Social Patterning of Health Risk Behaviors: the Mediating Role of Exposure to Childhood Adversity

by

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"…'Suppose I really am going to become somebody. Imagine.'
At that moment,…I decided the time had come when I should
cut down on dangerous habits like smoking, drinking, and cursing.
Imagine, I might really become somebody. Someday."

- Maya Angelou

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DEDICATION

This dissertation is
dedicated to:

My daughter,

Zoë Sinead Bormet

"Until she came into my life, I seemed to have been asleep, and hidden away in obscurity; but when she appeared, she woke me and led me to the light of day. Connecting all my impressions by a single thread, she wove them into a pattern of many colors, thus making herself my friend for life, the being nearest to my heart, the dearest and best known of all; while her disinterested love for all creation enriched me, and built up the strength needful for a hard life."

- Maxim Gorky

and

My grandmother,

Lillian Eleanor Engesath Boreen,

"Because they can never take your education away from you."

- Nipi

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I had the good fortune to grow up in the Bay Area of San Francisco at a time when relatively progressive state policy made augmented education programs available for children that showed academic promise. The California Department of Education conducted a timely "State Study of Educational Programs" sponsored by the State Legislature in 1957-1960. The study demonstrated that special provisions of the Mentally Gifted Minors (MGM) program were beneficial for the gifted, and that participating pupils made striking gains in achievement with accompanying personal and social benefits. My childhood circumstances, by virtue of the immediate social environment and the wider urban setting of metropolitan San Francisco, cast slim chances for my graduating from high school, let alone going to college. The likelihood of earning a doctoral degree was nil for a kid like me. However my participation in the MGM program reset my educational trajectory and changed my life chances. I am thankful to have been a part of MGM, since it opened up a world of possibilities through a love of learning.

I owe a debt of gratitude to a long line of exceptional teachers through all stages of my education. First, I am grateful to Ms. Poon for recommending that I be assessed for participation in the MGM program. I thank Ms. Adams for ensuring that I knew that “I” should always be in capitals – grammatically and otherwise. Mr. Barichievich deserves special recognition for his yearly “Don’t burn your bridges!” speech to every Sophomore biology class at El Camino High School, advising us to continue with our science, math, and English courses so we would be qualified to attend college. I would not otherwise have known the ramifications of my choice of

classes since I had no concept of what college was at the time, no idea what you did there, and no understanding of what difference a college education made. On that note, I acknowledge the influence of my high school friend Margaret Magee (née Miranda), who had aspirations and plans to attend college, which spurred me to figure out how to do the same.

My serendipity in education continued as Jane Ollenburger prohibited me from taking the proverbial year off after college and guided me to complete applications for graduate school as a doctoral student in Sociology. And John Hamlin who insisted that, despite my self-doubt, I was grad school material when he advised me to save an essay I had written about Stinchcombe for use in graduate school. Cynthia Robbins and Steve Martin are credited with directing me to the University of Michigan for a summer statistics course through the Inter-university Consortium for Political and Social Research (ICPSR) after my first year in graduate school. I quickly recognized that the University of Michigan and its reputation for fine research was right for me. I gladly returned to Ann Arbor the following year as a doctoral student in Sociology.

The University of Michigan has been very good to me. It has been an honor to be a part of an institution that seeks the ultimate best in many ways, but especially in regard to social research. I have had the privilege of learning in the company of legends and bearing witness to the words and deeds of those with expertise in every academic discipline imaginable. This atmosphere has cultivated a striving and appreciation for top notch work. My mentors have been many, especially given my extended time to degree, but I must mention those that shaped my training and experience most. Ronald C. Kessler, for being a teacher, research supervisor, and mentor for my NSRA training experience with the National Comorbidity Survey. David R. Williams, who generously lent his intellectual guidance, supported my progress, and included me in the Social Environment and Health research group at a crucial time in my A.B.D. status.

Nevertheless, they cannot hold a candle to my dissertation committee co-chairs, Sarah Burgard and Pamela Smock. Sarah and Pam saw me and this project through from start to finish, against odds of circumstance and doubt. I have always regarded the time I spent meeting with each of them as the best part of the process. They both remained stalwart as I found my way to the heart of this project and delivered it to form. Altogether I am wholeheartedly grateful to each of my dissertation committee members, including Jennifer Barber and Pamela Davis-Kean, for giving me a hand and the chance to finish.

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I thank Sean for seeing that the dedication, effort, and time required to become an elite athlete is analogous to what is required to finish a Ph.D. I could not have remained the parent our daughter deserves without his participation in co-parenting when the going got tough and the finish line was in sight.

Finally, any errors, omissions, or shortcomings of this dissertation are my own.

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ABSTRACT

Exposure to adverse childhood experience is common and has serious long-term serious consequences for physical and mental health as well as socioeconomic attainment. Yet we have limited understanding of what adverse experiences happen to which children. To address this knowledge gap, three research papers investigate exposure to adverse childhood experiences. The papers assess the childhood social and economic circumstances that shape exposure to adverse experiences, the link between childhood social and economic status (SES) and patterns in type and amount of exposure, and whether exposure to adverse experience mediates the relationship between childhood SES and health risk behavior. In Chapter 2, I demonstrate that while exposure to multiple adverse childhood experiences is associated with greater odds of current smoking and lower odds of former smoking in adulthood, exposure to adversity does not account for the association between childhood SES and adult smoking status. Chapter 3 explores links between childhood social and economic circumstances and patterns in type and amount of exposure to adverse childhood experience. Except for the consistent association with welfare receipt, aspects of disadvantaged childhood SES have varying associations with different adverse experiences. Additionally, disadvantaged childhood SES was associated with greater risk for multiple (3 or more) exposure. Chapter 4 examines the association between childhood SES and adolescent

substance use, and whether adverse experiences account for the association between childhood SES and adolescent substance use. Results suggest that while disadvantaged childhood SES is associated with increased odds of adolescent substance use, and exposure to most every adverse childhood experience is associated with increased odds of adolescent substance use, exposure to adverse experience only mediates the relationship between select childhood SES factors and adolescent use of certain substances. These results highlight the importance of expanding research on adverse childhood experience in population samples with a longitudinal design that represents all SES groups, uses multiple measures of childhood SES, and includes instruments that represent the universe of stressors for children.

CHAPTER 1
Introduction

Together, tobacco use, poor diet and physical inactivity, and alcohol consumption were the cause of close to 50% of all U.S. deaths in 2000. (Mokdad, Marks, Stroup and Gerberding 2004). A growing body of research demonstrates an association between exposure to adverse childhood experiences and many of the health behaviors that contribute to a range of chronic conditions and preventable illnesses in adulthood (Felitti, Anda, Nordenberg et al. 1998; Danese, Pariante, Caspi et al. 2007; Dube, Cook and Edwards 2010; Chapman, Liu, Presley- Cantrell et al. 2013). Research on adversity in animal models has provided evidence of the ways that early adversity can change neurobiology and contribute to risk for poor health outcomes. Although this research has not been replicated in humans it has highlighted the need for understanding the roots of adverse exposures (Shonkoff and Garner 2011; Garner and Shonkoff 2012). Social research can produce substantive information about the childhood social and economic circumstances surrounding exposure to adversity, provide evidence of the ways that circumstances shape exposure to childhood adversity, and contribute insight into the links between childhood adversity and health behavior so we can enact plans for detection and prevention and develop ways to assist those families and children in need of advocacy (Shonkoff, Boyce and McEwan 2009; Tough 2011).

Gaining greater detail about the association between childhood social and economic circumstances and exposure to childhood adversity has been somewhat overlooked in the rush to

both document how exposure to adversity impacts the neuroscience of early development and demonstrate its damaging effects on mental and physical health in adulthood (Bellis, Lowy, Leckenby, Hughes and Harrison 2013; Brent and Silverstein 2013). Awareness of the harmful effects of early childhood adversity has spurred research interest in the relationship between exposure to childhood adversity and health behavior. For example, patients that report a history of child abuse have impaired self-management of care, exhibit less collaboration in treatment, and have less trust in healthcare providers, resulting in overall higher health care costs (Rivara, Anderson, Fishman et al. 2007). Children in circumstances low parental psychological resources and low parental SES also evidence poor management of chronic illness (Drew, Berg, King et al. 2011). These results suggest a relationship between childhood SES, exposure to adverse childhood experience, and diminished health behavior.

Limitations of Existing Research

We do not have good understanding of the childhood social and economic circumstances surrounding exposure to adverse childhood experiences in the general population for a few main reasons. First, studies on adverse childhood experiences to date have been limited to non-representative samples based on convenience samples (i.e., a single healthcare maintenance organization), state by state surveys, and administrative data on individuals involved in the child welfare system. While these studies provide descriptive information on sociodemographic characteristics and prevalence estimates of overall exposure, they lack inclusion of details about the context of exposure to adverse childhood experiences and do not provide much insightful information about the nature and patterns of exposure.

Second, the research on adverse childhood experiences using general population samples is primarily focused on the earliest years of life, from in-utero to about age five. The scope of

explanatory social factors examined are generally limited to those that determine the immediate context of infancy through the pre-school years and whether a caregiver meets basic needs that are important for thriving and healthy development at that stage (e.g., sufficient nutrition, stimulation, preventive health care). Also, a focus anchored in early life limits the nature of the indicators examined to those that are reported by caregivers or observed by others (e.g., parent-child interactions, reaching developmental milestones, or brief observation periods). In contrast, adequate evaluation of exposure to adversity in childhood requires measurement of exposure to adversity beyond the preschool years, must include measurement of events and experiences that reflect the universe of stressors for youth, and are reported first hand by young individuals themselves (Avison 2010).

Third, closer examination of childhood social and economic circumstances as a factor that shapes exposure to adverse experience has been hampered by the tendency to use childhood poverty as a signal for exposure to adversity instead of analyzing a wider range of socioeconomic status (SES) groups to see whether they experience varying levels of childhood adversities. Despite clear evidence of the link between poverty and adverse experiences, exposure to childhood adversity surely occurs beyond those in impoverished circumstances. This speculation is based on a comparison of the proportion of estimated exposure to adverse childhood experience to the proportion of children estimated to live in poverty. We see that with exposure to adverse childhood experience estimated at more than 50% (Kessler, Davis and Kendler 1997; Fellitti, Anda, Nordenberg et al. 1998), exposure to adverse experience outweighs the poverty rate for children estimated at any point from the 1960s to early 2000 (poverty rate approximately 11% and 18%, respectively) (Citro and Michael 1995; Proctor 2006). As such, it seems that while exposure to adverse experience in childhood might occur less frequently in

higher SES groups, those with social and economic advantage are not spared from exposure to adverse experience.

The Importance of Social Context

A sociological approach to any issue examines social factors first. Gaining a better understanding of adverse childhood experiences requires focusing on the social factors associated with exposure to adverse experience. Family social and economic factors determine the resources available to its members and create the conditions in which children grow up (Fergusson, Swain-Campbell and Horwood 2004; Graham and Power 2004; Kuh, Power, Blane and Bartley 2004). Because children share social and economic position with their parents, childhood social and economic circumstances actually reflect family social and economic factors. This project thus takes a perspective that places birth into a family as the starting point for examining childhood social and economic circumstances that shape health behavior and views experiences in childhood as associated with the social and economic factors that characterize a family. Since experiences in childhood adversity in tandem with membership in a family, understanding the childhood social and economic circumstances associated with childhood adversity requires knowledge of the social and economic factors of the families in which exposure occurs.

Those with personal biographies that include early social and economic disadvantage are also characterized by exposure to adverse experiences in childhood. Generally, extant research has shown that the more disadvantaged an individual is on any given social or economic factor (e.g., education, income, occupation), the greater their exposure to chronic stressors (Adler and Stewart 2010). Moreoever, experts in early child development and health have asserted that the

use of family social and economic factors as a predictor variable in research is shorthand for a multiple risk score (Sameroff, Seifer and Baracosa 1987). A body of research on multiple risk exposure shows that family social and economic factors are related to multiple risk exposure across life domains (e.g., household, neighborhood, school) for children (Evans and Kim 2010). This suggests multiple risk exposure, such as exposure to childhood adversity, as a mediator between disadvantaged childhood circumstances and health-related outcomes.

Research that examines the relationship between childhood circumstances and health risk behavior has reached an ambiguous set of findings. Some research indicates no significant association between family social and economic factors and health behavior (Blane, Hart, Smith et al. 1996), while other research has found support for an inverse relationship with some health behaviors (i.e., less physical activity and less healthy diet) but not others (cigarette smoking and alcohol use) (Lynch, Kaplan and Shema 1997; van de Mheen, Stronks, Looman and Mackenbach 1998). Adjudication of these mixed findings is challenging because most research examines only one socioeconomic marker at a time and thus does not allow comparison of different markers of social and economic status to assess unique associations with various health behaviors (Cohen, Janicki-Deverts, Chen and Matthews 2010).

While research results are mixed on the association between family social and economic factors and health risk behavior, evidence is clear in demonstrating that exposure to early life adversity is associated with health risk behaviors (Dube, Cook and Edwards 2010; Edwards, Anda, Gu et al. 2007; Evans, Brooks-Gunn and Klevanov 2013; Rodgers et al. 2004; Simantov, Schoen and Klein 2000). Previous research has demonstrated that as the number of reported exposures to adverse childhood experiences increases, the risk for each of the following health risk behaviors increases: alcohol abuse and alcoholism, illicit drug use, sexually transmitted

diseases, and smoking (Anda, et al. 1999, 2008; Hillis, et al. 2000, 2004; Dube, et al. 2002, 2006; Dong, et al. 2003, 2004, 2006; Edwards, Anda, Felitti, and Dube 2003). Other health behavior outcomes also positively associated with the occurrence of ACEs include risk for intimate partner violence, multiple sexual partners, and suicide attempts.

Three Papers on Exposure to Adverse Childhood Experiences

Despite compelling evidence of the consequences of exposure to adverse childhood experiences, we know relatively little about the preceding circumstances and what adverse experiences happen to which children. The purpose of this project is to address this deficit in knowledge by examining the links between childhood social and economic circumstances, exposure to childhood adversity, and health behavior. Accordingly, three research papers comprise this project to address the following research questions: (1) Are disadvantaged childhood social and economic circumstances associated with increased likelihood of exposure to childhood adversity? (2) Is exposure to adverse childhood experiences associated with increased likelihood of health risk behavior? and (3) Does exposure to adverse childhood experiences mediate the relationship between childhood social and economic circumstances and health risk behavior?

Principles of the life course perspective and the Stress Process Model (SPM) provide a framework for examining the relationship between childhood SES circumstance and exposure to adverse childhood experience. A life course perspective directs attention toward examining the preceding SES conditions that lead to variation in exposure to adverse childhood experience (Pearlin, Schieman, Fazio, and Meersman 2005). The SPM acknowledges that stressors may take many forms, but calls attention to life events and more chronic, repeated stressors with the potential to exert a powerfully disruptive effect on an individual's life, such as loss events and

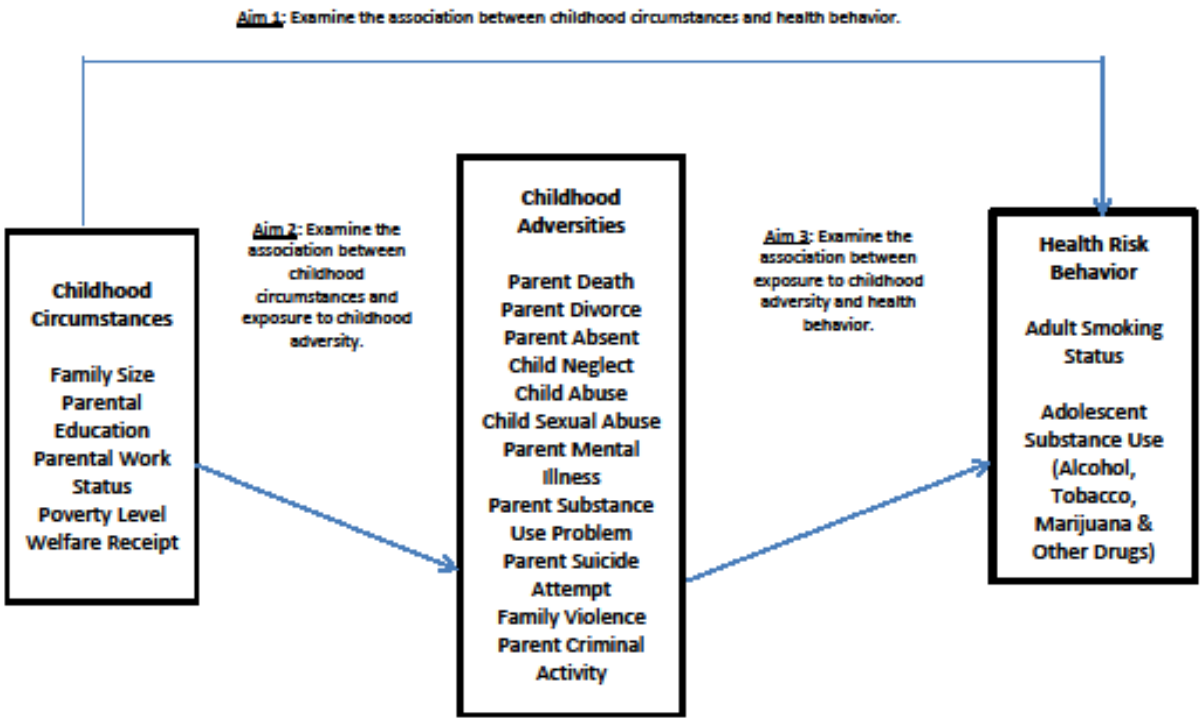
trauma, rather than events cognitively appraised as stressful (Pearlin 1999). A central tenet of the SPM is that the risk of exposure to stressors is distributed unequally so that those with the most disadvantaged social status will have the greatest chance of exposure to stress and that exposure to many stressors are rooted in social circumstances. Additionally, the social context of daily life is considered a natural origin of risk that shapes exposure to stressors. Applying the SPM to this project pinpoints the family as a natural origin of risk that shapes exposure to stressors in childhood, since the social context of childhood is centered on daily life in a family. Thus, membership in a family with more or less social and economic resources shapes the content of childhood experiences, which has potential consequences for exposure to adverse childhood experience.

