, or mother's boyfriend had ever done any of the following to the respondent's mother, stepmother, foster/adoptive mother, or father's girlfriend: (1) pushed, grabbed, slapped, or threw something at her; (2) kicked, bit, hit with a fist, or hit her with something hard; (3) repeatedly hit her for at least a few minutes; (4) threatened to use or actually used a knife or gun on her.	5-point scale: 1=never, 2=almost never, 3=sometimes, 4=fairly often, 5=very often	any response of "sometimes" or greater for questions 1 or 2, or any response except "never" for questions 3 or 4
Parental				
substance use	2	whether (1) a parent or (2) other adult living in the home had a problem with alcohol or drugs.	0=No 1=Yes	response of "yes" to either item
incarceration	1	parent or other adult in the home went to jail or prison	0=No 1=Yes	Yes
mental illness	1	parent or other adult in the home was treated or hospitalized for a mental illness	0=No 1=Yes	Yes
suicide attempt	1	parent or other adult in the home attempted suicide	0=No 1=Yes	Yes
suicide	1	parent or other adult in the home actually committed suicide	0=No 1=Yes	Yes

An experience of "any childhood adversity" was indicated by (1) any maltreatment (physical or emotional) or abuse (physical, emotional, sexual) (5 items) or (2) any maltreatment (physical or emotional) or abuse (physical, emotional, sexual) (5 items) or household dysfunction (battered mother, parental substance abuse, 4 other types of household dysfunction) (6 items).

For the count variable, each type of adverse event was summed (range: 0-11 events).

For the categorical variable, the count variable was coded into mutually exclusive categories (e.g., 0 events, 1-2 events, $\geq$3 events).

NESARC did not ask respondents to specify the (1) exact age at first occurrence of each of these events or (2) number of times that each of these events occurred. Therefore, I operationalized childhood adversity in these two ways: (1) as a summative count variable that captures the number of different types of childhood adversity that women experienced and (2) as a categorical variable. To create these two variables, first I determined whether each type of childhood adversity had been experienced as indicated by any abuse or neglect (physical, emotional, sexual) (5 items) and any household dysfunction (battered mother, parental substance abuse, 4 other types of household dysfunction) (6 items). Table 3.1 provides a summary of the items that I used to determine the occurrence of each type of adverse childhood event. To create the summative count variable, I added up the number of each of these types of adverse events (range: 0-11 events).

For the categorical variable, I examined the distribution of the count variable. Given that the literature has documented there are graded differences in health outcomes between experiences of no events compared with 1-2 events and also relative to $\geq$3 events (Afifi et al., 2011; Dube et al., 2003; Dong et al., 2003), I created mutually exclusive categories (e.g., 0 events, 1-2 events, $\geq$3 events). This allowed me to: (1) ensure that enough women are included in each category to support analyses and (2) determine whether risk for SUD is associated with graded increments in the number of different types of CA that are experienced.

3.3.1.2. Demographic characteristics

Gender at Wave 1 is a dichotomous variable with two categories: women and men.

Age at Wave 1 is a categorical variable with four groups: (1) 18-24 years, (2) 25-44 years, (3) 45-64 years, and (4) 65 and older. Dummy variables were created comparing 65 and older group, the reference group, to each of the other three groups.

Race/ethnicity is a categorical variable with four groups: (1) non-Hispanic Whites, (2) non-Hispanic Blacks, (3) Hispanics, and (4) other (Asian American, Pacific Islanders, American Indians, Native Americans, other). The sample size of NESARC women who are an “other”

race/ethnicity is small and made up of several different categories (e.g., Asian, Pacific Islander, Native American, American Indian, other), making it difficult to execute or interpret comparisons. Therefore I omitted the "other" group from the analytic sample that I used for all analyses. Furthermore, I created two dummy variables comparing non-Hispanic Whites, the reference group, to each of the other remaining groups (non-Hispanic Blacks, Hispanics).

Nativity status is a dichotomous variable measured by asking respondents whether they were born in the United States (1= US-born, 0=foreign-born).

3.3.1.3. Adult socioeconomic status

Total gross annual household income in the 12 months prior to Wave 1 is measured as a categorical variable with 21 response categories representing successively increasing intervals of income (e.g. $40,000-$49,999, $50,000-$74,999, and so on.). To aid interpretation of this variable and to ensure that it reflects the median household income in the United States,[13] I created 5 categories: (0) <$15,000, (1) $15,000 to $29,999, (2) $30,000 to $49,999, (3) $50,000 to $79,999, (4) $80,000 or higher. Dummy variables were created comparing the <$15,000 group, the reference group, to each of the four other groups.

Educational attainment at Wave 1 is operationalized as a categorical variable. Informed by the literature, the response categories were collapsed into five groups representing women with: (1) less than a high school education or general education degree (GED), (2) a GED or high school diploma, (3) some college education but no degree, (4) a 4-year college degree, (5) some post-baccalaureate education or higher. Four dummy coded variables were constructed comparing women with less than a high school or GED education (reference group) to each of the four other education response categories.

Current employment status at Wave 1 is a categorical variable as indicated by four groups: (1) full-time employment (35+ hours per week), (2) part-time employment (<35 hours

[13] According to the 2000 US Census, the median annual household income (dollars) is $41,994. The mean annual household income (dollars) is $56,544.

per week), (3) unemployed and looking for work, (4) unemployed and not looking for work, as indicated by being a (i) student, homemaker, retired, permanently disabled, or laid off and not seeking work/other and (ii) not employed full- or part-time, and (iii) not looking for work. Dummy coded variables were constructed comparing women who work full-time (reference group) to each of the three other response categories.

3.3.1.3. Control variable

Study *region*. Study region is measured by NESARC with a four-category variable: Northeast, Midwest, South, and West.

3.3.2. Variables for Part Two of the dissertation

The *focal dependent variable for Aim 6* is occurrence of any SUD in the 12-months prior to Wave 2. To ensure that there is enough statistical power for analysis, I categorized this variable as a dichotomous variable (0=no, 1=yes). I considered a response of "yes" to indicate SUD persistence. Occurrence of any SUD was defined per the criteria and methods that NESARC used to measure SUD as described for Part One.

The *focal independent variable for Aim 6* is substance use disorder type as measured for the 12-months prior to Wave 1 and coded by type into three mutually exclusive categories (0=alcohol use disorder only, 1=drug use disorder only, 2= poly-substance use disorder). Type of SUD was defined per the criteria and methods that NESARC used to measure SUD as described for Part One.

I operationalized *childhood adversity* as a categorical variable as described previously for Part One (e.g., 0 events, 1-2 events, $\geq$3 events).

I operationalized the remaining variables - *age, race/ethnicity, nativity status, socioeconomic status (household income, educational attainment, employment status), and region* – as described for Part One.

3.4. Dissertation sample

3.4.1. Demographic characteristics of the sample

The sample for Part One of this dissertation includes all 19,209 White, Black, and Hispanic women in the NESARC Wave 1 sample who completed a follow-up interview in Wave 2. Only Wave 2 included measurement of childhood adversity. For Aim 1 only, I also considered all 13,898 White, Black, and Hispanic men in NESARC. Table 3.2 shows the distribution of key variables for the dissertation based on the weighted data for the sample of women. The following descriptive information is based on weighted data. The race/ethnicity of this sample of women is 75.5% White, 12.8% Black, and 11.7% Hispanic. At Wave 1, 12.4% of the sample was between the ages of 18 and 24, 38.4% was 25 to 44 years old, 30.8% was 45 to 64, and 18.4% was 65 or older. About 14.3% of the women had not attained a high school education or GED at Wave 1, 30.0% had attained a high school degree or GED, 32.0% had attended some college but not attained a baccalaureate degree, 12.3% had attained a college degree, and 11.1% had at least some post-baccalaureate education. At Wave 1, about 17.9% reported their household income was <$15,000, 19.7% reported $15,000 to $29,999, 23.1% reported $30,000 to $49,999, 21.7% reported $50,000 to $79,999, and 17.7% reported $80,000 or higher.

The sample for Part Two of this dissertation includes all 1,025 White, Black, and Hispanic women in the NESARC Wave 1 sample who completed a follow-up interview in Wave 2 and who indicated having a SUD in the 12-months prior to Wave 1. Table 3.2 shows the distribution of key variables for the dissertation based on weighted data for this sample. Based on weighted data, race/ethnicity is 80.5% White, 10.8% Black, and 8.7% Hispanic. At Wave 1, 29.7% of the sample was between the ages of 18 and 24, 50.5% was 25 to 44 years old, 17.9% was 45 to 64, and 1.8% was 65 or older. About 8.4% of the women had not attained a high school education or GED at Wave 1, 26.6% had attained a high school degree or GED, 41.8% had attended some college but had not attained a degree, 13.6% had attained a college degree, and 9.4% had at least some post-baccalaureate education. At Wave 1, 18.8% reported their

household income was <$15,000, 17.8% reported $15,000 to $29,999, 21.7% reported $30,000 to $49,999, 22.4% reported $50,000 to $79,999, and 19.3% reported $80,000 or higher.

4.5. Power analysis

The sample of 19,209 women is large and adequate to address the analyses related to Part One, Aims 2-5. I used G*Power[14] to compute the statistical power analyses that are described in this section (see Appendix 1 for power calculations). I assumed a two-sided alpha of 0.05 and power of 0.80 for all analyses. I determined that the sample size of 19,209 enabled the detection of even a small effect when using logistic regression analyses to test the effect of childhood adversity on each type of substance use disorder (SUD) (i.e., alcohol use disorder only (AUD), drug use disorder only (DUD), poly-substance use disorder; referent is no SUD). Specifically, the sample size allowed for the detection of an odds ratio of 0.95 for the key predictor (i.e., childhood adversity), assuming about 25% of the study population had some type of SUD. With inclusion of the proposed moderators and other variables as covariates, the sample could still detect odds ratios of 0.94 to 0.95, given moderate correlations of 0.1 to 0.5 among predictors. In considering the three outcome categories (i.e., AUD, DUD, both) simultaneously in the analyses and having applied the Bonferroni corrections for multiplicity (i.e., the pre-specified alpha of 0.05 divided by 3), the sample size still provided sufficient power for detecting an odds ratio of 0.95 given a prevalence rate of 25%; with inclusion of covariates, the detectable odds ratios were 0.94 to 0.95 given moderate correlations of 0.1 to 0.5 among predictors. In other words, a difference in SUD occurrence (i.e., between women who have experiences of childhood adversity and women who do not have those experiences of childhood adversity) of approximately 5-6% or larger was detectable (statistically significant).

Aim 6 relies on a smaller sample of 1,025 women who had SUD in the 12-months prior to Wave 1. Of this sample, 61% did not have a SUD in the 12-months prior to Wave 2 (i.e., the

[14] Available online at http://www.gpower.hhu.de/en.html

SUD did not persist; n=626) and 39% had a SUD (i.e., SUD persistence; n=399). This sub-sample of 1,025 women provided adequate power for testing research hypotheses in Aim 6. Using logistic regression to assess predictors of a binary outcome (e.g., SUD persistence), the sample allowed for the detection of odds ratios of 0.77 to 0.84 for a predictor controlling for other predictors, assuming moderate correlations of 0.1 to 0.5 among predictors and that about 40% of the study population exhibited SUD persistence. In other words, a difference in SUD persistence of approximately 17-23% or larger was detectable (statistically significant).

3.6. Data analyses

3.6.1. Preliminary analysis strategies

I conducted all preliminary analyses using STATA 13.1 (StataCorp LP, 2014). I began by looking at the univariate and multivariate distributions of the study variables. I first examined unweighted data and then weighted data. These analyses included percentages, means, rates, correlations, measures of variance, and distribution characteristics, as appropriate to the measurement level of selected variables. During the univariate analysis, I computed descriptive statistics and frequency counts. I made appropriate transformations (e.g., create a categorical variable) of continuous variables to address deviations from normality. I examined the association between the dependent variable (i.e., substance use disorders [in lifetime for Aims 1-5, in past 12-months for Aim 6]) and independent variables (e.g., childhood adversity, race/ethnicity, SES, type of SUD) using *t*-tests for continuous variables and regression analysis or analysis of variance (ANOVA) procedures for categorical variables. I used correlation matrices to examine the bivariate associations between continuous variables included in this analysis (e.g., number of childhood adversities). I used frequency histograms and scatterplots to graphically visualize these univariate descriptives and bivariate associations.

3.6.2. Attrition analysis and missing data

Grant and colleagues (2009) compared the baseline characteristics of NESARC participants interviewed at Wave 2 and those lost to follow-up in relation to a number of baseline

(Wave 1) sociodemographic characteristics and diagnostic measures. Results indicated that there were no significant differences between the Wave 2 respondents and the population targeted for follow-up on age, race/ethnicity, gender, socioeconomic status, and the presence of any lifetime substance use disorder. Missing data were imputed by the NESARC team for variables that were identified as critical for analysis, for example, age, sex, race/ethnicity, education, and income (Grant & Kaplan, 2005). Imputation was done by means of a hot-deck procedure defined by combinations of relevant characteristics (Grant & Kaplan, 2005). For the variables that I examined for this dissertation, there are no missing data on the dependent variables of interest and there is a limited amount of missing data for the key independent variables. Therefore, I included in analysis only those respondents with complete data on all study variables. Figure 3.1 shows the number of NESARC respondents by gender with Wave 1 data and Wave 2 data and who are White, Black, or Hispanic.

Based on my comparison of the characteristics of NESARC women who participated in (1) Wave 1 of the survey, (2) both waves of the survey, and (3) those who formed the analytic sample for this dissertation, attrition among women who participated in NESARC minimally affected dissertation findings (see Table 3.2).

Figure 3.1. Number of respondents by gender with Wave 1 data and Wave 2 data and who are White, Black, or Hispanic, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

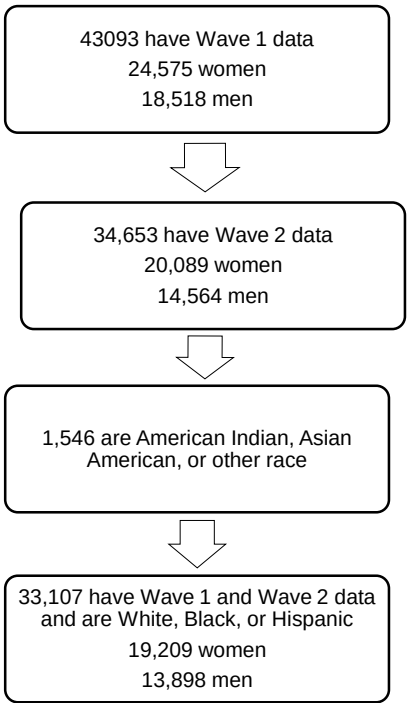


Table 3.2. Key characteristics among different samples of women, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), unweighted data

	Wave 1	Has Wave 1 & Wave 2 data	Targeted Sample for Aims 2-5	Actual Sample for Aims 2-5
Sample size	24,575	20,089	19,209	19,117
Age groups (%)				
Under 18 years	na	na	na	na
18 to 64 years	79.2	81.4	81.2	81.3
18 to 24 years	11.4	10.9	10.9	10.9
25 to 44 years	39.0	40.0	39.8	39.8
45 to 64 years	28.9	30.5	30.5	30.6
65 years and over	20.8	18.6	18.8	18.8
Missing	0.0	0.0	0.0	0.0
Median age (years)	44.0	44.0	44.0	44.0
Mean age and standard deviation (years)	47.1 (18.6)	46.4 (17.6)	46.5(17.8)	46.5(17.8)
Race/ethnicity (%)				
White	55.8	56.3	58.9	58.9
Black or African American	20.6	21.2	22.2	22.2
Hispanic or Latina	18.7	18.1	19.0	18.9
Asian or Pacific Islander	2.7	2.7	0.0	0.0
American Indian or Alaska Native	2.3	1.7	0.0	0.0
Missing	0.0	0.0	0.0	0.0
Nativity status - US born (%)	84.9	84.7	86.1	86.1
Missing	3.4	0.0	0.0	0.0
Education (%)				
Less than high school or GED	18.2	16.2	16.2	16.8
High school grad or GED	29.6	27.6	28.0	29.6
Some college or college degree	41.6	43.8	43.6	42.6
Some post-BA or advanced degree	10.5	12.4	12.2	11.0
Missing	0.0	0.0	0.0	0.0
Employed full-time (%)	43.4	45.3	45.2	46.3
Annual household income (dollars)				
<$15,000	24.9	19.8	19.9	19.9
$15,000-$24,999	16.1	15.7	15.8	15.8
$25,000-$34,999	13.6	12.8	12.8	12.9
$35,000-$49,999	15.3	15.1	15.1	15.1
$50,000-$79,999	17.5	19.9	19.8	19.8
$80,000-$99,999	5.0	6.1	6.1	6.1
>=$100,000	7.8	10.7	10.5	10.5
Missing		0.0	0.0	0.0
Region (%)				
Northeast	19.0	17.6	17.6	17.6
Midwest	20.9	18.9	18.8	18.8
South	37.5	38.0	38.0	38.0
West	22.6	25.6	25.6	25.6

3.6.3. Analyses pertaining to specific aims

In this section I discuss the statistical procedures of this dissertation and the regression models corresponding with each research question. Although I express my hypotheses as one-tailed, I recognize that outcomes may occur that are not in the direction expected. Therefore, I tested all hypotheses at the 0.05 significance level using a two-tailed test. Because variables are interpretable in their raw form and I am not seeking to compare the relative impact of the different independent variables on the outcomes of interest, I generated unstandardized regression coefficients. To facilitate interpretation, I exponentiated regression coefficients and interpreted them as odds ratios. To account for the complex sampling design of NESARC, I used weighted data by analyzing data with the STATA svy commands (Aims 1 and 3-6) or by using MPlus 7.2 and using the commands to specify the complex survey design (Muthén & Muthén, 2006) (Aim 2 only).

<u>Aim 1: Effect of Gender, Childhood Adversity, and Other Factors on Occurrence of Each Type of SUD</u>

As described earlier, Questions 1a-1c ask about gender differences in the relationship between childhood adversity, sociodemographic characteristics, and occurrence of each type of SUD. For this analysis, first I examined differences in the experiences and characteristics of women and men based on stratified descriptive analysis using the weighted data. I tested for group differences using an unadjusted chi square test for categorical variables and an adjusted Wald test for pairwise comparisons. Then, I used multinomial logistic regression to regress occurrence of SUD by type (0=no disorder, 1=alcohol use disorder only, 2=drug use disorder only, 3=poly-substance use disorder) on gender, childhood adversity, and other variables of interest.

I used multinomial regression to estimate the gross relationships because the outcome of occurrence of SUD by type is a nominal variable with four unordered categories. The unordered categorical property of the outcome distinguishes the use of multinomial regression

(which is appropriate for categorical data with more than two unordered categories) from linear regression (which is appropriate for a continuous dependent variable), from ordered logistic regression (which is appropriate for ordered categorical data), and from logistic regression (which is appropriate for two outcomes) (Powers & Xie, 2008). A key assumption of the multinomial regression model is that the odds ratio is independent of what other outcome options are available. In other words, alternative outcomes are "irrelevant."

In the context of the multinomial logit model, the odds are defined as the ratio of the probabilities of experiencing a particular outcome versus experiencing some other specific outcome, given a set of explanatory variables. In this section, I follow conventional mathematical notion (Fitzmaurice et al., 2011).

In the multinomial logit model, a set of coefficients is estimated, shown below as $\beta_1, \beta_2, \beta_3$ and β_4, given a set of explanatory variables, shown as X, corresponding to each outcome, shown as y:

$$\Pr(y=1) = \frac{\exp(\beta_1 X_1)}{\exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4)}$$

$$\Pr(y=2) = \frac{\exp(\beta_2 X_2)}{\exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4)}$$

$$\Pr(y=3) = \frac{\exp(\beta_3 X_3)}{\exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4)}$$

$$\Pr(y=4) = \frac{\exp(\beta_4 X_4)}{\exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4)} \quad (1)$$

The model is unidentified in that there is more than one solution to $\beta_1, \beta_2, \beta_3$, and β_4 that leads to the same probabilities for $y = 1$, $y = 2$, $y = 3$, and $y = 4$. To identify the model, I arbitrarily set one of $\beta_1, \beta_2, \beta_3$, or β_4 to 0. That is, when I set $\beta_1 = 0$, the remaining coefficients β_2, β_3, and β_4 measure the change relative to the $y = 1$ group. If I instead set $\beta_2 = 0$, the remaining coefficients β_1, β_3, and β_4 measure the change relative to the $y = 2$ group. The coefficients differ

because they have different interpretations, but the predicted probabilities for y = 1, 2, 3, and 4 remain the same. Thus either parameterization is a solution to the same underlying model. Setting $\beta_1 = 0$, the equations become

$$\Pr(y=1) = \frac{1}{1+\exp(\beta_0+\beta_2 X_2 +\beta_3 X_3+\beta_4 X_4)}$$

$$\Pr(y=2) = \frac{\exp(\beta_2 X_2)}{1+\exp(\beta_0+\beta_2 X_2 +\beta_3 X_3+\beta_4 X_4)}$$

$$\Pr(y=3) = \frac{\exp(\beta_3 X_3)}{1+\exp(\beta_0+\beta_2 X_2 +\beta_3 X_3+\beta_4 X_4)}$$

$$\Pr(y=4) = \frac{\exp(\beta_4 X_4)}{1+\exp(\beta_0+\beta_2 X_2 +\beta_3 X_3+\beta_4 X_4)} \quad (2)$$

The relative probability of y = 2 to the base outcome, known as the relative risk, is

$$\frac{\Pr(y=2)}{\Pr(y=1)} = \exp(X\beta_2) \quad (3)$$

The exponentiated value of a coefficient is interpreted as the relative-risk ratio for a one-unit change in the corresponding variable (risk is measured as the risk of the outcome relative to the base outcome).

In operation, multinomial regression uses maximum likelihood estimation to estimate a separate binary logit for each pair of outcome categories simultaneously (Long & Freese, 2014). An advantage of multinomial regression is that it is able to generate better estimates of the standard errors than sequential binary logit models (Long & Freese, 2014). Another advantage of multinomial regression is that it is possible to change the base category such that the model reports coefficients for the effect of each independent variable on each outcome category relative to whichever base outcome category is of interest (Long & Freese, 2014). This last characteristic of the model is a feature that I utilize for Aim 5.

For the analysis for Aim 1, I set the outcome of "no substance use disorder" to 0. Furthermore, I operationalized childhood adversity with two dummy variables – having experienced 1 to 2 types of events and having experienced ≥3 events, relative to the omitted reference category of having experienced no adversity (i.e., 0=0 events, 1=1-2 events, 2=≥3 events). I operationalized the variable in this way following the influential work of Turner and colleagues and others on the effects of cumulative adversity (Turner et al., 1995; Lloyd & Turner, 2008; Turner & Lloyd, 2003; Lloyd & Taylor, 2006). In addition to gender and childhood adversity, I added to the model other demographic characteristics (age, race/ethnicity, and nativity), indicators of socioeconomic status (adult household income, educational attainment, employment status), and region. I used an F-test to assess whether the effect of each independent variable on the odds of each type of SUD occurrence was statistically significant.

Next, I used gender-stratified multinomial logistic regression models to better understand possible differences by gender in the effects of childhood adversity and other variables on the likelihood of occurrence of difference types of SUD. I used an F-test to assess whether the effect of each independent variable on the odds of each type of SUD occurrence was statistically significant.

Then, I created an interaction term: (1) childhood adversity coded as a categorical variable (0=0 events, 1=1-2 events, 2=≥3 events) and (2) gender coded as a dichotomous variable (1=women, 0=men). I added the interaction term to the regression equation from the earlier step in the analysis to form the moderation model. As part of my post-hoc analyses, first I used an omnibus F-test to assess whether any difference by gender in the effect of childhood adversity on the odds of SUD was statistically significant. Then, I used this moderated model to calculate the predicted probabilities with 95% confidence intervals by gender for each type of SUD in relation to experiences of childhood adversity. Finally, to test which specific interaction contrasts were statistically significant, I used the moderated model to conduct pairwise comparisons corrected for multiple comparisons.

Aim 2: Measurement Issues Related to the Effect of Childhood Adversity on Occurrence of Each Type of SUD

For Questions 2a-2c I focused on the sample of NESARC women to examine changes in the magnitude of any relationship between childhood adversity and occurrence of each type of SUD when I considered simultaneously the type of childhood adversity and the number of different types of childhood adversity, the constructs that are captured by the concept of childhood adversity, and the relationship between type of childhood adversity and occurrence of each type of SUD (i.e., no disorder, alcohol only, drug only, poly-substance). For the reasons explained previously, I hypothesized that any association between childhood adversity and occurrence of each type of SUD will be attenuated when both type of adversity and the number of different types of adversity are considered simultaneously, (2b) most of the childhood adversity concept will be explained by two related but unique constructs: childhood maltreatment (i.e., childhood abuse and neglect) and childhood household dysfunction, and (2c) childhood maltreatment (i.e., childhood abuse and neglect) and childhood household dysfunction will each be positively associated with occurrence of each type of SUD.

First, for the same reasons stated in relation to Aim 1, I used multinomial regression to regress occurrence of SUD by type (0=no disorder, 1=alcohol use, 2=drug use, 3=poly-substance use) on the categorical variable that captures the number of different types of childhood adversity that have been experienced. I set the outcome of "no substance use disorder" to 0. In a second model, I added the variables that capture a history (1=yes vs. 0=no) of each of the 11 different types of childhood adversity (i.e., physical abuse; sexual abuse; emotional abuse; physical neglect; emotional neglect; living with a battered mother; parental problematic substance use; parental mental illness; parental suicide attempt; parental suicide completion; and parental incarceration). In a third model, I reduced the number of variables that indicate type of childhood adversity from 11 to these 3: abuse (physical, emotional, sexual), neglect (physical, emotional), household dysfunction (battered mom, parental incarceration,

parental mental illness, parental suicide attempt, parental suicide completion, and parental substance abuse). In a fourth model, I further reduced the number of variables that indicate type of childhood adversity from 11 to these 2: abuse or neglect and household dysfunction (battered mom, parental incarceration, parental mental illness, parental suicide attempt, parental suicide completion, and parental substance abuse). For each of these models, a statistically significant and positive regression coefficient for number of types of childhood adversity suggested that the number of these experiences has an effect on occurrence of each type of SUD (relative to no SUD) even after accounting for the effect of each type of childhood adversity. In addition, a reduction in the size of the regression coefficient indicated that any relationship between type of childhood adversity and occurrence of each type of SUD is attenuated when both type of childhood adversity and number of different types of childhood adversity are considered simultaneously. For each of these models, I used an F-test to assess whether the effect of number of types of childhood adversity on the odds of each type of SUD occurrence was statistically significant.

Next, to understand the number of unique constructs that are captured by the childhood adversity concept, I used MPlus 7.2 to conduct tetrachoric exploratory factor analysis on the 11 types of childhood adversity. Tetrachoric correlation is a special case of the polychoric correlation that is used when the observed variables are binary but it is assumed that there are underlying latent continuous variables (Irwig & Groeneveld, 1988). This analysis returns a pairwise correlation matrix that I used to perform an exploratory factor analysis, while accounting for the complex survey design. I used a geomin rotation.[15] To determine the optimal number of factors, I considered eigenvalues greater than 1 and, because eigenvalues are not an optimal criterion for deciding the number of factor in many circumstances (Floyd & Widaman, 1995; Reise, Comrey, & Waller, 2000), I also utilized a more accurate method - a scree plot

[15] Geomin rotation is an oblique rotation method that assumes that the factors are correlated (Reise, Comrey, & Waller, 2000).

(Floyd & Widaman, 1995). In a scree plot, factors that exhibit the most precipitous portion of the "drop" indicate that they account for the largest portion of variance (Floyd & Widaman, 1995). This analysis with geomin rotation yielded factors that described linear combinations of the variables. To determine the number of factors that best fit the data, I examined these standard indices of better fit: (1) a Root Mean Square Error of Approximation (RMSEA) index < 0.1 (Finch & West, 1997) and (2) a Tucker Lewis Index (TLI) of factoring reliability >0.95 (Floyd & Widaman, 1995). In addition, I also considered whether the number of factors that are identified (1) contain most of the information, as indicated by the size and pattern of the factor loadings and (2) allow for meaningful interpretation, as indicated by the uniqueness of the factors and the substantive meaning that each factor represents.

Finally, using the constructs identified in the exploratory factor analysis, I assessed the relationship between type of childhood adversity (childhood maltreatment, household dysfunction) and occurrence of each type of SUD (i.e., no disorder, alcohol only, drug only, poly-substance). I used multinomial regression to regress occurrence of SUD by type (0=no disorder, 1=alcohol use disorder, 2=drug use disorder, 3=poly-substance use disorder) on childhood maltreatment (yes vs. no) and household dysfunction (yes vs. no). In this model, I omitted the variable for number of types of childhood adversity and I included all of the other sociodemographic variables of interest. I used an F-test to assess whether the effect of each independent variable of interest (childhood maltreatment, household dysfunction) on the odds of each type of SUD occurrence was statistically significant.

Aim 3: Effect of Childhood Adversity on Occurrence of Each Type of SUD

As described earlier, Questions 3a-3b ask about the relationship between women's experiences of childhood adversity, sociodemographic characteristics, region, and occurrence of each type of SUD. For the same reasons stated in relation to Aim 1, I used multinomial logistic regression to test the hypotheses for Aim 3.

As I did for Aim 1, for this Aim I operationalized childhood adversity with two dummy variables, that is, having experienced 1 to 2 types of childhood adversity and having experienced 3 or more, relative to the omitted reference category of having experienced no adversity (i.e., 0=0 events, 1=1-2 events, 2=≥3 events). I added to this model demographic characteristics (gender, age, race/ethnicity, and nativity), socioeconomic status (adult household income, educational attainment, employment status), and region. I used an F-test to assess whether the effect of each independent variable on the odds of each type of SUD occurrence was statistically significant.

Aim 4: Moderation of the Effect of Childhood Adversity on SUD Occurrence by Adult Socioeconomic Status

Question 4a asks whether the relationship between women's experiences of childhood adversity and occurrence of SUD by type depends on adult socioeconomic status. To conduct this analysis, similar to the prior analysis, I estimated the gross relationships by regressing SUD (by type) on childhood adversity and the other factors of interest. The model included the indicator for adult SES, operationalized as a categorical variable indicating adult annual household income: (0) <$15,000, (1) $15,000 to $29,999, (2) $30,000 to $49,999, (3) $50,000 to $79,999, (4) $80,000 or higher. Statistically significant and negative regression coefficients for the income categories reflecting an income category greater than $15,000 suggests that compared with lower SES women (less than $15,000), higher SES women have a lower risk for each type of SUD, even after accounting for childhood adversity and other risk factors that contribute to SUD occurrence.

Next, I created an interaction term: (1) childhood adversity coded as a categorical variable (0=0, 1=1-2 events, 2=≥3 events) and (2) adult annual household income coded as a categorical variable (5 categories, described above). I added the interaction term to the regression equation from the previous step in the analysis to form the moderation model. As an example, if the interaction effects emerged as I hypothesized, I interpreted a significant

interaction term to indicate that in the context of childhood adversity, higher SES women use the resources provided by a higher income to address the consequences of childhood adversity and thereby avoid or reduce their risk for occurrence of different types of SUD. In contrast, lower SES women with a history of childhood adversity do not not have the benefit of those resources and therefore they encounter a greater risk for different types of SUD occurrence.

As part of my post-hoc analyses, first I used an omnibus F-test to assess whether any difference by household income in the effect of childhood adversity on the odds of SUD occurrence was statistically significant. Then, I used the moderated model to calculate the predicted probabilities by household income for each type of SUD in relation to experiences of childhood adversity. Finally, to test which specific interaction contrasts were statistically significant, I used the moderated model to conduct pairwise comparisons corrected for multiple comparisons.

In separate analyses I also examined the potential moderation effects of two other indicators of SES: educational attainment and employment status. Educational attainment was coded as a categorical variable: (0) less than a high school education or general education degree (GED), (1) a GED, (2) a high school diploma, (3) some college education but no degree or a 4-year college degree, and (4) some post-baccalaureate education or higher. Employment status was also coded as a categorical variable: (0) full-time employment (35+ hours per week), (1) part-time employment (<35 hours per week), (2) unemployed and looking for work, and (3) unemployed and not looking for work. I assessed the effect of each interaction term by repeating the analytic steps that I conducted for my analysis of the childhood adversity by adult annual household income interaction term.

In a final model, I analyzed all three SES moderators simultaneously. I used an omnibus F-test to assess whether any difference by each of the SES moderators in the effect of childhood adversity on the odds of occurrence of each type of SUD was statistically significant. Then, I used this moderated model to calculate the predicted probabilities by each SES

indicator for each type of SUD in relation to experiences of childhood adversity. Finally, to test which specific interaction contrasts were statistically significant, I used this moderated model to conduct pairwise comparisons corrected for multiple comparisons.

Aim 5: Variation in Factors Related to Occurrence of an Alcohol Use Disorder Only Relative to a Drug Use Disorder and a Poly-Substance Use Disorder

Question 5a asks whether there are differences in the factors that are related to whether women develop an alcohol use disorder versus a drug use disorder (either with or without an alcohol use disorder). To answer this question, I used the model from Aim 3 but I changed the reference category for the model such that the referent was occurrence of a drug use disorder order or occurrence of a poly-substance use disorder order (and not "occurrence of no SUD" as was the case for the prior Aims). Given this approach, for example, a negative and statistically significant coefficient for childhood adversity would suggest that childhood adversity decreases the risk for an alcohol use disorder more than it does for an drug use disorder only. As a part of this aim, I conducted separate analyses to examine women who develop two specific types of substance use disorders: marijuana use disorders and opioid use disorders. For each analyses, I used an F-test to assess whether the effect of each independent variable on the odds of occurrence of an alcohol use disorder was statistically significant.

Aim 6: Effect of SUD Type on SUD Persistence and Moderation by Race/Ethnicity

Questions 6a-6c ask about the relationship between SUD type (0=alcohol only, 1=drug only, 2=poly-substance), other factors (childhood adversity, sociodemographic characteristics), and SUD persistence (0=no, 1=yes). For this analysis, first I analyzed the weighted data to examine differences in the experiences and characteristics of women who did and did not persist in their SUD. I tested for group differences using an unadjusted chi square test for categorical variables and an adjusted Wald test for pairwise comparisons. Next, because the dependent variable is dichotomous, I used binary logistic regression to test my hypothesis. Logistic regression is a probabilistic model that is used to predict the outcome of a binary

categorical outcome based on one or more predictor variables (Long & Freese, 2014). The model calculates the odds of an outcome. The odds are defined as the probability that an event occurs divided by the probability that an event does not occur. Because the model is nonlinear, the magnitude of the change in the outcome probability that is associated with a given change in one of the independent variables depends on the levels of all the independent variables (Long & Freese, 2014). There are three ways to derive the binary regression model: (1) a linear latent-variable model[16]; (2) a nonlinear probability model[17]; and (3) a random utility or discrete-choice model[18] (Long & Freese, 2014). Each model leads to the same mathematical model and yields a model in which the predicted outcome is forced to range from 0 to 1 (Long & Freese, 2014).

A simple form of the binary logit model is expressed mathematically as the odds of observing a positive outcome versus a negative outcome (Long & Freese, 2014):

$$\Omega = \frac{\Pr(y=1)}{\Pr(y=0)} = \frac{\Pr(y=1)}{1-\Pr(y=1)} \tag{4}$$

The log of the odds is called the logit and the logit model is *linear in the logit*, meaning that the log odds are a linear combination of the X's and βs. For example, consider a logit model with three independent variables:

$$\ln\left\{=\frac{\Pr(y=1|x)}{1-\Pr(y=1|x)}\right\} = \ln\Omega(x) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \tag{5}$$

The coefficients can be interpreted as indicating that for a unit change in x_k, we expect the logit to change by β_k, holding all other variables constant. This interpretation is problematic, however,

[16] The binary dependent variable is conceptualized as an observed manifestation of some underlying continuum, i.e., an unobserved latent propensity that generates the observed state (Long & Freese, 2014).
[17] The model is derived without appealing to a latent variable by specifying a nonlinear model relating the explanatory variables to the probability of an event (Long & Freese, 2014).
[18] The binary dependent variable is conceptualized as a choice between two or more discrete alternatives, i.e., the potential outcome is not conceptualized as being continuous (Long & Freese, 2014).

because it does not depend on the level of the other variables of the model. To create a model that is multiplicative instead of linear, I take the exponential of both sides of the equation to create the odds where I take special note of the value of x_2. If I let x_2 change by 1, which leads to the odds ratio, i.e., here expressed in terms of the probability of success, μ_i:

$$\mu_i = \frac{\exp\left(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3\right)}{1 + \exp\left(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3\right)} \tag{6}$$

Accordingly, I can interpret the exponential of the coefficient as "For a unit change in x_k, the odds are expected to change by a factor of exp(β_k), holding all other variables constant." For the analyses related to this aim, I utilized two waves of NESARC data. Because of this prospective study design, I interpreted the odds ratios as risk ratios.

In the first step I estimated the gross relationship by regressing persistence of SUD on SUD type. Next, I included the other variables of interest in the regression analysis. A statistically significant and positive regression coefficient for the category of having a poly-substance use disorder indicated that this type of SUD increases the risk for SUD persistence more than having an alcohol use disorder only, and that this relationship exists even after accounting for other risk factors that contribute to SUD persistence. This is the main effects logit model:

$$\ln\left\{=\frac{\Pr(y=1|x)}{1-\Pr(y=1|x)}\right\} = \ln\Omega(x) = \beta_0 + \beta_1 X_{SUDtype} + \beta_2 X_{Race/ethnicity} + \beta_3 X_{Childhood\ adversity} + \beta_4 X_{Age} + \beta_5 X_{Nativity} + \beta_6 X_{Education} + \beta_7 X_{Employment} + \beta_8 X_{Income} + \beta_9 X_{Region} \tag{7}$$

This model is used for comparison with the conditional model that follows.

To examine whether race/ethnicity moderates the effect of SUD type on SUD persistence, I created an interaction term by multiplying: (1) SUD type, coded as a categorical

variable (described above) and (2) race/ethnicity, coded as a categorical variable: 0=White, 1=Black, 2=Hispanic. I added the product interaction term to form the moderated logit model:

$$\ln\left\{=\frac{\Pr(y=1|x)}{1-\Pr(y=1|x)}\right\} = \ln\Omega(x) = \beta_0 + \beta_1 X_{SUDtype} + \beta_2 X_{Race/ethnicity} + \beta_3 X_{Childhood\ adversity} + \beta_4 X_{Age} + \beta_5 X_{Nativity} + \beta_6 X_{Education} + \beta_7 X_{Employment} + \beta_8 X_{Income} + \beta_9 X_{Region} + \beta_1 X_{SUDtype} * \beta_2 X_{Race/ethnicity} \quad (8)$$

Whether the effect of SUD type is conditional on race/ethnicity was tested with an adjusted Wald test (i.e., an F test that adjusts for survey design) on the interaction term. When the interaction term was added to the regression, the coefficient for the interaction term represents the difference in the magnitude of the relationship between SUD type and SUD persistence among women who are Black or Hispanic relative to the relationship among women who are White. To facilitate interpretation of the interaction terms, I calculated and graphed the predicted probabilities. To assess moderation effects relative to each type of SUD and relative to each category of race/ethnicity, in a series of nine models I changed the referent category for each variable of the interaction term and I tested each one individually.

CHAPTER FOUR

RESULTS FOR AIM 1

For Aim 1, I sought to better contextualize the experiences of women with substance use disorders by examining how women are similar to and different from men in the experiences of childhood adversity, demographic characteristics (e.g., age, race/ethnicity, nativity status), and socioeconomic status (household income, educational attainment, employment status) that are related to the presence of different types of substance use disorders (i.e., no disorder, alcohol only, drug only, poly-substance). I also assessed whether there are gender differences in the relationship between childhood adversity and different types of substance use disorders.