The stress process model is characterized by an emphasis on exposure to stressors that are considered unwanted and unscheduled major adversities, such as circumstances or experiences that threaten personal safety, limit cultivating social ties, or are characterized by conflict, violence, or abuse (Garmezy and Masten 1994; Masten, Neemann, Adenas 1994; Hardt and Rutter 2004), the ramifications of exposure, and the social and economic circumstances surrounding exposure. Thus, the stress process perspective combined with a life course lens is best suited for this study because together they direct attention to understanding whether more or less disadvantaged childhood social and economic circumstances contribute to increased likelihood of exposure to adverse childhood experience.

The conceptual diagram in Figure 1.1 represents an application of the Stress Process Model to this project. The conceptualization of stress as a process included here is tailored to account for the role of each segment in a chain linking childhood social and economic circumstances, exposure to adverse childhood experience, and health risk behaviors. Childhood

social and economic circumstances are represented by the box on the left hand side of the figure and are the independent variables in this project. The family social and economic factors included are parent education, parent work status, welfare receipt, and, for the second and third papers only, poverty level and family size. A range of childhood adversities are included as mediating factors in the association between childhood social and economic circumstances and health risk behavior. Eight childhood adversities are included in the first paper, including interpersonal loss (parent death, divorce, or loss), child maltreatment (child neglect, child abuse, child sexual abuse), parent psychopathology (parent mental illness, parent alcohol or other drug problem), and parent problem behavior (family violence and parent criminal activity). For the second and third paper eleven childhood adversities are included, with an examination of parent death, divorce, or parent absence separately, and the addition of parent suicide attempt. Health risk behavior is the dependent variable and is represented by the box on the right hand side of the figure. The health risk behaviors examined in this project are adult smoking status (never smoker, current smoker, or former smoker) for the first paper and adolescent substance use (use of tobacco, alcohol, marijuana, prescription drugs, and other drugs) for the second and third papers.

Figure 1.1: Application of the Stress Process Model to the Examination of Childhood Circumstances, Exposure to Adversity, and Health Behavior



Project Overview

Chapter 2 examines the association between childhood social and economic circumstances and adult smoking status and considers whether exposure to childhood adversity mediates this relationship. The hypotheses to be tested are: 1) that disadvantaged childhood social and economic circumstances are associated with current smoking in adulthood; 2) that exposure to childhood adversity is associated with adult smoking status; and 3) that exposure to childhood adverse experience mediates the relationship between childhood SES and being a current vs. never smoking and current vs. former smoking. Exposure to adverse childhood experiences is expected to be associated with increased odds of being a current smoker versus never smoker status, and increased odds of being a current smoker versus former smoker.

Chapter 3 presents and tests a conceptual model that posits possible relationships between childhood social and economic circumstances and exposure to adverse experience in childhood. The general hypothesis is that disadvantaged childhood social and economic circumstances are associated with differential exposure to adverse childhood experience. This hypothesis rests on three assumptions: (1) that exposure to stressors is related to childhood SES; (2) that, compared to higher SES groups, members of lower SES groups experience higher levels of exposure to stressors; and (3) that childhood SES will be associated with variation in individual types of exposure to adverse childhood experience. The goals of this paper are to assess whether: 1) disadvantaged childhood SES is associated with increased likelihood of exposure to adverse childhood experience; 2) whether disadvantaged childhood SES is associated with increased likelihood of exposure to distinct types of adverse childhood experiences, and 3) whether disadvantaged childhood SES is associated with increased likelihood of exposure to multiple adverse childhood experiences.

Chapter 4 presents and tests a conceptual model that posits possible direct and indirect relationships among childhood SES, exposure to adverse experiences in childhood, and use of tobacco, alcohol, marijuana, prescription drugs, and other drugs in adolescence. The general hypothesis is that exposure adverse childhood experience mediates the relationship between childhood SES and adolescent substance use. This hypothesis rests on three assumptions: (1) that exposure to stressors is related to substance use; (2) that, compared to higher SES groups, members of lower SES groups experience higher levels of exposure to stressors; and (3) that greater exposure to stressors accounts for differences in adolescent substance use. The goals of this paper are to assess whether: 1) disadvantaged childhood SES is associated with increased likelihood of adolescent substance use; 2) exposure to adverse childhood experiences is associated with increased likelihood of adolescent substance use; and 3) exposure to adverse childhood experiences mediates the relationship between childhood SES and adolescent substance use.

Chapter 5 provides an overview of findings across the three research papers. Additionally, the results of hypothesized relationships between childhood social and economic circumstance, exposure to adverse childhood experiences, and health risk behavior are reviewed and discussed. Finally, directions for future research are suggested.

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CHAPTER 2
Adult Smoking Status: Links Between Childhood Social and Economic Circumstances and Exposure to Adversity

Introduction

Populations with multiple disadvantaged social and economic circumstances are disproportionately more likely to smoke, less likely to quit, and bear the greatest burden of smoking-related disease (Jarvis and Wardle 2006). Closer examination of the social and economic factors that consistently predict smoking suggest that multiple, simultaneous aspects of material disadvantage in adulthood, such as early and lone motherhood, low educational attainment, and receipt of welfare benefits, exert a strong influence on smoking status (Barbeau, Krieger, and Soobader 2004; Graham and Der 1999; Graham, Inskip, Francis and Harman 2006). In terms of quitting, the proximal adult social and economic factors that are shown to influence persistent smoking and low smoking cessation include joblessness and sparse social and economic resources (Weden, Astone and Bishai 2005), as well as general financial stress (Siahpush, Borland and Scollo 2003).

Research has demonstrated that disadvantaged childhood circumstances are significantly associated with increased risk of smoking initiation, progression to regular use, and decreased chances of cessation (Gilman, Abrams and Buka 2003). The association of childhood social and economic circumstances with the likelihood of persistent smoking and cessation in adulthood cannot be accounted for by adult socioeconomic circumstances (Jefferis, Graham, Manor and

Power. 2003; Power, Graham, Due, et al. 2005). Moreover, this effect is not explained by other childhood factors such as parental smoking (Jefferis, Power, Graham and Manor 2004). Perhaps there are other aspects of disadvantaged childhood circumstances that contribute to increased risk of smoking, but research has not yet explained the link between childhood disadvantage and increased chances of ever smoking and lower quitting among some adult populations (Healton and Nelson, 2004).

Some evidence suggests that exposure to adversity in childhood plays an important role in relation to health risk behaviors overall (Dube, Cook and Edwards 2010; Edwards, Anda, Gu et al. 2007; Evans, Brooks-Gunn, and Klebanov 2013; Rodgers 2004; Simantov, Schoen, and Klein 2000), but especially ever smoking and heavy smoking in adulthood (Anda, Croft, Felitti et al., 1999). This suggests that smoking careers in adulthood are embedded in biographies of disadvantage that are marked by social and economic hardship and exposure to childhood adversity. The relationship between childhood SES, exposure to early stress and adversity, and health behavior have generally been left out of the frame of consideration in identifying explanatory factors for health disparities (Pampel, Krueger, and Denney 2010; Umberson, Crosnoe, and Reczek 2010). As a result, we do not have confirmation of a link between childhood disadvantage, exposure to adversity, and increased risk for smoking in the general population.

This paper examines the association between childhood social and economic circumstances and adult smoking status and considers whether exposure to childhood adversity mediates this relationship. The hypotheses to be tested are: 1) that disadvantaged childhood social and economic circumstances are associated with current smoking in adulthood; 2) that exposure to childhood adversity is associated with adult smoking status; and 3) that exposure to

childhood adverse experience mediates the relationship between childhood SES and being a current vs. never smoking and current vs. former smoking. Exposure to adverse childhood experiences is expected to be associated with increased odds of being a current smoker versus never smoker status, and increased odds of being a current smoker versus former smoker.

Background

Scholarship addressing the stress-distress relationship across the life course suggests that personal trajectories marked by social disadvantage expose individuals to a lifetime of elevated exposure to stressful circumstances and adverse experiences that have detrimental consequences for physical and mental health. In fact, a large body of research provides indirect support for stress processes as a pathway in the association between SES and health by connecting disadvantaged social factors and stress on one hand, and connecting stress with health outcomes on the other hand, but we do not know if this holds for health behaviors like smoking. In regards to smoking, research has demonstrated that lower childhood SES is significantly associated with increased risk of smoking initiation, progression to regular use, and decreased chances of cessation (Gilman, Abrams and Buka 2003). Closer examination of the components of SES that consistently predict smoking status suggest that multiple, simultaneous aspects of material disadvantage, such as car ownership, early and lone motherhood, and receipt of welfare benefits, exert a strong influence on smoking (Barbeau, Krieger, and Soobader 2004; Graham and Der 1999; Graham, Inskip, Francis and Harman 2006). It seems that smoking careers are embedded in biographies of disadvantage marked by multiple hardships and exposure to the stress that accompanies adversity.

Overview of Smoking Patterns

The last four decades of research on the social patterning of smoking has amply demonstrated that that while some risk factors mediating the association between socioeconomic factors and smoking have been affected, others have emerged, resulting in an enduring, albeit transformed, association between socioeconomic position and smoking (Healton and Nelson, 2004). The highest rates of smoking are consistently found among the poorest and least educated Americans, the materially deprived and the marginalized (Tseng, Yeatts, Millikan, and Newman, 2001), and some evidence indicates that modifiable social factors such as exposure to adverse experiences and stressful circumstances in early life have a graded relationship with ever smoking as well as heavy smoking (Anda et al., 1999).

Prevalence of daily smoking in the U.S. adult population is estimated to be 19.8% and has hovered at about this rate for the better part of two decades now(Garrett, Dube, Trosclair et al. 2011) . Smoking prevalence is inversely related to educational attainment, such that rates are consistently highest for adults with a GED and those with 9-11 years of education, and lowest for those with an undergraduate or graduate degree. In fact, smoking prevalence in the U.S. declined between 1974 and 1987 nine times faster in the most educated group than in the least educated group (USDHHS 1989). Additionally, household income and occupation are repeatedly important predictors of smoking status, but low educational attainment has been found to be the strongest independent predictor of smoking with an effect that at least doubles the risk for smoking (Green, McCausland, Xiao et al. 2007).

Recent estimates for current smoking in the United States indicate that from 1983-2002 the gap in smoking prevalence by socioeconomic status did not narrow and instead may have actually widened (Barbeau, Kreiger, Soobader, 2004). In 2007, adults living below the federal

poverty level smoked at rates significantly higher (28.8%) than those at or above the federal poverty level (20.3%), and approximately one third of Medicaid recipients smoked (35.0%) (Garrett, Dube, Trosclair et al. 2011). One study revealed that among young adults (18-24 years) with a high school education or less, the most motivating factor in attempting to quit was the financial cost associated with smoking (Solberg, Asche, Boyle, McCarty and Thoele, 2007). This is an important finding since educational attainment is a predictor of a serious quit attempt, but family income is a predictor of a successful quit attempt (Winkleby, Cubbin, Ahn, Kraemer, 1990).

From 1978-80 to 1997, a span of almost twenty years, the likelihood of smoking almost doubled for blue-collar compared to white-collar workers, and for service versus white-collar workers (Giovino, Pederson, and Trosclair, 2000). For example, the most recent research results confirm inordinately high smoking prevalence rates for those in the food service industry, Eating and drinking places, 38.4%, and by occupation and gender, Female construction laborers, 51.9% and Male forestry & fishing, 38.8% (Smith 2008). Additionally, compared to white-collar ever smokers, blue-collar smokers are more likely to be heavy smokers, and blue-collar and service workers who have ever smoked are less likely to have quit and more likely to have started at a young age (Giovino, Pederson, and Trosclair, 2000).

Smoking prevalence is higher among men (22.3%) than women (17.4%), and is especially pronounced for males who drop out of high school (49.6%) (Garrett, Dube, Trosclair et al. 2011). The odds of heavy smoking were more than 4 times greater among men who had no further education beyond high school and were economically inactive compared with men in college or beyond (Yang, Lynch, Schulenberg, et al. 2008). Smoking prevalence among women of reproductive age (18-44 years) is highest for non-Hispanic whites (24.5%), those with a high

school diploma (29.4%), those with less than a high school diploma (28.3%), and divorced, widowed, or separated women (34.7%) (Garrett,Dube, Troclair et al. 2011). Women who leave school by age 16 are shown to be 2.31 times more likely to be a heavy smoker, and girls and women who did not graduate from high school are much more likely to smoke during pregnancy than women with a college degree (Graham, Inskip, Francis, Harman 2006; Mathews 2001).

Populations with multiple disadvantages are disproportionately more likely to smoke, less likely to quit, and bear the greatest burden of smoking-related disease (Jarvis and Wardle 2006). The variety of disadvantaged circumstances that predict smoking, whether material deprivation, environmental conditions, or indicators of stressful relational, personal, and household factors, suggests that most any marker of disadvantage can be expected to have an independent association with cigarette smoking. As a result, the majority of research on smoking prevalence among industrialized countries has overwhelmingly aimed to explain the graded association with SES, but research on the link between material deprivation and smoking has not achieved an answer to the question of why disadvantaged populations are more likely to smoke and why they find it harder to quit. Although the social patterning of smoking by social disadvantage is clear, understanding of the clustering of social disadvantage associated with smoking and the mechanisms that underlie the enduring relationship between social disadvantage and smoking are not well established.

Limitations of Existing Research

Identifying mechanisms at work in the social patterning of smoking prevalence and persistence has been hampered by three main limitations. First, smoking research is plagued with studies that do not accurately distinguish between findings based on psychological measures and those related to social conditions. These two very different kinds of independent variable are

often grouped together under the heading of "psychosocial environment" but psychological factors, as a source of important subjective states and meaningful perceptions, are not necessarily valid measurements of exposure in the social environment (Whitehead and Diderichsen 2001). This is an important distinction, since one potentially powerful mechanism underlying the SES-health gradient is that multiple risk exposure is one of the major pathways by which disadvantage leads to ill health (Evans and Kim 2010). A logical extension is that multiple risk exposure may be one of the major pathways by which disadvantage leads to adoption of health damaging behaviors, since health behaviors influence health outcomes. This highlights the importance of focusing on measurement of exposure as opposed to individual reflective experience.

Second, a prevailing focus on smoking as a lifestyle component, or individual health behavior, has diverted attention away from the social and environmental contexts that put people "at risk of risk" (Williams 1990). Overlooking the role of context has inhibited accounting for how social stratification differentially places population subgroups at risk of exposure to relevant risk factors and limits the identification of mechanisms that moderate the potential of risk factors (Kaplan 2004). Examining social and environmental context is particularly important to research on the etiology of smoking since it is likely that a mechanism operating at the stage of initiation is the interaction of individual-level and contextual-level factors.

Third, research on smoking has been slow to integrate social science paradigms into theory building and model testing. Recognizing the significance of "the social" in research on smoking implicates the role of broad social determinants and multiple levels, such as family, peers, and neighborhood, as etiological factors in smoking trajectories (Poland, Frohlich, Haines, Mykhalovskiy, Rock, and Sparks 2005). A social science lens on smoking suggests examining

risk exposure both within and between levels as a mediator in the association between social and economic status and smoking outcomes. A sociological approach also suggests identifying how multi-level social factors condition the effects of individual-level factors on smoking trajectories (i.e., moderating effects). Thus, bringing the social to bear on smoking research will enrich models of the multiple pathways between early life social and economic status, exposure to stress and adversity, and the potential role of multi-level social factors to explain differences in smoking behavior within and between population subgroups at risk (Flay and Clayton 2003; Wilcox 2003).

Results of research across disciplinary fields have reached an indisputable consensus on the deleterious impacts of early life stress on learning, behavior, and physical and mental well-being (Evans and English 2002; Evans and Kim 2007, 2010; McEwen 2003; Green and Darity 2010; Gunnar and Fisher 2006; McEwen and Gianaros 2010; Seeman, Epel, Gruenewald, Karlamanga, and McEwen 2010). This evidence has converged to usher in a paradigm shift in our understanding of health and disease across the lifespan suggesting that the seeds of many adult diseases take root through early exposure to stressful circumstances and exposure to adverse experiences (Shonkoff, Boyce, and McEwen 2009; Shonkoff, Garner, et al., 2012). An interface between the modifiable social factors that shape differential exposure to stress and adversity over the life course and the processes that balance risk exposure and protective factors is posited as a primary way that social disadvantage translates into health disparities (Turner 2010). At this time, some evidence indicates that early exposure to stressful circumstance and adverse experiences are associated with risky health behaviors in childhood and adolescence (Middlebrooks and Audage 2008). However, definitive evidence of the social factors that shape

early stress exposure, the kind and nature of exposures that play a causal role, and the modifying influences that are relevant to the adoption of risky health behaviors is sparse.

The ACE Study: Pioneer of Research on Childhood Adversity

The Adverse Childhood Experience (ACE) Study has been a lynchpin for documenting a strong link between exposure to childhood adversity and adult smoking. The ACE study was designed to assess the effect of specific adverse childhood experiences on the adoption of health behaviors in adulthood (Felitti, Anda, Nordenberg et al. 1998). In brief, the ACE Study uses an ACE Score, which is a count of the total number of adverse childhood experiences that a respondent reports has occurred prior to age 18 in their lifetime, to assess the total amount of adversity during childhood. Results of the ACE Study demonstrated a strong, graded relationship between ACE Score and smoking status (Anda, Croft, Felitti et al., 1999). All categories of adverse childhood experiences were shown to be associated with significantly higher risk of ever smoking and heavy smoking. Moreover, the relationship between number of adverse childhood experiences and age of smoking initiation was inversely associated so that those with no adverse experiences had a mean age of initiation of 20.9 years while those with 8 adverse experiences had a mean age of 17.3. A clustering of risk was also apparent such that if a respondent reported one ACE, there was an 85% chance that a respondent reported experiencing a second, and a 70% chance of reportedly experiencing a third adversity. Additionally, a dose-response relationship between ACE Score and smoking persistence was found among those with health problems that contraindicate smoking. That is, those with a history of exposure to adverse childhood experiences were more likely to continue smoking despite the presence of chronic illness and poor health - when quitting smoking would be clearly logical and beneficial (Edwards, Anda, Gu, et al. 2007). The ACE Study was refined and replicated in a 2002 Texas

Behavioral Risk Factor Surveillance System survey (Dube, Cook, and Edwards 2010). As with the original study, those with a history of both abuse and household dysfunction in childhood were significantly more likely to smoke than those without those adverse childhood experiences.

A social science lens on smoking suggests examining exposure to adversity as a mediator in the association between childhood circumstances and adult smoking status. The analysis included here presents an examination of the association between childhood circumstances and adult smoking status and evaluates whether exposure to childhood adversity mediates this relationship. This paper compares adult smoking status to see whether there is an association between exposure to childhood adversity and being a never smoker versus current smoker, net of childhood circumstances, and whether there is an association between exposure to childhood adversity and being a former smoker versus current smoker, net of childhood circumstances. A history of exposure to adversity is hypothesized to be associated with health risk behavior. In other words, exposure to childhood adversity will be associated with increased odds of current smoker versus never smoker status, and exposure to childhood adversity will be associated with increased odds of current smoker versus former smoker status.

Methods

Data

Data come from the National Comorbidity Survey Replication (NCS-R), a national survey of DSM-IV mental disorders among English-speaking adults (age 18+ years). The NCS-R was designed to investigate the prevalence and correlates of mental disorders, patterns of service use for disorders, and determinants of service use in a representative sample of the adult population living in non-institutionalized civilian households within the coterminous United States, plus students living in campus group housing that have a permanent household residence.

The survey was administered between February 2001 and April 2003. Information on the survey design and field procedures, including details of the weighting procedure, is available elsewhere (Kessler and Merikangas 2004; Kessler, Berglund, Chiu, et al. 2004).

The NCS-R was carried out face-to-face in the homes of respondents using laptop computer-assisted personal interview (CAPI) methods. The NCS-R interview schedule used the version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) that was developed for the WHO World Mental Health (WMH) Survey Initiative. The interview schedule was divided into two parts. Part I included all core WHM-CIDI disorders and was administered to all respondents. Part II included assessments of risk factors, consequences, services, other correlates of the core disorders, and other disorders that were of secondary importance or were especially time-consuming to assess. Part II was administered to 5,692 of the 9,282 NCS-R respondents, expressly oversampling those with clinically significant psychopathology. All respondents who did not receive Part II of the survey were administered a truncated demographic battery and then were either terminated or sampled in their appropriate proportions into sub-sampled interview sections.

Selection into Part II was determined by the CAPI program. Part II respondents were divided into three strata based on their Part I responses. The first stratum to receive Part II of the NCS-R consisted of respondents who either met lifetime criteria for at least one of the mental disorders assessed in Part I, met subthreshold lifetime criteria for any of these disorders and sought treatment for at least one of them at some time in their life, or ever either made a plan to commit suicide or attempted suicide. The second stratum consisted of respondents who did not meet criteria for placement into the first stratum and gave responses in Part I demonstrating that they either ever met subthreshold criteria for any of the Part I disorders, ever sought treatment

for any emotional or substance problem, ever had suicidal ideation, or used any psychotropic medications in the past 12 months to treat emotional problems, regardless of whether it was under the direct supervision of a physician. A probability sample of 59% of the respondents in this second stratum was selected to receive Part II of the survey. The third stratum consisted of all other respondents, of whom 25% were selected to receive Part II. Respondents in the second and third strata were selected with probabilities proportional to their household size. The analyses presented here were carried out on the subset of part II respondents (n=5,692) with an estimation sample of n=5,625 that contains complete data for all indicator variables included in these analyses.

Independent Variables

The concept of childhood social and economic circumstances is operationalized to include a range of indicators that measure the resources available to a child by virtue of parental or family circumstances. Respondents were asked about parental educational level, parental work status, and receipt of welfare benefits while they were growing up.

Parent Education. Parent educational attainment was measured by the question:

"How many years of school did (the male/female head of your household for most of your childhood) complete?"

The highest number of years of school completed by the individual named as the head of household for most of the respondent's childhood was used as the indicator of parental education. The number of years of school completed was categorized into less than high school (<12 years), high school graduate (12 years), some college (13-15 years), and a college degree (16+ years).

Parent Work Status. Parent work status was assessed by the question:

" How much of your childhood did (your father/male [or mother/female] head of household) either work for pay or work in a family business? Would you say all of the time, most, some, or not at all?"

Responses were dichotomized into those respondents that reported a parent worked all or most and those respondents that reported a parent worked less than all or most (some, or not at all) because a large majority of respondents reported that at least one parent worked all or most of the time.

Welfare Receipt. Receipt of welfare benefits was assessed by the question:

"During your childhood and adolescence, was there ever a period of six months or more when your family received money from a government assistance program like welfare, Aid to Families with Dependent Children, General Assistance, or Temporary Assistance to Needy Families?"

Responses were dichotomized into respondents who received welfare for six months or more and those from a family that did not receive welfare benefits.

Dependent Variable

Adult Smoking Status. Smoking Status was assessed by the question:

"Are you a current smoker, ex-smoker, or have you never smoked?"

Respondents were coded according to their answer to this question and categorized into one of three groups as a current smoker, former smoker, or never smoker.

Childhood Adversities

Eight childhood adversities experienced before age 18 were assessed including interpersonal loss, child maltreatment, and parental maladjustment. The measure of neglect was assessed based on commonly asked questions included in child welfare studies (Courtney, Piliavin, Grogan-Kaylor & Nesmith 1998). Parent mental illness and parent alcohol or other

drug problem were assessed based on the Family History Research Diagnostic Criteria Interview (Andreasen, Endicott and Spitzer 1978) and its extension (Kendler, et al. 1991). Family violence and child abuse were assessed based on a modified version of the Conflict Tactics Scale (Straus 1979).

Interpersonal Loss. Parent death, divorce, or loss was assessed by two questions:

1. "Did you live with both of your biological parents up until you were sixteen?"
2. "Reason you didn't live with biological parents until 16?"

If a respondent reported that they lived with both biological parents until 16, they were coded as not having experienced death of a parent, divorce or loss of a parent. Respondents that reported that a father or mother died, their parents separated/divorced/never lived together, they lived in foster care, they left home before age 16, or some other reason for not living with their parents until age 16 were coded as having experienced parental death/divorce/loss.

Child Neglect. Child neglect was assessed with a series of questions:

"How often did you have each of the following experiences during your childhood – often, sometimes, rarely, or never?"

1. "How often were you made to do chores that were too difficult or dangerous for someone your age?"

2. "How often were you left alone or unsupervised when you were too young to be alone?"

3. "How often did you go without things you need like clothes, shoes, or school supplies because your parents or caregivers spent the money on themselves?"

4. "How often did your parents or caregivers make you go hungry or not prepare regular meals?"

5. "How often did your parents or caregivers ignore or fail to get you medical treatment when you were sick or hurt?"

And

6. “How much effort did (man/woman who raised you) put into watching over you and making sure you had a good upbringing – a lot, some, a little, not at all?”

Respondents who reported that at least one of the five neglect experiences happened often, plus that the woman or man who spent the most time raising the respondent put only a little amount of effort or no effort at all into their upbringing, were categorized as having experienced neglect. Otherwise responses were coded as child neglect not reported.

Child Abuse. Child abuse was assessed by two questions:

1.“When you were growing up, how often did someone in your household do any of the things [on List A] (slapped, hit, pushed, grabbed, shoved, or threw something at them) to you – often, sometimes, rarely, or never?”

2. “As a child, were you ever badly beaten up by your parents or the people who raised you?”

Respondents that indicated they were badly either beaten by their parents/the people who raised them, or they were slapped, hit, pushed, grabbed, shoved, or something was thrown at them often or sometimes were coded as having experienced child abuse. Otherwise responses were coded as child not reported.

Sexual Abuse. Sexual Abuse was assessed by two questions:

1. “The next two questions are about sexual assault. We define this as someone either having sexual intercourse with you or penetrating your body with a finger or object when you did not want they to, either by threatening you or using force, or when you were so young that you didn’t know what was happening. Did this ever happen to you?”

2. “Other than rape, were you every sexually assaulted, where someone touched you inappropriately, or when you did not want them to?”

Respondents that indicated yes to either of these scenarios and that the event(s) occurred prior to age 18 were coded as having experienced child sexual abuse. Otherwise responses were coded as child sexual abuse not reported.

Parent Mental Illness. Parent mental illness was assessed with several questions.

For depression:

"During the years you were growing up, did (man/woman who raised respondent) ever have periods lasting 2 weeks or more where he/she was sad or depressed most of the time?"

For generalized anxiety disorder (GAD):

"During the time you were growing up, did (man/woman who raised respondent) ever have periods of a month or more when he/she was constantly nervous, edgy, or anxious?"

For panic disorder:

"Did (man/woman who raised respondent) ever complain about anxiety attacks where all of a sudden he/she felt frightened, anxious, or panicky?"

Respondents who replied yes to any of the three questions in regards to a parent or the people who raised them for any of the three questions were coded as having experienced parent mental illness. Otherwise responses were coded as parental mental illness not reported.

Parent Alcohol or Other Drug (AOD) Problem. Parent AOD problem was assessed with the question:

"Did (man/woman who raised the respondent) ever have a problem with alcohol or drugs?"

Respondents that indicated yes were coded as having experienced a parent with an AOD problem. Otherwise responses were coded as parent AOD problem not reported.

Family Violence. Family violence was assessed by two questions:

1. “How often did (your parents/the people who raised you) do any of these things (slapped, hit, pushed, grabbed, shoved, or threw something) to each other while you were growing up – often, sometimes, rarely, or never?”

2. “When you were a child, did you ever witness serious physical fights at home, like when your father beat up your mother?”

Respondents that reported their parents/the people who raised them slapped, hit, pushed, grabbed, shoved, or threw something at each other often or sometimes or that they witnessed serious physical fights at home were coded as having experienced family violence. Otherwise responses were coded as family violence not reported.

Parent Criminal Activity. Parent criminal activity was assessed by two questions:

1. “Was (woman/man who raised the respondent) ever involved in criminal activities like burglary or selling stolen property?”

2. “Was (woman/man who raised the respondent) ever arrested or sent to prison?”

Respondents who indicated yes to either question were coded as having experienced parent criminal activity. Otherwise responses were coded as parent criminal activity not reported by respondent..

Childhood Adversity Category. A variable was created that categorized the number of childhood adversities that a respondent had experienced prior to age 18 into three groups. The categories were no adversities (0), one adversity (1), two adversities (2), and three or more adversities (3+).

Analytic Plan

A multinomial regression model is used for data in which the dependent variable (y) is nominal and can have three or more response categories (K), with one category taken as the

baseline (reference) category, and independent variables are continuous or categorical predictors (Long 1997). A multinomial logistic model can be conceptualized as simultaneously estimating binary logits for all comparisons among alternative outcomes. For this paper, the dependent variable for this project (smoking status) included three categories (*K* ="0" [never smoker {NS}], "1" [current smoker {CS}], "2" [former smoker {FS}]), with current smoker (*K*=1) as the baseline category. Multinomial logistic regression is an extension of the binary regression model such that a set of *K*-1 simple logistic regression models are estimated that model the odds of being in category *y*=0 or y=2 versus the baseline category *y*=1. To fit the multinomial logistic regression model to this "trinomial" dependent variable, two generalized logit models are estimated:

$$\text{logit}\,(\pi(\text{“NS”}|x))=\text{logit}(\pi_0)=\ln\left(\frac{\pi(y=0|x)}{\pi(y=1|x}\right)=\beta_{0:0}+\beta_{0:1}x_1+\ldots+\beta_{0:\varrho}x_\varrho$$

$$\text{logit}\,(\pi(\text{“FS”}|x))=\text{logit}(\pi_2)=\ln\left(\frac{\pi(y=2|x)}{\pi(y=1|x}\right)=\beta_{0:0}+\beta_{2:1}x_1+\ldots+\beta_{2:\varrho}x_\varrho$$

In this model, the same independent variable appears in each of the *y* categories, and a separate intercept, $\beta_{0:0}$, and slope parameter, $\beta_{k:\varrho}x_\varrho$, are estimated for each contrast. The parameter, $\beta_{k:\varrho}$, represents the additive effect of a one-unit increase in the independent variable, χ_p, on the log-odds of being in category *y*= 0 or 2, rather than the reference category (*y*=1).

Exponentiating a parameter estimate provides an adjusted odds ratio, which represents the multiplicative impact of a one-unit increase in the predictor variable, χ_p, on the odds that the response is equal to *K* relative to the odds of a response in the baseline category:

$\hat{\Psi}_{k:p}$=exp($\hat{\beta}_{k:p}$)

$CI(\hat{\Psi}_{k:p})$=exp[$\hat{\beta}_{k:p} \pm t_{df,1-\alpha/2} \cdot se(\hat{\beta}_{k:j})$]

where $\hat{\beta}_{k:p}$ = the parameter estimate corresponding to predictor *p* in logit equation *K*. Confidence intervals (CIs) for individual coefficients can be used to make inferences regarding the significance of model predictors and to provide information on the potential magnitude and uncertainty associated with the estimated effects of individual predictor variables. An α=0.05 is used (in conjunction with the design-based degrees of freedom [*df*=42]), which provides a 95% confidence interval for the parameter (s).

The impact of a one-unit change in predictor χ_p on the odds of belonging to one of two nonbaseline categories can be obtained by estimating the odds ratio of the multiplicative effect of a one-unit change in χ_p on the odds of being in category *K* compared with category *K'*:

$\hat{\Psi}_{k,k\prime:p}$=exp($\hat{\beta}_{k:p}$ - $\hat{\beta}_{k\prime:p}$)

where $\hat{\beta}_{k:j}$, $\hat{\beta}_{k\prime:j}$ = the parameter estimates corresponding to predictor *p* in logit equations *k* and *k'*.

Goodness of Fit

The Wald test statistic is used to test the null hypothesis that a single coefficient is equal to zero or hypotheses that include fitted models with (*K*-1) x (*p*+1) parameter estimates. Standard *t*-tests for single parameters and Wald tests for multiple parameters are used to evaluate the significance of the covariate effects in individual logits, H_o:$\beta_{k:p}$=0, or among all estimated logits, H_o:$\beta_{0:p}$=$\beta_{2:p}$=⋯=$\beta_{k:p}$=0.

Likelihood-ratio test

$$G^2 = 2\Sigma f_o \log(\frac{f_o}{f_e})$$

Multinomial logistic regression techniques were used to test the association between sociodemographic characteristics, childhood social and economic circumstance, exposure to childhood adversity, and adult smoking status. A series of regression models were estimated as follows. In Model 1, the sociodemographic control variables were entered to measure the association with adult smoking status. In Model 2, the childhood social and economic circumstance variables were entered simultaneously with all sociodemographic control variables to test for the mutually adjusted association with adult smoking status. In Model 3, the childhood adversity category variable was entered to measure the association with adult smoking status. In the full model (Model 4), the sociodemographic control variables, childhood social and economic circumstance variables, and the childhood adversity category variable were simultaneously entered to assess if exposure to childhood adversity explained any of the association between childhood circumstances and adult smoking status. Finally, the respondent's own adult educational attainment was added in an additional model to assess whether their was association between childhood social and economic circumstances and adult smoking status, net of adult educational attainment, and whether childhood adversities had a significant association with adult smoking status over and above the effect of parents' and respondent's own educational attainment.