My hypotheses for this aim were as follows: (1a) For both genders, having experienced 1 to 2 or 3 or more different types of childhood adversity (relative to having experienced none) will be related to the presence of each type of SUD. (1b) Women and men will be more similar than different in the ways that demographic characteristics and socioeconomic status that are related to the presence of different types of substance use disorders, however some meaningful differences will be apparent. For example, women will be less likely than men to experience SUD at older ages but for both genders, a lower risk of each type of SUD will be associated with being a member of a minority racial/ethnic group, being born outside of the US, and higher socioeconomic status. Gender differences will vary by type of substance use disorder. (1c) The effect of childhood adversity on risk for each type of SUD will be moderated by gender such that experiences of adversity will increase the risk for each type of SUD more so among women than among men. Also, the moderation of the childhood adversity-SUD relationship by gender will be most evident in relation to drug use disorders and less evident in relation to alcohol use disorders.

4.1. Comparison of the experiences and sociodemographic characteristics of women and men

Table 4.1 presents the experiences and sociodemographic characteristics of the sample of women and men that I analyzed for Aim 1. I tested gender differences based on weighted

data using an unadjusted chi square test for categorical variables and an adjusted Wald test for pairwise comparisons. In this section, I summarize the key results from this analysis of the weighted data.

Significantly more women than men had no occurrence of a substance use disorder in their lifetime (78.0% vs. 54.7%). Fewer women than men had ever had an alcohol use disorder (14.8% vs. 31.2%), a drug use disorder (2.0% vs. 2.2%), or a poly-substance use disorder (5.2% vs. 11.9%).

Slightly more women than men had experienced no childhood adversity (46.7% vs. 44.8%). Among those who had experienced childhood adversity, fewer women than men had experienced 1 to 2 types of childhood adversity (34.0% vs. 39.0%) and more women than men had experienced 3 or more types of childhood adversity (19.3% vs. 15.9%).

Gender differences in the type of childhood adverse experiences that had been experienced were also apparent. Before age 18, more women than men had experienced sexual abuse (15.1% vs. 5.2%) and emotional abuse (8.5% vs. 7.1%) but fewer women than men had experienced physical abuse (16.7% vs. 18.1%). As for childhood neglect, fewer women than men had experienced physical and emotional neglect (31.8% vs. 36.4%). Finally, more women than men reported experiences of certain types of childhood household dysfunction, specifically parental problematic substance use (24.9% vs. 21.8%), having a battered mom (11.3% vs. 8.3%), parental mental illness (5.9% vs. 5.0%), and parental suicide attempt (3.9% vs. 3.5%). Conversely, more men than women reported that during their childhood a parent had committed suicide (2.5% vs. 1.9%). There were no statistically significant differences by gender in the proportion of individuals who had experienced parental incarceration before age 18.

There were differences by gender in several sociodemographic characteristics. In particular, at Wave 1 women were older than men on average (mean age=46.1 vs. 44.3, data not shown). Also, significantly more women than men were Black (12.8% vs. 10.8%) and fewer

were White (75.5% vs. 76.1%) or Hispanic (11.7% vs. 13.1%). More women than men had attained a high school (26.5% vs. 24.8%) or college degree (44.3% vs. 43.7%); fewer women had attained less than a high school degree (14.3% vs. 14.9%) or a GED (3.6% vs. 3.9%) or a post-baccalaureate degree (11.1% vs. 12.5%).

Fewer women than men were working full-time (44.8% vs. 66.9%) and more were working part-time or were not in the labor force. More women than men reported an annual household income of <$15,000 (17.9% vs. 10.3%) and fewer women reported an income of $50,000 to $79,999 (27.7% vs. 24.8%) or $80,000 or higher (17.7% vs. 22.0%). There were no differences by gender in nativity status or the region in which individuals lived.

Table 4.1. Characteristics of White, Black, and Hispanic women and men, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), Wave 1 and Wave 2 weighted data (n=33,107)

	Women (n=19,209; 52.1%)	Men (n=13,898; 47.9%)
Dependent variable		
Type of SUD in lifetime at Wave 1, %***		
None***	78.0	54.7
Alcohol***	14.8	31.2
Drug*	2.0	2.2
Poly-substance (alcohol and drug)***	5.2	11.9
Independent variable		
Number of different types of childhood adversity, %***		
0***	46.7	44.8
1-2***	34.0	39.0
>=3***	19.3	15.9
Type childhood adversity experienced, %		
Abuse***	26.8	22.1
Physical abuse***	16.7	18.1
Sexual abuse***	15.1	5.2
Emotional abuse***	8.5	7.1
Neglect***	31.8	36.4
Physical neglect***	27.8	33.1
Emotional neglect***	8.1	10.2
Household dysfunction***	31.5	28.0
Parental problematic substance use***	24.9	21.8
Battered mom***	11.3	8.3
Parental incarceration (p=.07)	6.9	7.2
Parental mental illness***	5.9	5.0
Parental suicide attempt***	3.9	3.5
Parental suicide completion***	1.9	2.5
Demographic characteristics at Wave 1		
Age, %***		
18 to 24***	12.4	13.5
25 to 44***	38.4	40.5
45 to 64	30.8	31.4
65 and older***	18.4	14.6
Race/ethnicity, %***		
White*	75.5	76.1
Black or African American***	12.8	10.8
Hispanic or Latina/o***	11.7	13.1
Nativity status, %		
US born	89.1	88.3

Continued on next page

Table 4.1. (continued) Characteristics of White, Black, and Hispanic women and men, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), Wave 1 and Wave 2 weighted data (n=33,015)

	Women (n=19,209; 52.1%)	Men (n=13,898; 47.9%)
Socioeconomic status at Wave 1		
Educational attainment, %***		
< HS/GED**	14.3	14.9
GED*	3.6	3.9
HS***	26.5	24.8
College*	44.4	43.7
Post-baccalaureate***	11.1	12.5
Employment status, %***		
Employed full-time (35+ hours/week)***	44.8	66.9
Employed part-time (<35 hours/week)***	14.1	7.0
Unemployed and looking for work***	2.8	3.3
Unemployed and not looking for work***	38.3	22.8
Adult household income in 12 months prior to Wave 1, %***		
<$15,000***	17.9	10.3
$15,000 to $29,999***	19.7	18.0
$30,000 to $49,999***	23.1	25.0
$50,000 to $79,999***	21.7	24.8
$80,000 or higher***	17.7	22.0
Covariate		
Region at Wave 1, %		
Northeast	17.9	17.8
Midwest	18.3	18.3
South	38.3	38.6
West	25.5	25.3

*p < 0.05; **p < 0.01; *** p < 0.001. Gender differences were tested based on weighted data using an unadjusted chi square test for categorical variables and an adjusted Wald test for pairwise comparisons. SUD=substance use disorder.

4.2. Analysis of the relationship between gender, childhood adversity and different types of substance use disorders

Table 4.2 shows the association between gender and the occurrence of each type of substance use disorder (relative to the occurrence of no substance use disorder). The results from the multinomial regression model indicated that women had a statistically significantly lower odds than men of having an alcohol use disorder (relative to no SUD) (odds ratio [OR] 0.32, 95% confidence interval [CI] 0.31, 0.34), a drug use disorder (relative to no SUD) (OR 0.57, 95% CI 0.52, 0.63), and a poly-substance use disorder (relative to no SUD) (OR 0.27, 95% CI 0.25, 0.30). These associations emerged even after accounting for experiences of childhood adversity and sociodemographic factors that may have influenced SUD occurrence, indicating that gender had an effect on the likelihood of each type of SUD occurrence that was independent of experiences of childhood adversity and socioeconomic factors.

Table 4.2. Association between gender and each type of substance use disorder, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), Wave 1 and Wave 2 weighted data (n=32,940: 19,117 women and 13,823 men)

	Alcohol use disorder (vs. no substance use disorder)				Drug use disorder (vs. no substance use disorder)				Poly-substance use disorder (vs. no substance use disorder)			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
Women (ref: men)	-1.13***	-1.17, -1.09	0.32	0.31, 0.34	-0.56***	-0.65, -0.46	0.57	0.52, 0.63	-1.30***	0.00, -1.37	0.27	0.25, 0.30

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 167 cases (92 women, 75 men) were omitted due to missing data on childhood adversity. Odds ratios (OR) are generated by exponentiating the estimated coefficients (b). These variables were included in the model but are not shown: number of different types of childhood adversity; age; race/ethnicity; nativity status; educational attainment; employment status; annual household income; region. I used an F-test to assess whether the effect of each independent variable on the odds of each type of SUD occurrence was statistically significant.

*p < 0.05; **p < 0.01; *** p < 0.001.

4.3. Gender-stratified analysis of the relationship between childhood adversity, sociodemographic characteristics, and different types of substance use disorders

In Table 4.3, I show gender-stratified results of multinomial logistic regression analysis of the predictors of each type of SUD. In this section, I present the results for each type of SUD in relation to each gender. I focus on the odds ratios (OR) (with 95% confidence intervals) that were generated by exponentiating the estimated coefficients (the estimated coefficients are presented in Appendix 2). I end this section with a qualitative summary of similarities and differences by gender in the relationship between childhood adversity, sociodemographic characteristics, and different types of SUD.

4.3.1. Alcohol use disorders (vs. no SUD)

4.3.1.1. Women

Among women, compared to not having experienced childhood adversity, there was a significant and positive association between occurrence of an alcohol use disorder (relative to no SUD) and experiences of 1 to 2 types of childhood adversity (OR 1.58 95% CI 1.50, 1.67) and 3 or more such experiences (OR 2.13 95% CI 2.00, 2.20).

Compared to women who were 18 to 24 years old, there was a significant and positive association between being 25 to 44 years old (OR 1.41 95% CI 1.28, 1.57) and occurrence of an alcohol use disorder (relative to no SUD). Compared to women who were 18 to 24 years old, there was a significant and negative association between being 65 years old or older (OR 0.44 95% CI 0.37, 0.51) and occurrence of an alcohol use disorder (relative to no SUD). The association between being 45 to 64 years old (relative to being 25 to 44 years old) and occurrence of an alcohol use disorder (relative to no SUD) was not statistically significant.

The likelihood of having an alcohol use disorder (relative to no SUD) was statistically significantly lower among both Black women (OR 0.41 95% CI 0.38, 0.44) and Hispanic women (OR 0.60 95% CI 0.56, 0.64), compared to White women.

Women who were born in the USA, compared to women born elsewhere, had a significantly greater likelihood of having an alcohol use disorder (relative to no SUD) (OR 3.08 95% CI 2.83, 3.36).

Compared to women who had attained less than a high school degree or GED, there was a significant and positive association between occurrence of an alcohol use disorder (relative to no SUD) and having attained some college education or a college degree (OR 1.60 95% CI 1.42, 1.81) or a post-baccalaureate degree (OR 1.90 95% CI 1.67, 2.17). The association between occurrence of an alcohol use disorder (relative to no SUD) and each of the other categories of educational attainment (i.e., GED, high school degree) was not statistically significant.

Women who worked part-time (OR 0.89 95% CI 0.83, 0.96) or who were not in the labor force (OR 0.75 95% CI 0.69, 0.80), compared to women who worked full-time, had a significantly lower likelihood of having an alcohol use disorder (relative to no SUD). Unemployed women, compared to women who worked full-time, had a significantly higher likelihood of having an alcohol use disorder (relative to no SUD) (OR 1.46 95% CI 1.29, 1.67).

Compared to women who had an annual household income of less than $15,000, there was a significant and negative association between occurrence of an alcohol use disorder (relative to no SUD) and having an income of $30,000 to $49,999 (OR 0.91 95% CI 0.82, 1.00) or $50,000 to $79,999 (OR 0.88 95% CI 0.79, 0.98). The association between occurrence of an alcohol use disorder (relative to no SUD) and each of the other categories of annual household income (i.e., $15,000 to $29,999 and $80,000 or more) was not statistically significant.

Women who lived in the Midwest (OR 0.84 95% CI 0.78, 0.92) or West (OR 0.86 95% CI 0.79, 0.94), compared to women who lived in the Northeast, had a significantly lower likelihood of having an alcohol use disorder (relative to no SUD). The association between occurrence of an alcohol use disorder (relative to no SUD) and living in the South was not statistically significant.

4.3.2.2. Men

Compared to men who had not experienced childhood adversity, there was a significant and positive association between occurrence of an alcohol use disorder (relative to no SUD) and experiences of 1 to 2 types of childhood adversity (OR 1.26 95% CI 1.19, 1.33) and 3 or more such experiences (OR 1.51 95% CI 1.41, 1.61).

Compared to men who were 18 to 24 years old, there was a significant and positive association between occurrence of an alcohol use disorder (relative to no SUD) and being 25 to 44 years old (OR 1.90 95% CI 1.78, 2.03), 45 to 64 years old (OR 1.81 95% CI 1.67, 1.98), and 65 years old or older (OR 1.17 95% CI 1.06, 1.28).

The likelihood of having an alcohol use disorder (relative to no SUD) was significantly lower among both Black men (OR 0.57 95% CI 0.54, 0.60) and Hispanic men (OR 0.88 95% CI 0.83, 0.93), compared to White men.

Men who were born in the USA, compared to men born elsewhere, had a significantly greater likelihood of having an alcohol use disorder (relative to no SUD) (OR 2.39 95% CI 2.23, 2.56).

Compared to men who had attained less than a high school degree or GED, there was a significant and positive association between occurrence of an alcohol use disorder (relative to no SUD) and having attained a GED (OR 1.25 95% CI 1.06, 1.48). Conversely, compared to men who had attained less than a high school degree or GED, there was a significant and negative association between occurrence of an alcohol use disorder (relative to no SUD) and having attained a high school degree (OR 0.87 95% CI 0.79, 0.95), some college education or a college degree (OR 0.91 95% CI 0.84, 0.98), or a post-baccalaureate degree (OR 0.89 95% CI 0.81, 0.97).

There was no statistically significant association between men’s employment status and occurrence of an alcohol use disorder.

Compared to men who had an annual household income of less than $15,000, there was a significant and negative association between occurrence of an alcohol use disorder (relative to no SUD) and having an income of $50,000 to $79,999 (OR 1.15 95% CI 1.04, 1.27) or $80,000 or higher (OR 1.16 95% CI 1.05, 1.28). The association between occurrence of an alcohol use disorder (relative to no SUD) and each of the other categories of annual household income (i.e., $15,000 to $29,999 and $30,000 to $49,999) was not statistically significant.

There was no statistically significant association between men's region of residence and occurrence of an alcohol use disorder.

4.3.2. Drug use disorders (vs. no SUD)

4.3.2.1. Women

Among women, compared to not having experienced childhood adversity, there was a significant and positive association between occurrence of a drug use disorder (relative to no DUD) and experiences of 1 to 2 types of childhood adversity (OR 1.80 95% CI 1.57, 2.05) and 3 or more such experiences (OR 3.90 95% CI 3.34, 4.54).

Compared to women who were 18 to 24 years old, there was a significant and negative association between occurrence of a drug use disorder (relative to no SUD) and being being 25 to 44 years old (OR 0.63 95% CI 0.54, 0.74), 45 to 64 years old (OR 0.31 95% CI 0.25, 0.38), and 65 years old or older (OR 0.03 95% CI 0.02, 0.07).

The likelihood of having a drug use disorder (relative to no SUD) was statistically significantly lower among both Black women (OR 0.66 95% CI 0.59, 0.75) and Hispanic women (OR 0.67 95% CI 0.50, 0.90), compared to White women.

Women who were born in the USA, compared to women born elsewhere, had a significantly greater likelihood of having a drug use disorder (relative to no SUD) (OR 3.26 95% CI 2.33, 4.54).

Compared to women who had attained less than a high school degree or GED, there was a significant and negative association between occurrence of a drug use disorder (relative

to no SUD) and having attained some college education or a college degree (OR 0.78 95% CI 0.65, 0.93) or a post-baccalaureate degree (OR 0.69 95% CI 0.55, 0.87). The association between occurrence of a drug use disorder (relative to no SUD) and each of the other categories of educational attainment (i.e., GED, high school degree) was not statistically significant.

Compared to women who worked full-time, women who worked part-time (OR 1.30 95% CI 1.07, 1.59) or who were unemployed (OR 1.66 95% CI 1.25, 2.19) or not in the labor force (OR 1.16 95% CI 1.02, 1.32) had a significantly higher likelihood of having a drug use disorder (relative to no SUD).

Compared to women who had an annual household income of less than $15,000, there was a significant and positive association between occurrence of a drug use disorder (relative to no SUD) and having an income of $80,000 or higher (OR 1.34 95% CI 1.11, 1.61). The association between occurrence of a drug use disorder (relative to no SUD) and each of the other categories of annual household income (i.e., $15,000 to $29,999, $30,000 to $49,999, $50,000 to $79,999) was not statistically significant.

Women who lived in the West (OR 0.70 95% CI 0.58, 0.86), compared to women who lived in the Northeast, had a significantly lower likelihood of having a drug use disorder (relative to no SUD). The association between occurrence of a drug use disorder (relative to no SUD) and living in each of the other regions was not statistically significant among women.

4.3.1.2. Men

Compared to men who had not experienced childhood adversity, there was a significant and positive association between occurrence of a drug use disorder (relative to no SUD) and experiences of 1 to 2 types of childhood adversity (OR 1.67 95% CI 1.36, 2.04) and 3 or more such experiences (OR 3.10 95% CI 2.64, 3.64).

Compared to men who were 18 to 24 years old, there was a significant and negative association between occurrence of a drug use disorder (relative to no SUD) and being 25 to 44

years old (OR 0.74 95% CI 0.62, 0.88), 45 to 64 years old (OR 0.54 95% CI 0.44, 0.66), and 65 years old or older (OR 0.04 95% CI 0.03, 0.05).

The likelihood of having a drug use disorder (relative to no SUD) was significantly lower among Black men (OR 0.75 95% CI 0.63, 0.90), compared to White men. The association between being Hispanic (compared to White) and occurrence of a drug use disorder (relative to no SUD) was not statistically significant.

Men who were born in the USA, compared to men born elsewhere, had a significantly greater likelihood of having a drug use disorder (relative to no SUD) (OR 4.66 95% CI 4.19, 5.19).

Compared to men who had attained less than a high school degree or GED, there was a significant and negative association between occurrence of a drug use disorder (relative to no SUD) and having attained a high school degree (OR 0.59 95% CI 0.47, 0.74), some college education or a college degree (OR 0.63 95% CI 0.51, 0.78), or a post-baccalaureate degree (OR 0.38 95% CI 0.28, 0.52). There were no statistically significant association between having a GED (relative to less than a high school degree or GED) and occurrence of a drug use disorder.

Compared to men who worked full-time, men who were unemployed (OR 1.74 95% CI 1.38, 2.18) had a significantly higher likelihood of having a drug use disorder (relative to no SUD). The association between occurrence of a drug use disorder (relative to no SUD) and working part-time or not being in the labor force were each not statistically significant.

There were no statistically significant associations between the annual household income among men and occurrence of a drug use disorder.

Men who lived in the Midwest (OR 1.60 95% CI 1.28, 2.00), compared to men who lived in the Northeast, had a significantly higher likelihood of having a drug use disorder (relative to no SUD). The association between occurrence of a drug use disorder (relative to no SUD) and living in each of the other regions was not statistically significant among men.

4.3.3. Polysubstance use disorders (vs. no SUD)

4.3.3.1. Women

Among women, compared to not having experienced childhood adversity, there was a significant and positive association between occurrence of a poly-substance use disorder (relative to no SUD) and experiences of 1 to 2 types of childhood adversity (OR 2.12 95% CI 1.87, 2.40) and 3 or more such experiences (OR 4.15 95% CI 3.70, 4.65).

Compared to women who were 18 to 24 years old, there was a significant and negative association between being 45 to 64 years old (OR 0.38 95% CI 0.33, 0.44) and being 65 years old or older (OR 0.03 95% CI 0.03, 0.04) and occurrence of a poly-substance use disorder (relative to no SUD). The association between being 25 to 44 years old (relative to being 25 to 44 years old) and occurrence of a poly-substance use disorder (relative to no SUD) was not statistically significant.

The likelihood of having a poly-substance use disorder (relative to no SUD) was statistically significantly lower among both Black women (OR 0.32 95% CI 0.28, 0.37) and Hispanic women (OR 0.61 95% CI 0.51, 0.73), compared to White women.

Women who were born in the USA, compared to women born elsewhere, had a significantly greater likelihood of having a poly-substance use disorder (relative to no SUD) (OR 7.28 95% CI 5.90, 8.99).

Compared to women who had attained less than a high school degree or GED, there was a significant and positive association between occurrence of a poly-substance use disorder (relative to no SUD) and having attained a GED (OR 2.36 95% CI 1.83, 3.03), some college education or a college degree (OR 1.71 95% CI 1.41, 2.09) or a post-baccalaureate degree (OR 1.57 95% CI 1.29, 1.90). The association between occurrence of a poly-substance use disorder (relative to no SUD) and having attained a high school degree was not statistically significant.

Compared to women who worked full-time, women who were unemployed had a significantly greater likelihood of having a poly-substance use disorder (relative to no SUD) (OR

2.43 95% CI 1.94, 3.05) whereas women were not in the labor force had a lower likelihood for this disorder (OR 0.76 95% CI 0.67, 0.86). The association between occurrence of a poly-substance use disorder (relative to no SUD) and part-time employment was not statistically significant.

Compared to women who had an annual household income of less than $15,000, there was a significant and negative association between occurrence of a poly-substance use disorder (relative to no SUD) and having an income of $50,000 to $79,999 (OR 0.84 95% CI 0.71, 1.00) or $80,000 or more (OR 0.85 95% CI 0.74, 0.99). The association between occurrence of a poly-substance use disorder (relative to no SUD) and each of the other categories of annual household income (i.e., $15,000 to $29,999 and $30,000 to $49,999) was not statistically significant.

There were no statistically significant associations between region among women and occurrence of a poly-substance use disorder.

4.3.3.2. Men

Compared to men who had not experienced childhood adversity, there was a significant and positive association between occurrence of a poly-substance use disorder (relative to no SUD) and experiences of 1 to 2 types of childhood adversity (OR 1.78 95% CI 1.64, 1.94) and 3 or more such experiences (OR 3.52 95% CI 3.18, 3.91).

Compared to men who were 18 to 24 years old, there was a significant and positive association between occurrence of a poly-substance use disorder (relative to no SUD) and being 25 to 44 years old (OR 1.42 95% CI 1.26, 1.58). In contrast, compared to men who were 18 to 24 years old, there was a significant and negative association between occurrence of a poly-substance use disorder (relative to no SUD) and being 45 to 64 years old (OR 0.79 95% CI 0.72, 0.87), and 65 years old or older (OR 0.05 95% CI 0.03, 0.07).

The likelihood of having a poly-substance use disorder (relative to no SUD) was significantly lower among both Black men (OR 0.49 95% CI 0.45, 0.55) and Hispanic men (OR 0.73 95% CI 0.64, 0.84), compared to White men.

Men who were born in the USA, compared to men born elsewhere, had a significantly greater likelihood of having a poly-substance use disorder (relative to no SUD) (OR 6.42 95% CI 4.77, 8.64).

Compared to men who had attained less than a high school degree or GED, there was a significant and positive association between occurrence of a poly-substance use disorder (relative to no SUD) and having attained a GED (OR 2.01 95% CI 1.54, 2.62). Conversely, compared to men who had attained less than a high school degree or GED, there was a significant and negative association between occurrence of a poly-substance use disorder (relative to no SUD) and having attained a high school degree (OR 0.73 95% CI 0.64, 0.83) or a post-baccalaureate degree (OR 0.69 95% CI 0.60, 0.79). There was no statistically significant association between attainment of some college education or a college degree and occurrence of a poly-substance use disorder.

Compared to men who worked full-time, men who were unemployed had a significantly greater likelihood of having a poly-substance use disorder (relative to no SUD) (OR 1.46 95% CI 1.29, 1.65) whereas men were not in the labor force had a lower likelihood for this disorder (OR 0.77 95% CI 0.67, 0.88). The association between occurrence of a poly-substance use disorder (relative to no SUD) and part-time employment was not statistically significant.

Compared to men who had an annual household income of less than $15,000, there was a significant and negative association between occurrence of a poly-substance use disorder (relative to no SUD) and each category of higher income, that is, $15,000 to $29,999 (OR 0.84 95% CI 0.74, 0.96), $30,000 to $49,999 (OR 0.81 95% CI 0.71, 0.93), $50,000 to $79,999 (OR 0.68 95% CI 0.59, 0.78), and $80,000 or higher (OR 0.73 95% CI 0.64, 0.84).

Men who lived in the Midwest, compared to men who lived in the Northeast, had a significantly higher likelihood of having a poly-substance use disorder (relative to no SUD) (OR 0.78 95% CI 0.71, 0.90). The association between occurrence of a poly-substance use disorder (relative to no SUD) and living in each of the other regions was not statistically significant among men.

Table 4.3. Relationship between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among women and men (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	Women		Men		Women		Men		Women		Men	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
No. of different types of childhood adversity (ref: 0)												
1-2	1.58***	1.50, 1.67	1.26***	1.19, 1.33	1.80***	1.57, 2.05	1.67***	1.36, 2.04	2.12***	1.87, 2.40	1.78***	1.64, 1.94
≥3	2.13***	2.00, 2.25	1.51***	1.41, 1.61	3.90***	3.34, 4.54	3.10***	2.64, 3.64	4.15***	3.70, 4.65	3.52***	3.18, 3.91
Age (ref: 18 to 24)												
25 to 44	1.41***	1.28, 1.57	1.90***	1.78, 2.03	0.63***	0.54, 0.74	0.74**	0.62, 0.88	0.99	0.85, 1.14	1.42***	1.26, 1.58
45 to 64	0.96	0.86, 1.07	1.81***	1.67, 1.98	0.31***	0.25, 0.38	0.54***	0.44, 0.66	0.38***	0.33, 0.44	0.79***	0.72, 0.87
65 and older	0.44***	0.37, 0.51	1.17***	1.06, 1.28	0.03***	0.02, 0.07	0.04***	0.03, 0.05	0.03***	0.03, 0.04	0.05***	0.03, 0.07
Race/ethnicity (ref: White)												
Black	0.41***	0.38, 0.44	0.57***	0.54, 0.60	0.66***	0.59, 0.75	0.75**	0.63, 0.90	0.32***	0.28, 0.37	0.49***	0.45, 0.55
Hispanic	0.60***	0.56, 0.64	0.88***	0.83, 0.93	0.67**	0.50, 0.90	1.01	0.85, 1.20	0.61***	0.51, 0.73	0.73***	0.64, 0.84
US born	3.08***	2.83, 3.36	2.39***	2.23, 2.56	3.26***	2.33, 4.54	4.66***	4.19, 5.19	7.28***	5.90, 8.99	6.42***	4.77, 8.64
Educational attainment (ref: < HS/GED)												
GED	1.12	0.86, 1.45	1.25**	1.06, 1.48	1.21	0.89, 1.63	1.27	0.91, 1.75	2.36***	1.83, 3.03	2.01***	1.54, 2.62
High school degree	1.09	0.96, 1.24	0.87**	0.79, 0.95	0.85	0.71, 1.03	0.59***	0.47, 0.74	0.87	0.69, 1.10	0.73***	0.64, 0.83
Some college/college graduate	1.60***	1.42, 1.81	0.91**	0.84, 0.98	0.78**	0.65, 0.93	0.63***	0.51, 0.78	1.71***	1.41, 2.09	0.88	0.77, 1.01
Past-baccalaureate	1.90***	1.67, 2.17	0.89**	0.81, 0.97	0.69**	0.55, 0.87	0.38***	0.28, 0.52	1.57***	1.29, 1.90	0.69***	0.60, 0.79

Continued on next page

Table 4.3. (continued) Relationship between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among women and men (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	Women		Men		Women		Men		Women		Men	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Employment status (ref: Full-time)												
Employed part-time (<35 hours/week)	0.89**	0.83, 0.96	1.05	0.96, 1.14	1.30**	1.07, 1.59	1.04	0.87, 1.24	0.97	0.85, 1.10	0.88	0.76, 1.02
Unemployed	1.46***	1.29, 1.67	0.98	0.86, 1.13	1.66***	1.25, 2.19	1.74***	1.38, 2.18	2.43***	1.94, 3.05	1.46***	1.29, 1.65
Not in labor force	0.75***	0.69, 0.80	1.00	0.92, 1.08	1.16*	1.02, 1.32	0.98	0.80, 1.20	0.76***	0.67, 0.86	0.77***	0.67, 0.88
Household income (ref: <$15,000)												
$15,000 to $29,999	0.91	0.82, 1.01	1.03	0.94, 1.13	1.12	0.88, 1.42	0.91	0.68, 1.22	1.14	0.97, 1.35	0.84**	0.74, 0.96
$30,000 to $49,999	0.91*	0.82, 1.00	1.07	0.97, 1.18	0.96	0.79, 1.16	0.92	0.69, 1.24	0.96	0.79, 1.16	0.81**	0.71, 0.93
$50,000 to $79,999	0.88*	0.79, 0.98	1.15**	1.04, 1.27	0.81	0.64, 1.03	1.11	0.83, 1.50	0.84*	0.71, 1.00	0.68***	0.59, 0.78
$80,000 or higher	1.09	0.99, 1.19	1.16**	1.05, 1.28	1.34**	1.11, 1.61	0.83	0.61, 1.14	0.85*	0.74, 0.99	0.73***	0.64, 0.84
Region (ref: Northeast)												
Midwest	0.84***	0.78, 0.92	1.03	0.96, 1.11	0.88	0.72, 1.08	1.60***	1.28, 2.00	1.07	0.91, 1.27	0.78***	0.71, 0.90
South	0.96	0.89, 1.04	0.96	0.90, 1.02	0.88	0.73, 1.07	1.19	0.98, 1.45	1.13	0.98, 1.31	0.89	0.78, 1.01
West	0.86***	0.79, 0.94	0.98	0.91, 1.05	0.70***	0.58, 0.86	1.05	0.86, 1.29	0.96	0.82, 1.12	0.95	0.85, 1.07

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. Models used no substance use disorder as the base outcome. 167 cases (92 women, 75 men) were omitted due to missing data on childhood adversity. Odds ratios (OR) are generated by exponentiating the estimated coefficients. The estimated coefficients are presented in Appendix 2.
*p < 0.05; **p < 0.01; *** p < 0.001.

4.3.4. Qualitative summary of similarities and differences by gender in the relationship between childhood adversity, sociodemographic characteristics, and different types of substance use disorders

To aid interpretation of the results from the gender-stratified models, in this section I present a qualitative summary of the nature of these relationships by gender (Table 4.4). It is important to note that with the exception of childhood adversity, I did not test with an interaction term whether the effect of each of the variables that I discuss in this section was different by gender.

For both women and men and in relation to each type of substance use disorder, the odds of having a disorder (relative to no SUD) was higher among those with 1 to 2 experiences of childhood adversity (relative to no such experiences) and also among those with 3 or more experiences of childhood adversity.

In addition to childhood adversity, among both genders the likelihood for each type of disorder was lower among Black individuals (relative to White individuals) and, in most instances, Hispanic individuals. In contrast, for both genders the likelihood for each type of disorder (relative to no SUD) was higher among those born in the USA, and, in most instances, unemployed individuals.

Gender differences were evident in the likelihood for occurrence of different types of SUD in relation to age and measures of socioeconomic status. The nature of these associations varied by type of SUD. In relation to age, among men each category of older age (relative to age 18 to 24) was associated with a higher likelihood for having an alcohol use disorder (relative to no SUD); among women likelihood for this disorder was higher among the 25 to 44 year old group, (relative to age 18 to 24), but lower among the 65 and older age group. In relation to drug use disorders, for both women and men each category of older age, relative to age 18 to 24, was associated with a higher likelihood for this type of SUD. In relation to poly-substance use disorders, except for the 25-44 year old group, each category of older age, relative to age

18 to 24, was also associated with a lower likelihood for this type of SUD – the 25-44 year old category was not related to the likelihood of a poly-substance use disorder among women; it was associated with a higher likelihood among men.

As for measures of socioeconomic status, I first consider educational attainment. Relative to attainment of less than a high school diploma or GED, the highest categories of educational attainment were associated with a greater likelihood for an alcohol use disorder among women; among men higher educational attainment (having attained a high school degree, a college education, or a post-baccalaureate degree) was associated with a lower likelihood for an alcohol use disorder. Lower likelihood for a drug use disorder was associated with attainment of a college education or post-baccalaureate degree among women, and attainment of a high school degree or more education among men. With some exceptions, more educational attainment was generally associated with a higher likelihood for a poly-substance use disorder among women and a lower likelihood for this disorder among men.

Among women but not among men, part-time employment (relative to full-time employment) was associated with a higher likelihood for an alcohol use disorder (relative to no SUD) and lower likelihood for a drug use disorder (relative to no SUD). Among women but not among men, being not in the labor force (relative to full-time employment) was associated with a higher likelihood for an alcohol use disorder (relative to no SUD) and for a drug use disorder (relative to no SUD) among women.

Some categories of higher household income (relative to an income of less than $15,000) were associated with a higher likelihood for an alcohol use disorder (relative to no SUD) among women but a lower likelihood for an alcohol use disorder (relative to no SUD) among men. For both women and men, income was mostly not related to occurrence of a drug use disorder. In relation to poly-substance use disorders, each category of higher income (relative to an income of less than $15,000) was associated with a lower likelihood for this disorder (relative to no SUD) among men; among women, only the two highest categories of

income (relative to an income of less than $15,000) were associated with a lower likelihood for a poly-substance use disorder (relative to no SUD).

Table 4.4. Summary of relationships between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among women and men (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)

	Alcohol use disorder (vs. no substance use disorder)		Drug use disorder (vs. no substance use disorder)		Poly-substance (vs. no substance use disorder)	
	Women	Men	Women	Men	Women	Men
Number of experiences of childhood adversity (ref: 0)						
1-2	+	+	+	+	+	+
>=3	+	+	+	+	+	+
Age (ref: <25 years)						
25-44 years	+	+	-	-	ns	+
45-64 years	ns	+	-	-	-	-
65 and older	-	+	-	-	-	-
Race/ethnicity (ref: White)						
Black	-	-	-	-	-	-
Hispanic	-	-	-	ns	-	-
US born (ref: not US born)	+	+	+	+	+	+
Education (ref: <HS/GED)						
GED	ns	+	ns	ns	+	+
HS	ns	-	ns	-	ns	-
College	+	-	-	-	+	ns
Post-baccalaureate	+	-	-	-	+	-
Employment status (ref: full-time)						
Part-time	-	ns	+	ns	ns	ns
Unemployed looking for work	+	ns	+	+	+	+
NILF	-	ns	+	ns	-	-
Household income (ref: <$15k)						
$15k-29999	ns	ns	ns	ns	ns	-
$30k-49999	-	ns	ns	ns	ns	-
$50k-79999	-	+	ns	ns	-	-
$80k and up	ns	+	+	ns	-	-
Region (ref: Northeast)						
Midwest	-	ns	ns	+	ns	-
South	ns	ns	ns	ns	ns	-
West	-	ns	-	ns	ns	ns

+ indicates a positive relationship - indicates a negative relationship ns indicates not statistically significant

4.4. Modification of childhood adversity by gender

To examine whether gender moderates the effect of childhood adversity on SUD occurrence by type, I created an interaction term by multiplying: (1) gender and (2) number of different types of childhood adversity (categorical variable). I added the product interaction term to the main effects model to form a moderation model. Results of an omnibus F-test indicated that the interaction term was statistically significant at $p<0.001$ in relation to alcohol use disorders, but it was not significant in relation to drug use disorders or poly-substance use disorders. When I re-ran the analysis using the continuous version of the childhood adversity variable, the omnibus F-test indicated that the interaction term was statistically significant in relation to alcohol use disorders and poly-substance use disorders, but it was not significant in relation to drug use disorders.

I used the moderated model to calculate the predicted probabilities with 95% confidence intervals by gender for each type of SUD in relation to experiences of childhood adversity. (Figure 4.1.1 – 4.1.3). Results indicated that women mostly exhibited a lower predicted probability for each type of SUD than men. Also, a visual inspection of the predicted probabilitites revealed that within the context of childhood adversity, differences by gender in likelihood for a SUD were greatest in relation to alcohol use disorders and much less so in relation to drug use disorders and poly-substance use disorders. For example, among individuals with 3 or more experiences of childhood adversity, predicted probability for an alcohol use disorder was 0.323 among men and 0.192 among women, a difference of approximately 0.131 (Figure 4.1.1). Compare this difference with that in relation to drug use disorders -- among individuals with 3 or more experiences of childhood adversity, predicted probability for a drug use disorder was 0.036 among men and 0.037 among women, a difference of approximately 0.001 (Figure 4.1.2).

The predicted probabilitites also revealed that with more experiences of childhood adversity, the gap between women and men in predicted probability narrowed in relation to

alcohol use disorders, converged in relation to drug use disorders, and widened in relation to poly-substance use disorders. For example, the gender difference in predicted probability for an alcohol use disorder was greatest among individuals with no experiences of childhood adversity (i.e., the difference between women and men in the predicted probabilitites was 0.18), but this gender gap narrowed with each increase in the number of adversities that had been experienced (Figure 4.1.1). Among individuals with 1 to 2 experiences of childhood adversity the gender gap in the predicted probability for an alcohol use disorder was 0.16, and among individuals with 3 or more such experiences it was 0.13.

A more striking pattern emerged in relation to drug use disorders (Figure 4.1.2). The gender difference in predicted probability for a drug use disorder was greatest among individuals with no experiences of childhood adversity. This gender gap narrowed with each increase in the number of types of adversities that had been experienced. Among individuals with experiences of different types of childhood adversity, the gender gap in the predicted probability for a drug use disorder was not statistically different. Among individuals with 3 or more such experiences, gender differences completely converged and flipped such that the predicted probability for a drug use disorder was slightly higher among women than among men, although this gender difference was not statistically significant.

As for poly-substance use disorders (Figure 4.1.3), the difference by gender in predicted probability widened with each increase in the number of types of childhood adversity that had been experienced. Specifically, among individuals with no experiences of childhood adversity, the predicted probability for occurrence of a poly-substance use disorder was higher among men (0.082) than among women (0.030), representing a difference of 0.052. This gender difference increased to 0.07 among individuals with 1 to 2 experiences of different types of childhood adversity and it widened further, to 0.109, among individuals with 3 or more such experiences.