All analyses were conducted using Stata v.12 (Stata Press 2011). Taylor series linearization was used to estimate the sampling variance of each parameter estimate, and the unique covariances between the parameter estimates. These estimated variances and covariances

are then used to develop Wald χ^2 test statistics. All analyses controlled for sex (male, female), race (White, Hispanic, African American, Other), and cohort (18-29, 30-44, 45-59, 60-98). Finally, analysis is restricted to data for respondents who completed the Part II interview, were assigned a sampling weight, and have complete data on all variables in the analysis (n=5,625). Cases with missing data were not deleted, but rather a subclass of complete cases was created using the subpop command in Stata v.z12. Using this subpopulation and survey estimation commands preserves the sample-to-sample variability of the full complex design and thus maintains the integrity of any variance estimation procedures.

Results

Sample Characteristics

Table 2.1 presents descriptive statistics for the sample with complete data on all childhood social and economic circumstance measures, childhood adversities, and adult smoking status. The sample included about equal proportions of men (47.1%) and women (52.9%). Age cohorts were about evenly distributed among 18-29 year olds (23.5%), 30-44 year olds (28.9%), 45-59 year olds (26.3%), and those aged 60 years and older (21.2%). The majority of the sample was white (72.9%), with about equal proportions of African American and Hispanic respondents (12.3% and 11.0%, respectively), and a smaller proportion in the Other race/ethnicity category (3.8%). About half (50.1%) of the sample had ever smoked regularly in their lifetime, with about one quarter current smokers (25.3%) and one quarter former smokers (24.4%) at the time of the interview.

Childhood Circumstances and Adult Smoking

Table 2.1 also shows that never smoking was highest among those with parents that had at least some college education or a college degree (58.3% and 57.7%, respectively). The rate

for never smoking was about the equal for those whose parents had less than high school or a high school education (48.7% and 47.5%, respectively). Current smoking was highest for those that did not know their parents' educational level (32.0%) and lowest for parental education that included some college (19.8%). The rate of former smoking was about equal between those that did not know their parents' educational level and those that reported less than high school (30.9% and 28.2%, respectively). About equal amounts of respondents with parents that worked all the time were never smokers (50.6%), current smokers (25.2%), and former smokers (24.2%) compared to those with parents that worked less than all the time (47.5%, 26.6%, and 25.9%, respectively). Current smoking status did not vary much by welfare receipt in early life.

In terms of demographic characteristics, over half of the respondents were women (52.9%), but a slightly greater proportion of men were current (27.9%) or former smokers (27.5%) compared to women (23.1% and 21.7%, respectively). Never smoking was slightly more prevalent among the two younger cohorts (56.2% and 53.4%, respectively) compared to the two older cohorts (46.6% and 44.0%, respectively). The prevalence of current smoking was about even among the three younger cohorts (30.2%, 29.5%, and 23.8 %, respectively), but much (DELETE:remarkably) lower for the oldest cohort (16.1%). Former smoking was more prevalent among the two older cohorts (29.6% and 39.8% versus 13.6% and 17.2%, respectively). The prevalence of never smoking was highest among African American respondents (58.2%) and lowest among white respondents (48.1%), with the rate of Other race/ethnicity (50.6%) and Hispanics (55.5%) in between. Rates of current smoking were lowest among African American respondents (23.6%), highest among Other race/ethnicity (30.3%), and about equal between white and Hispanic respondents (25.2% and 26.2%, respectively). The

prevalence of former smoking was highest for white respondents (26.7%) and about the same for African American (18.1%), Hispanic (18.4%), and Other race/ethnicity (19.1%) respondents.

Childhood Circumstances and Exposure to Childhood Adversity

Table 2.2 presents bivariate associations between childhood circumstances and each of the childhood adversities. A majority of respondents (60.8%) reported exposure to at least one of the eight childhood adversities measured in this study. One in three respondents reported experiencing either interpersonal loss (30.5%) or parent mental illness (29.3%), and one in five respondents were exposed to a parent with an AOD problem (21.1%). About equal proportions of respondents reported experiencing child sexual abuse (13.0%) and witnessing family violence (14.8%). About one in ten respondents reported experiencing child abuse (9.6%) and slightly less reported parent criminal activity (7.1%). Report of child neglect was least common (1.7%) for this sample.

Interpersonal loss, child sexual abuse, parent mental illness, and witnessing family violence are each associated with parent educational level, parent work status, and welfare receipt. Child neglect, child abuse, and parent criminal activity are each associated with parental work status and welfare receipt, but not parental education for this sample. Parent AOD problem is associated with welfare receipt, and slightly so with parent education and parent work status. In terms of demographic characteristics, gender was associated with child neglect, child sexual abuse, parent mental illness, and slightly so with family violence, but was not associated with interpersonal loss, child abuse, parent substance use problem, and parent criminal activity. Age cohort was associated with each of the eight childhood adversities, although the association was week for child neglect. Finally, race was associated with interpersonal loss, child neglect, parent mental illness, and family violence, and only slightly with parent substance abuse problem.

Exposure to Childhood Adversity and Adult Smoking

Table 2.3 presents results of the bivariate associations between exposure to childhood adversity and adult smoking status. A general pattern of exposure to childhood adversity holds for each adult smoking status, regardless of category: the rates of exposure to individual adversities rank the same, with only a couple of exceptions. That is, interpersonal loss is the most commonly reported childhood adversity, except for former smokers where parent mental illness is first. The second most common childhood adversity is parent mental illness, followed by parent AOD problem, family violence, child sexual abuse, child abuse, parent criminal activity, and child neglect.

Never smokers had less exposure to multiple adversities, with a large majority reporting zero (41.8%) or just one childhood adversity (30.5%). About 1 in 3 never smokers reported exposure to multiple (2 or 3+) childhood adversities (27.7%). Current smokers reported a lower proportion of zero (32.1%) or just one childhood adversity (25.5%) and a higher proportion of exposure to multiple childhood adversities (42.4%). Former smokers reported rates of exposure to childhood adversity that were comparable to never smokers for zero (41.3%) or one (25.2%) exposure to childhood adversity, as well as for exposure to multiple adversities (33.5%)

Multivariate Models

Table 2.4 presents results for the logistic regression analysis between childhood social and economic circumstances, exposure to childhood adversity, and adult smoking status. For never versus current smokers, Model 1 shows that respondents whose parents had a high school diploma had 30% lower chances of being a never smokers versus current smoker (OR=0.73) compared to those with a parent that did not graduate from high school, net of other factors.

Respondents that did not know their parents educational level, had 40% lower chances of being a never smoker versus current smoker (OR=0.56), net of other factors. The addition of exposure to childhood adversity in Model 2 does not show evidence of a mediation effect on the chances of being a never versus current smoker for those with low (OR=0.74) and uncertain (OR=0.56) parent education. Exposure to child abuse (OR=0.64), witnessing family violence (OR-0.66), exposure to parent AOD problem (OR=0.70), and parental loss (OR=0.81) are each associated with lower odds of being a never smoker versus.

The addition of control variables in Model 3 has an effect on parent education such that those with a parent that had some college (OR=1.81) or a college degree (OR=1.76) had increased odds of being a never smoker versus current smoker (OR=1.81 and 1.76, respectively) compared to those with a parent that did not graduate from high school, net of all other variables in the model. Respondents that did not know their parents education level had lower odds of being a never smoker versus current smoker (OR=0.50), net of all other variables in the model. The effect of exposure to childhood adversity is essentially unchanged with the addition of control variables, except that exposure to child sexual abuse was associated with lower odds of being a never smoker versus current smoker (OR=0.67), net of all other variables in the model. Among demographic characteristics, females had lower odds of being a never versus current smoker compared to males in this sample (OR=0.63), net of all other variables in the model. Compared to the youngest cohort (18-29), the oldest cohort (60+ years old) had almost twice the odds of being a never smoker versus current smoker (OR=1.95), net of all other variables in the model. Hispanics in this sample higher odds (OR=1.62) of being a never smoker versus current smoker compared to whites, net of all other variables in the model.

Table 2.4 also presents the results for the logistic regression analysis between childhood social and economic circumstances, exposure to childhood adversity, and current smoker versus former smoker status. Model 1 shows that having a parent with a high school education was associated with lower odds of being a former smoker versus a current smoker (OR=0.57). The addition of exposure to childhood adversity in Model 2 does not mediate this association, such that respondents whose parent had a high school education had lower odds of being a former smoker versus current smoker (OR=0.58). Exposure to either interpersonal loss or child abuse reduced the odds of being a former smoker versus current smoker (OR=0.58 and 0.61, respectively), net of all other variables in the model. The addition of control variables in Model 3 increased the odds of being a former smoker versus current smoker for respondents with a college educated parent (OR=1.67), net of all other variables in the model. The addition of control variables enhance the effect of exposure to neglect resulting in two-fold increased odds of being a former versus current smoker (OR=2.02), net of all other variables in the model. Among demographic characteristics, the chances of being a former smoker versus current smoker increase with each successive birth cohort (OR C_2: 1.43, C_3: 3.18, C_4: 7.19), compared to cohort 1, net of all other variables in the model.

Discussion

This study bridges a gap in existing research on the association between childhood social and economic circumstances, exposure to adversity, and adult smoking status by utilizing nationally representative survey data with a life course data design. Previous findings that indicate remarkable high rates of exposure to childhood adversity were confirmed here and results may be generalized to populations beyond this sample. Additionally, this study extends current knowledge about the effects of exposure to childhood adversity by examining its

association with stages of a smoking career, never smoking, current smoking, and former smoking. As such, this represents an improvement on previous studies of exposure to childhood adversity and health risk behavior since it makes comparison of the odds being in one health behavior status versus another, net of other factors. These results also provide new clues about of heterogeneity in outcomes.

The results of this analysis both confirm and lend new dimension to the relationship between childhood social and economic circumstances, exposure to childhood adversity, and smoking status in adulthood. First, parental educational level was associated with adult smoking status, such that higher parent educational level was associated positive health behavior, as represented by higher odds for never smoking among those with a college educated parent. Additionally, respondents that had a college educated parent were more likely to be never smoker, and if they became smokers, were more likely to quit. This result is consistent with other studies that find that those from childhood households with lower socioeconomic status are more likely to start smoking, more likely to become regular smokers, and less likely to quit (Graham and Derr 1999; Gilman, Abrams and Buka 2003; Kestilä, Koskinen, Martelin et al. 2006; Lacey, Cable, Stafford et al. 2010).

Although there was evidence of an effect of exposure to childhood adversity on adult smoking status generally, there appears to be no mediation effect for this analysis. Results show that exposure to childhood adversity does have an effect on health behavior, but not for all adverse experiences. Exposure to a parent with an AOD problem and witnessing family violence appear to increase the likelihood of becoming a smoker. Additionally, interpersonal loss and exposure to child abuse appear increase the likelihood of becoming a smoker decrease the likelihood of going from current to former smoker (i.e., quitting). Exposure to child sexual

abuse reduces odds of quitting smoking once demographic variables are taken into account. This suggests the possibility that gender is contributing to this finding given that rate of reported child sexual abuse by female respondents in this sample was four times that of male respondents (20.0% versus 5.0%, respectively). Exposure to neglect shows evidence of increasing the chances to quit smoking – this is contrary to expectations and a curious finding.

Exposure to adversity was examined in greater detail by testing models that substituted quantified exposure categories (i.e., 0,1,2,3+ adversities) in place of individual adversities[1]. Results showed no significant association between experience of 0 or 1 childhood adversity and adult smoking status. Exposure to 2 or more kinds of adversity was significantly associated with current smoking. A count of exposure to 3 or more kinds of adversity was significantly associated with former smoking. This evidence is consistent with other cross-sectional studies that find a positive relationship between childhood adversity and risk of current and ever smoking (Anda, Croft, Felitti, et al. 1999; Fergusson, Horwood, Boden, Jenkin 2007), and limited information (count of adversity only) for former smoking (Ford, Anda, Edwards et al. 2011).

To further explore the association of exposure to adversity and former smoking, one additional post-estimation model that included adult education was tested to explore for the possibility that respondent lifetime educational attainment might account for differences in smoking status over and above the effects of childhood social and economic factors[2]. The addition of the respondent's own educational attainment showed a significant association with adult smoking status. Parental educational level was no longer significantly associated with

[1] Results available upon request.
[2] Results available upon request.

adult smoking status after the addition of adult educational level. Regarding childhood adversity, interpersonal loss was no longer significantly associated with never smoking but maintained a marginally significant association with former smoking. Each of the significant associations between child abuse, family violence, child sex abuse, and parental substance use problem with never smoking remained, as did the marginally significant association between childhood neglect and former smoking. Contrary to other findings, it seems that adult educational attainment exerts an influence on adult smoking status over and above the effect of the childhood social and economic factors (Jefferis, Graham, Manor and Power 2003), but it does not account for the distinct influence of adversity exposure.

This study was limited by its cross-sectional design and the fact that the majority of measures used for this study were retrospective reports. For example, a good proportion of respondents were not able to clearly recall their parents' educational level. Hence, the inclusion of a "Don't Know" category for parent education. This category hampered the clarity of the findings on the potentially important role of parent education on smoking status. Additionally, as a survey intended to assess the prevalence of mental disorders in a U.S. population, the data included many opportune measures of childhood experiences within the family, but rather crude measures of family social and economic factors. In sum, while results add to existing research in small ways, but suggest that future work should ideally utilize longitudinal data as well as data that includes more detail and accurate measure of childhood social and economic circumstances.

The primary limitations of this study include a cross-sectional design which limits efforts to disentangle the cause and effect of childhood social and economic circumstances and exposure to adverse childhood experiences, and does not allow determination of the causal order of some of the associations of interest. Secondly, this study is limited by the retrospective nature of the

data. The life course data design is an advantage of studies of exposure to adverse childhood experience compared to other retrospective studies. Nonetheless it is likely that these results include a certain rate of false negatives. On the other hand, given the undesirable nature of eventful stressors, it is plausible to assert that false positives are likely rare. Thus, although there is some bias in retrospective reports, that bias is not great enough to invalidate retrospective studies of major adversities of an easily defined kind (Hardt and Rutter 2004). Finally, these analyses only examine exposure to a single adverse childhood experience or a count of exposure without stipulation of occurrence of clustered types of adverse experience. This loss of important information about the co-occurrence of exposure to adverse childhood experience and the interrelationships between exposure types and childhood social and economic circumstances constrains the insight gained about differential exposure to adverse childhood experiences.

Table 2.1: Childhood Social and Economic Circumstances of Respondents, Overall and by Adult Smoking Status in the National Comorbidity Survey Replication (n=5,625)

	Frequency	Wtd %	Never Smoker	Current Smoker	Former Smoker	t, (p)
Overall Sample	5,625		50.3	25.3	24.4	
Parental Education						***
< 12 years	1,242	24.3	48.7	23.1	28.2	
12 years	1,876	31.5	47.5	30.6	21.9	
13-15 years	780	13.5	58.3	19.8	21.9	
16+ years	1,230	20.5	57.7	20.2	22.2	
Don't Know	497	10.3	37.1	32.0	30.9	
Parental Work Status						
Work all	5,013	10.2	50.6	25.2	24.2	
Work < all	612	89.8	47.5	26.6	25.9	
Welfare Receipt						*
Received 6+ months	601	9.6	47.2	28.6	24.2	
Never received	5,024	88.4	50.9	24.7	24.4	
Sex						***
Male	2,357	47.1	44.6	27.9	553.0	
Female	3,268	52.9	55.3	23.1	21.7	
Age						***
Cohort 1 (18-29)	1,354	23.5	56.2	30.2	13.6	
Cohort 2 (30-44)	1,807	28.9	53.4	29.5	17.1	
Cohort 3 (45-59)	1,501	26.3	46.6	23.8	29.6	
Cohort 4 (60-98)	963	21.2	44.0	16.1	39.8	
Race						*
White	4,136	72.9	48.1	25.2	26.7	
Hispanic	518	11.0	55.5	26.2	18.4	
African American	704	12.3	58.2	23.6	18.1	
Other	267	3.8	50.6	30.3	19.1	

* p<.05. ** p<.01. *** p<.001

Table 2.2: Childhood Social and Economic Circumstances and Reported Exposure to Childhood Adversity, Overall and by Adversity Type (n=5,625)

	Inter-personal Loss	Child Neglect	Child Abuse	Child Sexual Abuse	Parent Mental Illness	Parent AOD Problem	Family Violence	Parent Criminal Activity
Overall Sample	30.5	1.7	9.6	13.0	29.3	21.1	14.8	7.1
Parent Education	***			***	***	*	**	
< 12 years	28.6	1.8	10.3	10.7	27.6	21.9	17.2	7.7
12 years	30.4	1.7	9.6	13.6	28.1	22.0	14.9	8.0
13-15 years	30.6	1.3	9.1	17.4	35.7	25.1	14.4	7.3
16+ years	26.5	1.1	8.0	13.0	31.5	16.8	10.2	4.9
Don't Know	42.8	2.7	11.9	10.3	23.9	19.3	18.0	6.9
Parent Work Status	***	**	***	***	**	*	***	**
Work all	27.8	1.2	8.9	12.5	28.4	20.5	13.3	6.6
Work < all	53.5	5.6	15.7	17.3	36.5	26.2	27.3	11.6
Welfare Receipt	***	**	***	***	***	***	***	***
Received for 6+ months	26.8	6.0	19.9	22.5	50.5	39.3	36.9	18.2
Never received	65.6	1.2	8.5	11.9	27.0	19.1	12.4	5.9
Sex		***		***	**		*	
Male	29.6	1.1	9.4	5.0	26.8	20.2	13.3	7.5
Female	31.3	2.2	9.9	20.0	31.4	21.9	16.1	6.7
Age	***	*	***	***	***	***	***	***
Cohort 1 (18-29)	41.8	1.3	8.4	15.1	29.2	19.7	15.4	11.5
Cohort 2 (30-44)	33.6	2.2	12.1	15.5	33.3	22.8	18.4	7.8
Cohort 3 (45-59)	22.1	2.2	10.9	13.1	30.2	25.5	13.8	5.3
Cohort 4 (60-98)	24.2	0.6	6.1	6.9	22.7	14.8	10.3	3.4

Race	***	***			***	*	**	
White	24.8	1.8	9.2	12.4	31.4	21.9	13.1	6.3
Hispanic	36.9	2.3	10.4	14.3	24.6	23.5	22.3	11.1
African American	58.0	0.4	7.7	13.7	17.9	16.0	17.4	8.7
Other	31.5	2.1	21.6	17.9	38.3	16.0	16.6	6.7

* p<.05 ** p<.01 *** p<.001

Table 2.3: Bivariate Association of Respondent Reported Exposure to Childhood Adversity, Individual Experience and Count, and Adult Smoking Status (n=5,625)

	Total Sample	Never Smoker	Current Smoker	Former Smoker	t, *(P)*
Adversity Type					
Interpersonal Loss	30.4	29.3	37.3	25.6	***
Child Neglect	1.6	1.1	2.0	2.4	*
Child Abuse	9.6	7.2	14.8	9.2	***
Child Sexual Abuse	12.9	10.8	15.9	14.4	**
Parent Mental Illness	29.3	27.5	31.7	30.5	
Parent AOD Problem	21.1	17.5	27.3	22.2	***
Family Violence	14.8	10.7	20.8	16.9	***
Parent Criminal Activity	7.1	5.3	10.1	7.7	***
Adversity Count					***
0 Adverse Experiences	39.2	41.8	32.1	41.3	
1 Adverse Experience	28.0	30.5	25.5	25.2	
2 Adverse Experiences	15.4	14.1	18.1	15.2	
3 Adverse Experiences	8.2	7.6	10.0	7.4	
4 Adverse Experiences	5.2	3.5	7.3	6.3	
5 Adverse Experiences	2.5	1.7	4.0	2.5	
6 Adverse Experiences	1.1	0.6	2.0	1.3	
7 Adverse Experiences	0.5	0.2	0.8	0.7	
8 Adverse Experiences	0.1	0.1	0.1	0.0	
Adversity Category					***
0 Adverse Experiences	39.2	41.8	32.1	41.3	
1 Adverse Experience	28.0	30.5	25.5	25.2	
2 Adverse Experiences	15.3	14.1	18.1	15.2	
3+ Adverse Experiences	17.5	13.6	24.3	18.3	

* p<.05 ** p<.01 *** p<.001

Table 2.4: Multinomial Regression of Childhood Social and Economic Circumstances, Reported Exposure to Childhood Adversity, and Adult Smoking Status (n=5,625)

	Model 1				Model 2				Model 3				Model 4			
	Never v. Current Smoker	t, (P)	Former v. Current Smoker	t, (P)	Never v. Current Smoker	t, (P)	Former v. Current Smoker	t, (P)	Never v. Current Smoker	t, (P)	Former v. Current Smoker	t, (P)	Never v. Current Smoker	t, (P)	Former v. Current Smoker	t, (P)
Parent Education																
< 12 years (ref)																
12 years					0.92		0.88						0.91		0.87	
13-15 years					1.77	***	1.55	*					1.82	***	1.58	*
16+ years					1.85	***	1.72	***					1.79	***	1.69	**
Don't Know					0.50	***	0.66						0.49	***	0.65	
Parent Work																
Work all (ref)																
Work <all					0.99		0.93						0.89		0.88	
Welfare Receipt																
Never (ref)																
6+ months					0.87		1.11						1.17		1.21	
Sex																
Male (ref)																
Female	1.46	***	0.87		1.46	***	0.86						1.59	***	0.89	
Age Cohorts																
Cohort 1 (ref)																
Cohort 2	0.98		1.29		1.11		1.45	*					1.12		1.45	*
Cohort 3	1.07		2.74	***	1.30		3.26	***					1.27		3.21	***
Cohort 4	1.47	*	5.47	***	2.24	***	7.50	***					1.98	***	7.17	***
Race																
White (ref)																
Hispanic	1.30		0.85		1.56	**	0.95						1.54	**	0.97	
African Am.	1.19		0.92		1.48		1.05						1.47		1.04	
Other	0.90		0.77		0.97		0.80						0.98		0.79	
Adversities																
0 (ref)																
1									0.92		0.76		0.92		0.83	
2									0.60	***	0.65	**	0.56	***	0.75	
3+									0.43	***	0.58	**	0.41	***	0.75	

* p<.05. ** p<.01. *** p<.001

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CHAPTER 3
Childhood Social and Economic Circumstances and Patterns of Exposure to Childhood Adversity

Introduction

Exposure to adverse childhood experiences, such as child physical, psychological, and sexual abuse and household dysfunction, underlie serious, long-lasting consequences for individual, social, and economic development (Fang, Brown, Florence and Mercy 2012). Yet our understanding of the origins of exposure and patterns by which adverse childhood experience occurs is limited. Research has demonstrated that exposure to early adversity has a deleterious impact on learning, behavior, and physical and mental well-being in childhood (Evans and English 2002; Evans and Kim 2007, 2010; McEwen 2003; Green and Darity 2010; Gunnar, Fisher, et al. 2006; McEwen and Gianaros 2010; Seeman, Epel, Gruenewald, Karlamanga, and McEwen 2010), and is associated with long-term mental illness (Rutter et al. 1976; Brown and Harris 1978; Kessler, Davis, and Kendler 1997; Chapman et al. 2004; McLaughlin et al. 2010; Dunn et al. 2011) and poorer physical health in adulthood (Stein et al. 2010). Exposure to adverse childhood experience is also associated with long-term deficits in educational attainment (Perez and Widom 1994; Boden, Horwood and Fergusson 2007) and economic productivity throughout life (Widom 1998; Fang, Brown, Florence et al. 2012). In light of this evidence, exposure to adverse childhood experience is arguably one of the most important determinants of variation in human health and well-being (Boyce, Essex, Woodward et al. 2002). Additionally, given the strong association between exposure to adverse childhood experiences and mental

illness (e.g., depression), early adverse experience is considered one of the leading causes of disability worldwide (Brent and Silverstein 2013).

It seems that personal biographies marked by social and economic disadvantage in adulthood are also characterized by exposure to adverse experience in childhood. Studies using adults' retrospective self-reports show that adverse childhood experience is common (Kessler, Davis and Kendler 1997; Felitti, Vincent, Anda et al. 1998; Bynum, Griffin and Ridings 2010; Green, McLaughlin, Berglund et al. 2010). At the same time, a study based on a sample in one state (i.e., Minnesota) indicates that exposure to adverse experience is not evenly distributed; it is more common among respondents who did not graduate from high school, who were unmarried, who rented rather than owned housing, who were unemployed, or who indicated financial hardship (Baum and Peterson-Hickey 2013). Another study based on a sample of Wisconsin residents shows a similar pattern. Adverse childhood experiences are more common among those with lower household incomes (O'Connor, Finkbiner and Watson 2012). Those with incomes below $35,000 reported exposure to a high level of (4 or more) of adverse childhood experiences twice as often as those with incomes above $35,000. Education operates in a similar manner. Those with less than a high school education reported exposure to a high level (4 or more) of adverse childhood experience twice as often as college graduates with high exposure (4 or more). Similarly, adults with greater exposure to adverse childhood experience were more likely to be "out of work" than those with lower exposure. Given continuities in social and economic disadvantage over the life course (Power and Hertzman 1997; Mirowsky and Ross 2001; Dannefer 2003), exposure to adverse childhood experience may be accompanied by childhood social and economic disadvantage.

Our understanding of the origins of exposure and patterns by which adverse childhood experience occurs is limited by the data available. Descriptive information on the social and economic distribution of exposure to certain types of adverse childhood experience, such as child maltreatment, is primarily available from sociodemographic characteristics included in child protective service records. Thus we know that lower household income and low parental education are risk factors for child maltreatment, but these associations vary with the type of maltreatment (May-Chahal and Cawson 2005; Hussey, Chang and Kotch 2006; Sidebotham, Heron and Golding 2002; Berger 2005). The fact that family social and economic indicators vary with incidence of exposure to maltreatment as well as type of maltreatment experienced suggests that social and economic context is potentially important in shaping exposure to adverse childhood experience.

The 2011/12 National Survey of Children's Health (NSCH) provides descriptive information on exposure to a limited set of adverse childhood experiences. The NSCH results show that children living at or near poverty level were more than twice as likely to be exposed to three or more adverse experiences compared to their more affluent peers (Child Trends 2013). Additionally, parents with a high school degree or less than high school degree more often reported that their child was exposed to three or more adverse childhood experiences compared to parents with more than a high school degree. Less educated parents reported no exposure to adverse childhood experience for their child less often than parents with more than a high school degree. Notably, because the NSCH telephone survey did not include measurement of child abuse, child neglect, child sex abuse, parent mental illness, or parent suicide attempt its value for comparison to other studies of exposure to adverse childhood experience is constrained.

Closer examination of childhood social and economic circumstances as a factor that shapes exposure to adverse experience has been hampered by the tendency to use childhood poverty as a signal for exposure to adversity instead of analyzing a wider range of socioeconomic status (SES) groups to see whether they experience varying levels of childhood adversities. Despite clear evidence of the link between poverty and adverse experiences, exposure to childhood adversity surely occurs beyond those in impoverished circumstances. This speculation is based on a comparison of the proportion of estimated exposure to adverse childhood experience to the proportion of children estimated to live in poverty. We see that with exposure to adverse childhood experience estimated at more than 50% (Kessler, Davis and Kendler 1997; Fellitti et al. 1998), exposure to adverse experience outweighs the poverty rate for children estimated at any point from the 1960s to early 2000 (poverty rate approximately 11% and 18%, respectively) (Citro and Michael 1995; U.S. Census Bureau 2011). As such, it seems that while exposure to adverse experience in childhood might occur less frequently in higher SES groups, those with social and economic advantage are not spared from exposure to adverse experience.

The goal of this study is three-fold. My first goal is to document whether exposure to adverse childhood experiences occurs across the spectrum of SES groups in childhood. The second is to investigate whether childhood SES shapes variation in type of exposure to adverse childhood experiences. The third is to investigate whether childhood SES shapes variation in amount of exposure to adverse childhood experiences. Past studies have demonstrated an inverse relationship between family income level and virtually every form of child abuse and neglect (Sedlak and Broadhurst 1996). However we do not know if a similar inverse relationship exists between family income level and other types of childhood experiences that are considered

adverse, such as interpersonal loss (parent death, divorce, absence), parent psychopathology (mental illness, substance use, suicide attempt), and parent problem behavior (family violence, criminal activity). Additionally, we do not have detailed information on what SES factors are associated with variation in amount of exposure to adverse childhood experience.

I address these gaps in knowledge through the following improvements in data, methods, and measurement. First, I use a nationally representative probability sample to estimate exposure to adverse childhood experience. Second, to improve the chances of bias in recall, I narrow the time frame of retrospective self-report by including youth ages 13-18. Third, this project will provide new detail on the relationship between family economic factors and exposure to childhood adversity by including standard indicators of childhood SES (e.g., parent educational attainment and work status) as well as poverty level and receipt of welfare as a means to distinguish exposure to adversity by income and economic hardship. Finally, measurement of the eleven types of exposure to childhood adversity in this project includes an indicator of child neglect that follows the uniform definitions for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi et al. 2008). This will provide results comparable to those available from administrative data, but this may be the first from a nationally representative sample of youth.

Background

Childhood SES and Exposure to Adverse Childhood Experience

Currently, most nationally representative data that provides information on the context of exposure to childhood adversity is predominantly focused on early life (prenatal and birth to about the age of 5). The scope of explanatory factors that are examined is thus focused on

variables that primarily determine the immediate social context of birth and the provision of early needs that are important for survival and healthy development in the first part of life, such as sufficient nutrition and preventive health care. This also limits the nature of the indicators examined to those that are reported by caregivers or observed by others, such as parent-child interactions or whether a child satisfied developmental milestones on time. Given the primacy of circumstances at birth for processes and outcomes in early life, there has been a heavy focus on the social status of parents as an adverse experience in itself if the circumstances are deemed as disadvantaged (e.g., teenage parent(s), low-income, or limited education). When this approach is extended to research outside the period of early life, important contextual SES indicators are lost for analysis when they are subsumed under a measure of adverse experience. That is, factors that may precede exposure to childhood adversity, such as welfare receipt, are instead used as a measure of exposure to childhood economic adversity which contributes to the exclusion of examining whether exposure to adverse childhood experience varies as a function of SES (see: McLaughlin, Green, Gruber et al. 2012).

Conducting research on exposure to childhood adversity beyond the early life stage must take a perspective that places birth into a family as the starting point and views experiences in childhood as shaped by the broader social and economic context. SES factors are critical in shaping circumstances and experiences in the family environment that surrounds a child. Generally, the more disadvantaged an individual is on any given SES factor, the greater their exposure to chronic stressors (Adler and Stewart 2010). For example, parent educational level is also the one SES component that if relatively low, may beget poverty, unemployment, unsatisfactory work conditions, and resulting economic hardship, strain, and a cascade of stress (Mirowsky and Ross 2003) for a family.

How family SES shapes everyday life circumstances and experiences for children depends on how it affects family functioning, the household interpersonal environment, and the extent to which it impacts parenting investment versus parent stress and behavior (Quinton and Rutter 1988). Family SES disadvantage has its most negative impact on children through loss of and disruption in close personal relationships, such as parental divorce, death, and periodic absence (Coyne and Downey 1991). There is convincing evidence that the stress that is endemic to enduring insufficient family income and material hardship can restrict parents' ability or willingness to provide social and emotional support to their children and that parents experiencing psychological distress tend to emotionally withdraw from their children, spend less time together, or to become hostile toward them (Gershoff, Aber, Raver and Lennon 2007). Persistent poverty and descent into poverty appear to move parenting and discipline behaviors in more harsh, punitive, irritable, inconsistent, and coercive directions (Repetti, Taylor and Seeman 2002). The clustering of disadvantaged circumstances and experiences creates a 'disequilibrating' aspect that interferes with the ability to practice effective parenting and provide needed care and supervision, thereby creating potential risk for abusive and neglectful treatment.

Type and Amount of Exposure to Adverse Childhood Experience

Aside from social and economic factors, a family that includes one or more members with psychopathology, substance abuse or dependence, or criminal involvement may present circumstances that expose children in the home to a range of adverse experiences that result from the behavior of their parents or other adults that inhabit the household environment (Collins, Maccoby, Steinberg et al. 2000). The effects of parental psychiatric status are pervasive and impacts negatively on parenting and overall family functioning. Parental psychopathology is associated with increased rates of marital discord, separation, and divorce, low levels of

caregiving, extremes of the range of family cohesion and adaptability (i.e., overprotection) and economic stability. Results published from the National Comorbidity Survey (NCS) data set indicate that nearly half of the U.S. population will experience a major psychiatric illness at some point over their lifetime (Kessler, McGonagle, Zhao, et al. 1994) and that the most common illness is a substance use disorder.

Substance use disorders are often associated with social and occupational impairment and physical and emotional illness, as well as high mortality stemming from alcohol- and drug-related accidents, homicide, and suicide. Substance-abusing parents have been shown to provide less social and/or emotional support to their children (Holden, Brown & Mott 1988), and adolescents with substance-abusing parents experience more stress (Brown, Vik & Creamer 1989) and more negative life events than those from non-substance-abusing families (Roosa, Beals, Sandler & Pillow 1990). Likewise, parent involvement in crime potentially exposes children to a range of stressors, including parental absence (incarceration), major negative life events, daily hassles, and frequent family transitions (i.e., divorce, separation, remarriage, residential moves) (Patterson & Capaldi 1991). Parent psychopathology and problem behaviors and compromises functioning of the family and effects many aspects of positive parenting practices, such as supervising and monitoring children, using consistent discipline, and being available to provide needed guidance and support.