Figure 4.1.1. Predicted probabilities (with 95% confidence intervals) by gender for occurrence of an alcohol use disorder in relation to experiences of childhood adversity, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)

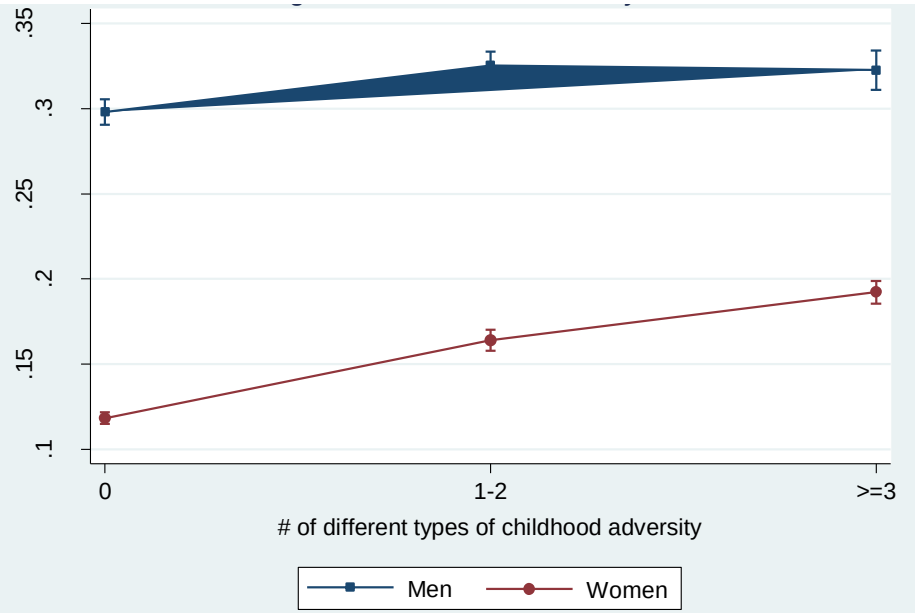


Figure 4.1.2. Predicted probabilities(with 95% confidence intervals) by gender for occurrence of a drug use disorder in relation to experiences of childhood adversity, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)

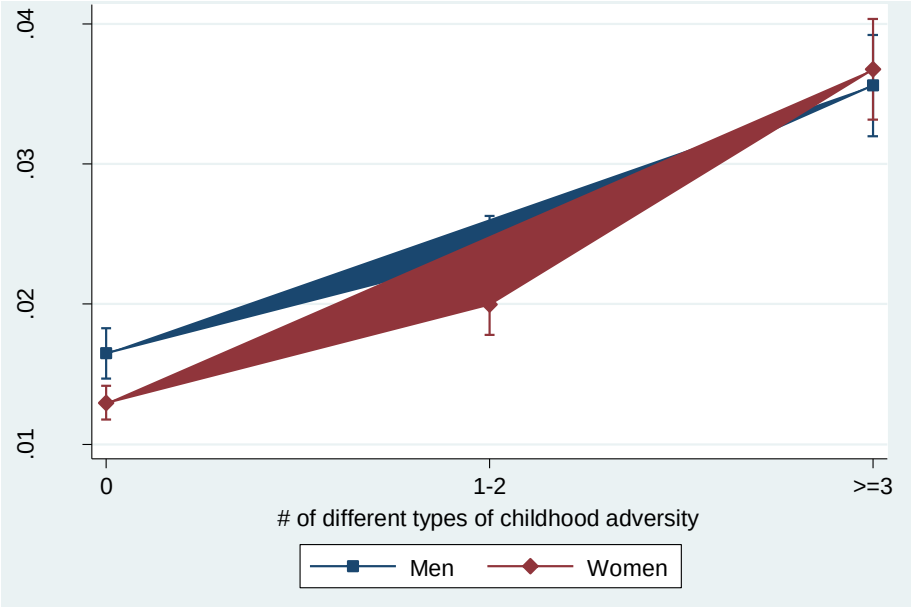
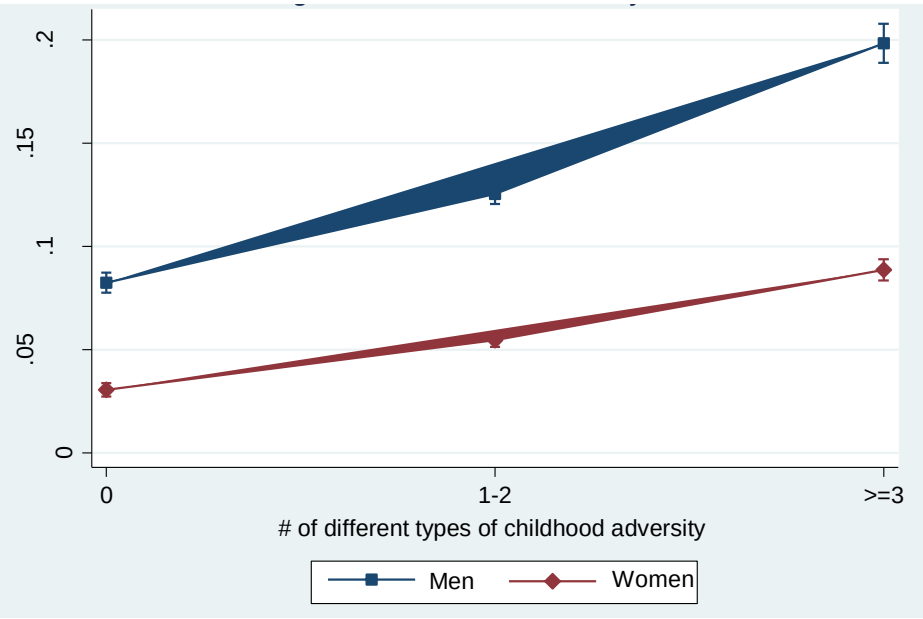


Figure 4.1.3. Predicted probabilities (with 95% confidence intervals) by gender for occurrence of a poly-substance use disorder in relation to experiences of childhood adversity, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)



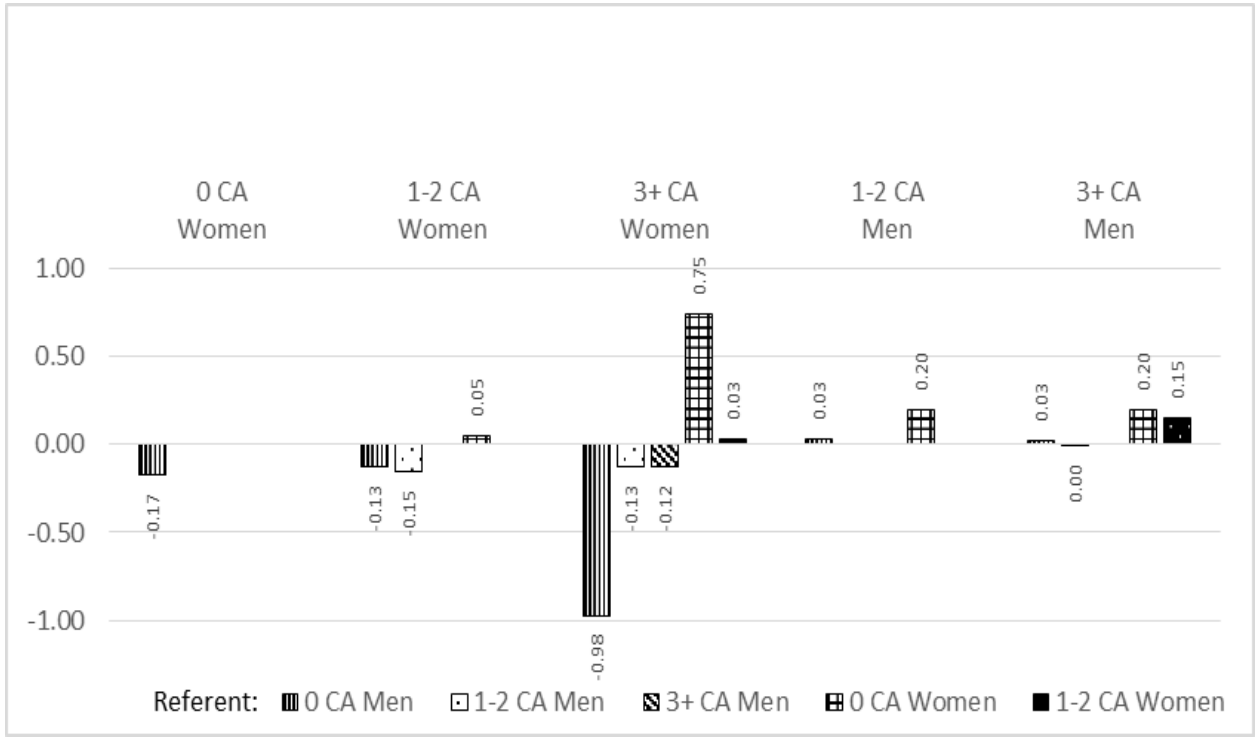
Finally, to test which specific interaction contrasts were statistically significant, I used the moderated model to conduct pairwise comparisons of the predicted probabilities for each type of SUD, corrected for multiple comparisons (Figures 4.2.1, 4.2.2, 4.2.3). Given that this dissertation is focused on women and that prior analyses indicated that the nature of the gender gap changed with more experiences of different types of childhood adversity (i.e., the gender gap in the predicted probabilities for alcohol use disorders narrowed, for drug use disorders it converged, and for poly-substance use disorders it widened), for this section I focus on summarizing the results that pertain to women who had experiences with 3 or more types of childhood adversity.

In relation to alcohol use disorders (Figure 4.2.1), women with experiences of 3 or more types of childhood adversity had a lower predicted probability of developing an alcohol use disorder than men, no matter the number of types of adversities that men had experienced. For example, women's predicted probability for this disorder was -0.98 lower compared to men with no experiences of adversity, - 0.13 lower compared to men with 1 to 2 experiences of adversity, and -0.12 lower compared to men with 3 or more experiences of adversity. Also, women with 3 or more experiences of childhood adversity had a higher predicted probability for an alcohol use disorder compared to women with 1 to 2 experiences of adversity and also compared to women with no experiences of adversity, with the differences in predicted probability being 0.03 and 0.75, respectively.

The predicted probability of developing a drug use disorder (Figure 4.2.2) was higher among women with experiences of 3 or more types of childhood adversity than it was among most of the comparison groups including among both women and men with no childhood adversity and those with 1 to 2 experiences of childhood adversity. There was no difference in predicted probability for this disorder between women and men with 3 or more experiences of childhood adversity.

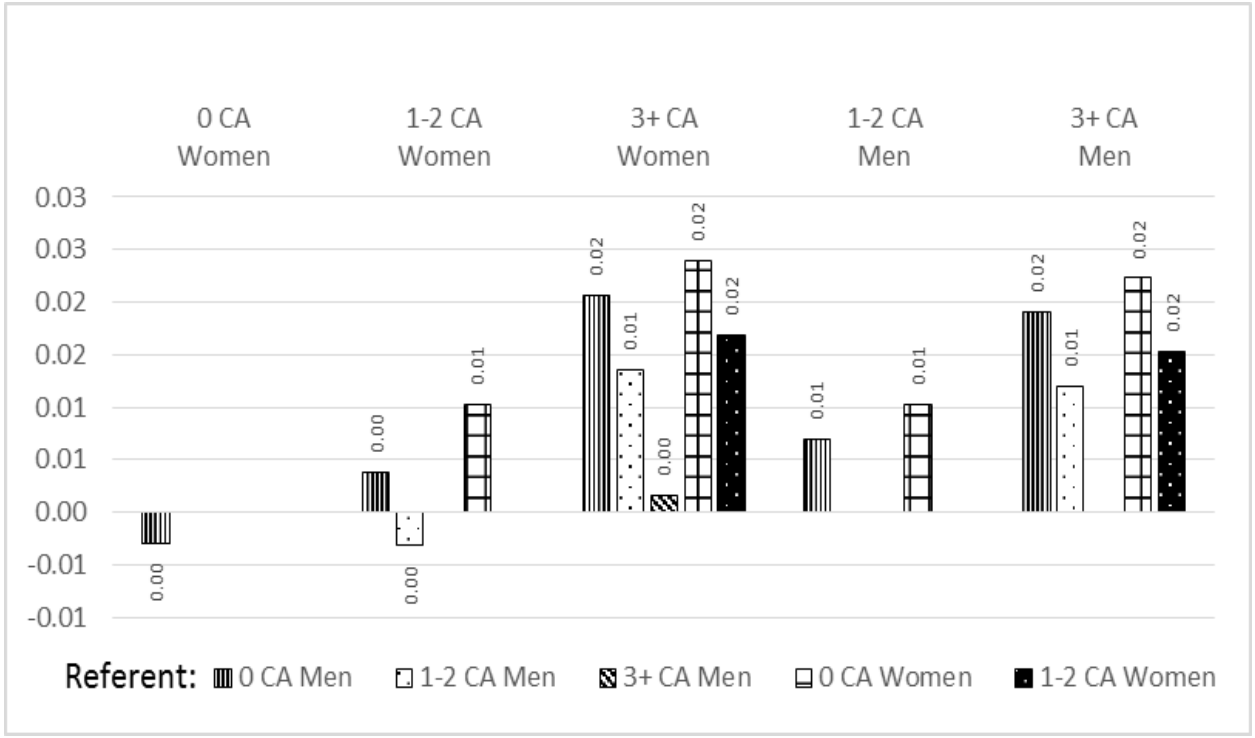
In relation to poly-substance use disorders (Figure 4.2.3), women with experiences of 3 or more types of childhood adversity had a lower predicted probability of developing a disorder than men with 1 to 2 experiences of childhood adversity and also compared to men with 3 or more experiences of childhood adversity. These women had a greater predicted probability for developing a disorder in comparison with men with no adversity and also in comparison with women with 1 to 2 experiences of adversity or no such experiences.

Figure 4.2.1. Pairwise comparison of predicted probabilities for occurrence of an alcohol use disorder (vs. no SUD) by gender and in relation to experiences of childhood adversity, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)



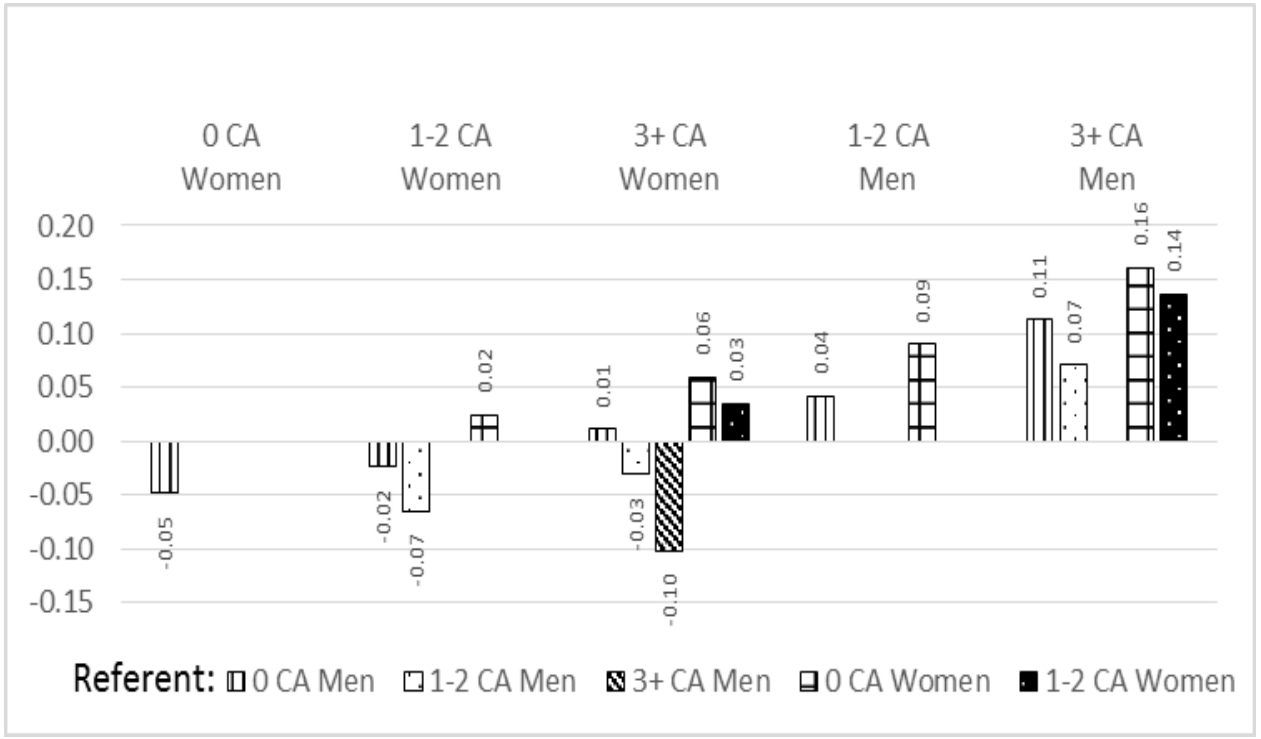
Corrected for multiple comparisons.
With one exception, each pairwise comparison is significant at p<0.001.
The one non-significant comparison is men with 3+ CA vs. men with 1-2 CA.
SUD=substance use disorder. CA= childhood adversity.

Figure 4.2.2. Pairwise comparison of predicted probabilities for occurrence of a drug use disorder (vs. no SUD) by gender and in relation to experiences of childhood adversity, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)



Corrected for multiple comparisons.
These comparisons are not significant: women with 3+ CA vs. men with 3+ CA and women with 1-2 CA vs. men with 1-2 CA.
These comparisons are significant at p<.01: women with 0 CA vs. men with 0 CA and women with 1-2 CA vs. men with 0 CA.
All other pairwise comparisons are significant at p<0.001.
SUD=substance use disorder. CA= childhood adversity.

Figure 4.2.3. Pairwise comparison of predicted probabilities for occurrence of a poly-substance use disorder (vs. no SUD) by gender and in relation to experiences of childhood adversity, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)



Corrected for multiple comparisons.
This comparison is significant at p<.01: women with 3+ CA vs. men with 0 CA.
All other pairwise comparisons are significant at p<0.001.
SUD=substance use disorder. CA= childhood adversity.

4.5. Chapter summary

Two key findings from the results that are presented in this chapter are that: (1) approximately half as many women as men have ever had an alcohol use disorder (14.8% vs. 31.2%) or a poly-substance use disorder (5.2% vs. 11.9%), but similar proportions of women and men have had a drug use disorder (2.0% vs. 2.2%) and (2) for both women and men, the occurrence of an alcohol use disorder, either alone or in combination with a drug use disorder, is more common than the occurrence of a drug use disorder alone.

Another critical finding from these results is that significant proportions of women and men in the U.S. - i.e., more than half - have experienced some form of childhood adversity, that is, childhood abuse, childhood neglect, or childhood household dysfunction. Among those who have experienced childhood adversity, fewer women than men have experienced 1 to 2 types of childhood adversity and more women than men have experienced 3 or more types of childhood adversity.

Findings also revealed gender differences in type of adverse childhood experiences. Before age 18, more women than men had experienced sexual abuse and emotional abuse but fewer women than men had experienced physical abuse. Fewer women than men had experienced physical and emotional neglect. Finally, more women than men reported experiences of certain types of childhood household dysfunction, specifically parental problematic substance use, having a battered mom, parental mental illness, and parental suicide attempt. Conversely, more men than women reported that during their childhood a parent had committed suicide.

As I had hypothesized, women and men appeared to be more similar than different in the ways that sociodemographic characteristics were related to the presence of different types of substance use disorders, however some meaningful differences were suggested. Specifically, women and men exhibited similarities in the ways that race/ethnicity, nativity status, and unemployment status were associated with each type of SUD. However, age and

socioeconomic status was associated with the occurrence of different types of SUD in ways that appeared to be different by gender.

Another key finding from these results is that, as I had hypothesized, for both women and men and in relation to each type of SUD, the odds of having a substance use disorder (relative to no SUD) was increased by experiences of childhood adversity and the magnitude of the likelihood for a SUD increased with each increase in the number of different types of adverse childhood experiences that had occurred.

Finally, results revealed more complex associations that I had hypothesized regarding modification by gender of the effect of childhood adversity on the likelihood for each type of SUD. I had expected that experiences of childhood adversity would increase the likelihood for each type of SUD more so among women than among men. However, I found that with more experiences of different types of childhood adversity, the gap between women and men in predicted probability narrowed in relation to occurrence of an alcohol use disorder, it converged in relation to occurrence of a drug use disorder, and it widened in relation to occurrence of a poly-substance use disorder.

CHAPTER FIVE

RESULTS FOR AIM 2

This chapter is divided into three parts. First, I focused on the sample of women who participated in NESARC to determine whether the magnitude of any relationship between childhood adversity and occurrence of each type of SUD is different when I consider simultanesouly the type of childhood adversity and the number of different types of childhood adversity. Then, I identified the constructs that are captured by the concept of childhood adversity. Finally, using the constructs identified in the prior analsyis, I assessed the relationship between type of childhood adversity and occurrence of each type of SUD (i.e., no disorder, alcohol only, drug only, poly-substance).

My hypotheses for Aim 2 were as follows: (2a) Any association between childhood adversity and risk for each type of SUD will be attenuated when both type of adversity and the number of different types of adversity are considered simultaneously. (2b) Most of the childhood adversity concept will be explained by two related but unique constructs: childhood maltreatment (i.e., childhood abuse and neglect) and childhood household dysfunction. (2c) Childhood maltreatment (i.e., childhood abuse and neglect) and childhood household dysfunction will each be positively associated with occurrence of each type of SUD.

5.1. Sample characteristics of women by occurrence of type of SUD

Table 5.1 shows the descriptive characteristics based on weighted NESARC data of the 19,209 women who form the sample for Aims 2-5 of this dissertation. As I reported in the prior chapter, at Wave 1, 78.0% of women reported no occurrence of a substance use disorder in the lifetime; 14.8% had an alcohol use disorder only; 2.0% had a drug use disorder only; and 5.2% had an alcohol and drug use disorder (a poly-substance use disorder). I tested differences in the outcome based on weighted data using an unadjusted chi square test for categorical variables and an adjusted Wald test for pairwise comparisons. Based on the weighted data, it is clear that a significantly greater percentage of women with an alcohol, drug, or poly-substance

use disorder had experienced childhood adversity than women with no SUD (63.7% – 74.8% vs. 49.4%). This pattern was evident within each type of childhood adversity (abuse, neglect, household dysfunction). As for the other characteristics that I examined, in general, a greater percentage of women who had each type of SUD, compared with women who had no SUD, were younger, White, and born in the USA. Associations between type of SUD occurrence and women's socioeconomic status (educational attainment, income, employment status) were much more mixed.

Table 5.1. Characteristics of White, Black , and Hispanic women by type of substance use disorder, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) weighted data (n=19,209)

	At Wave 1, lifetime occurrence of… [a]				
	No SUD (n=15,180)	Alcohol only (n=2,678)	Drug only (n=392)	Poly-substance (n=959)	Total (n=19,209)
Number of different types of childhood adversity, %***					
0	50.6	36.3	27.5	25.2	46.7
1-2	33.2	37.9	33.2	36.8	34.0
>=3	16.3	25.8	39.3	38.5	19.3
Experienced any childhood adversity, %***	49.4	63.7	72.5	74.8	53.3
Type of childhood adversity, %					
Abuse***	23.3	35.2	46.2	47.4	26.8
Physical abuse***	14.4	21.9	29.0	30.5	16.7
Sexual abuse***	12.6	19.9	28.8	33.1	15.1
Emotional abuse***	7.0	11.8	18.4	18.8	8.5
Neglect***	29.9	36.1	42.0	44.0	31.8
Physical neglect***	26.0	31.9	37.2	41.0	27.8
Emotional neglect***	9.5	11.3	15.4	16.1	10.2
Household dysfunction***	27.8	40.5	53.6	52.2	31.5
Parental problematic substance use***	21.7	32.4	43.6	44.5	24.9
Battered mom***	9.8	14.7	22.8	19.5	11.3
Parental incarceration***	5.9	9.1	16.4	12.4	6.9
Parental mental illness***	5.1	8.2	14.2	9.4	5.9
Parental suicide attempt***	3.3	4.9	8.8	7.7	3.9
Parental suicide completion***	1.7	2.0	3.7	2.8	1.2
Race/ethnicity, %***					
White	72.8	86.0	77.8	85.5	75.5
Black or African American	14.1	7.5	12.8	7.1	12.8
Hispanic or Latina	13.0	6.5	9.5	7.4	11.7
Nativity status, %***					
US born	86.9	96.4	95.6	98.2	89.1
Age at Wave 1, %***					
18 to 24	12.0	10.7	26.3	19.1	12.4
25 to 44	34.7	49.6	48.5	58.5	38.4
45 to 64	31.3	32.2	23.5	21.4	30.8
65 and older	22.1	7.5	1.7	1.0	18.4
Educational attainment at Wave 1, %***					
< HS/GED	16.0	7.7	14.2	7.8	14.3
= HS/GED	31.6	23.6	33.3	24.2	30.0
Some college but no baccalaureate degree	30.3	36.9	35.3	43.7	32.1
College graduate	11.7	15.8	9.3	13.8	12.4
Past-baccalaureate	10.3	16.1	7.9	10.5	11.1
Employment status at Wave 1, %***					
Employed full-time (35+ hours/week)	42.2	55.2	45.0	54.1	44.8
Employed part-time (<35 hours/week)	13.6	15.1	19.5	17.1	14.1
Unemployed and looking for work	2.4	3.6	5.3	7.3	2.8
Unemployed and not looking for work	41.9	26.1	30.2	21.6	38.2

Continued on next page

Table 5.1. (continued) Characteristics of White, Black , and Hispanic women by type of substance use disorder, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) weighted data (n=19,209)

	At Wave 1, lifetime occurrence of… [a]				
	No SUD (n=15,180)	Alcohol only (n=2,678)	Drug only (n=392)	Poly-substance (n=959)	Total (n=19,209)
Adult household income in 12 months prior to Wave 1, %***					
<$15,000	19.1	13.1	17.7	14.1	17.9
$15,000 to $29,999	20.5	15.2	20.2	19.6	19.7
$30,000 to $49,999	23.1	22.8	22.3	24.5	23.1
$50,000 to $79,999	21.2	24.1	18.3	23.3	21.7
$80,000 or higher	16.1	24.8	21.5	18.7	17.7
Region, %***					
Northeast	17.6	19.4	20.3	16.7	17.9
Midwest	18.6	16.8	19.1	18.7	18.3
South	38.0	39.3	39.2	40.5	38.3
West	25.9	24.5	21.5	24.2	25.5

SUD=substance use disorder.

[a] Among women with a drug use disorder (with or without an alcohol use disorder) (n=1,351), the most common type of drug use disorder is marijuana (75.8%), followed by cocaine (28.0%), amphetamines (20.2%), hallucinogens (11.5%), opioids (11.5%), sedatives (8.3%), tranquilizers (8.2%), solvents (2.1%), heroin (2.1%), and other substances (0.5%). Women can have more than one type of drug use disorder. Therefore, the sum of these percentages exceeds 100%.

*p < 0.05; **p < 0.01; *** p < 0.001.

5.2. Attenuation of associations when type and number of types of childhood adversity are considered simultaneously

I examined whether there was change in any relationship between adversity and likelihood for each type of SUD when the type and number of different types of adversity were considered simultaneously. Results indicated that when type of childhood adversity and the number of different types of childhood adversity experienced were considered simultaneously (Table 5.2), the magnitude of the relationship was attenuated between number of experiences of childhood adversity and risk for each type of SUD. For example, in Model 1 when I considered only the number of different types of childhood adversity, the odds ratio for an alcohol use disorder (relative to no SUD) was 1.58 in the context of 1 to 2 experiences of childhood adversity (relative to 0 experiences) and 2.13 in the context of 3 or more experiences of adversity (relative to 0 experiences). In Model 2, I also considered each of the 11 types of childhood adversity: physical abuse, emotional abuse, sexual abuse, physical neglect, emotional neglect, battered mom, parental incarceration, parental mental illness, parental suicide attempt, parental suicide completion, and parental substance abuse. In this model, the odds ratio for an alcohol use disorder was1.56 in the context of 1 to 2 experiences of childhood adversity and it was 1.95 in the context of 3 or more experiences of adversity. Attenuation occured for each type of SUD and no matter if the categories of childhood adversity were collapsed into three constructs (abuse, neglect, household dysfunction), as shown in Model 3, or two constructs (abuse/neglect, household dysfunction), as shown in Model 4.

Table 5.2. Attenuation of associations when both type and number of childhood adversities are considered (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data on White, Black, and Hispanic women (n=19,117)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
Model 1												
No. of different types of childhood adversity (ref: 0)												
1-2	0.46***	0.40, 0.51	1.58	1.50, 1.67	0.58***	0.45, 0.72	1.80	1.57, 2.05	0.75***	0.63, 0.87	2.12	1.87, 2.40
≥3	0.75***	0.70, 0.81	2.13	2.00, 2.25	1.36***	1.20, 1.51	3.90	3.34, 4.54	1.42***	1.31, 1.54	4.15	3.70, 4.65
Model 2												
No. of different types of childhood adversity (ref: 0)												
1-2	0.44***	0.36, 0.53	1.56	1.44, 1.69	0.35***	0.16, 0.54	1.43	1.18. 1.72	0.37***	0.22, 0.52	1.45	1.24, 1.68
≥3	0.67***	0.49, 0.85	1.95	1.63, 2.32	0.65***	0.27, 1.04	1.92	1.31, 2.83	0.60***	0.30, 0.90	1.83	1.36, 2.46
Model 3												
No. of different types of childhood adversity (ref: 0)												
1-2	0.21***	0.14, 0.45	1.42	1.92, 1.57	0.24	-0.02, 0.50	1.28	0.98, 1.66	0.48***	0.31, 0.66	1.62	1.37, 1.93
≥3	0.52***	0.35, 0.69	1.69	1.42, 2.00	0.70**	0.26, 1.13	2.00	1.29, 3.10	0.89***	0.62, 1.17	2.45	1.86, 3.21

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Table 5.2. (continued) Attenuation of associations when both type and number of childhood adversities are considered (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data on White, Black, and Hispanic women (n=19,117)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
Model 4												
No. of different types of childhood adversity (ref: 0)												
1-2	0.42***	0.30, 0.54	1.52	1.35, 1.71	0.16	-0.09, 0.42	1.30	0.95, 1.77	0.49***	0.27, 0.70	1.63	1.31, 2.02
≥3	0.68***	0.50, 0.85	1.97	1.65, 2.35	0.85***	0.40, 1.29	2.33	1.50, 3.62	1.04***	0.74, 1.33	2.82	2.10, 3.78

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 92 cases were omitted due to missing data on the independent variable. Odds ratios (OR) are generated by exponentiating the estimated coefficients. Variables included in each model but are not shown include: age, race/ethnicity, nativity status, educational attainment, employment status, annual household income, and region.

Model 1 does not include any of the 11 variables that indicate type of childhood adversity.

Model 2 includes 11 variables that indicate type of childhood adversity: physical abuse, emotional abuse, sexual abuse, physical neglect, emotional neglect, battered mom, parental incarceration, parental mental illness, parental suicide attempt, parental suicide completion, and parental substance abuse.

Model 3 includes 3 variables to indicate type of childhood adversity: abuse (physical, emotional, sexual), neglect (physical, emotional), household dysfunction (battered mom, parental incarceration, parental mental illness, parental suicide attempt, parental suicide completion, and parental substance abuse).

Model 4 includes 2 variables to indicate type of childhood adversity: abuse or neglect and household dysfunction (battered mom, parental incarceration, parental mental illness, parental suicide attempt, parental suicide completion, and parental substance abuse).

*p < 0.05; **p < 0.01; *** p < 0.001.

5.3. Exploratory factor analysis

In this section, I identify the constructs that are captured by the concept of childhood adversity. In my exploratory factor analysis I called for 1 to 4 factors to be returned. There were only two eigenvalues greater than 1 (i.e., the eigenvalues were 5.48 and 2.39, followed by eigenvalues less than 1), indicating a 2-factor solution was appropriate. However, a 3-factor solution appeared to account for the largest proportion of the variance as indicated by my visual inspection of the scree plot and the standard indices of better fit. Specifically, for the 3-factor model versus the 2-factor model, the RMSEA was 0.014 versus 0.027 (a smaller value indicates better fit), the CFI was 0.998 versus 0.987 (a larger value indicates better fit), and the TLI was 0.995 versus 0.980 (a larger value indicates better fit).

To choose between a 2-factor solution and a 3-factor solution, I next considered whether the number of factors that were identified (1) contained most of the information, as indicated by the size and pattern of the factor loadings and (2) allowed for meaningful interpretation, as indicated by the uniqueness of the factors and the substantive meaning that each factor represents.

The rotated loadings, factor correlations, and factor structure indicated that for the 2-factor model: (1) factor 1 mostly represented household dysfunction as indicated by these 5 variables - parental suicide completion or attempt, parental mental illness, parental incarceration, parental problematic use of alcohol or drugs (shown in order of greatest influence per the factor structure) and (2) factor 2 mostly represented abuse and neglect and also having a battered mom as indicated by these 6 variables - emotional abuse, physical abuse, battered mom, physical neglect, emotional neglect, and sexual abuse (shown in order of greatest influence per the factor structure). The correlation between factor 1 and factor 2 was 0.31. Taken together, the pattern of the factor loadings and their substantive meaning provided evidence that the two factors represented distinct concepts.

The 3-factor model was similar to the 2-factor model in that factor 1 was mostly comprised of the same 5 variables that represented household dysfunction. The models were different in that factor 2 was mostly made up of a single variable, having a battered mom, and factor 3 was mostly comprised of the remaining 5 variables that represented abuse and neglect. The correlation between factor 1 and factor 2 was 0.39, it was 0.45 between factor 1 and factor 3, and it was 0.43 between factor 2 and factor 3. Taken together, the pattern of the factor loadings and their substantive meaning provided evidence that factor 3 represented a concept that was distinct from factor 1 and 2 (abuse and neglect versus household dysfunction and battered mom), however factor 1 and 2 represented similar concepts (household dysfunction and battered mom). Therefore, I concluded that the measure "type of childhood adversity" may be best reduced using a 2-factor solution, i.e., a solution that captures childhood household dysfunction which is distinct from childhood maltreatment (abuse and neglect).

5.4. Relationship between type of childhood adversity and occurrence of each type of SUD

Using the constructs identified in the prior analysis, I assessed the relationship between type of childhood adversity (childhood maltreatment, household dysfunction) and occurrence of each type of SUD (i.e., no disorder, alcohol only, drug only, poly-substance) (Table 5.3). Results indicated that relative to not having a SUD, there was a significant and positive association between childhood maltreatment and occurrence of an alcohol use disorder (OR 1.41 95% CI 1.34, 1.48), a drug use disorder (OR 1.69 95% CI 1.47, 1.96), and a poly-substance use disorder (OR 1.99 95% CI 1.80, 2.20). Also, relative to not having a SUD, there was a significant and positive association between household dysfunction and occurrence of an alcohol use disorder (OR 1.45 95% CI 1.37, 1.54), a drug use disorder (OR 2.19 95% CI 1.92, 2.50), and a poly-substance use disorder (OR 1.92 95% CI 1.74, 2.12).

Table 5.3. Relationship between type of childhood adversity and occurrence of each type of substance use disorder (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data on White, Black, and Hispanic women (n=19,117)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
Childhood maltreatment (abuse and neglect) (ref: no)	0.34***	0.29, 0.40	1.41	1.34, 1.48	0.53***	0.38, 0.67	1.69	1.47, 1.96	0.69***	0.59, 0.79	1.99	1.80, 2.20
Household dysfunction (ref: no)	0.37***	0.32, 0.43	1.45	1.37, 1.54	0.78***	0.65, 0.92	2.19	1.92, 2.50	0.65***	0.55, 0.75	1.92	1.74, 2.12

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 92 cases were omitted due to missing data on the independent variable. Odds ratios (OR) are generated by exponentiating the estimated coefficients. Variables included in each model but are not shown include: age, race/ethnicity, nativity status, educational attainment, employment status, annual household income, and region.

Childhood maltreatment is a dichotomous variable defined as any of these 5 experiences during childhood: physical abuse, emotional abuse, sexual abuse, physical neglect, emotional neglect.

Household dysfunction is a dichotomous variable defined as any of these 6 experiences during childhood: battered mom, parental incarceration, parental mental illness, parental suicide attempt, parental suicide completion, and parental substance abuse.

*p < 0.05; **p < 0.01; *** p < 0.001.

5.5. Chapter summary

As I had hypothesized, the statistically significant and positive regression coefficients for the number of different types of childhood adversity that had been experienced suggested that it had an effect on occurrence of each type of SUD even after accounting for the effect of type of childhood adversity. In addition, a reduction in the size of the regression coefficients indicated that any relationship between number of types of childhood adversity and occurrence of each type of SUD is attenuated when both type and number of childhood adversity are considered simultaneously. Also as I had hypothesized, exploratory factor analysis indicated that type of childhood adversity may be best reduced to two concepts, i.e., childhood household dysfunction and childhood maltreatment (abuse and neglect). Finally, childhood household dysfunction and childhood maltreatment were each positively associated with the occurrence of each type of SUD.

The findings related to this aim provide further evidence for what has been documented in the literature regarding the ways in which relationships may be artificially suppressed when modeling the impact on outcomes of both the type and number of childhood adversity. In this dissertation, I seek to avoid this problem by using a summative measure of childhood adversity, as has been done by most research in the field (e.g., Lloyd & Taylor, 2006; Lloyd & Turner, 2008; Turner et al., 1995; Turner & Lloyd, 2003). Therefore, I do not consider type of childhood adversity for any of the other aims.

CHAPTER SIX

RESULTS FOR AIM 3

I this chapter I determine whether a dose-response relationship between childhood adversity and different types of substance use disorders (i.e., no disorder, alcohol only, drug only, poly-substance) exists, and whether demographic characteristics (e.g., age, race/ethnicity) and socioeconomic status (household income, educational attainment, employment status) influence the risk for the presence of different types of substance use disorders.

I hypothesize that (3a) childhood adversity will have a dose-response relationship with women's risk for different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance), such that a greater number of different types of adversity will produce a graded increment in the likelihood of each of the different types of SUD. Also, I expect that (3b) demographic characteristics (e.g., age, race/ethnicity, nativity status), socioeconomic status (household income, educational attainment, employment status), and region will have an effect on women's risk for different types of SUD (i.e., no disorder, alcohol only, drug only, poly-substance), such that, for example, for each type of SUD, risk will be increased by younger age and lower socioeconomic status (e.g., lower household income, lower educational attainment, being unemployed) and decreased by being Hispanic or Black and non-US born nativity status.

6.1. Dose-response relationship between childhood adversity and different types of SUD

I operationalized childhood adversity with two dummy variables – having experienced 1 to 2 different types of adversity and having experienced 3 or more types of adversity, relative to the omitted reference category of having experienced no adversity (i.e., 0=0 events, 1=1-2 events, 2=$\underline{\geq}$3 events). I estimated the gross relationship by regressing occurrence of each type of SUD on the childhood adversity variable (Table 6.1). Results from a Wald test indicated that I should reject the null hypothesis that the coefficients for childhood adversity are jointly equal to zero [Wald chi2(6)=364.54, $p<0.001$]. Therefore, I interpreted the coefficients for the categories of childhood adversity.

The statistically significant and positive regression coefficients for the categories of the childhood adversity variable suggested that experiences of childhood adversity, relative to no experience of childhood adversity, increased the odds for each type of SUD (i.e., alcohol use disorder, drug use disorder, poly-substance use disorder). The results also indicated that a greater number of different types of childhood adversity (i.e., 1-2, $\geq$3) produced a graded increment in the likelihood of each of the different types of SUD, indicating that childhood adversity had a dose-response relationship with women's likelihood for different types of SUD.

Specifically, results from the model indicated that having experienced 1 to 2 types of childhood adversity, rather than having experienced no childhood adversity, added 0.47 to the log odds of occurrence of an alcohol use disorder (odds ratio [OR] 1.59 95% CI 1.51, 1.68), that is, it increased the odds of an alcohol use disorder by 41%. Having experienced 3 or more types of childhood adversity (relative to none) yielded an odds ratio for occurrence of an alcohol use disorder (relative to no SUD) of 2.21 (95% CI 2.09, 2.33).

Similar associations were evident for occurrence of a drug use disorder. Compared to not having experienced any childhood adversity, having experienced 1 to 2 types of childhood adversity was associated with a greater odds of having a drug use disorder (relative to no SUD) (OR 1.84 95% CI 1.62, 2.09), as was having experienced 3 or more types of childhood adversity (relative to none) (OR 4.43 95% CI 3.84, 5.12).