The kind of unfavorable circumstances and experiences mentioned above are differentially represented in families and are not evenly distributed among the population. Disadvantaged social and economic factors tend to co-occur and are often part of a wider constellation of persistent difficulties evident in the household (Quinton and Rutter 1988). Families that are undermined by parental psychiatric disturbance, substance use and dependence,

or involvement in crime, provide labile circumstances that potentially set the stage for a chain reaction in which one 'bad' thing leads to another. Chain effects in risk of exposure are common and mutually reinforcing so that the negative effects of problems in one domain (e.g., parent mental health) tend to make it likely that negative effects of problems in another domain (e.g. work status) will be present (Rutter 1989). Parents who are impaired by mental illness or substance use problems may not be able to meet basic care needs for their children, let alone ensure safety, security, teaching, or the identification of looming danger that would spur them to take protective action on behalf of a vulnerable child. The clustering and accumulation of psychosocial disadvantage related to impaired parental functioning interacts with economic factors to create more or less risk within childhood circumstances for exposure to adverse childhood experience.

Family-based risk factors seem to have a cumulative and interactive effect, so that the presence of "risky" family characteristics create potential for a cascade of negative exposures and experiences (Repetti, Taylor, and Seeman 2002). The concept of risky family characteristics draws attention to the nesting of multiple risk factors within social environments that threaten personal safety, limit cultivating social ties, or are characterized by conflict, violence, or abuse (Taylor, Repetti, and Seeman 1997). A test of the Risky Families model was remarkable in demonstrating that risky family characteristics need not include features that are classified as abusive, but rather family features that indicate conflict, lack of routines, structure, and rituals, and other common family occurrences (Taylor, Lerner, Sage, et al. 2004). In other words, consistent with research on chaos and unfavorable environments (Evans and Wachs 2010), the Risky Families study suggest that the typical strain that accompanies ordinary, everyday family

problems may very well confer risk for exposure to adverse childhood experiences, especially when paired with disadvantaged childhood social and economic circumstances.

A series of studies that examined victimization among children (in the past year), revealed important methodological and conceptual directions for research on exposure to adversity and victimization in childhood (Finkelhor, Ormrod, and Turner 2007a; 2007b). Analysis of an aggregate, additive measure of the number of victimization types ("poly-victimization") revealed that a poly-victimization measure (4-6 types and 7+ types) eclipsed the explanatory power of single victimization types on psychological effects of trauma. At the same time, certain individual types of victimization and child maltreatment made independent contributions to distress symptoms over and above poly-victimization. Poly-victimized children tended to have more serious victimization and had higher rates of exposure to other adversities, such as domestic violence, than other child victims.

A follow-up study focusing on re-victimization patterns confirmed and further articulated the importance of adversity in the process of childhood victimization. Results from the second year follow-up indicated strong associations between ongoing childhood victimization and youth from families with occurrence of violence or maltreatment, substance abuse, imprisonment, unemployment, and single or stepparent families (Finkelhor, Ormrod, and Turner 2007c). Moreover, number of family problems predicted new poly-victimization among respondents, so that children in single parent or stepparent families, and households with domestic violence or child maltreatment, had a disproportionate risk of unprecedented, multiple victimization. A key feature of poly-victims was that they were much less likely to come from intact two parent families (Finkelhor, Ormrod, and Turner 2009). Closer examination of family structure and predictors of child victimization indicated that "family problems" (parent imprisonment, parent

unemployment, family substance abuse, and chronic parental arguing) was both the strongest independent predictor of recent victimization and the only mediator that accounted for greater victimization in stepfamilies (Turner, Finkelhor, and Ormrod 2006).

In sum, the victimization studies confirm the pervasive nature of exposure to childhood victimization. Additionally, given the consequential role of family problems, the victimization studies suggest that social and economic circumstances surrounding family problems may have potential explanatory value for examining how family SES stratifies exposure to adverse childhood experience since other research indicates that family structure type is shown to be a marker for the unequal distribution of risk for stress exposure (Barrett and Turner 2006). Methodologically, studies of child maltreatment and victimization strongly suggest that exposure to adversity should be conceptualized as co-occurring rather than a discrete set of events and that research should be sure to examine exposure to multiple forms of victimization. This assertion is supported by a body of research on multiple risk exposure (i.e., experiencing more than one risk at a time) showing that family SES is related to multiple risk exposure (Evans and Kim 2010).

Conceptual Framework

Principles of the life course perspective and the Stress Process Model (SPM) provide a framework for examining the relationship between childhood SES circumstance and exposure to adverse childhood experience. A life course perspective directs attention toward examining the preceding SES conditions that lead to variation in exposure to adverse childhood experience (Pearlin, Schieman, Fazio, and Meersman 2005). The SPM acknowledges that stressors may take many forms, but calls attention to life events and more chronic, repeated stressors with the potential to exert a powerfully disruptive effect on an individual's life, such as loss events and trauma, rather than events cognitively appraised as stressful (Pearlin 1999). A central tenet of

the SPM is that the risk of exposure to stressors is distributed unequally so that those with the most disadvantaged social status will have the greatest chance of exposure to stress and that exposure to many stressors are rooted in social circumstances. Additionally, the social context of daily life is considered a natural origin of risk that shapes exposure to stressors. Applying the SPM to this project pinpoints the family as a natural origin of risk that shapes exposure to stressors in childhood, since the social context of childhood is centered on daily life in a family. Thus, membership in a family with more or less social and economic resources shapes the content of childhood experiences, which has potential consequences for exposure to adverse childhood experience.

The stress process model is characterized by an emphasis on exposure to stressors that are considered unwanted and unscheduled major adversities, such as circumstances or experiences that threaten personal safety, limit cultivating social ties, or are characterized by conflict, violence, or abuse (Garmezy and Masten 1994; Masten, Neemann, Adenas 1994; Hardt and Rutter 2004), the ramifications of exposure, and the social and economic circumstances surrounding exposure. Thus, the stress process perspective combined with a life course lens is best suited for this study because together they direct attention to understanding whether more or less disadvantaged childhood social and economic circumstances contribute to increased likelihood of exposure to adverse childhood experience.

The purpose of the current study is to present and test a conceptual model that posits possible relationships between childhood SES circumstances and exposure to adverse experiences in childhood. The general hypothesis is that disadvantaged childhood SES circumstances are associated with differential exposure to adverse childhood experience. This hypothesis rests on three assumptions: (1) that exposure to stressors is related to childhood SES;

(2) that, compared to higher SES groups, members of lower SES groups experience higher levels of exposure to stressors; and (3) that childhood SES will be associated with variation in individual types of exposure to adverse childhood experience. The goals of this paper are to assess whether: 1) disadvantaged childhood SES is associated with increased likelihood of exposure to adverse childhood experience; 2) whether disadvantaged childhood SES is associated with increased likelihood of exposure to distinct types of adverse childhood experiences, and 3) whether disadvantaged childhood SES is associated with increased likelihood of exposure to multiple adverse childhood experiences.

Methods

Data

The National Comorbidity Survey Replication Adolescent Supplement (NCS-A) is a national survey of DSM-IV mental disorders among English-speaking adolescents ages 13-17 years (n=10,148). The NCS-A was designed to provide national data on the prevalence, correlates, and patterns of service use for mental disorders among adolescents living in households in the contiguous United States. The NCS-A extends the age range of the NCS-R by using a modification of the NCS-R interview schedule administered to adolescents who resided in households identified in the NCS-R plus a school sample. The survey was fielded between February 2001 and January 2004. Information on the survey design and field procedures, including details of the weighting procedure, is available elsewhere (Kessler, Avenevoli, Costello, et al. 2009).

The NCS-A is based on a dual-frame design in which one sample was recruited from NCS-R households and another from a representative sample of schools in the same sample counties as the NCS-R households. The number of adolescents residing in NCS-R households

was too small to satisfy the desired sample size of 10,000 respondents, so a school-based sample was added. Selection of NCS-R households was based on a three-stage clustered area probability sampling design that was representative of households in the continental United States. Details about the NCS-R design and field procedures are available elsewhere (Kessler, Berglund, Chiu, et al. 2004). In the household sample, if more than one adolescent resided in the household, a single adolescent was randomly selected by computer program. If by chance more than one adolescent per household was selected in the school sample both were invited to participate.

The school sample was selected from a government issued list of all licensed schools in the country. A representative sample of middle schools, junior high schools, and high schools in each of the counties or county clusters that made up the primary sampling units (PSUs) of the NCS-R was selected from the government list with probabilities proportional to the size of the student body in the classes that corresponded to the target sample of youths aged 13 to 17 years. All school types (i.e., public and private, schools for gifted children, therapeutic schools, residential schools) were eligible and included according to their true population proportions. In cases where a geographic area had several small schools, the schools were combined to form a cluster that was treated as a single school for sampling purposes. Student recruitment was based on rosters provided by participating schools with district and school principal approval. A stratified probability sample of 40 to 50 students was selected from each school to participate in the survey.

A total of 320 schools participated in the survey. Due to variation in school and district policies against releasing student information, those that stipulated a requirement of parental written consent were rejected for sample selection because active initial consent of this kind has

been shown to result in a very low response rate (Johnston, Bachman, O'Malley and Schulenberg 2007). This was the case in approximately 15% of the schools in the sample referred to as blinded schools because the identities of the sample students was concealed until after signed consent was obtained from parents by the school Principals. Additionally, due to low-initial school-level response rates and frequent extended time periods for recruitment, several replacement schools were recruited to replace refusal schools. Replacement schools were selected through standard procedures to match the original refusal schools in terms of school size, geographic area, and demographic characteristics.

The NCS-A used a modification of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) Version 3.0 instrument that was administered to adults in the NCS-R. Detailed information about the modifications made to the CIDI for use with adolescents is available elsewhere (Merikangas, Avenevoli, Costello et al. 2009). Interviews were completed face-to-face with adolescents in their home using computer-assisted personal interview (CAPI) methods. Parents were asked to complete paper and pencil self-administered questionnaires (PSAQ) while adolescent respondents were being interviewed. Principals and Mental Health Coordinators were asked to complete a self-administered questionnaire (SAQ) that described the school and its mental health resources. School staff was offered an alternative to provide the information in a telephone interview or in-person interview in cases where completed SAQ information could not be obtained.

The overall adolescent response rate was 75.6%, for a total of 10,148 complete interviews. The particulate response rates were 85.9% (n=904) in the household sample, 81.8% (n=8,912) in the unblinded school sample, and 22.3% (n=332) in the blinded school sample. Non-response was primarily due to refusal (21.3% total across households, unblinded schools,

and blinded schools), which in the household and unblinded school samples came chiefly from parents rather than adolescents (72.3% and 81.0%, respectively). The refusals in the blinded school sample came largely from parents failing to return active written consent (98.1%). Likewise, the response rate to the parent SAQ was substantially lower than in the adolescent survey (63.0% and 75.6%, respectively).

The data were weighted to adjust for differential probabilities of selection of respondents within household and school samples, differential nonresponse, and residual differences between the sample and the U.S. population on the cross-classification of sociodemographic variables. Additional details on the weighting procedures are available elsewhere (Kessler, Avenevoli, Costello, et al., 2009). 69 survey interview records were omitted from the analysis because of missing information on key variables, resulting in a final analytic sample of n=10,079 respondents.

Independent Variables

Family Size. Membership in a family with four or more children living at home is routinely considered a contextual risk factor (Rutter 1979; Werner and Smith 1982; Sameroff, Seifer, Zax and Barocas 1987). The number of children present in the home is shown to have a negative impact on the availability of both interpersonal parental resources and economic resources in a family (Downey 1995; 2001). Family size was measured using the number of children in the household reported by the respondent. The number of children reported was dichotomized to reflect an average size family (1-3 children) and a large size family (4 or more children).

Parent Education. Level of parent education was measured by the number of years of schooling completed by a male and/or female that was the head of the household for most of the respondent's childhood. The highest level of education for any male or female head of the household was used to indicate parental education. Responses were categorized into four groups: less than high school (<12 years), high school graduate (12 years), some education or training beyond college (13-15 years), college degree or advanced degree (16 or more years).

Parent Work Status. Respondents were asked:

> "How much of your childhood did (your father/mother MALE HEAD/FEMALE HEAD) either work for pay or in a family business – all, most, a little, or none of your childhood?"

The highest amount of work for any parental figure in the household was used to indicate parent work status. Responses were dichotomized into those respondents that reported a parent worked all or most and those respondents that reported a parent worked less than all or most (some, a little, or none) because a large majority of respondents reported that at least one parent worked all or most of the time.

Poverty Level. The poverty index ratio (PIR) was defined in relation to the 2001 federal poverty line and is based on family size and the ratio of family income to the family's poverty threshold level (Proctor and Dalaker 2002). Responses were coded into four categories: poor was less than or equal to 1.5 times the poverty line, low average income was more than 1.5 but less than 3.0 times the poverty line, high average income was more than 3.0 but less than 6.0 the poverty line, and high income was more than 6.0 times the poverty line.

Welfare Receipt. Respondents were asked:

> "Was there ever a time when your family received money from government assistance programs like welfare, Aid to Families with Dependent Children, General Assistance, or Temporary Assistance for Needy Families?"

Responses were coded into three categories: those that reported yes, their family had received welfare; no, their family had never received welfare; and don't know, for respondents that did not report a definitive answer to whether their family had received welfare.

Dependent Variables

Interpersonal Loss. Interpersonal Loss includes three kinds of experiences that entail either losing a parent permanently through death, reduction of daily contact through divorce, or not seeing a parent for an extended amount of time (6 or more months) due to a parent's temporary absence. Respondents were asked:

"Have you lived continuously with your biological father/mother for your whole life?" A response of no to living continuously with a father and/or mother was followed by asking respondents:

> "Why (didn't you ever live with/did you stop living with) your biological father/mother? Did your father/mother die, were your parents separated or divorced, or was there some other reason?"

Parental Death. Responses were dichotomized into those that reported yes, a father and/or mother died, and no, both parents were alive at the time of interview.

Parental Divorce: Responses were dichotomized into those that reported yes, their father and mother had divorced, and no, both parents remained married at the time of interview.

Parental Absence. A response of yes for a respondent that lived continuously with a father and/or mother was followed by asking respondents:

> "Was your father/mother ever away from home for six months or longer, like in the armed forces, in a hospital or jail, or on a business trip?"

Responses were dichotomized into those that reported yes, their father and/or mother had been absent for six months or more, and no, neither parent had been absent for six months or more.

Child Maltreatment: Child maltreatment assessed a respondent's report of having ever experienced neglect in care, verbal threats of aggression and physical abuse by a caregiver, or rape, sexual assault or molestation at the time of interview.

Child Neglect. Five questions used in child welfare investigations (Courtney, Piliavin, Grogan-Kaylor, and Nesmith 1998) were used to assess the frequency (often, sometimes, not very often, never) of neglectful care as follows:

1. "How often were you made to do chores that were too difficult or dangerous for someone your age?"
2. "How often were you left alone or unsupervised when you were too young to be alone?"
3. "How often did you go without things you need like clothes, shoes, or school supplies because your parents or caregivers spent the money on themselves?"
4. "How often did your parents or caregivers make you go hungry or not prepare regular meals?"
5. "How often did your parents or caregivers ignore or fail to get you medical treatment when you were sick or hurt?"

An additional question asked:

6. "Did he/she often fail to take care of his/her family?"

A positive response to any of the five questions above with a frequency of "often" or "sometimes" in combination with a positive answer to the "fail to take care" question was coded 1 as an indication of neglect.

Neglectful supervision was measured using a threshold age plus frequency to determine the occurrence of neglectful supervision in accord with prevailing U.S. child welfare laws (Straus and Kantor 2005) and developmental stage (Kantor, Holt, Mebert et al. 2004). Neglectful supervision was measured by asking:

7. "How old were you when you were first allowed to stay home by yourself without supervision from an adult or older brother or sister?"

If respondents indicated an age younger than 11 years, they were asked:

8. "How often were you left alone when you were (the age younger than 11) - just about every day, a few days a week, a few days a month, or less than once a month?"

If the age reported was 8 years old or younger, and the frequency was "just about every day", the response was coded 1 as an indication of neglectful supervision.

Coding follows the recommendation of the uniform definitions for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi et al. 2008). Responses to the six indicators of neglect described above were summed. A total of one or more was coded 1 as an indication of reporting experience of neglect during childhood. Otherwise, responses were coded as child neglect not reported.

Child Abuse. Physical and emotional abuse of the respondent by parents or a caregiver was assessed using a modified version of the Conflict Tactics Scale (Straus 1979) as follows:

1. "When you were growing up, how often did (the man and/or woman who raised you) do any of these things (insulted or swore; shouted, yelled, or screamed; threatened to hit) to you – often, sometimes, not very often, or never?"
2. "When you were growing up, how often did (the man and/or woman who raised you) do any of these things (pushed, grabbed or shoved; threw something; slapped or hit) to you – often, sometimes, not very often, or never?"
3. "When you were growing up, how often did (the man and/or woman who raised you) do any of these things (kicked, bit or hit with a fist; beat up; choked; burned or scalded; threatened with a knife or gun) to you – often, sometimes, not very often, or never?"
4. "Were you ever badly beaten up by your parents or the people who raised you?"

Coding follows the recommendation of the uniform definitions for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi et al. 2008). A response of often or sometimes to the first and second question, or a response of often, sometimes, or not very often to the third question, or a response of yes to the fourth question was coded 1 as an

indication of reporting experience of physical abuse during childhood. Otherwise, responses were coded as child abuse not reported.

Child Sexual Abuse. Experience of rape, sexual assault, or molestation reported by the respondent was assessed using items from the National Comorbidity Survey (Kessler, Davis and Kendler 1997) as follows:

1. "The next two questions are about sexual assault. The first is about rape. We define this as someone either having sexual intercourse with you or penetrating your body with a finger or object when you did not want them to, either by threatening you or by using force. Did this ever happen to you?"
2. "Other than rape, were you ever sexually assaulted or molested?"

Coding follows the recommendation of the uniform definitions for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi et al. 2008). A response of yes to either of these two questions was coded 1 as an indication of reporting experience of sexual abuse during childhood. Otherwise, responses were coded as child sexual abuse not reported.

Parent Psychopathology. Parent psychopathology assessed a respondent's report of ever experiencing a parent that had depression, Generalized Anxiety Disorder (GAD), or panic disorder. History of parent mental illness was measured using items from the Family History Research Diagnostic Criteria Interview (Andreasen, Endicott, Spitzer and Winokur 1977) and its extensions (Kendler, Silberg, Neale et al. 1991).

Parent Mental Illness. Parent history of depression, generalized anxiety disorder (GAD), and panic disorder was assessed as follows:

1. "Did (the man/woman who raised you) ever have times lasting two weeks or more where he/she was sad or depressed most of the time?"
2. "Did (the man/woman who raised you) ever have times lasting a month or more when he/she was constantly nervous, edgy, or anxious?"
3. "Did (the man/woman who raised you) ever have anxiety attacks where all of a sudden he/she felt frightened, anxious, or panicky?"

4. "How much did his/her (depression/nervousness/anxiety attacks) ever cause problems in his/her life or keep him/her from doing his/her regular activities – a lot, some, a little, or not at all?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of yes for any of the first three questions for any parental figure and a response of "a lot" or "some" for the fourth question was coded 1 as an indication of reporting experience of a parent with mental illness during childhood. Otherwise, responses were coded as parent mental illness not reported.

Parent Alcohol or Other Drug (AOD) Problem. Parent history of a problem with alcohol or drug use was assessed using items from the Family History Research Diagnostic Criteria Interview (Andreasen, Endicott, Spitzer and Winokur 1977) and its extensions (Kendler, Silberg, Neale et al. 1991) as follows:

1. "Did (the man/woman who raised you) ever have a problem with drinking alcohol?"
2. "Did he/she ever have a problem with drugs?"
3. "How much did his/her substance use every cause problems in his/her life or keep him/her from doing his/her regular activities – a lot, some, a little, or not at all?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of yes for either of the first two questions for any parental figure and a response of "a lot" or "some" for the third question was coded 1 as an indication of reporting experience of a parent with an AOD problem. Otherwise, responses were coded as parent AOD problem not reported.

Parent Problem Behavior. Parent problem behavior included measures of ever witnessing family violence and parent criminal activity.

Family Violence. Whether a respondent had ever witnessed violence between their caregivers was assessed using a modified version of the Conflict Tactics Scale (Straus 1979) and an item from the trauma section of the CIDI as follows:

1. "How often did (your parents/the couple who raised you) do any of these things (insulted or swore; shouted, yelled, or screamed; threatened to hit) to each other while you were growing up – often, sometimes, not very often, or never?"
2. "How often did (your parents/the couple who raised you) do any of these things (pushed, grabbed or shoved; threw something; slapped or hit) to each other while you were growing up – often, sometimes, not very often, or never?"
3. "How often did (your parents/the couple who raised you) do any of these things (kicked, bit or hit with a fist; beat up; choked; burned or scalded; threatened with a knife or gun) to each other – often, sometimes, not very often, or never?"
4. "Did you ever witness serious physical fights at home, like when your father beat up your mother?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of often or sometimes to the first and second question, a response of often, sometimes, or not very often to the third question, or a response of yes to the fourth question was coded 1 as an indication of reporting experience of household violence during childhood. Otherwise, responses were coded as witnessing family violence not reported.

Parent Criminal Activity. Parental history of crime and incarceration was assessed with questions from the National Comorbidity Survey (Kessler, Davis and Kendler 1997) as follows:

1. "Was (the man/woman who raised you) ever involved in criminal activities like burglary or selling stolen property?"
2. "Was (the man/woman) who raised you ever arrested or sent to prison?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of yes for either of these questions for any

parent or caregiver was coded 1 as an indication of reporting experience of parent criminal activity during childhood. Otherwise, responses were coded as parent criminal activity not reported.

Exposure to Adverse Childhood Experience. A variable was created that categorized the number of childhood adversities that a respondent had experienced prior to age 18 into three groups. The categories were no adversities (0), one adversity (1), two adversities (2), and three or more adversities (3+). A "high level" of exposure is represented by the 3+ exposure category.

Analysis Plan

Descriptive analyses were conducted first. Next, the association among each of the pairs of independent and dependent variables were examined. The relationship between childhood SES circumstances and exposure to childhood adversity by type and amount were examined. Logistic regression coefficients were exponentiated and are reported as odds ratios (ORs). All models included controls for sex, age at interview, and race-ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic/Latino, and Other). First, the basic relationships are presented for the logistic regression of each demographic variable. Three models were estimated for each of the eleven adverse childhood experiences. The first model (M1) estimates an association between the demographic control indicators and one of the eleven adverse childhood experience. The second model (M2) adds each family social and economic predictor variable to estimate the associations with one of the eleven adverse childhood experiences, net of sociodemographic indicators. The third model (M3) includes all sociodemographic control indicators, family social and economic predictors, and one of the eleven adverse childhood experiences to test for the significance of childhood SES circumstances after adjusting for sociodemographic controls. Logistic Regression was used to examine the relationship between childhood SES circumstances and quantity of exposure to childhood adversity.

All analyses were conducted using STATA v.12 (Stata Press 2011). Taylor series linearization was used to estimate the sampling variance of each parameter estimate, and the unique covariances between the parameter estimates. These estimated variances and covariances are then used to develop Wald χ^2 test statistics required to test hypotheses. All analyses controlled for sex (male, female), race (White, Black, Hispanic, Other), and age 13-18 years). Finally, only data without missing values on the variables of interest were included in this analysis for a complete case sample of n=10,079 records. Cases with missing data were not deleted, but rather a subclass of complete cases was created using the "subpop" command in Stata 12. Subpop preserves the sample-to-sample variability of the full complex design and thus maintains the integrity of any variance estimation procedures.

Results

Sample Characteristics

Table 1 displays descriptive information about the analytic sample. The sample is almost equally divided by gender. The age groups are approximately even in proportion at close to 20% for each age from 13-17, except the 18 year old group which comprises 5.6% of the sample. A majority of the respondents are white (65.6%), with almost equal proportions of African Americans (15.1%) and Hispanics (14.4%), and a relatively smaller group of those identified as an Other race/ethnicity (5.0%). Over one-third of the parents of respondents had a college education (35.4%), 1 in 5 had some college (19.5%), about 1 in 3 had a high school diploma (29.8%), and about 1 in 6 did not complete high school (15.2%). Most respondents had at least one parent that worked all or most of the time over their childhood (94.8%), while a small proportion worked only some, a little, or none (5.2%). Accordingly, the vast majority of respondents came from households with high (34.3%) or high average income (31.9%), while relatively less came from households with low average (19.1%) or low income (14.1%). At the

time of the interview most families of respondents in the sample had never received any money from government assistance (78.2%), while about 1 in 6 ever received welfare (15.7%). Family size tended to be in the average range of one to three children (60.4%), while 39.6% of respondents came from larger families with 4 or more children.

Childhood SES Circumstances and Exposure to Childhood Adversity

Table 3.2 shows that respondents with disadvantaged childhood SES circumstances have greater exposure to several kinds of adverse childhood experience. Additionally, certain childhood adversities are strongly associated with select social and economic factors. Family size was associated with greater reporting of exposure to several kinds of childhood adversity. Compared to respondents from average size families, those from larger families had higher reported exposure to parent divorce (11.1% vs. 26.7%), child abuse (18.1% vs. 24.4%), child sexual abuse (3.9% vs. 7.8%), parent AOD problem (10.9% vs. 14.6%), parent suicide attempt (2.2% vs. 3.8%), family violence (6.1% vs. 12.8%), and parent criminal activity (9.3% vs. 19.5%).

Parent education was associated with several kinds of childhood adversity, including parent divorce, child abuse, parental AOD problem, parent suicide attempt, family violence, and parent criminal activity. Respondents with a college educated parent consistently reported the lowest rates of exposure to each of these adversities. Compared to respondents with non-college educated parents, those from families with higher education had about half the rate of exposure to parent divorce (~20.2% vs. 11.6%), parent AOD problem (~14.3% vs. 8.3%), parent suicide attempt (~3.4% vs. 1.6%), and parent criminal activity (~17.1% vs. 6.9%), and 30% lower rate of reported child abuse (~23.2% vs. 15.9%).

Additional measures of parent social and economic factors showed mixed results. Work status was not consistently associated with exposure to childhood adversity. Work status was associated with death of a parent, parent divorce, and parent criminal activity, and weakly associated with child neglect, child abuse, and family violence. Reported rates of exposure for each of these childhood adversities was higher among respondents whose head of household worked less than all or most the time. Most noteworthy was a two-fold rate among parents working less than all /most the time compared to always working parents for divorce (34.7% vs. 16.3%), and parent involvement in crime (22.5% vs. 12.8%). Poverty status was associated with exposure to parent divorce, family violence, and parent criminal activity, with reported exposure rates highest among respondents with low income. Poverty status was weakly associated with child neglect and showed an inverse relationship for exposure to adversity, such that those with high income had the highest reported rate of exposure to child neglect

Welfare receipt exhibits the most remarkable association with exposure to childhood adversity. Welfare receipt was strongly associated with all but one of the eleven types of adversity. Respondents that reported receiving money from a government assistance program had rates of reported exposure that was about double the reported rate of exposure for those from families that did not receive welfare for: parental death (9.4% vs. 3.9%), parental divorce (28.4% vs. 14.8%), parent absence (7.7% vs. 5.1%), child abuse (33.2% vs. 18.2%), child sexual abuse (11.7% vs. 4.2%), parent mental illness (24.8% vs. 9.7%), parent AOD problem (24.6% vs. 10.1%), parent suicide attempt (8.5% vs. 1.6%), family violence (20.1% vs. 6.3%), and parent criminal activity (32.3% vs. 8.9%).

Sociodemographic characteristics had a variable association with reported exposure to childhood adversity. Gender was strongly associated with report of exposure to only one

adversity, sexual abuse, where the rate of exposure reported by females is almost nine times the rate reported by males (10.0% vs. 1.2%). Gender was also moderately associated with reported exposure to child neglect, parent mental illness, parent AOD problem, and parent suicide attempt, and weakly associated with child abuse and family violence. Compared to males in the sample, females reported greater exposure to parent mental illness (14.0% vs. 10.1%), parent AOD problem (13.7 vs. 11.2%), parent suicide attempt (3.7% vs. 2.0%), and witnessing family violence (9.9% vs. 7.7%). Males reported greater exposure to child neglect (7.6% vs. 5.0%) and child abuse (21.7% vs. 19.5%).

Age at the time of interview was strongly associated with greater report of exposure to sexual abuse and parental mental illness, and marginally associated with parental absence and parental AOD problem. Race and ethnicity showed a significant association with many of the eleven childhood adversities. Race was strongly associated with greater report of exposure to parent divorce, parent absence, child abuse, parent AOD problem, witnessing family violence, and parent criminal activity, and moderately associated with increased report of death of a parent, child neglect, and parent mental illness. Respondents that identified their race/ethnicity as Non-Hispanic White reported higher rates of exposure to child neglect (7.0%) and parent mental illness (13.2%) than other racial or ethnic groups in the sample. In contrast, respondents that identified as African American reported higher rates of exposure to death of a parent (8.1%) and divorce (26.2%) than other racial or ethnic groups in the sample. Respondents that identified as Hispanic reported higher rates of exposure to parent AOD problem (16.1%) than other racial or ethnic groups in the sample. Both African American and Hispanic respondents reported comparatively higher levels of exposure to parent absence (7.3%, respectively), child abuse (27.8% and 26.2%, respectively), and parent criminal activity (19.4% and 20.3%, respectively)

than White race respondents, but those that identified as Other race/ethnicity had the highest reported rate of parent absence (10.1%). For witnessing family violence, the rate of exposure was almost equal for African American, Hispanic, and Other race/ethnicity respondents (11.7%, 11.2%, and 11.4%, respectively) compared to Whites (7.4%).

Results for the association between childhood SES circumstances and quantity of exposure to childhood adversity are presented in Table 3.3[3]. These results show that disadvantaged childhood SES circumstances are associated with increased exposure to adverse childhood experience. Exposure to adverse experience was common among youth in this sample with about 56% of the sample reported exposure to at least one of the eleven kinds of adverse experience included in this study. 1 in 3 respondents from a large size family reported no exposure to adverse childhood experiences (33.3%) compared to 1 in 2 respondents from an average size family (51.1%). Exposure to three or more adverse childhood experiences was reported twice as often among respondents from large size families compared to average size families (20.0% vs. 10%, respectively).

For parent educational level, respondents whose parent had less than a college education reported no exposure to adverse childhood experiences less often than those with a college educated parent (about 40% vs. 52.8%, respectively). Additionally, exposure to multiple adverse childhood experiences (2 or 3+) was reported in greater numbers among respondents that had a parent with less than college education compared to those with a parent that had a college degree. This difference was especially pronounced for exposure to three or more adverse experiences such that respondents with less educated parents reported higher exposure almost twice as often as those with more educated parents (about 17% vs. 8.8%). Respondents with a

[3] Please refer to Appendix A for results of the tetrachoric correlations of the eleven childhood adversities.

parent that worked some, a little, or none reported no exposure to adverse childhood experiences in lower numbers compared to respondents with a parent that worked all or most of the time (30.9% vs. 44.7%, respectively). Additionally respondents with parents that worked less reported lower numbers of just one or two exposures to adverse experiences compared to those with a parent that worked all or most of the time (26.7% vs. 28.3%). Respondents with a parent that worked less also reported a high level (3 or more) of exposure to adverse childhood experience almost twice as often as those whose parent worked all or most of the time (25.3% vs. 13.3%, respectively).

Respondents from families with lower income reported the lowest number of no exposure to adverse childhood experience compared to those from the highest income families (39.3% vs. 48.8%), and reported exposure to three or more adverse experiences in greater numbers (17.5% vs. 11.5%, respectively). A difference in multiple exposure to adverse childhood experience was inversely related to income, such that the prevalence of a high level of exposure (3 or more) increased as the level of family income decreased. Only 1 in 5 respondents from families that received welfare reported no exposure to adverse childhood experiences (20.1%), while about 1 in 2 from families that did not receive welfare had no exposure whatsoever (49.2%). Respondents from families that received welfare reported a high level (3 or more) of exposure to adverse childhood experiences over three times more often than those from families that did not receive welfare (35.0% vs. 9.6%, respectively).

Results for the logistic regression analysis between childhood circumstances and interpersonal loss (parent divorce, parent death, parent absence) are presented in Table 3.4. Overall, this multivariate analysis shows that among childhood SES circumstances, only receipt of welfare was consistently association with exposure to interpersonal loss in childhood. For

divorce, Model 1 shows that the odds of exposure to divorce are two times higher for African American respondents in this sample (OR=2.0) compared to that for white respondents, net of all other variables in the model. Also, seventeen years olds have a greater likelihood of exposure to divorce (OR=1.37) compared to thirteen year old respondents, net of all other variables in the model. Model 2 shows that large family size was associated with two times greater odds of exposure to parent divorce (OR=2.57) compared to respondents from families of more average size, net of all other childhood SES factors in the model. The odds of exposure to divorce among respondents with a parent that has a high school diploma (OR=1.63) or some college (OR=1.64) are higher compared to respondents with a college educated parent, net of all other variables in the model. Having a parent that works some, a little, or none is associated with double the odds of exposure to divorce (OR=2.19) compared to respondents with a parent that worked all or most the time. Respondents with high average family income had higher odds of exposure to divorce (OR=1.32) compared to respondents from families with high income, net of all other variables in the model. Respondents from families that received welfare had higher odds of exposure to divorce (OR=1.55) compared to respondents from families that never received welfare, net of all other variables.

The addition of demographic controls in Model 3 shows that the higher odds of exposure to divorce among African American respondents that was evident in Model 1(OR=2.0) were attenuated by the addition of childhood SES factors (OR=1.25). The increased odds of exposure to divorce in Model 1 among respondents with a parent that had a high school education (OR=1.61) or some college (OR=1.64), or worked some, a little, or none of the time (OR=2.19), had high average income (OR=1.32), or received welfare (OR=1.51) maintained their effect with

the addition of demographic controls in Model 3. Additionally, the higher odds of exposure to parent divorce among seventeen year old respondents (OR=1.34) is maintained in Model 3.