Compared to not having experienced any childhood adversity, having experienced 1 to 2 types of childhood adversity was associated with a greater odds of having a poly-substance use disorder (relative to no SUD) (OR 2.19 95% CI 1.94, 2.49), as was having experienced 3 or more types of childhood adversity (relative to none) (OR 4.74 95% CI 4.25, 5.28).

Table 6.1. Bivariate relationship between childhood adversity and lifetime substance use disorders among women (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data on White, Black, and Hispanic women (n=19,117)

Variable	b	95% CI	OR	95% CI
	Alcohol use disorder (vs. no substance use disorder)			
Number of different types of childhood adversity (ref: 0)				
1-2	0.47***	0.41, 0.52	1.59	1.51, 1.68
≥3	0.79***	0.74, 0.84	2.21	2.09, 2.33
	Drug use disorder (vs. no substance use disorder)			
Number of different types of childhood adversity (ref: 0)				
1-2	0.61***	0.48, 0.74	1.84	1.62, 2.09
≥3	1.49***	1.34, 1.63	4.43	3.84, 5.12
	Poly-substance use disorder (vs. no substance use disorder)			
Number of different types of childhood adversity (ref: 0)				
1-2	0.79***	0.61, 0.91	2.19	1.94, 2.49
≥3	1.56***	1.44, 1.66	4.74	4.25, 5.28

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 92 cases were omitted due to missing data on the independent variable. Odds ratios (OR) are generated by exponentiating the estimated coefficients (b).
Results from a Wald test indicated that I should reject the null hypothesis that the coefficients for childhood adversity are jointly equal to zero [Wald chi2(6df)=364.54, p<0.001]
*p < 0.05; **p < 0.01; *** p < 0.001.

6.2. Influence of demographics and socioeconomic status on risk for different types of SUD

To examine other determinants besides childhood adversity in relation to different types of SUD, I added these variables to the model described in the prior section: demographic characteristics (age, race/ethnicity, and nativity), socioeconomic status (adult household income, educational attainment, employment status), and region (Table 6.2).

The coefficient for the categories of childhood adversity was positive and statistically significant for each type of SUD even when these other variables were considered in the model. This suggests that experiences of childhood adversity uniquely affected occurrence of each type of SUD, as opposed to affecting SUD occurrence through its relationship with other factors (e.g., adult socioeconomic status).

When I added additional covariates to the model, results from a series of F-tests indicated that for each of the variables that considered, I should reject the null hypothesis that the coefficients are jointly equal to zero. In other words, these tests suggested that in addition to experiences of childhood adversity significant relationships were also evident between sociodemographic characteristics and the occurrence of each type of SUD. In the next section I provide a summary these relationships as they pertain to each type of SUD; a full explanation of these relationships is provided in Chapter 5. Then, I summarize the ways in which the effects of these variables are similar across each type of SUD.

6.2.1. Effects of demographics and socioeconomic status by type of SUD

6.2.1.1. Alcohol use disorders

There was a statistically significant negative association between occurrence of an alcohol use disorder (relative to no SUD) and each of these factors: being age 65+ (relative to age 18 to 24), part-time employment and not being in the labor force (relative to full-time employment), an annual household income of $30,000 to $80,000 (relative to less than $15,000), and living in the Midwest or the West (relative to Northeast).

In contrast, the likelihood of occurrence of an alcohol use disorder (relative to no SUD) was positively associated with each of these factors: being age 25 to 44 (relative to age 18 to 24), White race/ethnicity (relative to Black and Hispanic), US nativity status (relative to being born elsewhere), a college education or post-baccalaureate education (relative to less than a high school degree or GED), and unemployment (relative to full-time employment).

6.2.1.2. Drug use disorders

There was a significant negative association between occurrence of a drug use disorder (relative to no SUD) and each of these factors: being age 25 to 44, 45 to 64, or 65 or older (relative to age 18 to 24), a college or post-baccalaureate education (relative to less than a high school degree or GED), and living in the West (relative to Northeast).

In contrast, the likelihood of occurrence of a drug use disorder (relative to no SUD) was positively associated with each of these factors: White race/ethnicity (relative to Black and Hispanic), US nativity status (relative to being born elsewhere), part-time employment, being unemployed, and not being in the labor force (relative to full-time employment), and an annual household income of $80,000 or more (relative to less than $15,000).

6.2.1.3. Poly-substance use disorders

There was a significant negative association between occurrence of a poly-substance use disorder (relative to no SUD) and each of these factors: being age 45 to 64, or 65 or older (relative to age 18 to 24), not being not in the labor force (relative to full-time employment), and an annual household income of $50,000 to $79,999 or $80,000 or more (relative to less than $15,000).

Occurrence of a poly-substance use disorder (relative to no SUD) was positively associated with these factors: a college or post-baccalaureate education (relative to less than a high school degree or GED) and living in the West (relative to the Northeast).

6.2.2. Sociodemographics effects that were similar for each type of SUD

Relative to white women, Black and Hispanic women each had a significantly lower odds of having an alcohol use disorder (relative to no SUD) (Black OR 0.41 95% CI 0.38, 0.44; Hispanic OR 0.60 95% CI 0.56, 0.64), a drug use disorder (Black OR 0.66 95% CI 0.59, 0.75; Hispanic OR 0.67 95% CI 0.50, 0.90), and a poly-substance use disorder (Black OR 0.32 95% CI 0.28, 0.37; Hispanic OR 0.61 95% CI 0.51, 0.73).

Women who were born in the United States, compared with women who were born elsewhere, had a significantly higher odds of having an alcohol use disorder (relative to no SUD) (OR 3.08 95% CI 2.83, 3.36), a drug use disorder (OR 3.26 95% CI 2.33, 4.54), and a poly-substance use disorder (OR 7.28 95% CI 5.90, 8.99).

Women who were unemployed, compared with women who were working full-time, had a significantly higher odds of having an alcohol use disorder (relative to no SUD) (OR 1.46 95% CI 1.29, 1.67), a drug use disorder (OR 1.66 95% CI 1.25, 2.19), and a poly-substance use disorder (OR 2.43 95% CI 1.94, 3.05).

The nature of the associations between the remaining factors (i.e., educational attainment, some categories of employment status, annual household income, region) and odds for occurrence of a SUD varied by type of SUD.

Table 6.2. Relationship between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among White, Black, and Hispanic women (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=19,117)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
No. of different types of childhood adversity (ref: 0)												
1-2	0.46***	0.40, 0.51	1.58	1.50, 1.67	0.58***	0.45, 0.72	1.80	1.57, 2.05	0.75***	0.63, 0.87	2.12	1.87, 2.40
≥3	0.75***	0.70, 0.81	2.13	2.00, 2.25	1.36***	1.20, 1.51	3.90	3.34, 4.54	1.42***	1.31, 1.54	4.15	3.70, 4.65
Age (ref: 18 to 24)												
25 to 44	0.35***	0.24, 0.45	1.41	1.28, 1.57	-0.46***	-0.62, -0.31	0.63	0.54, 0.74	-0.02	-0.16, 0.13	0.99	0.85, 1.14
45 to 64	-0.43	-0.15, 0.06	0.96	0.86, 1.07	-1.18***	-1.34, -0.97	0.31	0.25, 0.38	-0.96***	-1.11, -0.81	0.38	0.33, 0.44
65 and older	-0.83***	-0.98, -0.67	0.44	0.37, 0.51	-3.41***	-4.12, -2.63	0.03	0.02, 0.07	-3.38***	-3.55, -3.22	0.03	0.03, 0.04
Race/ethnicity (ref: White)												
Black	-0.90***	-0.97, -0.82	0.41	0.38, 0.44	-0.41***	-0.53, -0.29	0.66	0.59, 0.75	-1.14***	-1.28, -0.99	0.32	0.28, 0.37
Hispanic	-0.51***	-0.58, -0.44	0.60	0.56, 0.64	-0.40**	-0.69, -0.11	0.67	0.50, 0.90	-0.49***	-0.68, -0.31	0.61	0.51, 0.73
US born	1.13***	1.04, 1.21	3.08	2.83, 3.36	1.18***	0.85, 1.51	3.26	2.33, 4.54	1.99***	1.77, 2.20	7.28	5.90, 8.99
Educational attainment (ref: < HS/GED)												
GED	0.11	-0.15, 0.37	1.12	0.86, 1.45	0.19	-0.11, 0.49	1.21	0.89, 1.63	0.86***	0.61, 1.11	2.36	1.83, 3.03
High school degree	0.09	-0.04, 0.22	1.09	0.96, 1.24	-0.16	-0.35, 0.03	0.85	0.71, 1.03	-0.14	-0.37, 0.10	0.87	0.69, 1.10
College	0.47***	0.35, 0.59	1.60	1.42, 1.81	-0.25**	-0.42, -0.08	0.78	0.65, 0.93	0.54***	0.34, 0.74	1.71	1.41, 2.09
Past-bacc	0.64***	0.51, 0.78	1.90	1.67, 2.17	-0.37**	-0.60, -0.14	0.69	0.55, 0.87	0.45***	0.26, 0.64	1.57	1.29, 1.90

Continued on next page

Table 6.2. (continued) Relationship between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among White, Black, and Hispanic women (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=19,117)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
Employment status (ref: Full-time)												
Employed part-time (<35 hours/week)	-0.12**	-0.19, -0.05	0.89	0.83, 0.96	0.26**	0.67, 0.46	1.30	1.07, 1.59	-0.03	-0.16, 0.09	0.97	0.85, 1.10
Unemployed	0.38***	0.25, 0.51	1.46	1.29, 1.67	0.50**	0.23, 0.78	1.66	1.25, 2.19	0.89***	0.66, 1.12	2.43	1.94, 3.05
Not in labor force	-0.29***	-0.37, -0.22	0.75	0.69, 0.80	0.15*	0.02, 0.27	1.16	1.02, 1.32	-0.27***	-0.40, -0.15	0.76	0.67, 0.86
Household income (ref: <$15,000)												
$15,000 to $29,999	-0.10	-0.20, 0.01	0.91	0.82, 1.01	0.11	-0.13, 0.35	1.12	0.88, 1.42	0.13	-0.03, 0.30	1.14	0.97, 1.35
$30,000 to $49,999	-0.10*	-0.19, -0.00	0.91	0.82, 1.00	-0.04	-0.24, 0.15	0.96	0.79, 1.16	-0.04	-0.23, 0.15	0.96	0.79, 1.16
$50,000 to $79,999	-0.13*	-0.23, -0.02	0.88	0.79, 0.98	-0.21	-0.45, 0.03	0.81	0.64, 1.03	-0.17*	-0.34, 0.00	0.84	0.71, 1.00
$80,000 or higher	0.08	-0.01, 0.17	1.09	0.99, 1.19	0.29**	0.11, 0.47	1.34	1.11, 1.61	-0.16*	-0.30, -0.01	0.85	0.74, 0.99
Region (ref: Northeast)												
Midwest	-0.17***	-0.25, -0.09	0.84	0.78, 0.92	-0.13	-0.33, 0.08	0.88	0.72, 1.08	0.07	-0.10, 0.24	1.07	0.91, 1.27
South	-0.04	-0.12, 0.04	0.96	0.89, 1.04	-0.12	-0.31, 0.07	0.88	0.73, 1.07	0.12	-0.02, 0.27	1.13	0.98, 1.31
West	-0.15***	-0.24, -0.07	0.86	0.79, 0.94	-0.35***	-0.55, -0.15	0.70	0.58, 0.86	-0.04	-0.20, 0.11	0.96	0.82, 1.12

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 92 cases were omitted due to missing data on the independent variable. Odds ratios (OR) are generated by exponentiating the estimated coefficients.
*p < 0.05; **p < 0.01; *** p < 0.001.

6.3 Chapter summary

The results that are featured in this chapter indicate that, as I had hypothesized, there was a dose-response relationship between childhood adversity and the occurrence of different types of substance use disorders (i.e., no disorder, alcohol only, drug only, poly-substance). Increases in the number of types of childhood adversities that women had experienced incrementally increased the risk for each type of SUD. An implication of this finding is that, consistent with what has been reported by other studies on childhood adversity (e.g., Patterson et al., 2014; Turner & Lloyd, 2008), a greater number of childhood adversities has a strong and persistent positive effect on women's risk for different types of SUD.

It is also clear that demographic characteristics (e.g., age, race/ethnicity), socioeconomic status (household income, educational attainment, employment status), and region influenced the likelihood for the presence of different types of SUD. Specifically, as I had hypothesized, being White, U.S. born, and unemployed were each positively associated with the occurrence of each type of SUD (relative to no SUD).

Other characteristics had effects on the likelihood of SUD occurrence that were unique to each type of SUD and, in some cases, were not as I had hypothesized. These included age, educational attainment, annual household income, and region. As I had expected, each age category older than age 24 (relative to age 18 to 24) was negatively associated with a drug use disorder. Also as I had expected, being age 65 and older (relative to age 18 to 24) was negatively associated with the occurrence of an alcohol use disorder; it was also negatively associated with the occurrence of a poly-substance use disorder. Contrary to my expectations, however, being age 25 to 44 (relative to age 18 to 24) was positively associated with the occurrence of an alcohol use disorder.

The effect of educational attainment provided another key example of how factors influenced the likelihood of SUD occurrence in ways that varied by type of SUD and, in some cases, were different from my expectations. For example, contrary to my expectations, more

educational attainment was positively associated with the occurrence of an alcohol use disorder and a poly-substance use disorder; consistent with my expectations, this same characteristic was negatively associated with the occurrence of a drug use disorder.

A final example was provided by the results for household income. As I had expected, several categories of a higher annual household income (relative to an income <$15,000) were negatively associated with the occurrence of an alcohol use disorder and a polysubstance use disorder but, not as I had not expected, the highest income category was positively associated with the occurrence of a drug use disorder.

CHAPTER SEVEN

RESULTS FOR AIM 4

In this section I examine whether the effect of childhood adversity is conditional on adult socioeconomic status (SES). I focus on annual household income as a key indicator of SES but I consider educational attainment and employment status as well. I hypothesized that relationships between childhood adversity and risk for different types of SUD would be different based on adult socioeconomic status, such that exposure to any level of childhood adversity (relative to no exposure) would increase the risk for each type of SUD more so among lower income women than it does among higher income women.

7.1. Moderation of childhood adversity by SES – individual consideration of moderators

First I added to the regression model from Chapter 6, each of these interaction terms individually: annual household income by number of experiences of childhood adversity; educational attainment by number of experiences of childhood adversity; and employment status by number of experiences of childhood adversity. A F-test on the interaction term for each type of SUD indicated that I should reject the null hypothesis that the coefficients for the interaction term was jointly equal to zero. To facilitate interpretation of the interaction terms, I calculated and graphed the predicted probabilities. Model results and the predicted probabilities are presented in Appendix 3.

7.2. Moderation of childhood adversity by SES – simultaneous consideration moderators

Next, I analyzed the correlation among the three SES variables. Results indicated that the variables captured similar yet distinct concepts. Therefore, I re-ran the multinomial regression with simultaneous inclusion of each of these three interaction terms: childhood adversity by annual household income, childhood adversity by educational attainment, and childhood adversity by employment status. A F-test on each interaction term indicated that for each type of SUD I should reject the null hypothesis that the coefficients for each interaction term was jointly equal to zero.

I used the results from the model in which the three SES moderators were considered simultaneously to calculate the pairwise comparisons of predicted probabilities for each interaction term. In the next section, I present the pairwise comparisons that reflect the effect of different levels of SES given the same level of exposure to experiences of childhood adversity. I do not report on the pairwise comparisons that reflect the effect of different levels of SES given different exposure levels to experiences of childhood adversity. Also, because with this aim I set out to examine whether the effect of childhood adversity was conditional on adult SES, I present in the figures the findings that relate to women with no exposure to childhood adversity but I do not report on them in the text.

7.2.1. Household income

Shown in Figure 7.1 are the predicted pairwise comparisons for occurrence of an alcohol use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, 3 or more) and household income (less than $15,000, $15,000 to $29,999, $30,000 to $49,999, $50,000 to $79,999, $80,000 or more).

Within the context of having had 1 to 2 experiences of childhood adversity, more income (relative to less income) had a significant and positive association with occurrence of an alcohol use disorder (relative to no SUD), particularly among women in the highest income category of $80,000 or more. Specifically, among women with 1 to 2 experiences of childhood adversity and an annual household income of $80,000, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was: 0.049 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000; 0.029 compared to women with an income of $15,000 to $29,999; 0.025 compared to women with an income of $30,000 to $49,999; and 0.045 compared to women with an income of $50,000 to $79,999.

In addition, among women with 1 to 2 experiences of childhood adversity and an annual household income of $15,000 to $29,999, the predicted probability for occurrence of an alcohol

use disorder (relative to no SUD) was 0.020 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000.

Similarly, among women with 1 to 2 experiences of childhood adversity and an annual household income of $30,000 to $49,999, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was 0.024 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000.

A contrast to these relationships is presented by the comparison of women with 1 to 2 experiences of childhood adversity and an annual household income of $50,000 to $79,999 to women with an income of $30,000 to $49,999. The predicted probability for this comparison was was -0.020.

Within the context of having had 3 or more experiences of childhood adversity, more income (relative to less income) generally had a significant and negative association with occurrence of an alcohol use disorder (relative to no SUD). Specifically, among women with 3 or more experiences of childhood adversity and an annual household income of $15,000 to $29,999, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was -0.057 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000.

Similarly, among women with 3 or more experiences of childhood adversity and an annual household income of $30,000 to $49,999, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was -0.050 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000. This same relationship was evident among women with an annual household income of $50,000 to $79,999 and also among those with an income of $80,000 or more.

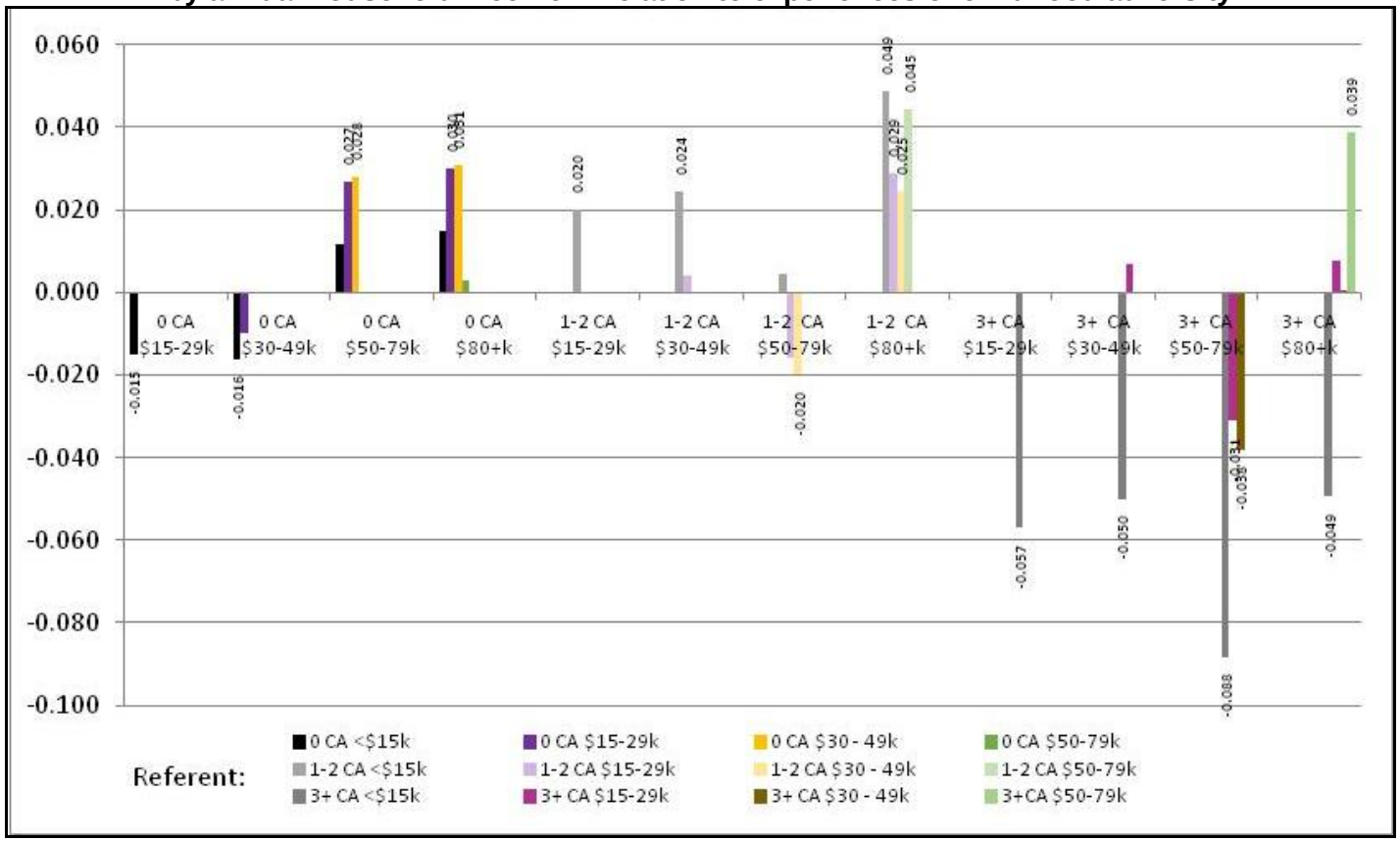
In addition, among women with 3 or more experiences of childhood adversity and an annual household income of $50,000 to $79,999, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was lower compared to women with the same number

of experiences of childhood adversity and a lower annual household income ($15,000 to $29,999; $30,000 to $49,999).

As one contrast to these relationships, among women with 3 or more experiences of childhood adversity and an annual household income of $80,000 or more, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was 0.039 compared to women with the same number of experiences of childhood adversity and an income of $50,000 to $79,999.

None of the other comparisons were statistically significant.

Figure 7.1. Pairwise comparisons of predicted probabilities for occurrence of an alcohol use disorder (vs. no SUD) by annual household income in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

Shown in Figure 7.2 are the predicted pairwise comparisons for occurrence of a drug use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, 3 or more) and household income (less than $15,000, $15,000 to $29,999, $30,000 to $49,999, $50,000 to $79,999, $80,000 or more).

Within the context of having had 1 to 2 experiences of childhood adversity, more income (relative to less income) had a significant and positive association with occurrence of a drug use disorder (relative to no SUD), particularly among women in the highest income category of $80,000 or more. Specifically, among women with 1 to 2 experiences of childhood adversity and an annual household income of $80,000, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was: 0.011 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000; 0.013 compared to women with an income of $30,000 to $49,999; and 0.010 compared to women with an income of $50,000 to $79,999.

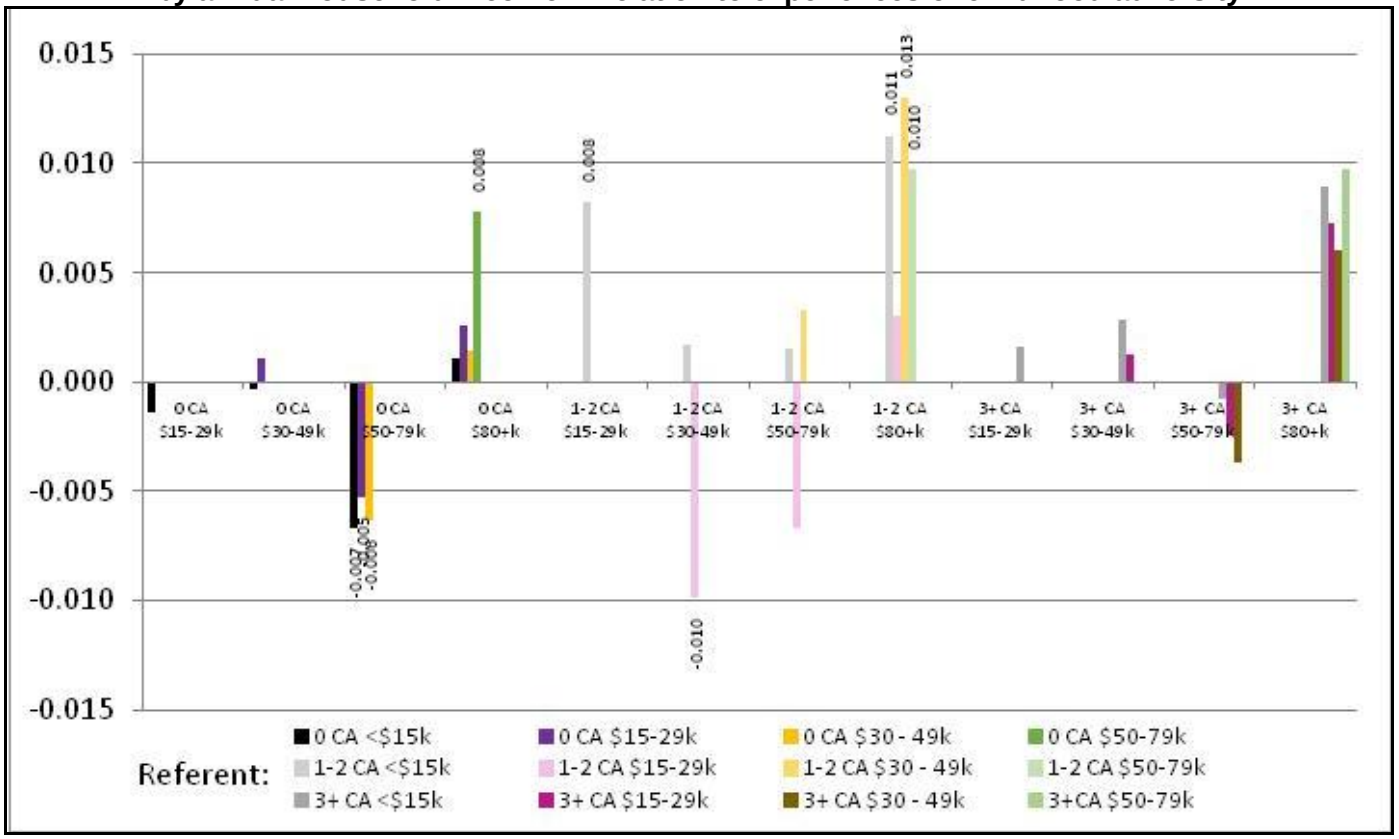
In addition, among women with 1 to 2 experiences of childhood adversity and an annual household income of $15,000 to $29,999, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was 0.008 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000.

As one contrast to these relationships, among women with 1 to 2 experiences of childhood adversity and an annual household income of $30,000 to $49,999, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was -0.010 compared to women with the same number of experiences of childhood adversity and an annual household income of $15,000 to $29,999.

Within the context of having had 3 or more experiences of childhood adversity, there was not a statistically significant association between more income (relative to less income) and occurrence of a drug use disorder (relative to no SUD).

None of the other comparisons were statistically significant.

Figure 7.2. Pairwise comparisons of predicted probabilities for occurrence of a drug use disorder (vs. no SUD) by annual household income in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

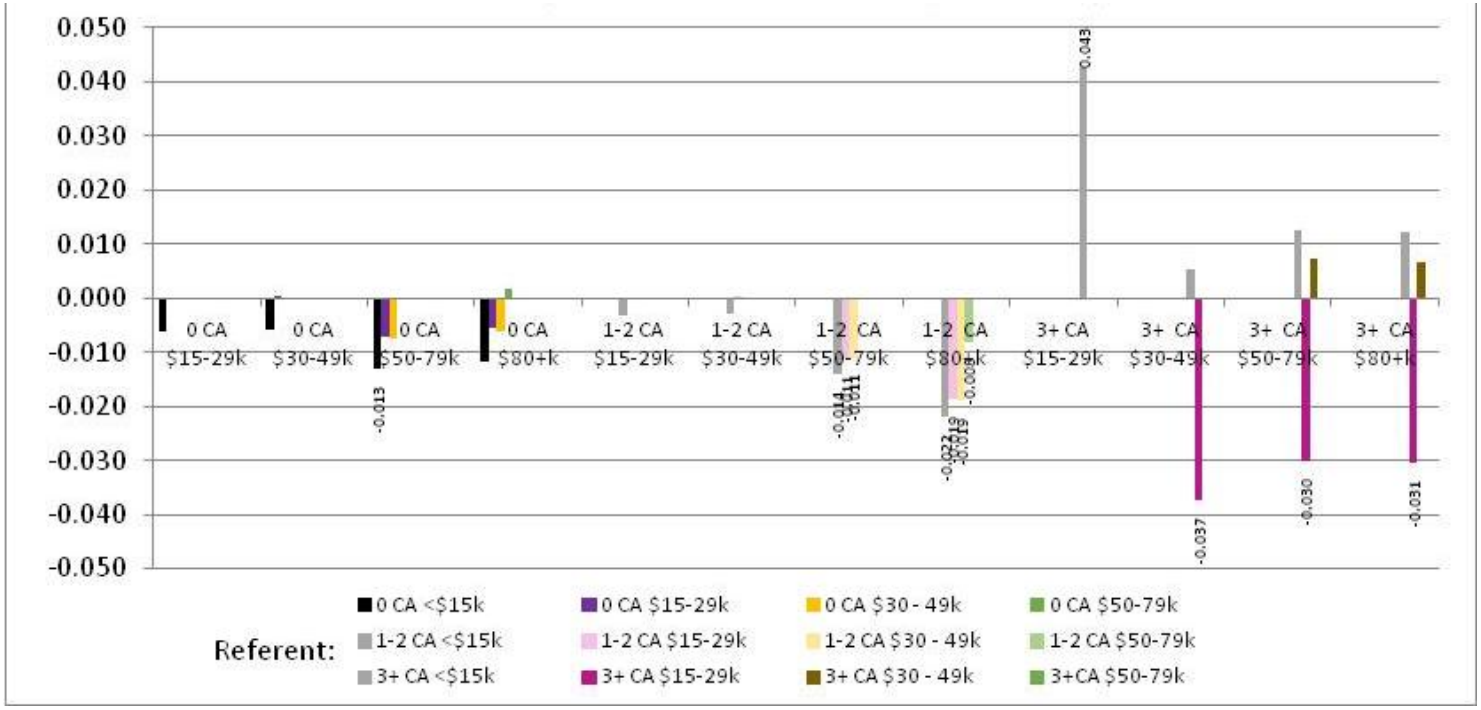
Shown in Figure 7.3 are the predicted pairwise comparisons for occurrence of a poly-substance use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, 3 or more) and household income (less than $15,000, $15,000 to $29,999, $30,000 to $49,999, $50,000 to $79,999, $80,000 or more).

Among women with 1 to 2 experiences of childhood adversity and an annual household income of $80,000, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was: -0.022 compared to women with the same number of experiences of childhood adversity and an annual household income of less than $15,000; -0.019 compared to women with an income of $15,000 to $29,999; -0.019 compared to women with an income of $30,000 to $49,999; and -0.008 compared to women with an income of $50,000 to $79,999. A similar set of relationships was evident among women with 3 or more experiences of childhood adversity and an annual household income of $50,000 - $79,999 compared to women in each of the categories of lower income.

Within the context of having had 3 or more experiences of childhood adversity, the risk for a poly-substance use disorder (relative to no SUD) was lower among women with an annual household income of $30,000 to $49,999 (-0.037), $50,000 to $79,999 (-0.030), and $80,000 or more (-0.031) relative to women with an income of $15,000 to $29,999. However, among women with 3 or more experiences of childhood adversity and an income of $15,000 to $29,999, the predicted probability was higher (0.043) compared to women with an income of less than $15,000.

None of the other comparisons were statistically significant.

Figure 7.3. Pairwise comparisons of predicted probabilities for occurrence of a poly-substance use disorder (vs. no SUD) by annual household income in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

7.2.2. Educational attainment

Shown in Figure 7.4 are the predicted pairwise comparisons for occurrence of an alcohol use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, 3 or more) and educational attainment (less than high school degree or GED, GED, high school degree, college education, post-baccalaureate degree).

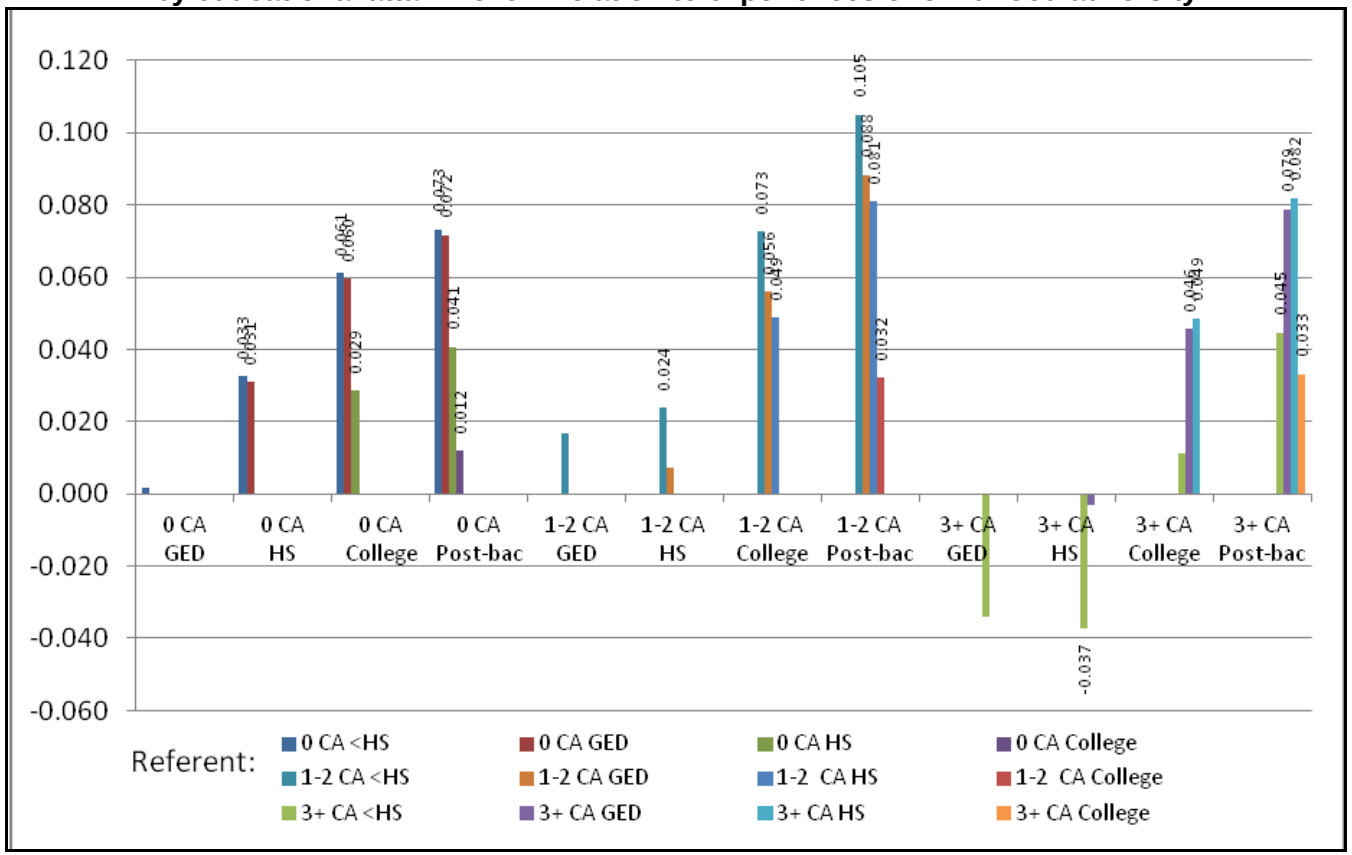
Within the context of having had 1 to 2 experiences of childhood adversity, more education (relative to less education) had a significant and positive association with occurrence of an alcohol use disorder (relative to no SUD) (Figure 7.4). Among women with 1 to 2 experiences of childhood adversity and a post-baccalaureate degree, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was: 0.105 compared to women with the same number of experiences of childhood adversity and less than a high school degree or GED; 0.088 compared to women with a GED; 0.081 compared to women with a high school degree; and 0.032 compared to women with a college education. A similar set of relations was evident among women who had 1 to 2 experiences of childhood adversity and had attained a college education relative to women who had attained less education.

Among women who had 3 or more experiences of childhood adversity, this same set of relationships was apparent among women who had attained a college education, relative to most of the categories of lower educational attainment, and also among women who had attained a post-baccalaureate degree relative to each of the categories of lower educational attainment.

As one point of contrast, among women with 3 or more experiences of childhood adversity and a high school degree, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was -0.037 compared to women with the same number of experiences of childhood adversity and less than a high school degree or GED.

None of the other comparisons were statistically significant.

Figure 7.4. Pairwise comparisons of predicted probabilities for occurrence of an alcohol use disorder (vs. no SUD) by educational attainment in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

Shown in Figure 7.5 are the predicted pairwise comparisons for occurrence of a drug use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, 3 or more) and educational attainment (less than high school degree or GED, GED, high school degree, college education, post-baccalaureate degree).

Among women who had 1 to 2 experiences of childhood adversity and a college education, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was: -0.12 compared to women with the same number of experiences of childhood adversity and less than a high school degree and - 0.09 compared to women with a high school degree.

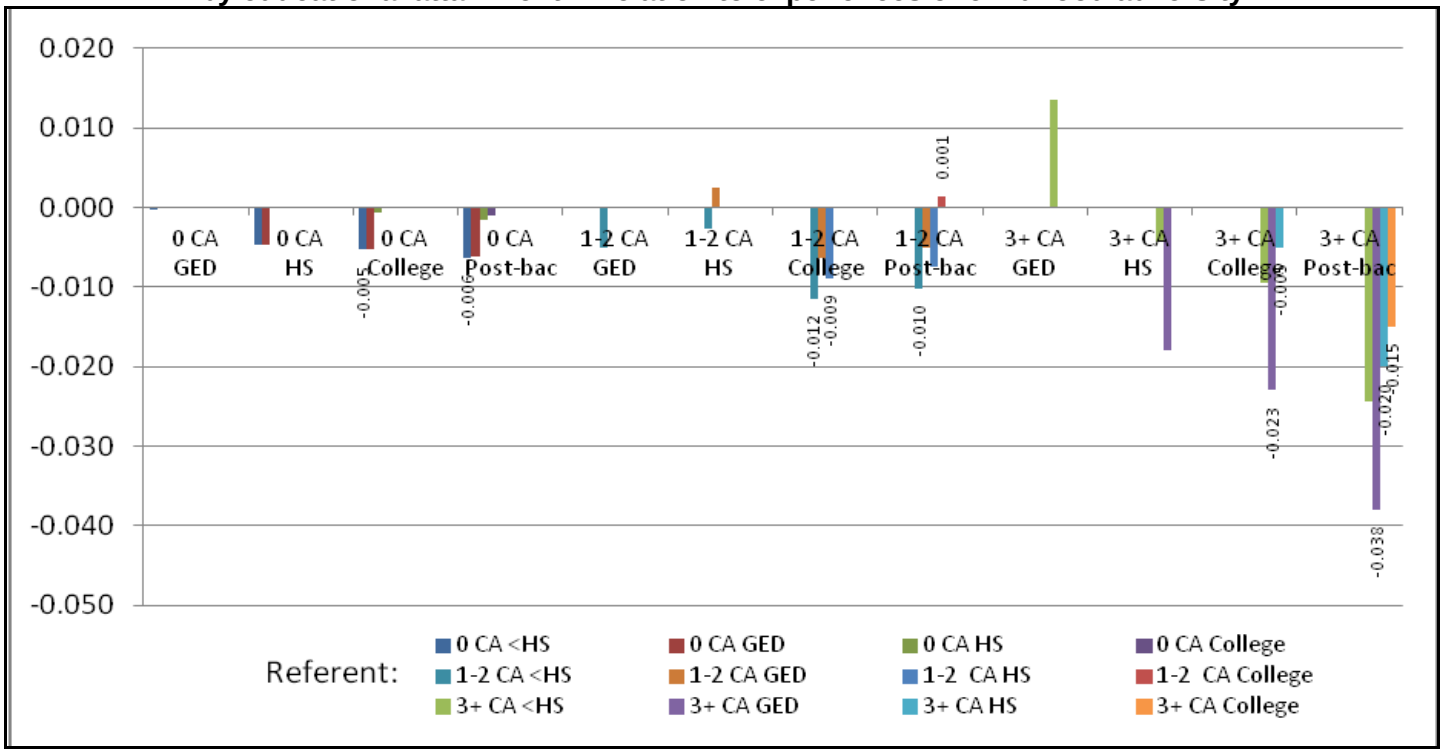
Among women who had 1 to 2 experiences of childhood adversity and a post-baccalaureate education, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was: -0.10 compared to women with the same number of experiences of childhood adversity and less than a high school degree and 0.001 compared to women with a college education.

Among women who had 3 or more experiences of childhood adversity and a college education, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was: -0.023 compared to women with the same number of experiences of childhood adversity and a GED and - 0.009 compared to women with a high school degree.

Among women who had 3 or more experiences of childhood adversity and a post-baccalaureate degree, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was: -0.038 compared to women with the same number of experiences of childhood adversity and a GED; - 0.020 compared to women with a high school degree; and -0.015 compared to women with a college education.

None of the other comparisons were statistically significant.

Figure 7.5. Pairwise comparisons of predicted probabilities for occurrence of a drug use disorder (vs. no SUD) by educational attainment in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

Patterns were much more mixed in relation to educational attainment, childhood adversity, and the occurrence of a poly-substance use disorder (Figure 7.6). Among women who had 1 to 2 experiences of childhood adversity and a high school degree, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was -0.071 compared to women with the same number of experiences of childhood adversity and a GED.

Among women who had 1 to 2 experiences of childhood adversity and a college education, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was: 0.029 compared to women with the same number of experiences of childhood adversity and less than a high school degree or GED; -0.042 compared to women with a GED; and 0.029 compared to women with a high school degree. A similar set of relationships was evident among women with 1 to 2 experiences of childhood adversity and a post-baccalaureate degree.

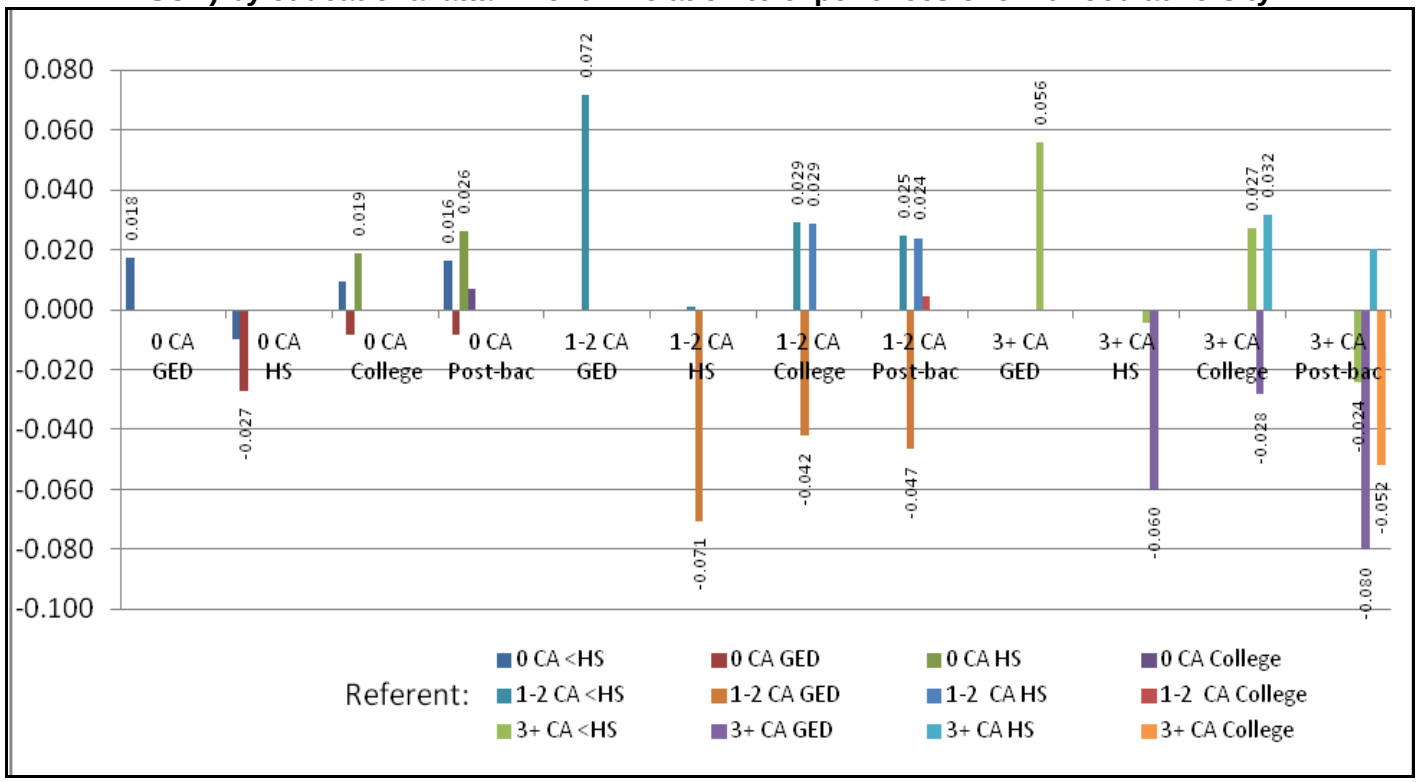
Among women who had 3 or more experiences of childhood adversity and a high school degree, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was -0.060 compared to women with the same number of experiences of childhood adversity and a GED.

Among women who had 3 or more experiences of childhood adversity and a college education, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was: 0.027 compared to women with the same number of experiences of childhood adversity and less than a high school degree or GED; -0.028 compared to women with a GED; and 0.032 compared to women with a high school degree.

Among women who had 3 or more experiences of childhood adversity and a post-baccalaureate degree, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was: -0.024 compared to women with the same number of experiences of childhood adversity and less than a high school degree or GED; -0.08 compared to women with a GED; and -0.052 compared to women with a college education.

None of the other comparisons were statistically significant.

Figure 7.6. Pairwise comparisons of predicted probabilities for occurrence of a poly-substance use disorder (vs. no SUD) by educational attainment in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

7.2.3. Employment status

Shown in Figure 7.7 are the predicted pairwise comparisons for occurrence of an alcohol use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, three or more) and employment status (full-time, part-time, unemployed, not in the labor force).

Among women with 1 to 2 experiences of childhood adversity and who worked part-time, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was -0.022 compared to women with the same number of experiences of childhood adversity and who worked full-time.

Among women with 1 to 2 experiences of childhood adversity and who were unemployed, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was 0.082 compared to women with the same number of experiences of childhood adversity and who worked full-time, and 0.103 compared to women who worked part-time.

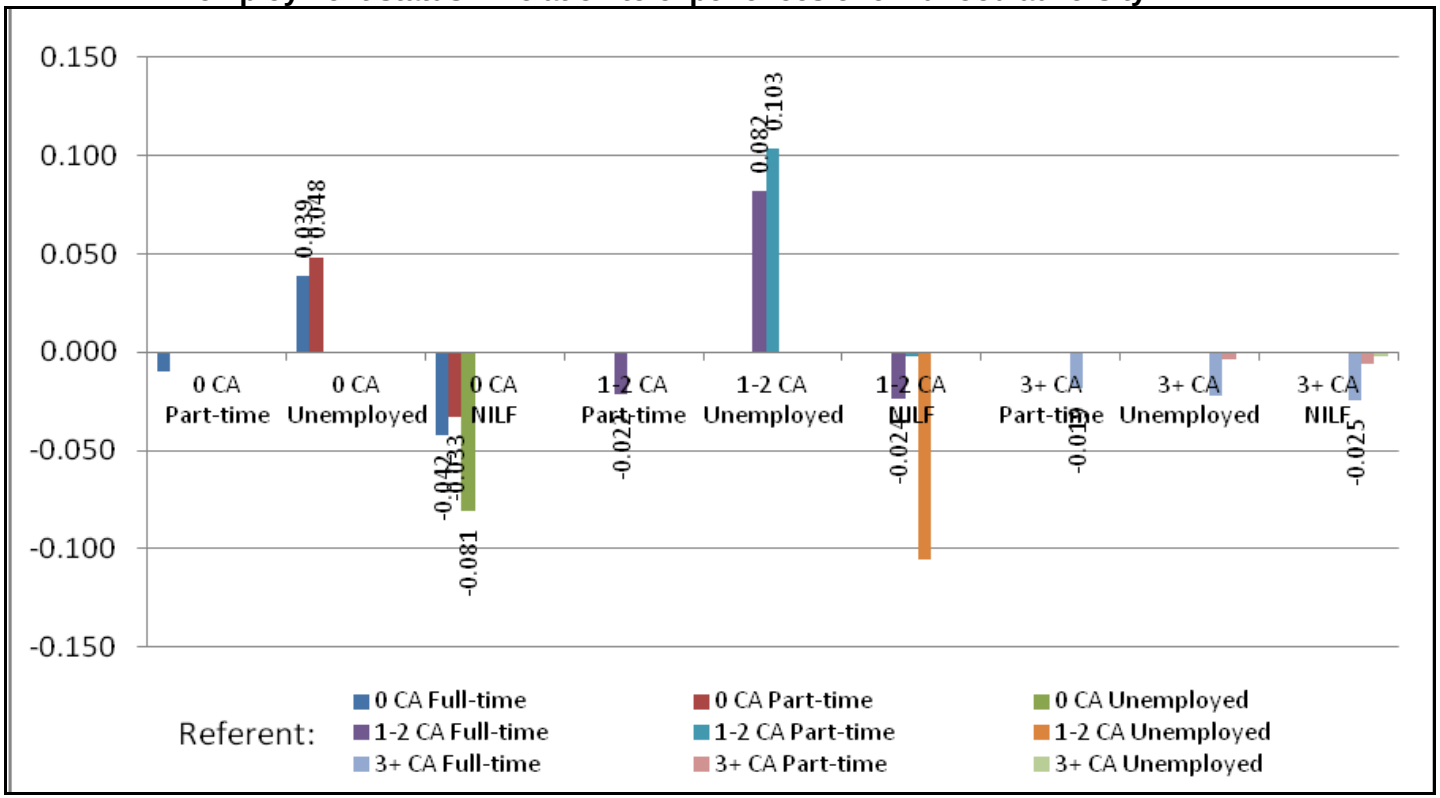
Among women with 1 to 2 experiences of childhood adversity and who were not in the labor force, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was -0.024 compared to women with the same number of experiences of childhood adversity and who worked full-time.

Among women with 3 or more experiences of childhood adversity and who worked part-time, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was -0.010 compared to women with the same number of experiences of childhood adversity and who worked full-time.

Among women with 3 or more experiences of childhood adversity and who were not in the labor force, the predicted probability for occurrence of an alcohol use disorder (relative to no SUD) was -0.025 compared to women with the same number of experiences of childhood adversity and who worked full-time.

None of the other comparisons were statistically significant.

Figure 7.7. Pairwise comparisons of predicted probabilities for occurrence of an alcohol use disorder (vs. no SUD) by employment status in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

Shown in Figure 7.8, are the predicted pairwise comparisons for occurrence of a drug use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, 3 or more) and employment status (full-time, part-time, unemployed, not in the labor force).

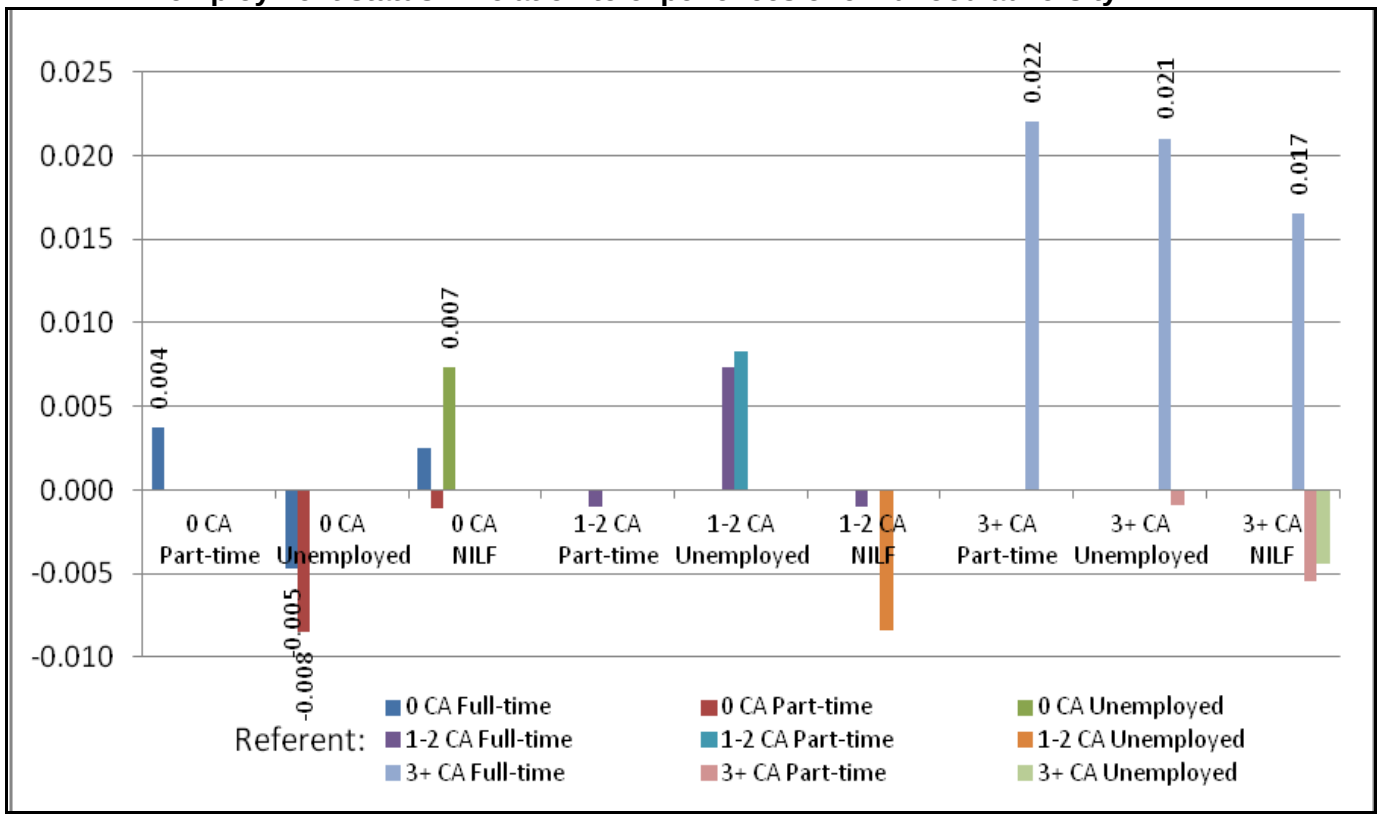
Among women with 3 or more experiences of childhood adversity and who worked part-time, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was 0.022 compared to women with the same number of experiences of childhood adversity and who worked full-time.

Among women with 3 or more experiences of childhood adversity and who were unemployed, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was 0.021 compared to women with the same number of experiences of childhood adversity and who worked full-time.

Among women with 3 or more experiences of childhood adversity and who were not in the labor force, the predicted probability for occurrence of a drug use disorder (relative to no SUD) was 0.017 compared to women with the same number of experiences of childhood adversity and who worked full-time.

None of the other comparisons were statistically significant.

Figure 7.8. Pairwise comparisons of predicted probabilities for occurrence of a drug use disorder (vs. no SUD) by employment status in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

Shown in Figure 7.9 are the predicted pairwise comparisons for occurrence of a poly-substance use disorder (relative to no SUD) in relation to number of experiences of childhood adversity (0, 1 to 2, 3 or more) and employment status (full-time, part-time, unemployed, not in the labor force).

Among women with 1 to 2 experiences of childhood adversity and who were unemployed, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was 0.024 compared to women with the same number of experiences of childhood adversity and who worked full-time.

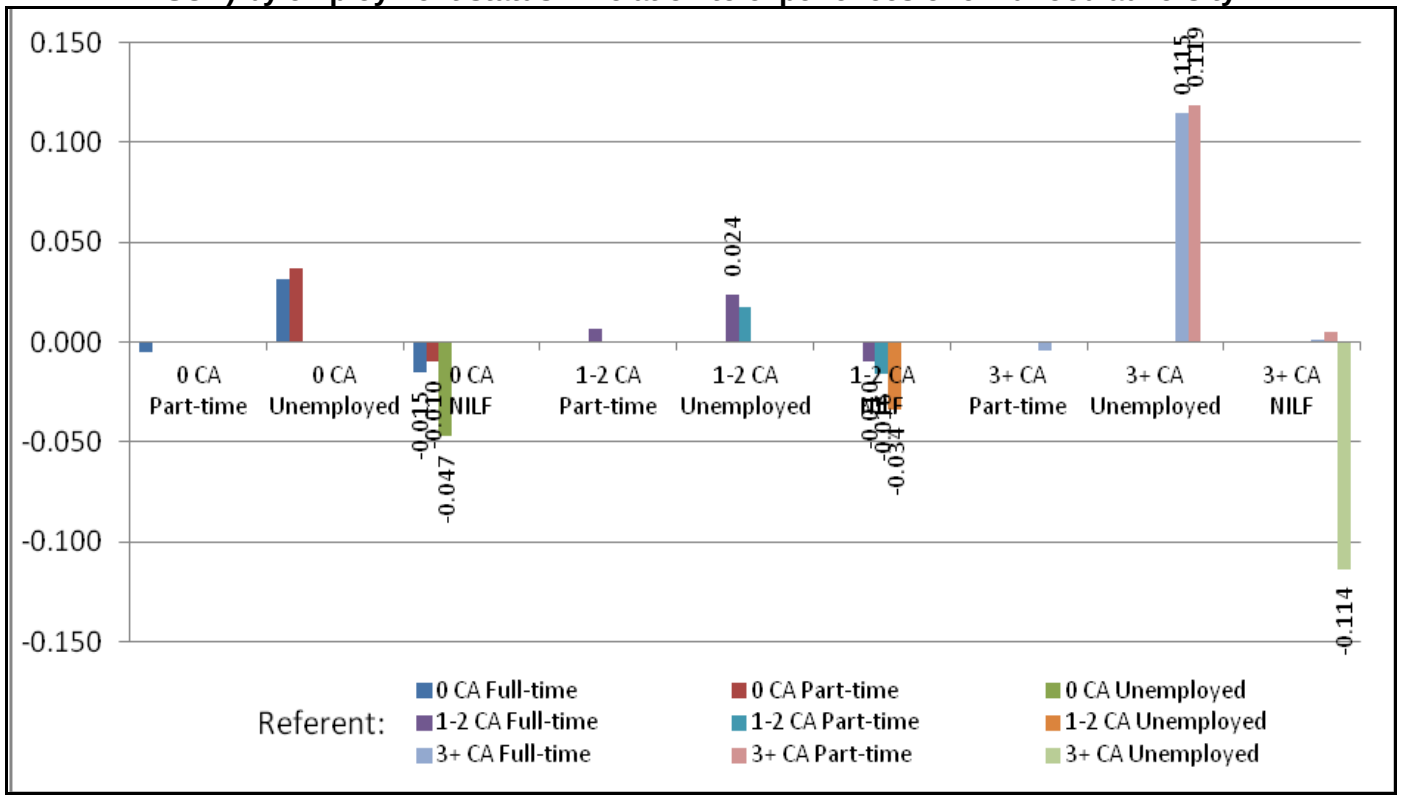
Among women with 1 to 2 experiences of childhood adversity and who were not in the labor force, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was -0.010 compared to women with the same number of experiences of childhood adversity and who worked full-time; -0.016 compared to women who worked part-time; and -0.034 compared to women who were unemployed.

Among women with 3 or more experiences of childhood adversity and who were unemployed, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was 0.115 compared to women with the same number of experiences of childhood adversity and who worked full-time and 0.119 compared to women who worked part-time.

Among women with 3 or more experiences of childhood adversity and who were not in the labor force, the predicted probability for occurrence of a poly-substance use disorder (relative to no SUD) was -0.114 compared to women with the same number of experiences of childhood adversity and who were unemployed.

None of the other comparisons were statistically significant.

Figure 7.9. Pairwise comparisons of predicted probabilities for occurrence of a poly-substance use disorder (vs. no SUD) by employment status in relation to experiences of childhood adversity



SUD=substance use disorders. CA=childhood adversity. Estimates are generated from the multinomial model that included three interaction terms: childhood adversity by household income, childhood adversity by educational attainment, and childhood adversity by employment status. Corrected for multiple comparisons. A value is shown only for those pairwise comparisons that are statistically significant at *p < 0.05; **p < 0.01; *** p < 0.001.

7.3. Chapter summary

I hypothesized that the relationships between childhood adversity and risk for different types of SUD would be different based on adult socioeconomic status, such that exposure to any level of childhood adversity (relative to no exposure) would increase the risk for each type of SUD more so among lower income women than it does among higher income women. The results indicated that the relationships between childhood adversity, SES, and occurrence of a SUD were more complex than I had hypothesized, primarily because the nature of these relationship varied according to the number of types of childhood adversity that have been experienced, the indicator for SES, and the type of SUD. In the remainder of this section, first I summarize the results in relation to alcohol use disorders, then I summarize the results for drug use disorders, followed by poly-substance use disorders.

7.3.1. Alcohol use disorders

Contrary what I had hypothesized, there was some support for the idea that in relation to alcohol use disorders, the flexible resources that are provided by higher socioeconomic status do not help women to avoid the adverse consequences of childhood adversity. Instead, within the context of moderate exposure to childhood adversity, more income appears to exacerbate or heighten women's likelihood for an alcohol use disorder. Specifically, within the context of having had 1 to 2 experiences of childhood adversity, more income (relative to less income) had a significant and positive association with occurrence of an alcohol use disorder (relative to no SUD), particularly among women in the highest income category of $80,000 or more. Similarly, within the context of having had 1 to 2 and 3 or more experiences of childhood adversity, more education (relative to less education) had an effect that was similar to that of more income in that it also had a significant and positive association with occurrence of an alcohol use disorder (relative to no SUD).

However, there was also some support for the hypothesis that higher socioeconomic status helps women to avoid the adverse consequences of childhood adversity, particularly

within the context of having had a greater exposure to childhood adversity. Specifically, given a history of having had 3 or more experiences of childhood adversity, more income (relative to less income) generally had a significant and negative association with occurrence of an alcohol use disorder (relative to no SUD). Similarly, being unemployed (relative to full- or part-time employed) was positively associated with occurrence of an alcohol use disorder; working part-time and being not in the labor force (relative to full-time employment) was negatively associated with an alcohol use disorder.

7.3.2. Drug use disorders

There was some support for the idea that in relation to drug use disorders, the adverse health consequences of childhood adversity are amplified by higher SES as provided by a higher income but they are dampened by higher SES as provided by greater educational attainment and certain employment statuses. Specifically, within the context of having had 1 to 2 experiences of childhood adversity, more income (relative to less income) had a significant and positive association with occurrence of a drug use disorder (relative to no SUD), particularly among women in the highest income category of $80,000 or more. Furthermore, within the context of having had 3 or more experiences of childhood adversity, there was not a statistically significant association between more income (relative to less income) and occurrence of a drug use disorder (relative to no SUD).

In contrast, within the context of having had 1 to 2 and 3 or more experiences of childhood adversity, more education (relative to less education) had a significant and negative association with occurrence of a drug use disorder (relative to no SUD). Also, compared to working full-time, each of the other employment statuses was positively associated with occurrence of a drug use disorder (relative to no SUD).

7.3.3. Poly-substance use disorders

Within the context of having had 1 to 2 or 3 or more experiences of childhood adversity, a significant and negative association with a poly-substance use disorder (relative to no SUD)

generally occurred with higher SES as indicated by more income (relative to less income), having attained an education other than a GED, and being not in the labor force (relative to each of the other categories of employment status). In addition, in the context of 1 to 2 and 3 or more childhood adversities, being unemployed (relative to being employed) had a significant and positive association with occurrence of a poly-substance use disorder (relative to no SUD).

The effect of higher SES on occurrence of a poly-substance use disorder as indicated by the highest levels of educational attainment was, in some cases, influenced by the amount of exposure to childhood adversity. In the context of 1 to 2 and 3 or more childhood adversities, college (relative to less education) was positively associated with a poly-substance use disorder. However, in the context of 1 to 2 adversities, a post-baccalaureate degree (relative to less education) was positively associated with a disorder; in the context of 3 or more adversities, it was negatively associated with a disorder.

CHAPTER EIGHT

RESULTS FOR AIM 5

8.1. A focus on different types of substance use disorders

For Aim 5, I considered whether there are differences in the factors that are related to whether women develop an alcohol use disorder only versus a drug use disorder (either with or without an alcohol use disorder).

I hypothesized that (5a) there would be differences in the factors that are related to whether women develop an alcohol use disorder versus a drug use disorder (either with or without an alcohol use disorder), such that women who have an alcohol use disorder only, relative to women with a drug use disorder (either with or without an alcohol use disorder) would have had exposure to fewer types of childhood adversity, be older, and have a higher socioeconomic status (as indicated by higher educational attainment, employment, and higher income).

To answer my research questions, I used the multinomial logistic regression model from Aim 3 but I changed the reference category for the model such that the referent was occurrence of a drug use disorder order and then occurrence of a poly-substance use disorder order (and not "occurrence of no SUD" as was the case for the prior Aims). Given this approach, for example, a negative and statistically significant coefficient for childhood adversity would suggest that childhood adversity lowers the odds for an alcohol use disorder more than it does for a drug use disorder only. I used an F-test to assess whether the effect of each independent variable on the odds of occurrence of an alcohol use disorder was statistically significant.

As a part of this aim, I also examined the characteristics of women who developed two specific types of substance use disorders: marijuana use disorders and opioid use disorders. The results for these analyses are presented in Appendix 4.

8.2. Alcohol use disorders (vs. drug use disorders)

In this section I examine whether the relationships between childhood adversity, sociodemographic characteristics, and SUD risk are different for women who have an alcohol use disorder only compared with women who have a drug use disorder only (Table 8.1).

Compared to having a drug use disorder only, there was a significant and negative association between having an alcohol use disorder and 3 or more experiences of childhood adversity (OR 0.55 95% CI 0.45, 0.64).

Compared to the occurrence of a drug use disorder only, there was a significant and positive association between an alcohol use disorder and being age 25 to 44, age 45 to 64 and age 65 and older (relative to age 18 to 24). Moreover, the size of the odds ratio increased incrementally for each of these older age groups. Specifically, the odds ratio for an alcohol use disorder only, compared to a drug use disorder, was 2.24 (95% CI 1.86, 2.71) among women aged 25 to 44 (relative to women aged 18 to 24), it was 3.11 (95% CI 2.49, 3.86) among women aged 45 to 64, and it was 13.15 (95% CI 6.04, 28.65) among women aged 65 and older.

Compared to White women, Black women had a significantly lower odds for an alcohol use disorder only relative to a drug use disorder only (OR 0.62 95% CI 0.54, 0.71).

There was a significant and positive association between having an alcohol use disorder (relative to a drug use disorder only) and having a high school degree (relative to having attained less than a high school degree or GED) (OR 1.28 95% CI 1.06, 1.55), a college education (OR 2.10 95% CI 1.74, 2.44), and a post-baccalaureate degree (OR 2.76 95% CI 2.18, 3.48). Also, the size of the odds ratio for an alcohol use disorder only, compared to a drug use disorder only, increased incrementally with more educational attainment.

There was a significant and negative association between having an alcohol use disorder (relative to a drug use disorder only) and being employed part-time (relative to being employed full-time) (OR 0.68 95% CI 0.56, 0.83) and not being in the labor force (OR 0.64 95% CI 0.56, 0.74).

Compared with having a household income of less than $15,000, an income of $80,000 or more was negatively associated with an alcohol use disorder only (relative to having a drug use disorder) (OR 0.81 95% CI 0.66, 1.00).

Associations were not statistically significant between having an alcohol use disorder (relative to a drug use disorder only) and these factors: experience of 1 to 2 types of childhood adversity (relative to none); Hispanic race/ethnicity (relative to White); US nativity status; having attained a GED (relative to less than a high school degree or GED); being unemployed (relative to full-time employment); each income category less than $80,000 (relative to less than $15,000); and region.

8.3. Alcohol use disorders (vs. poly-substance use disorders)

In this section I examine whether the relationships between childhood adversity, sociodemographic characteristics, and SUD risk are different for women who have an alcohol use disorder only compared with women who have a poly-substance use disorder (Table 8.1).

Compared to having a poly-substance use disorder, there was a significant and negative association between having an alcohol use disorder only and 1 to 2 experiences of childhood adversity (OR 0.75 95% CI 0.66, 0.85) and 3 or more experiences of childhood adversity (OR 0.51 95% CI 0.45, 0.58).

Compared to the occurrence of a poly-substance use disorder, there was a significant and positive association between an alcohol use disorder and being age 25 to 44, age 45 to 64 and age 65 and older (relative to age 18 to 24). Moreover, the size of the odds ratio increased incrementally for each of these older age groups. Specifically, the odds ratio for an alcohol use disorder only, compared to a poly-substance disorder, was 1.44 (95% CI 1.23, 1.68) among women aged 25 to 44 (relative to women aged 18 to 24), it was 2.50 (95% CI 2.16, 2.90) among women aged 45 to 64, and it was 12.90 (95% CI 10.61, 15.61) among women aged 65 and older.

Compared to White women, Black women had a significantly higher odds for an alcohol use disorder only relative to a poly-substance use disorder (OR 1.27 95% CI 1.10, 1.48).

Compared to being non-US born, US born women had a significantly lower odds for an alcohol use disorder relative to a poly-substance use disorder (OR 0.42 95% CI 0.34, 0.53).

There was a significant and negative association between having an alcohol use disorder (relative to a poly-substance use disorder) and having a GED (relative to having attained less than a high school degree or GED) (OR 0.47 95% CI 0.34, 0.66).

There was a significant and negative association between having an alcohol use disorder (relative to a poly-substance use disorder) and being unemployed (relative to being employed full-time) (OR 0.60 95% CI 0.48, 0.78).

Compared to having a household income of less than $15,000, there was a negative association between having an alcohol use disorder only (relative to a poly-substance use disorder) and an income of $15,000 to $29,999 (OR 0.79 95% CI 0.66, 0.95) and a positive association with an income of $80,000 or more (OR 1.27 95% CI 1.09, 1.48).

There was a significant and negative association between having an alcohol use disorder (relative to a poly-substance use disorder) and living in the Midwest (relative to the Northeast) (OR 0.79 95% CI 0.67, 0.93) and South (OR 0.85 95% CI 0.73, 0.99).

Associations were not statistically significant between having an alcohol use disorder (relative to a poly-substance use disorder) and these factors: Hispanic race/ethnicity (relative to White); having attained a high school degree or more education (relative to less than a high school degree or GED); being part-time employed or not in the labor force (relative to full-time employment); income between $30,000 and $79,999 (relative to less than $15,000); and living in the West (relative to the Northeast).

Table 8.1. Relationship between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among White, Black, and Hispanic women (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=4,029)

	Alcohol use disorder (vs. drug use disorder)				Alcohol use disorder (vs. poly-substance use disorder)			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
No. of different types of childhood adversity (ref: 0)								
1-2	-0.13	-0.27, 0.02	0.88	0.76, 1.02	-0.29***	-0.42, -0.16	0.75	0.66, 0.85
≥3	-0.61***	-0.76, -0.45	0.55	0.45, 0.64	-0.67***	-0.79, -0.55	0.51	0.45, 0.58
Age (ref: 18 to 24)								
25 to 44	0.81***	0.61, 1.00	2.24	1.86, 2.71	0.36***	0.21, 0.52	1.44	1.23, 1.68
45 to 64	1.13***	0.92, 1.35	3.11	2.49, 3.86	0.92***	0.77, 1.06	2.50	2.16, 2.90
65 and older	2.58***	1.80, 3.35	13.15	6.04, 28.65	2.55***	2.36, 2.74	12.90	10.61, 15.61
Race/ethnicity (ref: white)								
Black	-0.48***	-0.62, -0.35	0.62	0.54, 0.71	0.24**	0.09, 0.39	1.27	1.10, 1.48
Hispanic	-0.11	-0.41, 0.19	0.89	0.66, 1.21	-0.01	-0.19, 0.16	0.99	0.83, 1.17
US born	-0.55	-0.40, 0.29	0.95	0.67, 1.34	-0.86***	-1.09, -0.63	0.42	0.34, 0.53
Educational attainment (ref: < HS/GED)								
GED	-0.08	-0.40, 0.25	0.93	0.67, 1.29	-0.75***	-1.07, -0.42	0.47	0.34, 0.66
High school degree	0.25*	0.06, 0.44	1.28	1.06, 1.55	0.23	-0.01, 0.47	1.26	0.99, 1.60
Some college/college graduate	0.72***	0.55, 0.89	2.10	1.74, 2.44	-0.07	-0.29, 0.16	0.94	0.75, 1.17
Past-baccalaureate	1.01***	0.78, 1.25	2.76	2.18, 3.48	0.19	-0.05, 0.43	1.21	0.96, 1.54
Employment status (ref: Full-time)								
Employed part-time (<35 hours/week)	-0.38***	-0.58, -0.19	0.68	0.56, 0.83	-0.08	-0.22, 0.06	0.92	0.80, 1.06
Unemployed	-0.12	-0.40, 0.15	0.88	0.67, 1.16	-0.51***	-0.73, -0.29	0.60	0.48, 0.78
Not in labor force	-0.44***	-0.59, -0.30	0.64	0.56, 0.74	-0.02	-0.16, 0.12	0.98	0.85, 1.13

Continued on next page

Table 8.1. (continued) Relationship between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among White, Black, and Hispanic women (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=4,029)

Household income (ref: <$15,000)								
$15,000 to $29,999	-0.21	-0.45, 0.03	0.81	0.64, 1.03	-0.23*	-0.42, -0.05	0.79	0.66, 0.95
$30,000 to $49,999	-0.05	-0.27, 0.16	0.95	0.76, 1.18	-0.06	-0.26, 0.14	0.94	0.77, 1.15
$50,000 to $79,999	0.09	-0.18, 0.35	1.09	0.84, 1.42	0.04	-0.13, 0.22	1.04	0.88, 1.24
$80,000 or higher	-0.21*	-0.41, -0.00	0.81	0.66, 1.00	0.24**	0.09, 0.39	1.27	1.09, 1.48
Region (ref: Northeast)								
Midwest	-0.04	-0.29, 0.20	0.96	0.75, 1.22	-0.24**	-0.40, -0.08	0.79	0.67, 0.93
South	0.08	-0.15, 0.31	1.09	0.86, 1.37	-0.16*	-0.32, -0.01	0.85	0.73, 0.99
West	0.20	-0.04, 0.44	1.22	0.96, 1.55	-0.11	-0.26, 0.45	0.90	0.77, 1.05

Notes: CI = confidence interval. Models used multinomial regression. 92 cases were omitted due to missing data on the independent variable. Odds ratios (OR) are generated by exponentiating the estimated coefficients. I used an F-test to assess whether the effect of each independent variable on the odds of each type of SUD occurrence was statistically significant.

*p < 0.05; **p < 0.01; *** p < 0.001.

8.4. Chapter summary

As I had hypothesized, having experienced 3 or more types of childhood adversity (relative to none) was negatively associated with occurrence of an alcohol use disorder only, relative to a drug use disorder or a poly-substance use disorder.

Results also revealed significant associations between demographic characteristics and occurrence of an alcohol use disorder. The odds of having an alcohol use disorder (compared to having a drug use disorder or poly-substance use disorder) were higher for women age 25 and older (relative to women age 18 to 24). Also, compared to White women, Black women had a lower likelihood of having an alcohol use disorder relative to a drug use disorder but a higher likelihood of having an alcohol use disorder relative to a poly-substance use disorder. Finally, US born women, compared to non-US born women, had a lower likelihood of having an alcohol use disorder than a poly-substance use disorder.

Socioeconomic status was also related to occurrence of an alcohol use disorder. Having a high school degree or more education was positively associated with occurrence of an alcohol use disorder (relative to a drug use disorder and a poly-substance use disorder).

Being employed part-time or not working in the labor force (relative to working full-time) were each negatively associated with an alcohol use disorder (relative to a drug use disorder). Being unemployed (relative to working full-time) was negatively associated with an alcohol use disorder (relative to a poly-substance use disorder).

An income of $80,000 or more was negatively associated with an alcohol use disorder (relative to a drug use disorder) but it was positively associated with an alcohol use disorder (relative to a poly-substance use disorder).

Region was associated with an alcohol use disorder relative to a poly-substance use disorder, but not relative to a drug use disorder.

CHAPTER NINE

RESULTS FOR AIM 6

9.1. Part Two – Persistence of substance use disorders

In this chapter I assess persistence of substance use disorders among women in relation to type of substance use disorder (i.e., alcohol only, drug only, poly-substance), experiences of childhood adversity, and other sociodemographic factors. I also investigate whether the relationship between SUD type and SUD persistence varies by race/ethnicity.

I hypothesized that (6a) type of SUD (i.e., alcohol only, drug only, poly-substance) would have a differential effect on women's risk for SUD persistence such that a drug use disorder (either with or without an accompanying alcohol use disorder) would increase the likelihood of SUD persistence more than an alcohol use disorder only. I also expected that (6b) Other factors (childhood adversity, sociodemographic characteristics) would increase women's risk for SUD persistence, such that, for example, the risk for persistence would be increased by experiences of childhood adversity and by Hispanic or Black race/ethnicity and decreased by older age and higher socioeconomic status (as indicated by higher educational attainment, higher income, being employed). Finally, I expected that (6c) any relationship between type of SUD (i.e., alcohol only, drug only, poly-substance) and SUD persistence would differ by race/ethnicity such that (i) among women with an alcohol use disorder only, Blacks and Whites would each be more likely to persist than Hispanics, (ii) among women with a drug use disorder only, Blacks would be more likely to persist than Whites and Hispanics, and (iii) among women with both an alcohol and a drug use disorder, there would not be differences by race/ethnicity in the likelihood of persistence.

9.2. Sample characteristics for Part Two

Table 9.1 presents the characteristics of women as measured at Wave 1 by whether or not their SUD persisted at Wave 2. I tested for group differences using an unadjusted chi square test for categorical variables and an adjusted Wald test for pairwise comparisons.

Compared with women who did not have a persistent SUD at Wave 2, a greater percentage of women who had a persistent SUD at Wave 2 had a poly-substance use disorder at Wave 1 (13.9% vs. 5.6%) and fewer of them had an alcohol use disorder (74.0% vs. 81.8%). In addition, more women with a persistent SUD had experienced 3 or more types of adverse childhood experiences than women who did not have a persistent SUD (36.5% vs. 27.4%) and fewer of them had no experiences of childhood adversity (28.7% vs. 39.6%).

Finally, compared with women who did not have a persistent SUD, fewer women with a persistent SUD were Hispanic (7.8% vs. 9.2%), and more were US born (96.4% vs. 95.1%). Also, more women with a persistent SUD were age 18 to 24 at Wave 1 than women who did not have a persistent SUD (33.1% vs. 27.5%), and fewer were 45 to 64 (15.7% vs. 19.4%) or age 65 or older (1.1% vs. 2.4%). More women with a persistent SUD had attained some college education than women who did not have a persistent SUD (63.8% vs. 54.4%), and fewer had attained a high school degree or less education or had attained a post-baccalaureate degree. More women with a persistent SUD were unemployed and looking for work than women who did not have a persistent SUD (9.3% vs. 4.8%), and fewer were not in the labor force (18.0% vs. 22.5%). More women with a persistent SUD lived in the Midwest or the West than women who did not have a persistent SUD, and fewer lived in the Northeast.

There were no differences between groups in the percentage of women who at Wave 1 had a drug use disorder only, had experienced 1 to 2 types of childhood adversity, were White or Black, were age 25 to 44, were employed full-time or part-time, each category of annual household income, and lived in the South.

Table 9.1. Characteristics of White, Black, and Hispanic women with a SUD in 12 months prior to Wave 1, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), Weighted Data (n=1,025)

	Did SUD persist at Wave 2?		
	Yes (n=399; 40.0%)	No (n=626; 60.0%)	Total (n=1,025)
Key independent variable			
SUD type in 12 months prior to Wave 1, %***			
Alcohol only***	74.0	81.8	78.7
Drug only	12.1	12.6	12.4
Poly-substance***	13.9	5.6	8.9
Secondary independent variable			
Number of different types of childhood adversity, %***			
0***	28.7	39.6	35.2
1-2	34.9	33.0	33.8
>=3***	36.5	27.4	31.0
Demographic characteristics at Wave 1			
Age at Wave 1, %***			
18 to 24**	33.1	27.5	29.7
25 to 44	50.2	50.7	50.5
45 to 64**	15.7	19.4	17.9
65 and older***	1.1	2.4	1.8
Race/ethnicity, %**			
White	81.2	80.0	80.5
Black or African American	11.0	10.7	10.8
Hispanic or Latina***	7.8	9.2	8.7
US born, %*	96.4	95.1	95.6
Socioeconomic status at Wave 1			
Educational attainment at Wave 1, %***			
< HS/GED**	6.1	8.1	8.5
= HS/GED*	20.9	24.3	26.6
Some college but no degree or college graduate***	63.8	54.4	41.8
Post-baccalaureate**	9.3	13.2	9.5
Employment status at Wave 1, %***			
Employed full-time (35+ hours/week)	57.9	58.0	58.0
Employed part-time (<35 hours/week)	14.6	14.9	14.8
Unemployed and looking for work***	9.3	4.8	6.6
Unemployed and not looking for work***	18.0	22.5	20.6
Adult household income in 12 months prior to Wave 1, %			
<$15,000	19.5	18.4	18.8
$15,000 to $29,999	18.6	17.2	17.8
$30,000 to $49,999	21.0	22.2	21.7
$50,000 to $79,999	21.4	23.0	22.4
$80,000 or higher	19.5	19.2	19.3
Covariate			
Region at Wave 1, %***			
Northeast**	16.6	20.6	19.0
Midwest**	18.6	15.4	16.7
South	41.3	43.3	42.5
West**	23.4	20.8	21.8

*p<0.05; **p<0.001; ***p<0.001 SUD=substance use disorder.

9.3. Predictors of SUD persistence

First I estimated the gross relationship by regressing persistence of SUD as measured at Wave 2 on type of SUD as measured at Wave 1 (Table 9.2). Results from a Wald test indicated that I should reject the null hypothesis that the coefficients for SUD type are jointly equal to zero [Wald chi2(2)=44.21, p<0.001]. However, based on the results of a coefficient t-test, I failed to reject the null hypothesis that the coefficient for the drug use disorder only category equals zero (p=.40) and I rejected the null hypothesis that the coefficient for the poly-substance use disorder category equals zero (p<.000). Therefore, I interpreted the coefficient only for the poly-substance use disorder category of the SUD type variable. The statistically significant and positive regression coefficient for the poly-substance use disorder category of the SUD type variable suggested that having a poly-substance use disorder, relative to having an alcohol use disorder only, increased the risk for SUD persistence.

Table 9.2. Bivariate relationship between type of SUD at Wave 1 and persistence of SUD at Wave 2 among White, Black, and Hispanic women, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), Weighted Data (n=1,025)

	Coefficient	95% CI	Risk ratio	95% CI
Type of SUD in 12 months prior to Wave 1 (vs. alcohol only)				
Drug only	0.06	-0.09, 0.21	1.06	0.92, 1.23
Poly-substance	1.00***	0.79, 1.21	2.73	2.21, 3.38

*p < 0.05; **p < 0.01; *** p < 0.001. Note: CI = confidence interval. Model used logistic regression. Risk ratios are generated by exponentiating the estimated coefficients. Results from a Wald test indicated that I should reject the null hypothesis that the two coefficients for type of SUD are jointly equal to zero [Wald chi2(2df)=44.21, p<0.001].

Next, I included the other variables of interest in the regression analysis (Table 9.3). A statistically significant and positive regression coefficient for the category of having a poly-substance use disorder indicated that this type of SUD (relative to having an alcohol use disorder only) was positively associated with SUD persistence, and that this relationship existed even after accounting for other risk factors that contributed to SUD persistence.

There was a significant relationship between SUD persistence and number of experiences with different types of childhood adversity. The likelihood of SUD persistence

(relative to SUD desistence) was positively associated with having experienced 1 to 2 (RR 1.52 95% CI 1.28, 1.81) and 3 or more (RR 1.92 95% CI 1.60, 2.31) different types of childhood adversity compared to having no experiences of childhood adversity.

There was a significant relationship between SUD persistence and several sociodemographic characteristics. Specifically, relative to being 25 years old or younger, there was a significant and negative association between SUD persistence (relative to SUD desistence) and being aged 45-64 (RR 0.68 95% CI 0.53, 0.86) and aged 65 and older (RR 0.49 95% CI 0.38, 0.64). Also, each of these variables was negatively associated with SUD persistence (relative to SUD desistence): being Hispanic (RR 0.77 95% CI 0.67, 00.88) compared to being White and working part-time (RR 0.82 95% CI 0.69, 0.97) or being not in the labor force (RR 0.80 95% CI 0.67, 0.96) relative to working full-time. Finally, there was a significant and positive association between SUD persistence (relative to SUD desistence) and having attained a high school degree (RR 1.33 95% CI 1.00, 1.77) or college education (RR 1.55 95% CI 1.25, 1.92), relative to having less than a high school degree, and being unemployed compared to full-time employment (RR 1.59 95% CI 1.15, 2.19).

There was not a statistically significant association between SUD persistence and each of these variables: being age 25 to 44, Black race/ethnicity, nativity status, having obtained a GED or post-baccalaureate degree, annual household income, and region of residence.

Table 9.3. Predictors of SUD persistence at Wave 2 among White, Black, and Hispanic women, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data (n=1,022)

	Coefficient	95% CI	Risk ratio	95% CI
Type of SUD in 12 months prior to Wave 1 (ref: alcohol only)				
Drug only	0.03	-0.12, 0.17	1.03	0.89, 1.19
Poly-substance	0.93***	0.70, 1.15	2.53	2.02, 3.16
Number of types of experiences of childhood adversity (ref: 0)				
1-2	0.42***	0.25, 0.60	1.52	1.28, 1.81
>=3	0.65***	0.47, 0.84	1.92	1.60, 2.31
Age (ref: <25 years)				
25-44 years (p=0.058)	-0.19	-0.39, 0.01	0.82	0.68, 1.01
45-64 years	-0.39**	-0.63, -0.15	0.68	0.53, 0.86
65 and older	-0.71***	-0.96, -0.45	0.49	0.38, 0.64
Race/ethnicity (ref: White)				
Black	-0.04	-0.23, 0.15	0.96	0.79, 1.17
Hispanic	-0.26***	-0.39, -0.13	0.77	0.67, 0.88
US born	0.03	-0.29, 0.35	1.03	0.75, 1.41
Education (ref: <HS/GED)				
GED	-0.17	-0.61, 0.28	0.85	0.54, 1.32
HS	0.29*	0.00, 0.57	1.33	1.00, 1.77
College	0.44***	0.22, 0.65	1.55	1.25, 1.92
Post-baccalaureate	0.25	-0.11, 0.61	1.29	0.90, 1.85
Employment status (ref: Full-time)				
Part-time	-0.20*	-0.37, -0.03	0.82	0.69, 0.97
Unemployed looking for work	0.46**	0.14, 0.78	1.59	1.15, 2.19
Not in labor force	-0.22*	-0.39, -0.04	0.80	0.67, 0.96
Household income (ref: <$15k)				
$15k-29,999	-0.02	-0.34, 0.30	0.98	0.71, 1.35
$30k-49,999	-0.16	-0.46, 0.14	0.85	0.63, 1.15
$50k-79,999	-0.15	-0.44, 0.14	0.86	0.65, 1.15
$80k and up	0.03	-0.27, 0.33	1.03	0.76, 1.39
Region (ref: Northeast)				
Midwest	0.37	0.13, 0.61	1.45	1.14, 1.85
South	0.04	-0.18, 0.26	1.04	0.83, 1.29
West	0.29	0.06, 0.52	1.34	1.07, 1.68

*p < 0.05; **p < 0.01; *** p < 0.001. Note: CI = confidence interval. Model used logistic regression. Risk ratios are generated by exponentiating the estimated coefficients. 3 cases were omitted due to missing data on childhood adversity.

9.4. Moderation of SUD type by race/ethnicity

To examine whether race/ethnicity moderated the effect of SUD type on SUD persistence I conducted analysis according to these steps. First, to better understand relationships between SUD type and SUD persistence that may be unique to each race/ethnicity, I stratified the sample by race/ethnicity and I conducted logistic regression analysis to examine the predictors of SUD persistence for each group. A summary of the results from these analyses is presented in Appendix 5.

Next, I returned to the model shown in Table 9.3. I created interaction terms by multiplying: (1) SUD type, coded as a categorical variable, and (2) race/ethnicity. An omnibus test indicated that the interaction term was not statistically significant. I calculated and plotted the predicted probabilities (Figure 9.1). A visual inspection of the 95% confidence intervals around the plotted predicted probabilities indicated that the effect of SUD type on risk for SUD persistence was modified by race/ethnicity, and in ways that varied by type of SUD. To assess the nature of these relationships, I compared effects relative to each type of SUD and in relation to each category of race/ethnicity by creating nine interaction terms (i.e., three categories of SUD type by three categories of race/ethnicity). I tested each one individually against each referent group in a series of nine logistic regression models (Table 9.4).

Model 1 and Model 2 on Table 9.4 indicated that among women with an alcohol use disorder at Wave 1, Hispanic women were less likely to have a persistent SUD at Wave 2 than women who were White (Model 1 RR 0.71 95% CI 0.62, 0.82) or Black (Model 2 RR 0.78 95% CI 0.61, 0.99). Conversely, Model 3 indicated that among women with an alcohol use disorder, White and Black women were each more likely to have a persistent SUD than Hispanic women.

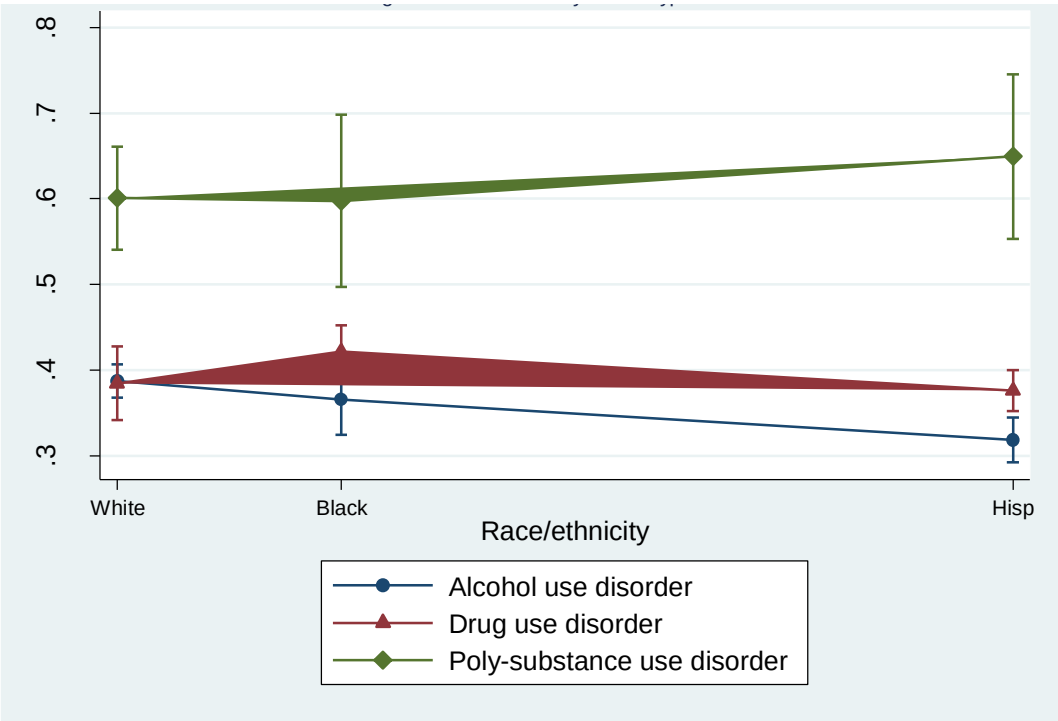
Model 4 and Model 6 indicated that among women with a drug use disorder at Wave 1, Black women were more likely to have a persistent SUD at Wave 2 than women who were White (Model 4, RR 1.26 95% CI 1.01, 1.59) or Hispanic (Model 6 RR 1.24 95% CI 1.08, 1.42).

Models 7 through 9 indicated that among women with a poly-substance use disorder at Wave 1, there were no differences by race/ethnicity in the risk for SUD persistence at Wave 2 (Models 7-9).

The results also revealed differences by race/ethnicity in the ways that type of SUD was related to persistence of SUD. Specifically, Black women with only a drug use disorder at Wave 1 were more likely to have a persistent SUD than Black women with only an alcohol use disorder at Wave 1 (Model 2 RR 1.29 95 % CI 1.04, 1.59). This was also true among Hispanic women. Hispanic women with only a drug use disorder were more likely to have a persistent SUD than Hispanic women with only an alcohol use disorder (Model 3 RR 1.34 95% CI 1.14, 1.56). In contrast, however, White women with only a drug use disorder were not more likely to have a persistent SUD than White women with only an alcohol use disorder (Model 1 RR 0.92 95% CI 0.78, 1.11).

Finally, for each category of race/ethnicity, women with a poly-substance use disorder at Wave 1 were more likely to have a persistent SUD at Wave 2 than women with either only an alcohol use disorder or only a drug use disorder (Models 1-9).

Figure 9.1. Predicted probabilities(with 95% confidence intervals) by type of SUD at Wave 1 for persistence of a SUD at Wave 2 in relation to race/ethnicity among White, Black, and Hispanic women, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data (n=1,022)



These covariates were included in the logistic regression model that was the basis for these predicted probabilities: SUD type, number of different types of experiences of childhood adversity, age, race/ethnicity, nativity status, educational attainment, employment status, annual household income, region and the interaction term SUD type by race/ethnicity. 3 cases were omitted due to missing data on childhood adversity.

Table 9.4. Moderation of SUD type at Wave 1 by race/ethnicity on risk for SUD persistence at Wave 2 among White, Black, and Hispanic women, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data (n=1,022)

Risk ratio (95% CI)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Alcohol by White	Ref	1.10 (0.88, 1.37)	1.41 (1.22, 1.62)***	1.08 (0.90, 1.29)	0.85 (0.74, 0.98)*	1.06 (0.92, 1.21)	0.42 (0.33, 0.55)***	0.41 (0.26, 0.65)***	0.37 (0.23, 0.59)***
Alcohol by Black	0.91 (0.73, 1.13)	Ref	1.28 (1.01, 1.63)*	0.98 (0.74, 1.30)	0.78 (0.63, 0.96)*	0.96 (0.77, 1.20)	0.39 (0.28, 0.54)***	0.37 (0.24, 0.59)***	0.33 (0.20, 0.56)***
Alcohol by Hisp	0.71 (0.62, 0.82)***	0.78 (0.61, 0.99)*	Ref	0.76 (0.61, 0.95)*	0.60 (0.51, 0.71)***	0.75 (0.64, 0.87)***	0.30 (0.23, 0.40)***	0.29 (0.18, 0.47)***	0.26 (0.16, 0.43)***
Drug by White	0.92 (0.78, 1.11)	1.02 (0.77, 1.35)	1.31 (1.05, 1.64)*	Ref	0.79 (0.63, 1.00)*	0.98 (0.79, 1.22)	0.39 (0.28, 0.55)***	0.38 (0.24, 0.61)***	0.34 (0.20, 0.58)***
Drug by Black	1.17 (1.01, 1.36)*	1.29 (1.04, 1.59)*	1.66 (1.40, 1.96)***	1.26 (1.01, 1.59)*	Ref	1.24 (1.08, 1.42)**	0.50 (0.38, 0.66)***	0.48 (0.30, 0.77)**	0.43 (0.26, 0.70)**
Drug by Hisp	0.95 (0.83, 1.08)	1.04 (0.83, 1.30)	1.34 (1.14, 1.56)***	1.02 (0.82, 1.27)	0.81 (0.70, 0.92)**	Ref	0.40 (0.31, 0.53)***	0.39 (0.24, 0.62)***	0.35 (0.21, 0.57)***
Poly by White	2.36 (1.82, 3.06)***	2.59 (1.84, 3.62)***	3.32 (2.51, 4.40)***	2.54 (1.81, 3.55)***	2.01 (1.52, 2.66)***	2.49 (1.89, 3.27)***	Ref	0.97 (0.57, 1.64)	0.86 (0.50, 1.48)
Poly by Black	2.43 (1.53, 3.87)***	2.67 (1.69, 4.22)***	3.43 (2.13, 5.54)***	2.62 (1.64, 4.17)***	2.07 (1.30, 3.29)**	2.57 (1.61, 4.09)***	1.03 (0.61, 1.74)	Ref	0.89 (0.46, 1.72)
Poly by Hisp	2.74 (1.69, 4.42)***	3.00 (1.800, 5.01)***	3.86 (2.35, 6.34)***	2.94 (1.73, 5.02)***	2.33 (1.44, 3.78)**	2.89 (1.77, 4.72)***	1.16 (0.68, 2.00)	1.13 (0.58, 2.18)	Ref

*p < 0.05; **p < 0.01; *** p < 0.001. CI= confidence interval. Ref= referent category. Hisp = Hispanic. Poly = poly-substance use disorder. These covariates were included in each model but are not shown: age, region, nativity status, educational attainment, employment status, household income, number of experiences of childhood adversity. 3 cases were omitted due to missing data on childhood adversity.

9.5. Chapter summary

The results from this chapter indicated that among women, SUD persistence (relative to SUD desistence) was positively associated with the presence of a poly-substance use disorder (relative to an alcohol use disorder), even after accounting for experiences of childhood adversity, and other risk factors that contributed to SUD persistence. In addition to type of SUD, SUD persistence (relative to SUD desistence) was also positively associated with having experienced 1 to 2 and 3 or more different types of childhood adversity, compared to having no experiences of childhood adversity.

There was also a significant relationship between SUD persistence and several sociodemographic characteristics. Each of these variables was negatively associated with SUD persistence (relative to SUD desistence): being 45 years old or older, relative to being age 25 or younger; Hispanic relative to White race/ethnicity; and working part-time or being not in the labor force relative to working full-time. Factors that were positively related to SUD persistence included having attained a high school degree or college education, relative to having less than a high school degree, and being unemployed compared to full-time employment.

Finally, results indicated that the relationship between SUD type and SUD persistence varied by race/ethnicity. Furthermore, the nature of the moderation effect varied by both SUD type and also by race/ethnicity. Women who were White or Black were each more likely to have a persistent alcohol use disorder than women who were Hispanic. Black women were more likely to have a persistent drug use disorder than both White women and Hispanic women. Among women with a poly-substance use disorder, there were no differences by race/ethnicity in the risk for SUD persistence. Among both Black women and Hispanic women, having a drug use disorder elevated the risk for SUD persistence more than having only an alcohol use disorder. In contrast, however, among White women having a drug use disorder did not elevate the risk for persistence of SUD more than having only an alcohol use disorder. For each category of race/ethnicity, women with a poly-substance use disorder were more likely to have a

persistent disorder than women with either only an alcohol use disorder or only a drug use disorder.

CHAPTER TEN

DISCUSSION

10.1. Discussion of major findings

10.1.1. Findings from Aim 1

A key finding from the results related to Aim 1 is that similar proportions of women and men have had a drug use disorder (2.0% vs. 2.2%) but approximately half as many women as men have ever had an alcohol use disorder (14.8% vs. 31.2%) or a poly-substance use disorder (5.2% vs. 11.9%). A second key finding from the Aim 1 results is that, for both women and men, the occurrence of an alcohol use disorder, either alone or in combination with a drug use disorder, was more common than the occurrence of a drug use disorder alone. Both of these findings are consistent with national prevalence data (e.g., SAMHSA, 2013) indicating that alcohol use disorders affect more women and men in the USA than other types of SUD and that men are more likely to exhibit abuse or dependence on alcohol and illicit drugs, however these problems affect a substantial proportion of women as well. These findings also highlight how the gender gap in rates of substance use disorders varies depending on the type of SUD that is considered. Findings underscore the need to understand the prevalence and course of different types of SUD among women and men.

Another critical finding from the Aim 1 results is that significant proportions of women and men in the USA - i.e., more than half - have experienced some form of childhood adversity, that is, childhood abuse, childhood neglect, or childhood household dysfunction. Among those who have experienced childhood adversity, fewer women than men have experienced 1 to 2 types of childhood adversity and more women than men have experienced 3 or more types of childhood adversity. Findings also revealed gender differences in type of adverse childhood experiences. Before age 18, more women than men had experienced sexual abuse and emotional abuse but fewer women than men had experienced physical abuse. Also, fewer women than men had experienced physical and emotional neglect. Finally, more women than

men reported experiences of certain types of childhood household dysfunction, specifically parental problematic substance use, having a battered mom, parental mental illness, and parental suicide attempt. Conversely, more men than women reported that during their childhood a parent had committed suicide. When we consider together these findings regarding differences by gender in the number and type of childhood adversity, it emerges that perhaps one reason why women experience more types of childhood adversity than men is because some of the types of childhood adversity that women experience are less likely to be detected and reported than the types of adversity that are experienced by men. Thus, it may be that women accrue a greater number of adverse childhood events because women's exposure to childhood adversity endures for more years of the life course than men's exposure to it.

Another implication of these findings is that it may be that the relationship between childhood adversity and SUD occurrence is dependent on both the number and also the type of adverse event. In relation to women in particular, it is notable that although a significant percentage of women have experienced some form of household dysfunction, most research on women that has examined the relationship between childhood adversity and SUD has focused on the influence of sexual abuse. These findings highlight the need to understand the relative impacts that household dysfunction and other types of adverse childhood experiences have in relation to the occurrence of different types of SUD among women, a topic that I explored further in relation to women in Aim 2.

Another key finding from these results is that, as I had hypothesized, for both women and men and in relation to each type of SUD, the odds of having a substance use disorder (relative to no SUD) was positively associated with experiences of childhood adversity (relative to no such experiences). Findings are consistent with other reports in the literature that have documented a strong and persistent relationship between childhood adversity and increased risk for occurrence of substance use disorders (e.g., Dube et al., 2002; Afifi et al., 2012; Felitti et al., 1998; Fenton et al., 2013; Green et al., 2010; Mersky et al., 2013; Pilowsky et al., 2009).

Findings also provide support for ideas proposed by Pearlin and colleagues (Pearlin, 1985; Pearlin et al., 2005) regarding how early life adverse circumstances can have long-lasting detrimental effects on health. An important implication is that to prevent substance use disorders, efforts to help children and adolescents develop strategies for coping with adversity may be especially valuable. Also, further study is needed to know how and why childhood adversity functions as an important early life origin of a greater likelihood for the occurrence of different types of SUD in adulthood. For example, it may be that childhood adversity precipitates earlier first use of substances as has been documented amonf clinic-based samples (e.g., Whitesell et al., 2009), an event which could beget other stressors, such as low educational attainnment or pregnancy at a young, in a serial unfolding of stressors, a process known as stress proliferation (Pearlin, 1985; Pearlin et al., 2005), such that as an individual progresses through the life course, they accrue more stressors and suffer more adverse consequences, collectively creating circumstances that worsen stress and challenge capacities to avoid adverse health.

Results revealed more complex associations than I had hypothesized regarding modification by gender of the effect of childhood adversity on the likelihood for each type of SUD. I had expected that experiences of childhood adversity would be positively associated with the likelihood for each type of SUD more so among women than among men. However, I found that with more experiences of different types of childhood adversity, the gap between women and men in predicted probability for a disorder narrowed in relation to occurrence of an alcohol use disorder, the gender gap converged in relation to occurrence of a drug use disorder, and it widened in relation to occurrence of a poly-substance use disorder. These findings suggest that childhood adversity may act as a force that elevates women's odds for an alcohol use disorder or a drug use disorder to levels that approximate or mirror those that are evident among men and increases the odds for a poly-substance use disorder more sharply among

men than among women. Why childhood adversity had effects on the odds for each type of SUD that were different by gender is an area for future study.

Finally, women and men appeared to be more similar than different in the ways that sociodemographic characteristics were related to the presence of different types of substance use disorders; however some meaningful differences were suggested. Specifically, women and men exhibited similarities in the ways that race/ethnicity, nativity status, and unemployment status were associated with each type of SUD. However, age and socioeconomic status were associated with the occurrence of different types of SUD in ways that appeared to be different by gender. These apparent gender differences were not statistically tested and therefore these results warrant formal assessment with statistical testing and further exploration.

10.1.2. Findings from Aim 2

As I had hypothesized, the statistically significant and positive regression coefficients for the number of different types of childhood adversity that had been experienced suggested that it had an effect on occurrence of each type of SUD even after accounting for the effect of type of childhood adversity. In addition, a reduction in the size of the regression coefficients indicated that any relationship between number of types of childhood adversity and occurrence of each type of SUD was attenuated when both type and number of childhood adversity were considered simultaneously. Findings provide further evidence for what has been documented in the literature regarding the ways in which relationships may be artificially suppressed when modeling the impact on outcomes of both the type and also the number of experiences of childhood adversity. In this dissertation, I sought to avoid this problem by using a summative measure of childhood adversity, as has been done by most research in the field (e.g., Lloyd & Taylor, 2006; Lloyd & Turner, 2008; Turner et al., 1995; Turner & Lloyd, 2003). However, by conducting exploratory factor analysis I also determined that in relation to women, type of childhood adversity may be best reduced to two concepts, i.e., childhood household dysfunction and childhood maltreatment (abuse and neglect). In subsequent analysis, these two variables

were each positively associated with the occurrence of each type of SUD. Confirmatory factor analysis is needed to test this hypothesized factor structure and examine its relationship with occurrence of different types of SUD among women.

10.1.3. Findings from Aim 3

The results that were featured in this chapter indicated that, as I had hypothesized, there was a dose-response relationship between childhood adversity and the occurrence of different types of substance use disorders (i.e., no disorder, alcohol only, drug only, poly-substance). Specifically, increases in the number of types of childhood adversities that women had experienced incrementally increased the risk for each type of SUD. Findings suggest that reducing the number of types of adversity that a girl is exposed to, for example via screening and intervention efforts during childhood, is likely to lead to reductions in the prevalence of different types of SUD among adult women.

It was also clear that women's demographic characteristics (e.g., age, race/ethnicity), socioeconomic status (household income, educational attainment, employment status), and region influenced the likelihood for the presence of different types of substance use disorders. Findings from these analyses lend support to the idea that the occurrence of different types of SUD are socially determined in important ways. Specifically, as I had hypothesized, being White, U.S. born, and unemployed were each positively associated with the occurrence of each type of SUD (relative to no SUD). Findings are consistent with a number of epidemiological surveys that have reported prevalence rates of SUD to be higher among individuals with these characteristics.

Other characteristics had effects on the likelihood of SUD occurrence that were unique to each type of SUD and, in some cases, were not as I had hypothesized. These included age, educational attainment, annual household income, and region. As I had expected, each age category older than age 24 (relative to age 18 to 24) was negatively associated with a drug use disorder. Also as I had expected, being age 65 and older (relative to age 18 to 24) was

negatively associated with the occurrence of an alcohol use disorder; it was also negatively associated with the occurrence of a poly-substance use disorder. Contrary to my expectations, however, being age 25 to 44 (relative to age 18 to 24) was positively associated with the occurrence of an alcohol use disorder. Findings highlight how women's risk for a SUD varies by age and also by type of SUD. In particular, age 18 to 24 is a period in the life course in which women face a higher risk for a drug use disorder, whereas age 25 to 44 functions as a higher risk period for an alcohol use disorder. In other words, elevated risk for a drug use disorder occurs during women's early adult years and it endures for a relatively narrow span of the life course, whereas elevated risk for an alcohol use disorder occurs as women transition into their middle adult years and it appears to endure for more years of women's life course.

The effect of educational attainment provided another key example of how factors influenced the likelihood of SUD occurrence in ways that varied by type of SUD and, in some cases, were different from my hypotheses. For example, contrary to my expectations, more educational attainment was positively associated with the occurrence of an alcohol use disorder and a poly-substance use disorder; consistent with my expectations, this same characteristic was negatively associated with the occurrence of a drug use disorder. Findings suggest that the changes in cultural milieu and social roles that generally accompany increases in education may hinder the development of a drug use disorder but facilitate the development of an alcohol use disorder.

A final example was provided by the results for household income. As I had expected, several categories of a higher annual household income (relative to an income <$15,000) were negatively associated with the occurrence of an alcohol use disorder and a polysubstance use disorder but, not as I had not expected, the highest income category (relative to an income <$15,000) was positively associated with the occurrence of a drug use disorder.

10.1.4. Findings from Aim 4

The results indicated that the moderation by SES of the relationships between childhood adversity and occurrence of each type of SUD were more complex than I had hypothesized, primarily because the nature of these relationships varied according to the number of different types of childhood adversity that had been experienced, the indicator for SES, and the type of SUD.

Contrary to the ideas proposed by Link and Phelan, there was some support for the idea that in relation to alcohol use disorders, the flexible resources that are provided by higher socioeconomic status do not help women to avoid the adverse consequences of childhood adversity. Instead, within the context of moderate exposure to childhood adversity (1 to 2 types of childhood adversity), more income and more education each appeared to heighten women's likelihood for an alcohol use disorder. However, there was also some support for the hypothesis that within the context of having had a greater exposure to childhood adversity, higher socioeconomic status helped women to avoid the adverse consequences of childhood adversity. Specifically, given a history of having had 3 or more experiences of childhood adversity, more income (relative to less income) generally had a significant and negative association with occurrence of an alcohol use disorder (relative to no SUD). These findings suggest that in the face of moderate childhood adversity (i.e., experiences with 1 to 2 types of childhood adversity) women may not recognize their use of alcohol to be a maladaptive coping mechanism, but that this awareness does emerge in the context of greater exposure to childhood adversity. These relationships may be exacerbated by the fact that women may not recognize harmful drinking behaviors to be problematic and problematic drinking is perceived to be normative behavior among certain groups of higher SES women such as women with a college education and higher income. An implication of this finding is the need to educate women about the concept of harmful drinking as an adverse coping mechanism and to provide women with alternatives to coping with childhood adversity in lieu of drinking alcohol.

When other indicators of SES were examined, it emerged that higher SES functioned as hypothesized to dampen the negative effects of childhood adversity. For example, in the context of childhood adversity, being unemployed (relative to full- or part-time employed) was positively associated with occurrence of an alcohol use disorder. These findings suggested that employment, compared to unemployment, modified the effect of childhood adversity in ways that reduced women's odds of an alcohol use disorder. It may be that employment supports women's positive self-esteem or provides a means to access health care to address the effects of childhood adversity.

In relation to drug use disorders, there was some support for the idea that the adverse consequences of childhood adversity were amplified by higher SES as provided by a higher income but they were dampened by higher SES as provided by greater educational attainment and certain employment statuses. Specifically, within the context of having had 1 to 2 experiences of childhood adversity, more income (relative to less income) had a significant and positive association with occurrence of a drug use disorder (relative to no SUD), particularly among women in the highest income category of $80,000 or more. In contrast, within the context of having had 1 to 2 and 3 or more experiences of childhood adversity, more education (relative to less education) had a significant and negative association with occurrence of a drug use disorder (relative to no SUD). Also, compared to working full-time, each of the other employment statuses was positively associated with occurrence of a drug use disorder (relative to no SUD).

Within the context of having had 1 to 2 or 3 or more experiences of childhood adversity, a significant and negative association with a poly-substance use disorder (relative to no SUD) generally occurred with higher SES as indicated by more income (relative to less income), having attained an education other than a GED, and being not in the labor force (relative to each of the other categories of employment status). In addition, in the context of 1 to 2 and 3 or more types of childhood adversity, being unemployed (relative to being employed) had a

significant and positive association with occurrence of a poly-substance use disorder (relative to no SUD).

The effect of higher SES on occurrence of a poly-substance use disorder as indicated by the highest levels of educational attainment was, in some cases, influenced by the amount of exposure to childhood adversity. Specifically, in the context of 1 to 2 and 3 or more types of childhood adversity, attainment of a college education (relative to less education) was positively associated with a poly-substance use disorder. However, in the context of 1 to 2 types of childhood adversity, a post-baccalaureate degree (relative to less education) was positively associated with a disorder; in the context of 3 or more types of childhood adversity, it was negatively associated with a disorder.

10.1.5. Findings from Aim 5

The results from Aim 5 indicated that having experienced 3 or more types of childhood adversity (relative to none) was negatively associated with an alcohol use disorder only (relative to a drug use disorder or a poly-substance use disorder). These results suggest that exposure to more types of childhood adversity increases the risk that women will develop a more severe form of SUD – i.e., a drug use disorder or a poly-substance use disorder (relative to an alcohol use disorder).

Results also revealed significant associations between demographic characteristics and occurrence of an alcohol use disorder. The odds of having an alcohol use disorder (compared to having a drug use disorder or poly-substance use disorder) were higher for women age 25 and older relative to women age 18 to 24. These findings suggest that women's likelihood for an alcohol use disorder is not limited to occurrence during younger ages only. Instead, as women age the likelihood for an alcohol use disorder (relative to a drug use disorder with and without an alcohol use disorder) continues to exist.

I also found that compared to White women, Black women had a lower likelihood of having an alcohol use disorder relative to a drug use disorder but a higher likelihood of having

an alcohol use disorder relative to a poly-substance use disorder. These findings suggest that compared to White women, Black women are more likely to use drugs only instead of alcohol only, and they are less likely to develop a poly-substance use disorder.

US born women, compared to non-US born women, had a lower likelihood of having an alcohol use disorder than a poly-substance use disorder. This finding is consistent with reports by other epidemiological studies that the prevalence and severity of substance use disorders is generally greater among US born populations than among those who were born elsewhere.

Having a high school degree or more education was positively associated with occurrence of an alcohol use disorder (relative to a drug use disorder and a poly-substance use disorder). These findings may be partly explained by the idea that educational settings provide women with exposure to drinking contexts outside of the home (Stewart et al., 2009) and, among women with more education, drinking is a more socially acceptable behavior than drug use (Stewart et al., 2009). These findings underscore the role that sociocultural forces may play in shaping the course of alcohol use disorders among women.

Findings were more mixed regarding the relationship between an alcohol use disorder and the other indicators of SES. Being employed part-time or not in the labor force (relative to working full-time) were each negatively associated with an alcohol use disorder (relative to a drug use disorder). Also, being unemployed (relative to working full-time) was negatively associated with an alcohol use disorder (relative to a poly-substance use disorder). Substance abuse generally has a negative impact on labor force participation, work performance, job retention, and earnings (for reviews, see Henkel, 2011; Huang et al., 2011). However, the temporal relationship between unemployment and the development of substance use disorders is complex and poorly understood (Henkel, 2011). Employment is critical to identity formation (Leufstadius et al., 2009; Luyckx et al., 2008), women's physical and mental well-being, and their overall quality of life (Falba et al., 2009; Mossakowski, 2008; Silver, 2010; Zabkiewicz,

2010). Therefore, it may be that the lack of full-time employment itself increases women's risk for a drug use disorder (relative to an alcohol use disorder only).

Finally, an income of $80,000 or more was negatively associated with an alcohol use disorder (relative to a drug use disorder) but it was positively associated with an alcohol use disorder (relative to a poly-substance use disorder). These findings may reflect the idea that higher income women more so than women in the lowest income category (less than $15,000) encompass two general types of substance abusers: women who only use alcohol and women who use both alcohol and drugs.

10.1.6. Findings from Aim 6

The results related to this aim indicated that SUD persistence was positively associated with the presence of a more severe form of a SUD – i.e., a poly-substance use disorder (relative to an alcohol use disorder) - even after accounting for experiences of childhood adversity, and other risk factors that contributed to SUD persistence. It is important to consider this finding in relation to the prior finding suggesting that exposure to more types of childhood adversity increased the risk that women would develop a more severe form of SUD – i.e., a drug use disorder or a poly-substance use disorder (Aim 5). When these two findings are considered together, a key implication is that more exposure to childhood adversity may somehow propel women to a more severe form of a SUD, which in turn heightens women's risk for persistence of that SUD over the life course. These ideas extend current thinking regarding the possible causal mechanisms through which childhood adversity may lead to SUD persistence among women.

In addition to type of SUD, SUD persistence was also positively associated with having experienced 1 to 2 and 3 or more different types of childhood adversity, compared to having no experiences of childhood adversity. There was also a significant relationship between SUD persistence and several sociodemographic characteristics. Each of these variables was negatively associated with SUD persistence (relative to SUD desistence): being 45 years old or

older, relative to being age 25 or younger; Hispanic relative to White race/ethnicity; and working part-time or being not in the labor force relative to working full-time. Factors that were positively related to SUD persistence included having attained a high school degree or college education, relative to having less than a high school degree, and being unemployed compared to full-time employment.

Results also indicated that the relationship between SUD type and SUD persistence varied by race/ethnicity. Furthermore, the nature of the moderation effect varied by both SUD type and also by race/ethnicity. Women who were White or Black were each more likely to have a persistent alcohol use disorder than women who were Hispanic. Findings likely reflect the idea that Hispanic women are less likely than women of other racial/ethnic groups to abuse alcohol or drugs (SAMHSA, 2001) because of strict cultural sanctions against drinking by women among Hispanic cultures (Canino, 1994; Zemore, 2007) or other factors such as the presence of coping strategies besides drinking to respond to stress (Hwang et al., 2008).

Also, Black women were more likely to have a persistent drug use disorder than both White women and Hispanic women. One possible explanation for this finding is that Black women are more likely than their Hispanic and White counterparts to believe that a SUD will resolve on its own without medical treatment (Anglin et al., 2008; Ward et al., 2009) and that Black women avoid seeking help for their SUD more than other racial/ethnic groups of women because of the real or perceived disproportionate likelihood that the parental rights of Black women will be terminated once substance abuse is detected by medical personnel or others (Roberts & Nuru-Jeter, 2012). When combined with the presence of a drug use disorder (e.g., stimulants, heroin/opioids), i.e., a disorder that has a greater addiction liability and generally requires some form of SUD treatment or social support to resolve, these beliefs may create circumstances in which Black women are less able than White or Hispanic women to avoid a persistent SUD. Clearly, additional research is needed to understand whether these speculative explanations are valid or not.

Another finding was that among both Black women and Hispanic women, having a drug use disorder elevated the risk for SUD persistence more than having only an alcohol use disorder. In contrast, however, among White women the presence of a drug use disorder did not elevate the risk for persistence of SUD more than having only an alcohol use disorder. This finding highlights how the course of a disorder varies by both the type of the SUD and also by women's race/ethnicity.

Finally, I also found that among women with a poly-substance use disorder, there were no differences by race/ethnicity in the risk for SUD persistence. In other words, for each category of race/ethnicity, women with a poly-substance use disorder were more likely to have a persistent disorder than women with either only an alcohol use disorder or only a drug use disorder. Findings underscore how the presence of a more severe disorder, i.e., a poly-substance use disorder, heightens the risk for SUD persistence, and that this is the case for women no matter their race/ethnicity.

10.2. Study limitations

This dissertation has yielded findings that must be considered in the context of a number of limitations. Assessment of substance use disorders was based on women's self-reported information. Alcohol and drug use information collected from women who are current and former substance users may be subject to social desirability bias (Murphy et al., 2010, Prendergast et al., 2013), a situation that describes misrepresentation of an answer due to social pressures or a concern for revealing sensitive behaviors (Gordis, 2004). To limit this potential source of bias, NESARC used several procedures that are known to reduce the provision of socially desirable responses including the use of audio computer-assisted interview technology (Gribble et al., 2000) and assurances to participants that the information provided would be kept confidential and used for research purposes only (Prendergast et al., 2013).

Data on childhood adversity were collected retrospectively, which may have introduced some error due to recall and reporting bias. For example, it is possible that women with

substance use disorders were more likely to subjectively recall an experience as abusive or traumatic. There is evidence to support the validity of accurate recall of adverse childhood events (Hardt & Rutter, 2004). Prior studies that have examined the validity of retrospective recall of childhood adversity have concluded that although these reports may be biased, they are sufficiently valid for epidemiological research, particularly when childhood adversity is well-defined (Brewin et al. 1993; Hardt & Rutter, 2004; Patten et al., 2014) as was done by NESARC. Under-reporting of adversity in this study may have resulted in attenuation of the relationship between adversity and SUD, whereas over-reporting may have led to an overestimation of this relationship. Also, material adversity during childhood likely has important implications for women's SUD but because it was poorly measured by NESARC, I did not consider it in this dissertation.

The cross-sectional design of NESARC precluded determining the temporal sequencing of key experiences, making it difficult to draw causal inferences for the aims related to Part One. For example, it is possible that for some women, a SUD developed either prior to the occurrence of adverse childhood events or at the same time as those events occurred. I speculate that this potential limitation was of minimal import for this dissertation given that: (1) the NESARC measurement of childhood adversity focused on events that occurred prior to age 18 and NESARC women generally first *used* alcohol or drugs in young adulthood (mean and median age of first use was 20.6 and 17.0, respectively), (2) national prevalence data indicates that a substance use *disorder* generally develops some time after first use and typically during young adulthood (ages 18-24) among women, even though *use* may begin before age 18, and (3) I am not aware of any theoretical basis for the idea that the development of a SUD prior to age 18 causes childhood adversity. Nevertheless, it is still the case that given the NESARC study design, the relationships between these factors for the aims I examined in Part One may not be causal in the direction that I have hypothesized and therefore must be interpreted with caution.

NESARC encompasses a heterogeneous sample of individuals, most of whom did not use alcohol or drugs at levels that are problematic. A large sample with SUD was provided by NESARC, a strength that I capitalized on for Aims 1-5. For Aim 6, I utilized data on 1,025 women. The power analysis that I conducted for this dissertation indicated there was adequate power to detect a difference in outcomes by the independent variables of interest that were specified for this aim.

Finally, understanding SUD among women is a complex undertaking. The issues explored in this dissertation are not exhaustive. I did not explore relationships by sub-category of drug type (e.g., heroin compared with marijuana) or the potential impact of certain other known risk factors for SUD among women, most notably co-occurring mental illness. It is also notable that I did not examine how genetic or neurochemical factors relate to the psychological and social experience of SUD. The biological basis of SUD is a relatively recent and largely unexplored topic (NIDA, 2012; Fromme & D'Amico, 1999). Limited studies of alcohol report that only some individuals who are biologically predisposed to SUD will develop the disorder and of those who do develop it, only some demonstrate a biologic predisposition (Dick & Agrawal, 2008). Findings suggest that the expression of biological susceptibility to SUD may be influenced by psychological, environmental, or other factors, underscoring the need to increase understanding of the role these other factors play in SUD risk, progression, and outcome.

10.3. Study strengths

A primary strength of this dissertation is that it utilized data provided by NESARC which is a nationally representative survey. As such, NESARC provides a critical foundation for assessing the patterns and prevalence of childhood adversity, sociodemographic characteristics, and SUD in the general population of women in the United States. The nature of the data enabled the generation of broadly generalizeable knowledge on the early life factors and social determinants that contribute to women's SUD.

Another methodological strength is the survey of a large sample of women and the deliberate overrepresentation of young adults, racial/ethnic minorities (Hispanics and Blacks), and women living in group home settings. The overrepresentation of young adults ensures that the sample covers a time in the life course that is commonly associated with the progression from substance use to substance abuse and dependence (i.e., SUD). The diverse and large study sample permitted investigation of variations within and between different subgroups of women in the factors that influence SUD risk.

In addition, NESARC is a longitudinal study. The study utilized a rich set of measures that were repeated with the same cohort at two time-points covering three years of follow-up. For Aim 6, this repeated measures longitudinal design permitted direct study of precise changes that occur within women in the SUD outcome (Fitzmaurice et al., 2011; Weiss, 2005). This design demonstrates good internal validity (Fitzmaurice et al., 2011) and is indispensable for advancing knowledge about women's SUD persistence, in addition to understanding the factors that shape this process.

From a conceptual perspective, a key strength of this dissertation is that I focused on women, a group that has historically been underrepresented in addiction research and theory (Brady & Back, 2009; Mathias, 1995; SAMHSA, 2009). Limiting the study to women contrasts with typical approaches that seek to compare women and men, making the underlying question, "How do women differ from men?" My within-woman design encourages exploration of the diversity of experiences and outcomes among subgroups of women.

Another conceptual strength of this dissertation is its reliance on a theoretical framework integrating a life course epidemiological perspective, a social determinants perspective, and two related perspectives on stress and coping spanning more than 30 years of research in the behavioral and population sciences. Each of the models that informed this dissertation—a life course (Elder, 1974, 1998, 2002) epidemiological perspective (Braveman & Barclay, 2009; Kuh et al., 2003), a social determinants perspective (Marmot, 1999), the Stress Process Model

(Pearlin, 1981, 1989, 2005), and the Theory of Fundamental Causes (Link & Phelan, 1995; Phelan et al., 2010)—offer theoretical guidance and support for different aspects of the dissertation. The integration of concepts that are provided by these models offers a more complete picture than any single theory of how women's exposures to certain social environments during childhood and other social forces contributes to the occurrence and persistence of substance use disorders in adulthood.

10.4. Public health implications

Dissertation findings advance understanding of how early life experiences and other social forces act as fundamental causes of different types of substance use disorders among women and men. In relation to women in particular, findings extend current thinking regarding factors that modify the relationship between childhood adversity and different types of substance use disorders. The knowledge gained through identifying and explicating these relationships has the potential to inform evidence-based treatments, but may also be useful for shaping other types of public health initiatives to ameliorate or prevent the occurrence and persistence of substance use disorders.

Appendix 1. Power calculations[19]

Aim 2-5

[1] Assumes the correlation among predictors is 0
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= .25
	Power (1-β err prob)	= 0.80
	Total sample size	= 19209
	R^2 other X	= 0
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.9543777

[2] Assumes the correlation among predictors is .1
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= .25
	Power (1-β err prob)	= 0.80
	Total sample size	= 19209
	R^2 other X	= .1
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.9519686

[3] Assumes the correlation among predictors is .2
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= .25

[19] I used G*Power to perform this power analysis. G*Power is available online at http://www.gpower.hhu.de/en.html

	Power (1-β err prob)	= 0.80
	Total sample size	= 19209
	R^2 other X	= .2
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.9491283

[4] Assumes the correlation among predictors is .3
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= .25
	Power (1-β err prob)	= 0.80
	Total sample size	= 19209
	R^2 other X	= .3
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.9457102

[5] Assumes the correlation among predictors is .4
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= .25
	Power (1-β err prob)	= 0.80
	Total sample size	= 19209
	R^2 other X	= .4
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.9414860

[6] Assumes the correlation among predictors is .5
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= .25

	Power (1-β err prob)	= 0.80
	Total sample size	= 19209
	R^2 other X	= .5
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.9360773

Aim 6

[1] Assumes the correlation among predictors is 0
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= 0.4
	Power (1-β err prob)	= 0.80
	Total sample size	= 1025
	R^2 other X	= 0
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.8352591

[2] Assumes the correlation among predictors is .1
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1
	α err prob	= 0.05
	Pr(Y=1|X=1) H0	= 0.4
	Power (1-β err prob)	= 0.80
	Total sample size	= 1025
	R^2 other X	= .1
	X distribution	= Normal
	X parm μ	= 0
	X parm σ	= 1
Output:	Critical z	= -1.9599640
	Odds ratio	= 0.8270292

[3] Assumes the correlation among predictors is .2
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	= Two
	Effect direction	= p2 <= p1

	α err prob	=	0.05
	Pr(Y=1|X=1) H0	=	0.4
	Power (1-β err prob)	=	0.80
	Total sample size	=	1025
	R^2 other X	=	.2
	X distribution	=	Normal
	X parm μ	=	0
	X parm σ	=	1
Output:	Critical z	=	-1.9599640
	Odds ratio	=	0.8173774

[4] Assumes the correlation among predictors is .3
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	=	Two
	Effect direction	=	p2 <= p1
	α err prob	=	0.05
	Pr(Y=1|X=1) H0	=	0.4
	Power (1-β err prob)	=	0.80
	Total sample size	=	1025
	R^2 other X	=	.3
	X distribution	=	Normal
	X parm μ	=	0
	X parm σ	=	1
Output:	Critical z	=	-1.9599640
	Odds ratio	=	0.8058328

[5] Assumes the correlation among predictors is .4
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	=	Two
	Effect direction	=	p2 <= p1
	α err prob	=	0.05
	Pr(Y=1|X=1) H0	=	0.4
	Power (1-β err prob)	=	0.80
	Total sample size	=	1025
	R^2 other X	=	.4
	X distribution	=	Normal
	X parm μ	=	0
	X parm σ	=	1
Output:	Critical z	=	-1.9599640
	Odds ratio	=	0.7916690

[6] Assumes the correlation among predictors is .5
z tests - Logistic regression
Options: Large sample z-Test, Demidenko (2007) with var corr
Analysis: Sensitivity: Compute required effect size

Input:	Tail(s)	=	Two
	Effect direction	=	p2 <= p1

	α err prob	=	0.05
	Pr(Y=1|X=1) H0	=	0.4
	Power (1-β err prob)	=	0.80
	Total sample size	=	1025
	R^2 other X	=	.5
	X distribution	=	Normal
	X parm μ	=	0
	X parm σ	=	1
Output:	Critical z	=	-1.9599640
	Odds ratio	=	0.7736923

Appendix 2. Coefficients for multinomial logistic regression model shown in Table 4.3

Table A2.1. Relationship between childhood adversity, sociodemographic characteristics, and lifetime substance use disorders among women and men (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=32,940: 19,117 women and 13,823 men)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	Women		Men		Women		Men		Women		Men	
	b	95% CI	b	95% CI	b	95% CI	b	95% CI	b	95% CI	b	95% CI
No. of different types of childhood adversity (ref: 0)												
1-2	0.46***	0.40, 0.51	0.23***	0.18, 0.28	0.58***	0.45, 0.72	0.51***	0.31, 0.71	0.75***	0.63, 0.87	0.58***	0.49, 0.66
≥3	0.75***	0.70, 0.81	0.41***	0.34, 0.48	1.36***	1.21, 1.51	1.13***	0.97, 1.29	1.42***	1.31, 1.53	1.26***	1.16, 1.36
Age (ref: 18 to 24)												
25 to 44	0.35***	0.24, 0.45	0.64***	0.57, 0.71	-0.46***	-0.62, -0.31	-0.30**	-0.47, -0.12	-0.01	-0.16, 0.13	0.35***	0.23, 0.46
45 to 64	-0.04	-0.15, 0.06	0.60***	0.51, 0.68	-1.18***	-1.38, -0.97	-0.62***	-0.81, -0.42	-0.96***	-1.11, -0.81	-0.23***	-0.33, -0.14
65 and older	-0.83***	-0.98, -0.67	0.16***	0.06, 0.25	-3.41***	-4.18, -2.63	-3.28***	-3.50, -3.06	-3.38***	-3.55, -3.21	-3.05***	-3.39, -2.72
Race/ethnicity (ref: White)												
Black	-0.90***	-0.97, -0.82	-0.57***	-0.62, -0.51	-0.41***	-0.53, -0.29	-0.28**	-0.46, -0.10	-1.14***	-1.28, -0.99	-0.71***	-0.81, -0.60
Hispanic	-0.51***	-0.58, -0.44	-0.13***	-0.18, -0.07	-0.40**	-0.69, -0.11	0.01	-0.17, 0.19	-0.49***	-0.68, -0.31	-0.32***	-0.45, -0.18
US born	1.13***	1.04, 1.21	0.87***	0.80, 0.94	1.18***	0.85, 1.51	1.54***	1.43, 1.65	1.99***	1.77, 2.20	1.86***	1.56, 2.16
Educational attainment (ref: < HS/GED)												
GED	0.11	-0.15, 0.37	0.22**	0.54, 0.39	0.19	-0.11, 0.49	0.24	-0.09, 0.56	0.86***	0.61, 1.11	0.70***	0.43, 0.96
High school degree	0.09	-0.04, 0.22	-0.14**	-0.23, -0.05	-0.16	-0.35, 0.03	0.53***	-0.76, -0.30	-0.14	-0.37, 0.10	-0.32***	-0.44, -0.19
Some college/college graduate	0.47***	0.35, 0.59	-0.10**	-0.18, -0.02	-0.25**	-0.42, -0.08	-0.46***	-0.68, -0.25	0.54***	0.34, 0.74	-0.12	-0.26, 0.01

Past-baccalaureate	0.64***	0.51, 0.78	-0.12**	-0.21, -0.03	-0.37**	-0.60, -0.14	-0.96***	-1.26, -0.65	0.45***	0.25, 0.64	-0.38***	-0.51, -0.24
Employment status (ref: Full-time)												
Employed part-time (<35 hours/week)	-0.12**	-0.19, -0.05	0.05	-0.04, 0.14	0.26**	0.07, 0.46	0.04	-0.13, 0.21	-0.03	-0.16, 0.09	0.12	-0.27, 0.02
Unemployed	0.38***	0.25, 0.51	-0.01	-0.15, 0.12	0.50***	0.23, 0.78	0.55***	0.32, 0.78	0.88***	0.66, 1.11	0.38***	0.25, 0.50
Not in labor force	-0.29***	-0.37, -0.22	-0.00	-0.08, 0.07	0.15*	0.02, 0.27	-0.02	-0.23, 0.18	-0.27***	-0.40, -0.15	-0.26***	-0.40, -0.13
Household income (ref: <$15,000)												
$15,000 to $29,999	-0.10	-0.20, 0.00	0.03	-0.06, 0.13	0.11	-0.13, 0.35	-0.09	-0.39, 0.20	0.13	-0.03, 0.30	-0.17**	-0.30, -0.04
$30,000 to $49,999	-0.10*	-0.19, -0.00	0.07	-0.03, 0.17	-0.04	-0.24, 0.15	-0.08	-0.37, 0.21	-0.04	-0.23, 0.15	-0.21**	-0.34, -0.08
$50,000 to $79,999	-0.13*	-0.23, -0.02	0.14**	0.04, 0.24	-0.21	-0.45, 0.03	0.11	-0.19, 0.40	-0.17*	-0.34, 0.00	-0.39***	-0.53, -0.25
$80,000 or higher	0.08	-0.01, 0.17	0.14**	0.04, 0.24	0.29**	0.11, 0.47	-0.18	-0.49, 0.13	-0.16*	-0.30, -0.01	-0.31***	-0.44, -0.17
Region (ref: Northeast)												
Midwest	-0.17***	-0.25, -0.09	0.03	-0.04, 0.10	-0.13	-0.33, 0.08	0.47***	0.25, 0.69	0.07	-0.10, 0.24	-0.23***	-0.35, -0.10
South	-0.04	-0.12, 0.04	-0.04	-0.10, 0.02	-0.12	-0.31, 0.06	0.17	-0.02, 0.37	0.12	-0.02, 0.27	-0.12	-0.24, 0.00
West	-0.15***	-0.24, -0.07	-0.02	-0.10, 0.05	-0.35***	-0.55, -0.15	0.05	-0.15, 0.26	-0.04	-0.20, 0.11	-0.05	-0.16, 0.07

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 167 cases were omitted due to missing data on childhood adversity.
*p < 0.05; **p < 0.01; *** p < 0.001.

Appendix 3. Moderation of childhood adversity by SES – individual consideration of moderators

A3.1. Household income

I added the interaction term annual household income X number of experiences of childhood adversity to the regression model from Chapter 7. A F-test on the interaction term for each type of SUD indicated that I should reject the null hypothesis that the coefficients for the interaction term are jointly equal to zero. To facilitate interpretation of the interaction terms, I calculated and graphed the predicted probabilities (Figure A3.1).

In Table A3.1, I re-ran the model such that the coefficients in the model are interpreted in relation to the omitted reference category for adult household income (<$15,000) and for the number of childhood adversities experienced (3 or more). A F-test on the interaction term for each type of SUD indicated that I should reject the null hypothesis that the coefficients for the interaction term are jointly equal to zero.

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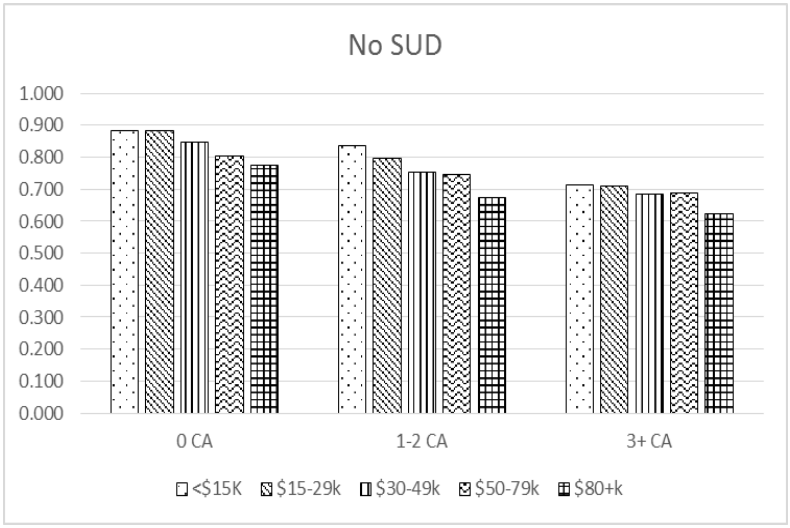
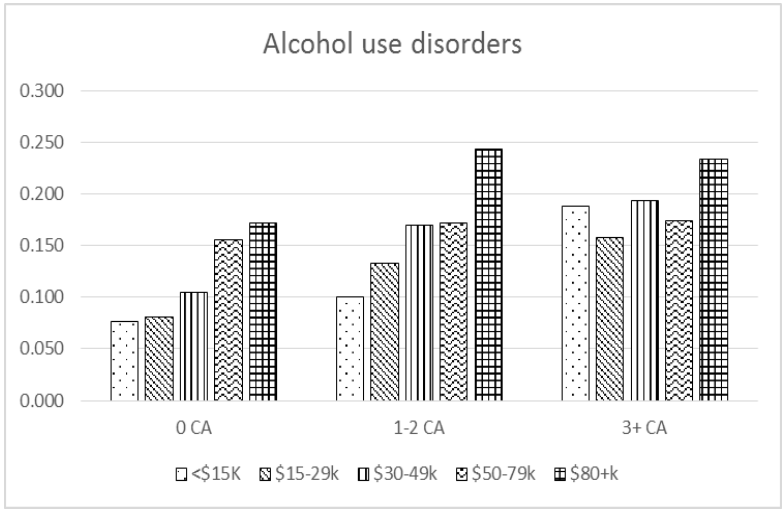
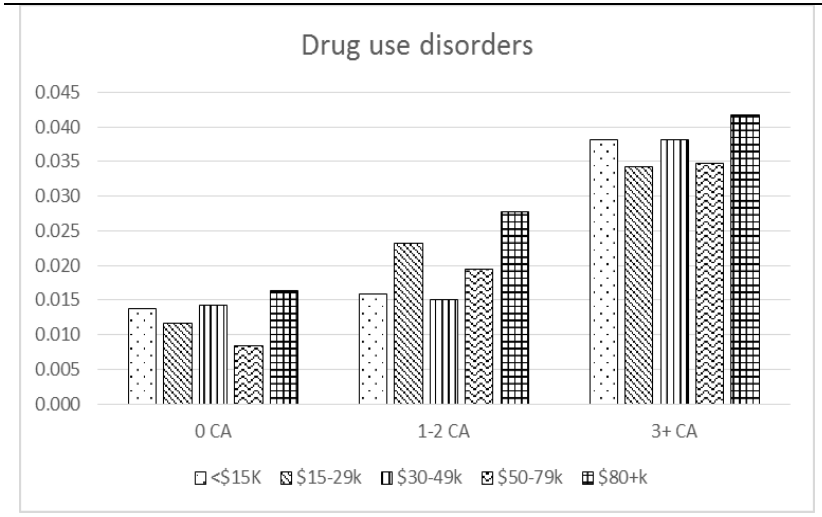
Figure A3.1. Predicted probabilities for each type of substance use disorder (SUD) in relation to experiences of childhood adversity, by level of annual household income







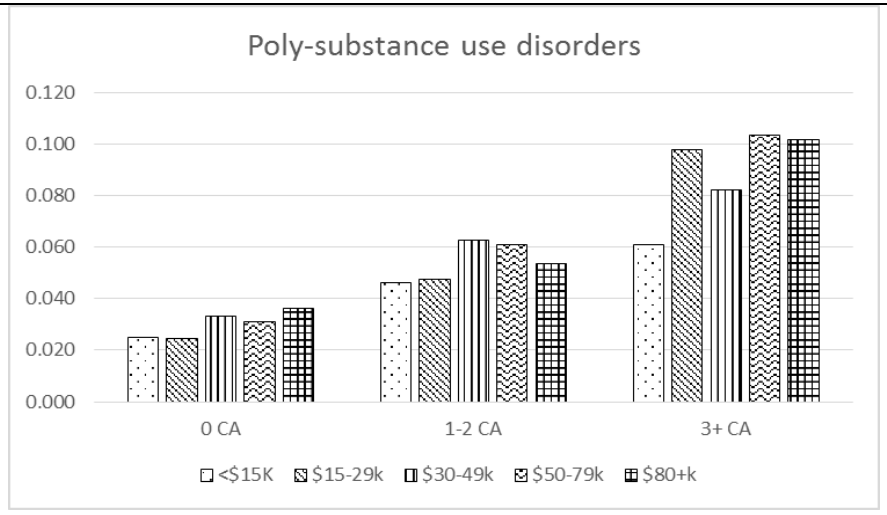


Table A3.1. Interaction of childhood adversity and household income on lifetime substance use disorders among women controlling for other sociodemographic characteristics, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=19,117) (weighted)

	Alcohol use disorder (vs. no substance use disorder)				**Drug use disorder (vs. no substance use disorder)**				**Poly-substance use disorder (vs. no substance use disorder)**			
	B	95% CI	RR	95% CI	b	95% CI	RR	95% CI	b	95% CI	RR	95% CI
Age (ref: 18 to 24)												
25 to 44	0.34***	0.23, 0.44	1.41	1.28, 1.56	-0.46***	-0.62, -0.30	0.63	0.54, 0.74	-0.01	-0.15, 0.13	0.99	0.86, 1.14
45 to 64	-0.44	-0.15, 0.06	0.96	0.86, 1.06	-1.17***	-1.37, -0.97	0.31	0.25, 0.38	-0.95***	-1.10, -0.81	0.38	0.33, 0.45
65 and older	-0.80***	-0.96, -0.65	0.45	0.38, 0.52	-3.40***	-4.18, -2.62	0.03	0.02, 0.07	-3.38***	-3.55, -3.21	0.03	0.03, 0.04
Race/ethnicity (ref: White)												
Black	-0.90***	-0.97, -0.83	0.41	0.38, 0.44	-0.41***	-0.53, -0.29	0.66	0.59, 0.75	-1.14***	-1.29, -1.00	0.32	0.28, 0.37
Hispanic	-0.51***	-0.58, -0.44	0.60	0.56, 0.65	-0.39**	-0.68, -0.10	0.68	0.50, 0.90	-0.49***	-0.68, -0.30	0.61	0.51, 0.73
US born	1.12***	1.03, 1.20	3.06	2.81, 3.33	1.18***	0.85, 1.51	3.26	2.33, 4.54	1.99***	1.78, 2.20	7.31	5.91, 9.04
Educational attainment (ref: < HS/GED)												
GED	0.09	-0.18, 0.35	1.10	0.84, 1.42	0.18	-0.12, 0.49	1.20	0.89, 1.63	0.86***	0.61, 1.11	2.36	1.84, 3.03
HS	0.10	-0.03, 0.23	1.10	0.97, 1.25	-0.15	-0.34, 0.04	0.86	0.71, 1.04	-0.14	-0.38, 0.10	0.87	0.69, 1.10
College	0.48***	0.36, 0.61	1.62	1.43, 1.83	-0.24**	-0.42, -0.07	0.78	0.66, 0.93	0.54***	0.34, 0.74	1.71	1.40, 1.90
Past-bacc	0.64***	0.51, 0.77	1.90	1.66, 2.17	-0.36**	-0.59, -0.13	0.69	0.55, 0.87	0.44***	0.25, 0.64	1.56	1.28, 1.90
Employment status (ref: Full-time)												
Part-time (<35 hours/week)	-0.12**	-0.19, -0.05	0.89	0.82, 0.95	0.26**	0.07, 0.46	1.30	1.07, 1.59	-0.04	-0.17, 0.09	0.96	0.85, 1.09
Unemployed	0.38***	0.25, 0.51	1.46	1.28, 1.66	0.51***	0.23, 0.78	1.66	1.26, 2.19	0.90***	0.67, 1.12	2.45	1.95, 3.07
Not in labor force	-0.29***	-0.37, -0.22	0.74	0.69, 0.80	0.15*	0.02, 0.28	1.16	1.02, 1.32	-0.28***	-0.40, -0.15	0.76	0.67, 0.86
Region (ref: Northeast)												

Midwest	-0.17***	-0.25, -0.09	0.84	0.78, 0.91	-0.12	-0.32, 0.08	0.88	0.72, 1.08	0.07	-0.10, 0.24	1.07	0.90, 1.27
South	-0.04	-0.12, 0.04	0.96	0.89, 1.04	-0.12	-0.30, 0.07	0.89	0.74, 1.07	0.11	-0.03, 0.26	1.12	0.97, 1.30
West	-0.15***	-0.24, -0.07	0.86	0.79, 0.93	-0.34***	-0.54, -0.15	0.71	0.58, 0.86	-0.05	-0.21, 0.11	0.95	0.81, 1.12
Childhood adversity X Household income (ref: 3+ CA & <$15k)												
0 CA & <$15k	-1.21***	-1.40, -1.02	0.30	0.25, 0.36	-1.34***	-1.67, -1.01	0.26	0.19, 0.36	-1.30***	-1.67, -0.93	0.27	0.19, 0.40
1-2 CA & <$15k	-0.86***	-1.03, -.68	0.43	0.36, 0.51	-1.13***	-1.52, -0.73	0.32	0.22, 0.48	-0.59***	-0.79, -0.39	0.55	0.46, 0.68
0 CA & $15k to $29k	-1.34***	-1.52, -1.15	0.26	0.22, 0.32	-1.46***	-1.92, -1.01	0.23	0.15, 0.37	-1.45***	-1.76, -1.13	0.24	0.17, 0.32
1-2 CA & $15k to $29k	-0.69***	-0.87, -0.51	0.50	0.42, 0.60	-0.62**	-1.00, -0.24	0.54	0.37, 0.78	-0.59***	-0.81, -0.37	0.56	0.45, 0.69
3+ CA & $15k to $29k	-0.34***	-0.52, -0.17	0.71	0.59, 0.85	-0.04	-0.44, 0.36	0.96	0.64, 1.43	0.37***	0.17, 0.57	1.44	1.18, 1.76
0 CA & $30k to $49k	-1.31***	-1.48, -1.15	0.27	0.23, 0.32	-1.37***	-1.72, -1.00	0.26	0.18, 0.37	-1.39***	-1.68, -1.10	0.25	0.19, 0.33
1-2 CA & $30k to $49k	-0.67***	-0.84, -0.50	0.51	0.43, 0.61	-1.15***	-1.45, -0.84	0.32	0.23, 0.43	-0.56***	-0.80, -0.32	0.57	0.45, 0.72
3+ CA & $30k to $49k	-0.42***	-.059, -.024	0.66	0.55, 0.79	-0.10	-0.50, 0.30	0.90	0.61, 1.34	-0.14	-0.33, 0.05	0.87	0.72, 1.05
0 CA & $50k to $79k	-1.04***	-1.19, -0.88	0.35	0.30, 0.41	-1.92***	-2.20, -1.64	0.15	0.11, 0.19	-1.59***	-1.77, -1.40	0.20	0.17, 0.25
1-2 CA & $50k to $79k	-0.85***	-1.03, -0.67	0.43	0.36, 0.51	-1.00***	-1.42, -0.58	0.37	0.24, 0.56	-0.81***	-0.98, -0.63	0.45	0.37, 0.53
3+ CA & $50k to $79k	-0.72***	-0.91, -0.53	0.49	0.40, 0.59	-0.30	-0.68, 0.08	0.74	0.51, 1.09	-0.15	-0.38, 0.07	0.86	0.68, 1.08
0 CA & $80k+	-1.00***	-1.15, -0.85	0.37	0.32, 0.43	-1.18***	-1.49, -0.87	0.31	0.23, 0.42	-1.45***	-1.63, -1.28	0.23	0.20, 0.28
1-2 CA & $80+	-0.48***	-0.64, -0.33	0.61	0.52, 0.72	-0.49**	-0.84, -0.13	0.62	0.43, 0.88	-0.88***	-1.06, -0.70	0.41	0.35, 0.50
3+ CA & $80k+	-0.43***	-0.61, -0.25	0.65	0.54, 0.78	0.03	-0.28, 0.33	1.03	0.75, 1.40	-0.13	-0.34, 0.08	0.88	0.71, 1.09

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 92 cases were omitted due to missing data on the independent variable. Odds ratios (RR) are generated by exponentiating the estimated coefficients.
*p < 0.05; **p < 0.01; *** p < 0.001.

A3.2. Educational attainment

I added the interaction term educational attainment X number of experiences of childhood adversity to the regression model from Chapter 7. A F-test on the interaction term for each type of SUD indicated that I should reject the null hypothesis that the coefficients for the interaction term are jointly equal to zero. To facilitate interpretation of the interaction terms, I calculate and graph the predicted probabilities (Figure A3.2).

In Table A3.2, I re-ran the model such that the coefficients in the model are interpreted in relation to the omitted reference category for education (<high school education) and for number of childhood adversities experienced (3 or more). A F-test on the interaction term for each type of SUD indicated that I should reject the null hypothesis that the coefficients for the interaction term are jointly equal to zero.

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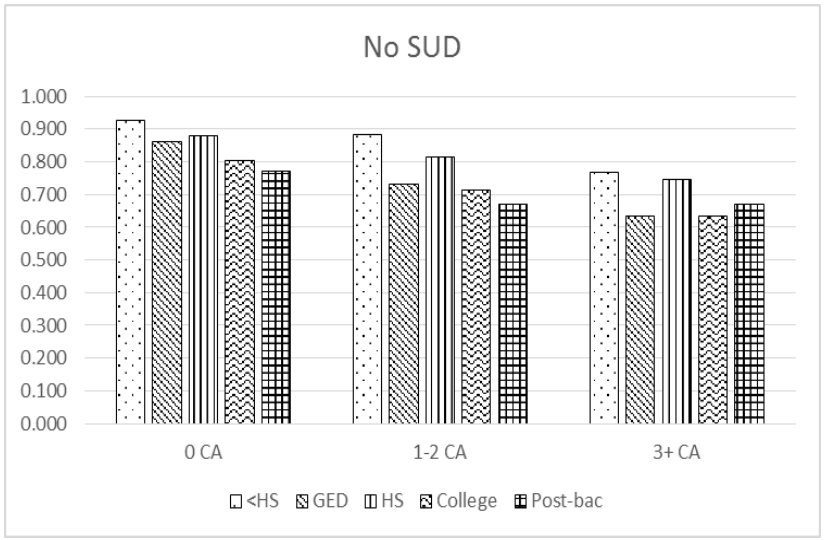
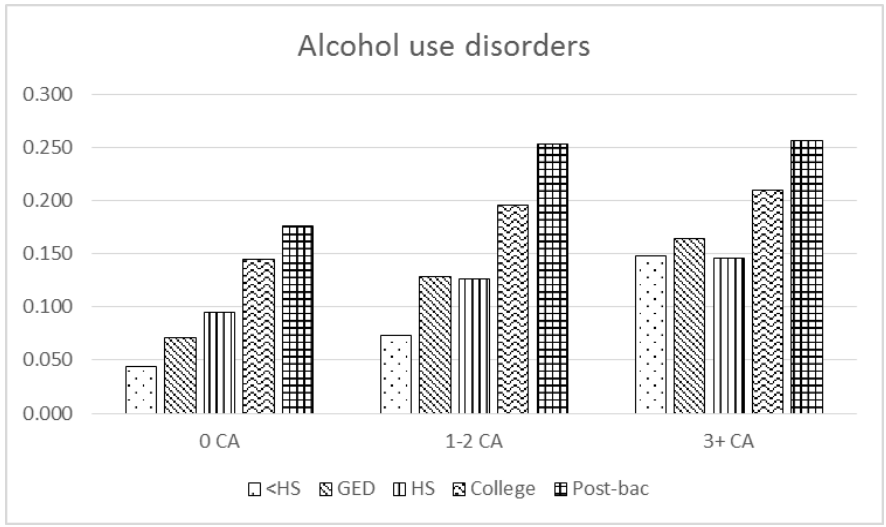
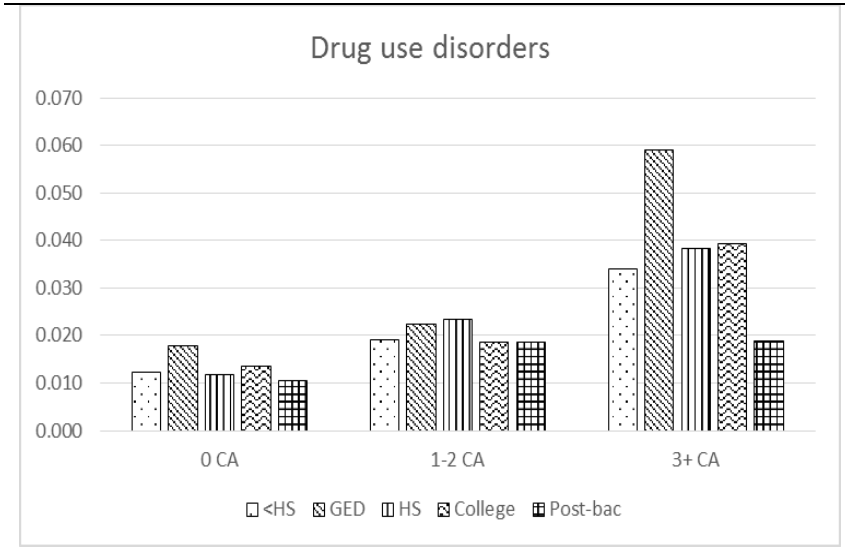
Figure A3.2. Predicted probabilities for each type of substance use disorder (SUD) in relation to experiences of childhood adversity, by level of educational attainment







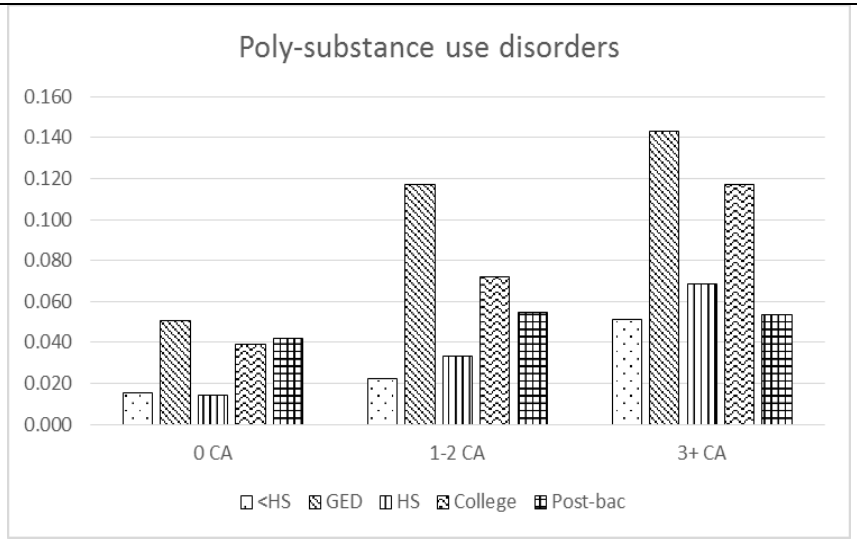


Table A3.2. Interaction of childhood adversity and educational attainment on lifetime substance use disorders among women controlling for other sociodemographic characteristics, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=19,117) (weighted)

	Alcohol use disorder (vs. no substance use disorder)				Drug use disorder (vs. no substance use disorder)				Poly-substance use disorder (vs. no substance use disorder)			
	B	95% CI	RR	95% CI	b	95% CI	RR	95% CI	b	95% CI	RR	95% CI
Age (ref: 18 to 24)												
25 to 44	0.35***	0.24, 0.45	1.41	1.28, 1.56	-0.47***	-0.62, -0.31	0.63	0.54, 0.73	-0.02	-0.17, 0.12	0.98	0.85, 1.13
45 to 64	-0.04	-0.14, 0.07	0.97	0.87, 1.08	-1.17***	-1.38, -0.97	0.31	0.25, 0.38	-0.96***	-1.10, -0.81	0.38	0.33, 0.45
65 and older	-0.82***	-0.97, -0.66	0.44	0.38, 0.52	-3.41***	-4.19, -2.63	0.03	0.02, 0.07	-3.38***	-3.54, -3.20	0.03	0.03, 0.04
Race/ethnicity (ref: White)												
Black	-0.89***	-0.96, -0.82	0.41	0.38, 0.44	-0.41***	-0.53, -0.29	0.67	0.59, 0.75	-1.13***	-1.28, -1.00	0.32	0.28, 0.37
Hispanic	-0.50***	-0.57, -0.44	0.60	0.56, 0.65	-0.40**	-0.69, -0.11	0.67	0.50, 0.90	-0.50***	-0.68, -0.32	0.61	0.50, 0.73
US born	1.12***	1.03, 1.20	3.06	2.81, 3.33	1.18***	0.84, 1.51	3.25	2.33, 4.54	1.98***	1.77, 2.19	7.27	5.89, 8.97
Household income (ref: <$15k)												
$15k-$29k	-0.10	-0.20, 0.01	0.91	0.82, 1.01	0.11	-0.13, 0.35	1.12	0.88, 1.43	0.13	-0.03, 0.30	1.14	0.97, 1.35
$30k -$49k	-0.10*	-0.20, -0.00	0.91	0.82, 1.00	-0.05	-0.24, 0.15	0.95	0.79, 1.16	-0.04	-0.23, 0.15	0.96	0.79, 1.17
$50k -$79k	-0.13*	-0.24, -0.02	0.88	0.79, 0.98	-0.21	-0.45, 0.03	0.81	0.64, 1.03	-0.17*	-0.34, -0.00	0.84	0.71, 1.00
$80k +	0.08	-0.01, 0.17	1.09	0.99, 1.19	0.29**	0.11, 0.48	1.34	1.11, 1.61	-0.16*	-0.31, -0.01	0.85	0.74, 0.99
Employment status (ref: Full-time)												
Employed part-time (<35 hours/week)	-0.12**	-0.19, -0.05	0.89	0.82, 0.95	0.27**	0.07, 0.47	1.31	1.07, 1.59	-0.03	-0.16, 0.09	0.97	0.85, 1.10
Unemployed	0.38***	0.25, 0.50	1.46	1.28, 1.65	0.51***	0.23, 0.79	1.66	1.26, 2.19	0.88***	0.65, 1.11	2.41	1.92, 3.03
Not in labor force	-0.29***	-0.37, -0.22	0.74	0.69, 0.80	0.15*	0.02, 0.27	1.16	1.02, 1.31	-0.28***	-0.40, -0.16	0.76	0.67, 0.85
Region (ref: Northeast)												

Midwest	-0.17***	-0.26, -0.09	0.84	0.77, 0.91	-0.14	-0.35, 0.07	0.87	0.70, 1.07	0.07	-0.10, 0.24	1.07	0.91, 1.27
South	-0.04	-0.12, 0.03	0.96	0.89, 1.03	-0.12	-0.31, 0.06	0.88	0.73, 1.07	0.13	-0.02, 0.27	1.13	0.98, 1.31
West	-0.15***	-0.24, -0.07	0.86	0.79, 0.93	-0.36***	-0.56, -0.16	0.70	0.57, 0.85	-0.05	-0.20, 0.11	0.96	0.82, 1.11
Childhood adversity X Education level (ref: 3+ CA & <HS)												
0 CA & <HS	-1.52***	-1.78, -1.25	0.22	0.17, 0.29	-1.36***	-1.79, -0.93	0.26	0.17, 0.40	-1.58***	-2.14, -1.03	0.21	0.12, 0.36
1-2 CA & <HS	-0.92***	-1.14, -0.70	0.40	0.32, 0.50	-0.84***	-1.14, -0.53	0.43	0.32, 0.59	-1.13***	-1.55, -0.71	0.32	0.21, 0.49
0 CA & GED	-1.41***	-1.96, -0.86	0.24	0.14, 0.43	-1.33***	-2.11, -0.55	0.26	0.12, 0.58	-0.92***	-1.45, -0.40	0.40	0.23, 0.67
1-2 CA & GED	-0.60***	-1.03, -0.17	0.55	0.36, 0.84	-0.88***	-1.31, -0.44	0.42	0.27, 0.64	0.17	-0.24, 0.58	1.19	0.79, 1.79
3+ CA & GED	-0.17**	-0.50, -0.17	0.85	0.60, 1.19	0.30	-0.14, 0.74	1.35	0.87, 2.10	0.59**	0.22, 0.96	1.81	1.25, 2.61
0 CA & HS	-1.05	-1.24, -0.85	0.35	0.29, 0.43	-1.66***	-2.02, -1.31	0.19	0.13, 0.27	-2.01***	-2.42, -1.61	0.13	0.09, 0.20
1-2 CA & HS	-0.66***	-0.87, -0.45	0.52	0.42, 0.64	-0.88***	-1.25, -0.51	0.41	0.29, 0.60	-1.05***	-1.45, -0.65	0.35	0.23, 0.52
3+ CA & HS	-0.40***	-0.60, -0.19	0.67	0.55, 0.83	-0.25	-0.61, 0.12	0.78	0.54, 1.12	-0.18	-0.51, 0.15	0.83	0.60, 1.16
0 CA & College	-0.69***	-0.87, -0.51	0.50	0.42, 0.60	-1.63***	-1.89, -1.37	0.20	0.15, 0.25	-1.11***	-1.40, -0.82	0.33	0.25, 0.44
1-2 CA & College	-0.25**	-0.44, -0.05	0.78	0.64, 0.95	-1.17***	-1.47, -0.88	0.31	0.23, 0.42	-0.33*	-0.63, -0.04	0.72	0.53, 0.96
3+ CA & College	-0.03	-0.22, 0.16	0.97	0.80, 1.18	-0.26	-0.57, 0.05	0.77	0.57, 1.06	0.32*	0.00, 0.64	1.38	1.00, 1.90
0 CA & Post-bacc	-0.54***	-0.72, -0.36	0.58	0.48, 0.69	-1.72***	-2.09, -1.35	0.18	0.12, 0.26	-0.87***	-1.21, -0.53	0.42	0.30, 0.59
1-2 CA & Post-bacc	-0.01	-0.22, 0.19	0.99	0.80, 1.21	-0.97***	-1.32, -0.61	0.38	0.27, 0.54	-0.38*	-0.75, -0.01	0.68	0.47, 0.99
3+ CA & Post-bacc	-0.01	-0.27, 0.25	0.99	0.77, 1.29	-0.96***	-1.24, -0.68	0.38	0.29, 0.54	-0.46*	-0.90, -0.03	0.63	0.41, 0.97

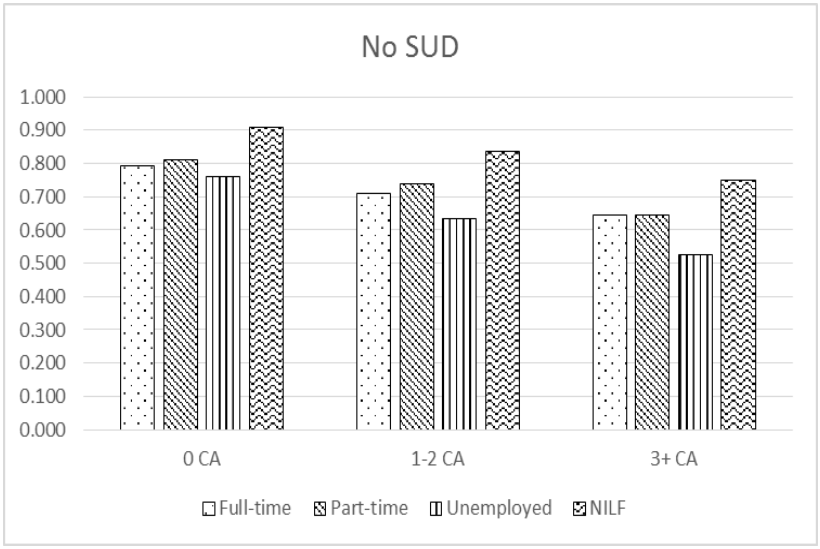
Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 92 cases were omitted due to missing data on the independent variable. Odds ratios (RR) are generated by exponentiating the estimated coefficients.
*p < 0.05; **p < 0.01; *** p < 0.001.

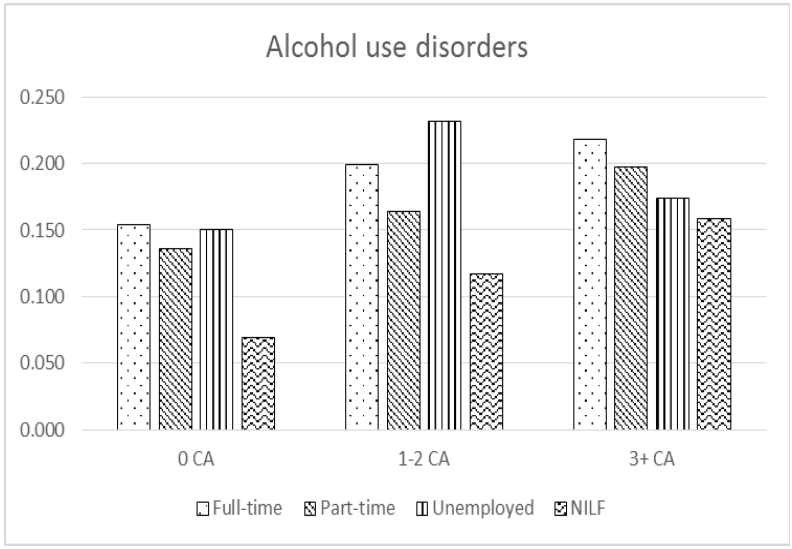
A3.3. Employment status

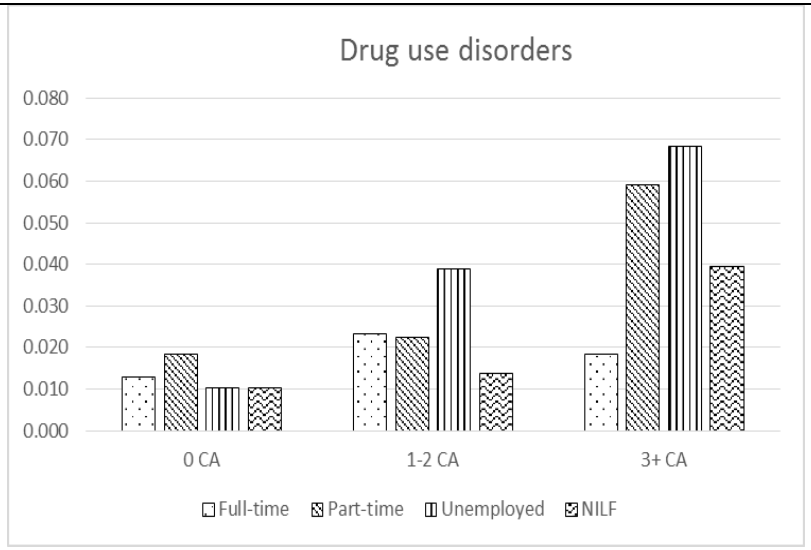
I added the interaction term employment status X number of experiences of childhood adversity to the regression model from Chapter 7. A F-test on the interaction term for each type of SUD indicated that I should reject the null hypothesis that the coefficients for the interaction term are jointly equal to zero. To facilitate interpretation of the interaction terms, I calculated and graphed the predicted probabilities (Figure A3.3).

In Table A3.3, I re-ran the model such that the coefficients in the model are interpreted in relation to the omitted reference category for employment status (unemployed) and for number of childhood adversities experienced (3 or more). A F-test on the interaction term for each type of SUD indicated that I should reject the null hypothesis that the coefficients for the interaction term are jointly equal to zero.

Figure A3.3. Predicted probabilities for each type of substance use disorder (SUD) in relation to experiences of childhood adversity, by employment status







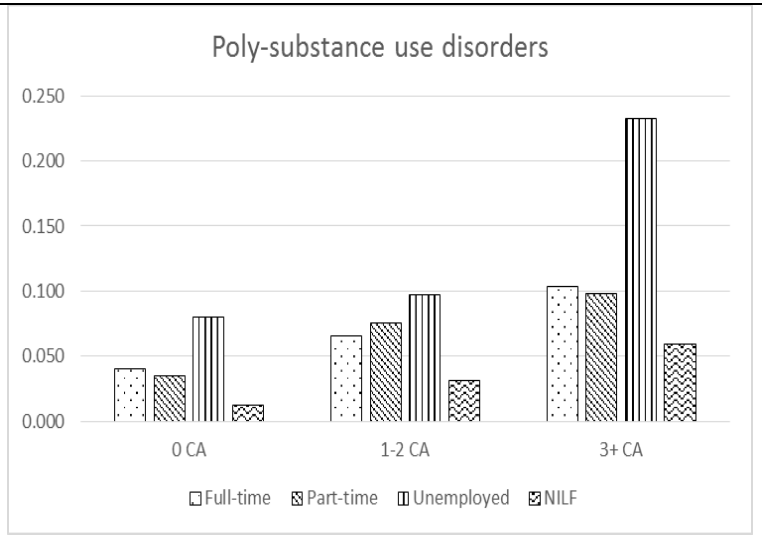


Table A3.3. Interaction of childhood adversity and employment status on lifetime substance use disorders among women controlling for other sociodemographic characteristics, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=19,117) (weighted)

	Alcohol use disorder (vs. no substance use disorder)				Drug use disorder (vs. no substance use disorder)				Poly-substance use disorder (vs. no substance use disorder)			
	b	95% CI	RR	95% CI	b	95% CI	RR	95% CI	b	95% CI	RR	95% CI
Age (ref: 18 to 24)												
25 to 44	0.34***	0.24, 0.44	1.40	1.27, 1.56	-0.47***	-0.63, -0.32	0.62	0.53, 0.73	-0.02	-0.17, 0.12	0.98	0.85, 1.13
45 to 64	-0.05	-0.16, 0.06	0.95	0.85, 1.06	-1.19***	-1.39, -0.98	0.31	0.25, 0.37	-0.97***	-1.11, -0.82	0.38	0.33, 0.44
65 and older	-0.80***	-0.96, -0.64	0.45	0.38, 0.53	-3.40***	-4.18, -2.61	0.03	0.02, 0.07	-3.34***	-3.52, -3.17	0.04	0.03, 0.04
Race/ethnicity (ref: White)												
Black	-0.90***	-0.97, -0.83	0.41	0.38, 0.44	-0.40***	-0.52, -0.28	0.67	0.60, 0.76	-1.13***	-1.27, -1.00	0.32	0.28, 0.37
Hispanic	-0.51***	-0.58, -0.44	0.60	0.56, 0.65	-0.39**	-0.68, -0.10	0.68	0.51, 0.90	-0.49***	-0.68, -0.32	0.61	0.51, 0.73
US born	1.13***	1.04, 1.22	3.10	2.84, 3.37	1.18***	0.85, 1.51	3.26	2.33, 4.54	1.98***	1.77, 2.19	7.27	5.90, 8.97
Household income (ref: <$15,000)												
$15,000-$29,999	-0.10	-0.21, 0.01	0.91	0.82, 1.01	0.12	-0.12, 0.36	1.13	0.89, 1.43	0.14	-0.03, 0.31	1.15	0.98, 1.37
$30,000-$49,999	-0.10*	-0.19, -0.00	0.91	0.83, 1.00	-0.03	-0.23, 0.16	0.97	0.80, 1.18	-0.04	-0.23, 0.15	0.96	0.79, 1.17
$50,000-$79,999	-0.12*	-0.23, -0.01	0.88	0.79, 0.99	-0.20	-0.44, 0.04	0.82	0.64, 1.04	-0.17*	-0.34, -0.00	0.84	0.71, 1.00
$80,000+	0.08	-0.01, 0.17	1.09	0.99, 1.19	0.29**	0.11, 0.48	1.34	1.12, 1.61	-0.16*	-0.31, -0.01	0.85	0.74, 0.99
Educational attainment (ref: <HS)												
GED	-0.11	-0.15, 0.37	1.12	0.86, 1.45	0.21	-0.09, 0.52	1.24	0.91, 1.68	0.86***	0.61, 1.11	2.37	1.85, 3.04
HS	0.09	-0.03, 0.22	1.10	0.97, 1.24	-0.15	-0.34, 0.04	0.86	0.71, 1.04	-0.13	-0.37, 0.10	0.87	0.69, 1.10
College	0.48***	0.36, 0.60	1.61	1.43, 1.81	-0.24**	-0.41, -0.06	0.79	0.66, 0.94	0.55***	0.35, 0.74	1.73	1.43, 2.11
Post-bacc	0.65***	0.51, 0.78	1.91	1.67, 2.17	-0.37**	-0.60, -0.14	0.69	0.55, 0.87	0.46***	0.27, 0.65	1.58	1.30, 1.92

Region (ref: Northeast)												
Midwest	-0.17***	-0.25, -0.09	0.85	0.78, 0.92	-0.11	-0.32, 0.09	0.89	0.73, 1.10	0.08	-0.10, 0.25	1.08	0.91, 1.28
South	-0.03	-0.11, 0.04	0.97	0.89, 1.04	-0.11	-0.30, 0.08	0.89	0.74, 1.08	0.13	-0.02, 0.28	1.14	0.98, 1.31
West	-0.15***	-0.24, -0.07	0.86	0.79, 0.94	-0.34***	-0.54, -0.14	0.71	0.58, 0.87	-0.04	-0.20, 0.12	0.96	0.82, 1.22
Childhood adversity X Employment status (ref: 3+ CA & Unemployed)												
0 CA & Full-time	-0.89***	-1.10, -0.68	0.41	0.33, 0.51	-2.01***	-2.44, -1.58	0.13	0.09, 0.21	-2.39***	-2.66, -2.13	0.09	0.07, 0.12
1-2 CA & Full-time	-0.49***	-0.71, -0.28	0.61	0.49, 0.76	-1.29***	-1.72, -0.85	0.28	0.18, 0.43	-1.77***	-2.02, -1.51	0.17	0.13, 0.22
3+ CA & Full-time	-0.29**	-0.52, -0.06	0.75	0.60, 0.94	-0.86***	-1.31, -0.41	0.42	0.27, 0.67	-1.19***	-1.48, -0.90	0.30	0.23, 0.40
0 CA & Part-time	-0.99***	-1.23, -0.75	0.37	0.29, 0.47	-1.73***	-2.16, -1.29	0.18	0.12, 0.27	-2.58***	-2.89, -2.27	0.08	0.06, 0.10
1-2 CA & Part-time	-0.68***	-0.93, -0.43	0.51	0.39, 0.65	-1.40***	-1.92, -0.89	0.25	0.15, 0.41	-1.67***	-1.97, -1.38	0.19	0.14, 0.25
3+ CA & Part-time	-0.33***	-0.57, -0.09	0.72	0.57, 0.91	-0.26	-0.80, 0.27	0.77	0.45, 1.31	-1.23***	-1.56, -0.90	0.29	0.21, 0.40
0 CA & Unempoyed	-0.60***	-0.90, -0.30	0.55	0.41, 0.74	-2.34***	-2.77, -1.91	0.10	0.06, 0.15	-1.58**	-2.47, -0.70	0.21	0.08, 0.50
1-2 CA & Unemployed	0.06	-0.25, 0.36	1.06	0.78, 1.43	-0.81**	-1.36, -0.27	0.44	0.26, 0.77	-1.16***	-1.51, -0.81	0.31	0.22, 0.45
0 CA & Not in labor force	-1.41***	-1.66, -1.16	0.24	0.19, 0.31	-1.84***	-2.28 - 1.40	0.16	0.10, 0.25	-3.08***	-3.38, -2.77	0.05	0.03, 0.06
1-2 CA & Not in labor force	-0.76***	-1.00, -0.52	0.47	0.34, 0.59	-1.44***	-1.95, -0.93	0.24	0.14, 0.39	-2.02***	-2.35, -1.70	0.13	0.10, 0.18
3+ CA & Not in labor force	-0.29*	-0.55, -0.03	0.75	0.58, 0.97	-0.38	-0.81, 0.05	0.69	0.45, 1.05	-1.15***	-1.47, -0.84	0.32	0.23, 0.43

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. 92 cases were omitted due to missing data on the independent variable. Odds ratios (RR) are generated by exponentiating the estimated coefficients.
*p < 0.05; **p <0.01; *** p < 0.001.

Appendix 4. Two types of drug use disorders: Marijuana and heroin/opioids

A4.1. Marijuana use disorders

In this section I focus on the occurrence of marijuana use disorders among women. Marijuana is the most widely used illicit substance nationwide (NSDUH, 2012). Moreover, the incidence and prevalence of marijauna use disorders are expected to increase in the near future (Budney & Moore, 2002; ASAM, 2012; Volkow et al., 2014) due to dramatic shifts in public opinion regarding marijuana and cannabis-related law and public policy (Grella et al., 2014; Pacula et al., 2005, 2014; Pew Research Center, 2014). At the same time, the current research base on women with marijuana use disorders has mostly been derived from research conducted with clinical samples who are in treatment for substance use problems (Calabria et al., 2010; Gordon et al., 2013; Hall & Degenhardt, 2013; Karila et al., 2014; Lev-Ran et al., 2014; Volkow et al., 2014). The data provided by NESARC provides the opportunity to examine the characteristics of women with marijuana use disorders and identify the factors that are related to occurrence of this type of disorder.

Table A4.1 presents the characteristics of women by type of marijuana use disorder: presence of a (1) marijuana use disorder only (i.e., no other type of SUD is present), (2) marijuana use disorder and an alcohol use disorder (i.e., both types of disorders are present, but there is no other type of drug use disorder), and (3) marijuana and an other type of drug use disorder. For contextual purposes, these data are presented alongside women who had a substance use disorder other than a marijuana use disorder and also in comparison with with women who had no SUD.

Based on the weighted NESARC data, I focus on differences in characteristics and experiences among women with different types of marijuana use disorders. I pay particular attention to women with a marijuana use disorder only, and the ways in which their sociodemographic characteristics compare to women who have an alcohol or drug use disorder in addition to a marijuana use disorder.

In general, compared with women who had an alcohol or drug use disorder plus a marijuana use disorder, women with a marijuana use disorder only were younger, more were Black and fewer were White, women in this group had attained fewer years of education, fewer were working full-time, and more were not in the labor force. In relation to experiences of childhood adversity, fewer women with a marijuana use disorder only had experienced 3 or more types of adversity than women with an accompanying drug use disorder.

In Table A4.1.2. I present results from multinomial regression analysis of the relationship between childhood adversity, sociodemographic characteristics, and lifetime marijuana use disorders among the White, Black, and Hispanic women in National Epidemiologic Survey on Alcohol and Related Conditions (NESARC).

Table A4.1. Characteristics of White, Black, and Hispanic women (weighted) by type of marijuana use disorder, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

	At Wave 1, lifetime occurrence of…				
	Marijuana use disorder only (n=217; 1.1%)	Marijuana and alcohol use disorder (n=430; 2.2%)	Marijuana and other drug use disorder (n=687; 3.6%)	Non-marijuana substance use disorder (n=2,695; 14.0%)	No substance use disorder (n=15,180; 78.0%)
Number of different types of childhood adversity, %***					
0	26.3	29.3	23.2	36.3	50.6
1-2	38.9	39.8	31.8	37.8	33.1
>=3	34.8	31.0	45.0	25.9	16.3
Age at Wave 1, %***					
18 to 24	35.0	20.0	18.0	10.6	12.0
25 to 44	46.5	54.8	59.3	49.6	34.7
45 to 64	18.1	24.9	21.0	32.2	31.3
65 and older	0.004	0.002	0.02	0.08	22.1
Age, Mean (SD)***	32.9 (0.49)	35.6 (0.30)	36.6 (0.31)	41.6 (0.16)	47.6 (0.09)
Race/ethnicity, %***					
White	77.5	85.6	83.8	86.0	72.8
Black or African American	15.2	9.0	6.6	7.5	14.1
Hispanic or Latina	7.4	5.5	9.6	6.6	13.0
Nativity status, %					
US born***	96.4	98.0	97.4	96.4	86.9
Educational attainment at Wave 1, %***					
< HS/GED	12.1	6.4	10.7	7.7	16.0
GED	6.3	4.1	9.5	2.9	3.4
HS	27.1	16.2	19.7	20.6	28.3
College	42.4	59.6	53.3	52.8	42.0
Past-baccalaureate	12.0	13.8	6.7	16.0	10.3
Employment status at Wave 1, %***					
Employed full-time (35+ hours/week)	44.1	57.2	50.5	55.0	42.2
Employed part-time (<35 hours/week)	18.1	19.0	17.1	15.1	13.6
Unemployed and looking for work	7.2	7.1	6.5	3.6	2.4
Unemployed and not looking for work	30.7	16.8	25.9	26.3	41.9
Adult household income in 12 months prior to Wave 1, %***					
<$15,000	17.9	10.9	17.1	13.0	19.1
$15,000 to $29,999	18.4	16.6	22.1	15.3	20.5
$30,000 to $49,999	21.4	26.8	23.0	22.7	23.1
$50,000 to $79,999	18.0	22.9	21.9	24.2	21.2
$80,000 or higher	24.3	22.9	16.0	24.8	16.1
Region, %					
Northeast	22.9	17.9	16.1	19.3	17.6
Midwest	19.1	20.0	17.5	16.9	18.6
South	41.0	36.7	42.5	39.2	38.0
West	17.0	25.5	24.0	24.5	25.9

SUD=substance use disorder.

Table A4.1.2. Relationship between childhood adversity, sociodemographic characteristics, and lifetime marijuana use disorders among White, Black, and Hispanic women (weighted), National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=19,117)

	Marijuana use disorder only (vs. no substance use disorder)				**Marijuana and alcohol use disorder only (vs. no substance use disorder)**				**Marijuana and drug use disorder (vs. no substance use disorder)**			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
No. of different types of childhood adversity (ref: 0)												
1-2	0.83***	0.63, 1.02	2.28	1.88, 2.77	0.71***	0.52, 0.90	2.03	1.69, 2.45	0.68***	0.56, 0.80	1.97	1.75, 2.22
≥3	1.35***	1.15, 1.54	3.84	3.15, 4.68	1.11***	0.95, 1.28	3.05	2.59, 3.59	1.61***	1.46, 1.75	4.98	4.31, 5.74
Age (ref: 18 to 24)												
25 to 44	-0.89***	-1.08, -0.69	0.41	0.34, 0.50	-0.21*	-0.38, -0.04	0.81	0.68, 0.96	0.15	-0.05, 0.34	1.16	0.95, 1.41
45 to 64	-1.85***	-2.07, -1.63	0.16	0.13, 0.20	-0.93***	-1.12, -0.74	0.39	0.33, 0.48	-0.84***	-1.06, -0.61	0.43	0.35, 0.54
65 and older	-5.34***	-5.56, -5.11	0.00	0.00, 0.01	-4.86***	-5.09, -4.63	0.01	0.00, 0.01	-2.84***	-3.29, -2.40	0.06	0.04, 0.09
Race/ethnicity (ref: White)												
Black	-0.25**	-0.41, -0.08	0.78	0.66, 0.92	-0.82***	-1.01, -0.63	0.44	0.36, 0.53	-1.23***	-1.36, -1.11	0.29	0.26, 0.33
Hispanic	-0.69**	-1.16, -0.21	0.50	0.31, 0.81	-0.76***	-0.97, -0.55	0.47	0.38, 0.58	-0.30**	-0.51, -0.08	0.74	0.60, 0.92
US born	1.21***	0.57, 1.84	3.34	1.77, 6.32	1.77***	1.33, 2.22	5.89	3.78, 9.17	1.76***	1.43, 2.09	5.83	4.19, 8.11
Educational attainment (ref: < HS/GED)												
GED	0.43**	0.16, 0.70	1.54	1.18, 2.01	0.40	-0.09, 0.90	1.50	0.91, 2.46	0.82***	0.57, 1.06	2.27	1.77, 2.90
High school degree	-0.02	-0.27, 0.24	0.98	0.77, 1.27	-0.08	-0.41, 0.25	0.92	0.66, 1.28	-0.19*	-0.38, 0.00	0.83	0.68, 1.00
Some college/college graduate	-0.16	-0.39, 0.07	0.85	0.68, 1.07	0.63***	0.34, 0.92	1.88	1.41, 2.51	0.24**	0.05, 0.44	1.28	1.06, 1.55
Past-baccalaureate	0.30*	0.00, 0.59	1.34	1.00, 1.80	0.71***	0.42, 0.99	2.03	1.53, 2.70	-0.20	-0.41, 0.02	0.82	0.66, 1.02
Employment status (ref:												

Full-time)												
Employed part-time (<35 hours/week)	0.19	-0.07, 0.46	1.21	0.93, 1.58	0.05	-0.15, 0.25	1.05	0.86, 1.29	0.02	-0.12, 0.15	1.02	0.89, 1.16
Unemployed	0.80***	0.45, 1.14	2.22	1.57, 3.13	0.94***	0.58, 1.30	2.56	1.79, 3.67	0.69***	0.48, 0.90	1.99	1.61, 2.46
Not in labor force	0.29**	0.12, 0.46	1.34	1.13, 1.58	-0.48***	-0.69, -0.28	0.62	0.50, 0.76	-0.13*	-0.24, -0.01	0.88	0.79, 0.99
Household income (ref: <$15,000)												
$15,000 to $29,999	0.10	-0.23, 0.43	1.10	0.80, 1.53	0.22	-0.03, 0.47	1.25	0.97, 1.61	0.07	-0.09, 0.24	1.08	0.91, 1.28
$30,000 to $49,999	0.01	-0.26, 0.27	1.01	0.77, 1.31	0.27	-0.03, 0.58	1.31	0.97, 1.79	-0.24**	-0.41, -0.07	0.79	0.66, 0.93
$50,000 to $79,999	-0.12	-0.50, 0.26	0.88	0.60, 1.29	0.01	-0.24, 0.26	1.01	0.79, 1.30	-0.32***	-0.50, -0.15	0.72	0.61, 0.86
$80,000 or higher	0.48***	0.23, 0.73	1.62	1.26, 2.08	0.21	0.04, 0.45	1.23	0.96, 1.57	-0.34***	-0.51, -0.18	0.71	0.60, 0.84
Region (ref: Northeast)												
Midwest	-0.24	-0.52, 0.04	0.78	0.59, 1.04	-0.13	-0.12, 0.32	1.10	0.89, 1.38	0.07	-0.19, 0.22	1.02	0.83, 1.24
South	-0.22	-0.45, 0.00	0.80	0.64, 1.00	-0.12	-0.23, 0.17	0.97	0.79, 1.18	0.12*	0.03, 0.38	1.23	1.03, 1.46
West	-0.70***	-1.00, -0.41	0.49	0.37, 0.66	-0.35	-0.21, 0.16	0.97	0.81, 1.17	-0.04	-0.23, 0.15	0.96	0.80, 1.17

Notes: CI = confidence interval. Models used multinomial regression. Models used no substance use disorder as the base outcome. Included in analysis but omitted from the table is the presence of any other substance use disorder (not involving marijuana) relative to the presence of no disorder. 92 cases were omitted due to missing data on the independent variable. Odds ratios (OR) are generated by exponentiating the estimated coefficients (b).
*p ≤ 0.05; **p ≤ 0.01; *** p ≤ 0.001.

A4.2. Heroin and other opioids

In this section I focus on the occurrence of heroin and other opioid use disorders among women. Relatively few individuals nationwide have a past-year heroin use disorder, however rates of prescribed opioid use disorders have escalated dramatically in the past decade, and increases have been greatest among women. Heroin and other opioids are highly addictive and lethal, and once a disorder has developed, cessation of daily use is particularly challenging. Most major longitudinal studies of heroin abusers have recruited all- or mostly male samples, precluding a focus on women. The data provided by NESARC provides the opportunity to examine the characteristics of women with use of heroin and other opioid disorders and identify the factors that are related to occurrence of this type of disorder.

Table A4.2.1 presents the characteristics of women heroin/opioid use disorders compared with those of women with all other types of a substance use disorder (other than heroin/opioids) and also in comparison with with women who had no SUD.

In general, compared with women who had another type of SUD, a greater proportion of women with a heroin/opioid use disorder were aged 18-24 (20.8% vs. 14.0%) or aged 65 or older (12.8% vs. 5.3%) and fewer were aged 24-44 (39.6% vs. 51.8%). More women with this type of disorder were White (90.0% vs. 85.1%) and fewer were Black (4.6% vs. 7.9%) or Hispanic (5.3% vs. 7.0%). Women with a heroin/opioid use disorder had fewer years of education, more were unemployed and not looking for work (34.3% vs. 25.3%), and more had a lower income (<$15,000 and $15,000 to $29,999) but more also had an income of $50,000 to $79,999. Women with a heroin/opioid use disorder experienced more different types of childhood adversity than women with other types of SUD (mean= 2.4 vs. 1.9).

In Table A4.1.3. I present results from multinomial regression analysis of the relationship between childhood adversity, sociodemographic characteristics, and lifetime heroin/opioid use disorders among the White, Black, and Hispanic women in National Epidemiologic Survey on Alcohol and Related Conditions (NESARC).

Table A4.2.1. Characteristics of White, Black, and Hispanic women with heroin/opioid use disorders, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) weighted data (n=19,209)

	At Wave 1, lifetime occurrence of…		
	Heroin/opioid use disorder (n=43; 0.22%) 0.002% weighted	Other type of SUD (n=3,986; 20.8%) 21.7% weighted	No substance use disorder (n=15,180; 78.0%) 78.0% weighted
Age at Wave 1, %***			
18 to 24	20.8	14.0	12.0
25 to 44	39.6	51.8	34.7
45 to 64	26.8	28.9	31.3
65 and older	12.8	5.3	22.1
Age, Mean (SD)***	42.4 (1.8)	39.8 (0.14)	47.6 (0.09)
Race/ethnicity, %***			
White	90.0	85.1	72.8
Black or African American	4.6	7.9	14.1
Hispanic or Latina	5.3	7.0	13.0
Nativity status, %			
US born***	98.4	96.7	86.9
Educational attainment at Wave 1, %***			
< HS/GED	11.6	8.3	16.0
GED	12.4	4.2	3.4
HS	25.5	20.3	28.3
College	44.1	53.2	42.0
Past-baccalaureate	6.4	14.1	10.3
Employment status at Wave 1, %***			
Employed full-time (35+ hours/week)	48.3	54.0	42.2
Employed part-time (<35 hours/week)	16.5	16.0	13.6
Unemployed and looking for work	1.0	4.7	2.4
Unemployed and not looking for work	34.3	25.3	41.9
Adult household income in 12 months prior to Wave 1, %***			
<$15,000	15.4	13.7	19.1
$15,000 to $29,999	19.2	16.7	20.5
$30,000 to $49,999	19.8	23.2	23.1
$50,000 to $79,999	35.9	23.2	21.2
$80,000 or higher	9.8	23.2	16.1
Region, %***			
Northeast	23.3	18.8	17.6
Midwest	8.6	17.6	18.6
South	57.6	39.4	38.0
West	10.6	24.3	25.9
Number of different types of childhood adversity, Mean (SD) Missing (n=92)***	2.4 (0.10)	1.9 (0.01)	1.2 (0.01)
Number of different types of childhood adversity, %***			
0	33.3	32.9	50.6
1-2	23.5	37.2	33.1
>=3	43.1	29.9	16.3

Statistical tests are based on weighted data. SUD=substance use disorder.

Table A4.2.2. Relationship between childhood adversity, sociodemographic characteristics, and lifetime heroin/opioid use disorders among White, Black, and Hispanic women, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), (n=19,117)

	Heroin/opioid use disorder only (vs. no substance use disorder)				**Heroin/opioid use disorder only (vs. other type of substance use disorder)**			
	b	95% CI	OR	95% CI	b	95% CI	OR	95% CI
No. of different types of childhood adversity (ref: 0)								
1-2	0.09	-0.21, 0.39	1.09	0.80, 1.48	-0.44**	-0.76, -0.13	0.64	0.47, 0.88
≥3	1.37***	1.01, 1.73	3.95	2.75, 5.66	0.41*	0.05, 0.76	1.50	1.05, 2.14
Age (ref: 18 to 24)								
25 to 44	-0.56***	-0.81, -0.31	0.57	0.45, 0.73	-0.70***	-0.95, -0.44	0.50	0.39, 0.64
45 to 64	-0.91***	-1.37, -0.44	0.40	0.25, 0.64	-0.51*	-0.97, -0.05	0.60	0.38, 0.95
65 and older	-1.08**	-1.83, -0.33	0.34	0.16, 0.72	0.36	-0.39, 1.10	1.43	0.68, 3.02
Race/ethnicity (ref: White)								
Black	-1.41***	-1.67, -1.16	0.24	0.19, 0.31	-0.53***	-0.79, -0.26	0.59	0.45, 0.77
Hispanic	-0.74***	-1.02, -0.46	0.48	0.36, 0.63	-0.25	-0.53, 0.04	0.78	0.59, 1.04
US born	2.11***	1.92, 2.31	8.33	6.85, 10.12	0.84***	0.63, 1.05	2.32	1.88, 2.85
Educational attainment (ref: < HS/GED)								
GED	1.24**	0.32, 2.16	3.46	1.38, 8.64	0.91*	-0.01, 1.82	2.48	0.99, 6.18
High school degree	-0.07	-0.98, 0.84	0.93	0.38, 2.31	-0.08	-0.99, 0.83	0.92	0.37, 2.30
Some college/college graduate	-0.01	-0.82, 0.79	0.99	0.44, 2.21	-0.42	-1.24, 0.39	0.66	0.29, 1.48
Past-baccalaureate	-0.35	-1.15, 0.46	0.71	0.32, 1.58	-0.87*	-1.68, -0.06	0.42	0.19, 0.94
Employment status (ref: Full-time)								
Employed part-time (<35 hours/week)	-0.04	-0.39, 0.32	0.96	0.67, 1.38	0.02	-0.35, 0.40	1.02	0.71, 1.49
Unemployed	-1.30**	-2.29, -0.31	0.27	0.10, 0.73	-1.86***	-2.83, -0.87	0.16	0.06, 0.42
Not in labor force	-0.13	-0.40, 0.14	0.88	0.67, 1.15	0.12	-0.15, 0.39	1.13	0.86, 1.48
Household income (ref: <$15,000)								
$15,000 to $29,999	0.15	-0.62, 0.92	1.17	0.54, 2.52	0.18	-0.59, 0.94	1.19	0.55, 2.57
$30,000 to $49,999	-0.09	-0.70, 0.51	0.91	0.50, 1.67	-0.01	-0.61, 0.58	0.99	0.54, 1.79

$50,000 to $79,999	0.62*	0.09, 1.16	1.86	1.09, 3.18	0.77**	0.23, 1.32	2.17	1.26, 3.73
$80,000 or higher	-0.31	-0.97, 0.35	0.73	0.38, 1.42	-0.37	-1.03, 0.29	0.69	0.36, 1.34
Region (ref: Northeast)								
Midwest	-1.03**	-1.66, -0.40	0.36	0.19, 0.67	-0.93**	-1.57, -0.28	0.40	0.21, 0.75
South	0.16	-0.53, 0.85	1.17	0.59, 2.34	0.17	-0.52, 0.87	1.19	0.59, 2.38
West	-1.24**	-2.00, -0.48	0.29	0.14, 0.62	-1.10**	-1.88, -0.32	0.33	0.15, 0.73

Notes: CI = confidence interval. Models used multinomial regression. 92 cases were omitted due to missing data on the independent variable. Odds ratios (OR) are generated by exponentiating the estimated coefficients.
*p < 0.05; **p < 0.01; *** p < 0.001.

Appendix 5. Summary of predictors of SUD persistence stratified by race/ethnicity

Table A5.1. Summary of predictors of SUD persistence among women at Wave 2 stratified by race/ethnicity, National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), weighted data (n=1,022)

	White (n=691)	Black (n=176)	Hispanic (n=155)
Key independent variable			
SUD type at Wave 1 (ref: Alcohol only)			
Drug only	ns	+	+
Poly-substance	+	+	+
Secondary independent variable			
Number of types of experiences of childhood adversity (ref: 0)			
1-2	+	ns	+
>=3	+	+	+
Demographic characteristics at Wave 1			
Age (ref: <25 years)			
25-44 years	-	+	ns
45-64 years	-	+	ns
65 and older	-	ne	ne
US born	ns	+	-
Socioeconomic status at Wave 1			
Education (ref: <HS/GED)			
GED	ns	-	+
HS	ns	+	+
College	ns	+	ns
Post-bacc	ns	+	ns
Employment status (ref: Full-time)			
Part-time	ns	-	-
Unemployed looking for work	ns	+	ns
NILF student	ns	ns	ns
NILF disabled/homemaker/other	-	-	-
NILF retired	-	ne	ne
Annual household income (ref: <$15k)			
$15k-29,999	ns	ns	ns
$30k-49,999	ns	-	-
$50k-79,999	ns	-	-
$80k and up	ns	-	ns
Covariate			
Region ref: Northeast			
Midwest	ns	+	+
South	ns	ns	ns
West	+	+	ns

Models used logistic regression, stratified by race/ethnicity. ns indicates not statistically significant based on conventional cut-off values for determining statistical significance; + indicates a positive association; - indicates a negative association; ne indicates not estimated because of small sample size. 3 cases were omitted due to missing data on childhood adversity.

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