Table 3.4 shows that few childhood SES factors are associated with increased odds of parent death. The results of Model 1 for parental death show two-fold odds for exposure among African American respondents (OR=2.10) compared to white respondents, net of all other variables in the model. Model 2 shows higher odds of exposure to death of a parent for respondents with a parent that worked some, a little, or none of the time (OR=1.79) compared to those with a parent that worked all or most of the time and for receipt of welfare (OR=2.39) compared to those that did not receive welfare, net of all other variables in the model. The higher odds of exposure to death of a parent among African American respondents (OR=1.78), those with a household head that worked some, a little, or none of the time (OR=1.76), and from families that received welfare (OR=2.22) evident in Model 1 maintain their significant association in Model 3, net of all other variables in the model.

The results for parental absence presented in Table 3.4 show a different pattern for the relationship between childhood circumstances and exposure to parent death and divorce. Namely, that receipt of welfare is the sole childhood SES factor that was associated with parent absence in this analysis. Model 1 shows that age and race each have a significant effect on odds of exposure to parental absence. The odds of exposure to absence of a parent are higher for each year of age from age 14 to 17 (14: OR=1.97, 15: OR=1.97, 16: OR=2.15, and 17: OR=1.78) compared to that for 13 year olds, net of all other sociodemographic indicators. Among racial/ethnic groups, odds of exposure to parent absence was greater for Hispanic (OR=1.73), African American (OR=1.75), and Other (OR=2.52) respondents compared to that for white respondents, net of all other sociodemographic indicators. Model 2 shows that respondents from

families that received welfare had higher odds of exposure to absence of a parent (OR=1.72), compared to those that did not receive welfare, net of all other SES predictors in the model. The inclusion of all sociodemographic indicators and childhood SES predictors in Model 3 slightly attenuated the increased odds of exposure to parent absence for respondents from families that received welfare (OR=1.60) compared to those that did not receive welfare. However, the odds of exposure to parent absence for select sociodemographic indicators were essentially unchanged. The odds of exposure to parental absence are slightly higher for each year of age (14: OR=2.03, 15: OR=2.01, 16: OR=2.19, 17: OR=1.81) compared to that for 13 year olds, net of all other variables in the model. The odds of exposure to parental absence were nearly double for African American (OR=1.87), Hispanic (OR=1.87), and Other race/ethnicity (OR=2.43) respondents compared to white respondents, net of all other variables in the model. Although parent education was not significantly associated with odds of exposure to parent absence in Model 2, having a parent with some college education (OR=0.66) or a high school diploma (OR= 0.68) was associated with lower odds of exposure to absence of a parent, net of all other variables in Model 3.

Results for the logistic regression analysis between childhood SES circumstances and childhood maltreatment (child neglect, child abuse, child sex abuse) are presented in Table 4.5. This analysis showed that the association between childhood SES circumstances and child maltreatment is distinct for each kind of maltreatment. For child neglect, female respondents had lower odds of reported exposure (OR=0.64) compared to males in this sample, net of all other sociodemographic indicators. 18 year old respondents had about twice the odds of reported exposure to child neglect (OR=1.94) compared to 13 year olds, net of all other indicators. Among racial/ethnic minorities, both Hispanic and African American respondents had lower

odds of reported exposure to child neglect (OR=0.69 and OR=0.63, respectively) compared to white respondents, net of all other sociodemographic indicators. In Model 2, respondents whose parent had a high school diploma (OR=0.61) or did not graduate from high school (OR=0.71) had lower odds of exposure to child neglect compared to respondents with a parent that had a college education, net of all other childhood SES predictors. Respondents with a parent that worked some, a little, or none of the time had greater odds of reported exposure to child neglect (OR=1.68) compared to respondents with a parent that worked all or most of the time, net of all other childhood SES predictors . Respondents from families with low incomes (<1.5 PL) had lower odds of reported exposure to child (OR=0.60) compared to respondents from the highest income group in the sample (>6 PL), net of all other childhood SES variables. Except for the association between lower odds of reported exposure to child neglect for respondents with a parent that had less than a high school education (OR=0.78), all of the sociodemographic indicators and childhood SES predictors maintained their significant association with odds of exposure to child neglect after the addition of control variables in Model 3, with the exception of parent educational level of less than high school.

Select disadvantaged childhood SES circumstances were associated with greater odds of exposure to child abuse. Table 3.5 shows that female respondents were slightly less likely to report exposure to child abuse compared to males (OR=0.86), net of other sociodemographic indicators. The odds of exposure to child abuse were higher for those age 16 (OR=1.51) and 17 (OR=1.50) compared to 13 year olds, and African American and Hispanic respondents each had increased odds of exposure to child abuse (OR=1.83 and 1.66, respectively) compared to white respondents in this sample, net of all other sociodemographic indicators in the model. Model 2 shows that respondents from a large family had higher odds of reported exposure to child abuse

(OR=1.29) compared to respondents from an average family size, net of all other childhood SES predictors. Respondents with a parent that had a high school diploma (OR=1.41) or some college (OR=1.54) had higher odds of reported exposure to child abuse compared to those with a college educated parent, net of all other childhood SES predictors. Respondents from families that had received welfare had double the odds of reported exposure to child abuse (OR=1.99) compared to those from families that did not receive welfare, net of all other childhood SES variables.

The addition of sociodemographic indicators in Model 3 attenuated the higher odds of exposure to child abuse among both African American (OR=0.71) and Hispanic respondents (OR=0.63) compared to white respondents, net of all sociodemographic indicators and childhood SES predictors in the model. There was not attenuation of the odds of reported exposure to child abuse in Model 1 compared to Model 3 for female respondents (OR=0.85) compared to males, or for 16 (OR=1.48) and 17 year olds (OR=1.45) compared to 13 year olds, net of all other variables in the model. The increased odds of reported exposure to child abuse among respondents from a large size family were not attenuated (OR=1.20) compared to those from an average size family, or for those with a parent that had a high school education (OR=1.34) or some college (OR=1.50) compared to respondents with a college educated parent, or for being a member of a family that received welfare (OR=1.90) compared to those that did not, net of all other variables in the model.

Results for the logistic regression analysis between childhood SES circumstances and exposure to child sex abuse are included in Table 3.5. Across childhood circumstances, only select disadvantaged SES factors were associated with exposure to child sex abuse for this sample. Model 1 shows that the odds of exposure to child sexual abuse were over nine times

higher for female respondents (OR=9.49) compared to male respondents, and that odds of exposure to child sex abuse were higher for every year of age from 14 to 18 (OR= 14: 2.42, 15: 2.51, 16: 3.77, 17: 4.58, and 18: 5.16) compared to that for 13 year olds, net of all other sociodeomgraphic indicators in the model. Model 2 shows that a large family size is associated with increased odds of exposure to child sex abuse (OR=1.79) compared to respondents from an average size family, net of all other childhood SES predictors in the model. Respondents from families that received welfare were almost three times more likely to report exposure to child sexual abuse (OR=2.70) compared to respondents from families that did not receive welfarenet of all other SES factors. The addition of sociodemographic indicators in Model 3 did not attenuate the effect of the results from previous multivariate models, except that the odds of exposure to child sex abuse decreased for Hispanic respondents (OR=0.69) compared to white respondents, net of all other sociodemographics indicators and childhood SES predictors in the model. Each of the variables in the previous models that had a significant association with exposure to child sexual abuse maintained their predictive value for increased odds of exposure in Model 3. Addtionally, the odds of exposure to child sexual abuse among respondents that reported they did not know whether their family had received welfare increased from the crude odds in Model 1 to the fully adjusted odds in Model 3(OR=1.26 vs. OR=1.82, respectively).

Results for the logistic regression analysis between childhood SES circumstances and parental psychopathology (parental mental illness, parental substance use problem, parental suicide attempt) are presented in Table 3.6. Among childhood SES circumstances, family receipt of welfare was outstanding in its association with increased odds of reported exposure to all three types of parental psychopathology. For parent mental illness, female respondents had higher odds of reported exposure (OD=1.45) compared to males in this sample, and odds of reported

exposure to parent mental illness were higher for every year of age from 16 to 18 (OR= 16: 1.67, 17: 2.22, and 18: 1.93) compared to 13 year olds, net of all other sociodemographic indicators in the model. Additionally, African American respondents had lower odds of exposure to parent mental illness (OR=0.58) compared to white respondents, net of all other indicators in the model. In Model 2 respondents from families that received welfare had over three times higher odds (OR=3.35) of reported exposure to parent mental illness compared to respondents from families that did not receive welfare, net of all other childhood SES predictors in the model. Respondents with a parent that had less than a high school education had lower odds of reported exposure to parental mental illness (OR=0.69) than those with at least one college educated parent, net of all other childhood SES predictors. The addition of sociodemographic control variables in Model 3 did not attenuate any of the estimated effects of sociodemographic indicators or childhood SES predictors on likelihood of exposure to parent mental illness, except for the decreased odds of exposure to parent mental illness for Hispanic respondents (OR=0.74).

Results for the logistic regression between childhood SES circumstances and parent AOD problem are included in Table 3.6. Overall, select disadvantaged childhood SES factors were associated with increased odds of exposure to parent AOD problem. Females had higher odds of reported exposure to a parent AOD problem (OR=1.27) compared to males in this sample, and older adolescents had slightly higher odds of exposure to a parent substance use problem (OR= 17: 1.59, 18: 1.52) compared to 13 year olds, net of all other sociodemographic indicators. Among race/ethnic groups, Hispanics had higher odds of exposure to a parent AOD problem (OR=1.36) compared to white respondents, net of all other sociodemographic indicators. In Model 2, respondents that had a parent with either a high school education (OR=1.80) or some college (OR=1.80) had increased odds of exposure to parent AOD problem compared to

respondents with a college educated parent, net of all other SES factors in the model. Respondents from families with high average income had lower odds of reported exposure to a parent AOD problem (OR=0.72) compared to respondents from a family with high income, net of all other SES factors in the model. Respondents from a family that received welfare were almost three times more likely to report exposure to a parent substance use problem (OR=2.69) than respondents from a family that did not receive welfare, net of all other SES factors in the model. Model 3 shows that the addition of sociodemographic indicators attenuates the odds of exposureto a parent AOD problem among Hispanic respondents (OR=1.14) , but that each of the variables in the previous models that had a significant association with exposure to a parent AOD problem maintained their significant association with increased odds of exposure.

Results for the logistic regression between childhood SES circumstances and reported exposure to parent suicide attempt are included in Table 3.6. Among childhood SES factors, only having a parent with a high school education and receipt of welfare were associated with increased odds of exposure to parent suicide in the adjusted model. Model 1 shows that females had higher odds of reporting exposure to a parent suicide attempt (OR=1.83) compared to male respondents in this sample, and that the odds of reported exposure to a parent suicide attempt were double for respondents aged 17 (OR=2.00) and 18 (OR=2.29) compared to 13 year old respondents, net of all other sociodemographic indicators in the model. African American respondents reported about lower odds of exposure to parent suicide attempt (OR=0.56) compared to white respondents, net of all other indicators in the model. Model 2 shows higher odds of exposure to parent suicide attempt among respondents that had a parent with a high school education (OR=1.75) compared to those with a college educated parent, net of all other childhood SES predictors. Respondents from a family that received welfare had almost five

times higher odds of exposure to a parent suicide attempt (OR=4.94) compared to respondents from a family that did not receive welfare, net of all other childhood SES predictors. Moreover, with the addition of sociodemographic indicators in Model 3, the odds of reported exposure to parent suicide attempt increased (OR=5.45) among respondents from families that received welfare as well as for respondents that did not know if their family received welfare (OR=2.50) compared to respondents from families that did not receive welfare, net of all other variables in the model. The addition of sociodemographic indicators in Model 3 did not attenuate the association between parent education, gender, age, or race/ethnicity and odds of reported exposure to parent suicide attempt estimated in Model 1 or Model 2.

Results for the logistic regression analysis between childhood social and economic factors and parental problem behaviors (family violence, parent criminal activity) are presented in Table 3.7. The childhood SEs circumstances that are associated with increased odds of exposure to parent problem behavior are identical. Large family size, having a parent with less than a college education, and welfare receipt was associated with greater exposure to family violence and parent criminal activity, separately. In Model 1, females had higher odds of reported exposure to witnessing family violence (OR=1.32) compared to male respondents in this sample, net of all other sociodemographic indicators in the model. 17 year old respondents had higher odds of reported exposure to witnessing family violence (OR=1.46) compared to 13 year old respondents, net of all other indicators in the model. Both Hispanic and African American respondents had increased odds of reported exposure to witnessing family violence (OR=1.63 and 1.70, respectively) compared to white respondents, net of all other indicators in the model.

In Model 2, respondents from a large size family had higher odds of reported exposure to witnessing family violence (OR=1.70) compared to respondents from a more average size family, net of all other childhood SES predictors in the model. Respondents with a parent that had less than a high school education (OR=1.94) or a high school degree (OR=1.85), or some college (OR=1.79) had increased odds of reported exposure to witnessing family violence compared to respondents with a college educated parent, net of all other SES predictors. Respondents from a family that received welfare were almost three times more likely to report exposure to witnessing family violence (OR=2.95) compared to respondents from a family that did not receive welfare, net of all other SES predictors. Model 3 shows that the higher odds of witnessing family violence among Hispanic and African American respondents was attenuated with the addition of sociodemographic indicators and childhood SES predictors (OR=1.02 and 0.99, respectively). Otherwise, each of the variables in Model 1 and Model 2 that had a significant association with reported exposure to witnessing family violence maintained their predictive value for increased odds of exposure in Model 3.

Results for the logistic regression analysis between childhood social and economic factors and parent criminal involvement are included in Table 3.7. Several disadvantaged childhood SES predictors were associated with increased odds of exposure to parent criminal involvement. Among demographic predictor variables, Hispanic and African American respondents had double the odds of exposure to parent criminal involvement (OR=2.17 and 2.05, respectively), net of all other sociodemographic indicators. In Model 2, respondents from a large size family had increased odds of exposure to parent criminal involvement (OR=1.73) compared to those that from an average family size, net of all other childhood SES predictors. Respondents with a parent that had less than a high school education (OR=1.81), or a high school education

(OR=1.93), or some college (OR=1.94) had increased odds of exposure to parent criminal involvement compared to respondents with a college educated parent, net of all other childhood SES predictors. Respondents from a family that received welfare had three times higher odds of exposure to parent criminal involvement (OR=3.61) compared to respondents from a family that did not receive welfare, net of all other childhood SES predictors. Additionally, respondents that reported they did not know whether their family received welfare had double the odds of exposure to parent criminal involvment (OR=2.07) compared to respondents from a family that did not receive welfare, net of all other childhood SES predictors. Model 3 shows that among Hispanic and African American respondents, the higher crude odds of exposure to a parent involved in crime from Model 1 is attenuated by the addition of sociodemographic indicators in Model 3(OR=1.18).

Discussion

This paper set out to assess whether: 1) disadvantaged childhood SES is associated with increased likelihood of exposure to adverse childhood experience; 2) disadvantaged childhood SES is associated with increased likelihood of exposure to co-occurring adverse childhood; and whether 3) non-disadvantaged childhood SES is associated with increased likelihood of exposure to non-victimization types of adverse childhood experiences (parent psychopathology, parent problem behavior). Results suggest that receipt of welfare is the sole disadvantaged childhood SES measure associated with a higher prevalence of exposure to adverse childhood experiences, a greater likelihood of reporting exposure to multiple adverse childhood experiences, and increased odds of exposure to almost every of the eleven adverse childhood experiences studied here. Child neglect was the only experience not associated with welfare receipt in childhood. Family size emerged as important, being the second most consistent childhood SES predictor.

This was followed by parent educational level. Parent employment and family poverty level were each associated with a more limited set of the same adverse childhood experiences.

A remarkable finding was the fact that poverty level (<1.5 PL), unlike welfare receipt, was not associated with a greater likelihood of exposure to childhood adversity. Oftentimes it seems that reference to impoverishment implicitly implies welfare receipt and the difference is chalked up to semantics. But the results presented here showed that groups with the lowest income among the sample did not have the same pattern of association with prevalence of reported adverse childhood experience or similar odds of exposure, compared to those for welfare receipt. The association and predictive power resided with whether a respondent reported ever receiving welfare benefits. The kind of childhood adversities that had substantial increased odds for the likelihood of exposure included parental mental illness, parental substance use problem, parental suicide attempt, and domestic violence. These particular types of childhood adversity suggest more in depth exploration of how parent psychopathology and problem behavior affects household functioning and, in turn, the well-being of resident children across life domains.

It seems that the relationship between exposure to childhood adversity and ever receiving welfare is different from that of exposure to childhood adversity and the most disadvantaged poverty level (<1.5 PL). The rates of reported exposure for every of the eleven childhood adversities are consistently higher for those from families that received welfare than for those from families with the lowest income in this sample. This is an important distinction since it suggests that welfare receipt (as measured by insufficient income to needs) and being considered impoverished are not interchangeable in research on childhood adversity. Some indicators of poverty, such as unemployment and material hardship, are associated with Child Protective

Services (CPS) intervention, but can be shared temporary states that are shared by the larger population (e.g., economic shocks). In contrast, several characteristics of welfare receipt, including current receipt status, duration of receipt, and lower state benefit levels, tend to be more chronic and associated with substantiated rates of child maltreatment (Paxson and Waldfogel 2003; Fein and Lee 2003). This study confirms that welfare receipt makes a unique contribution to the chances of exposure to childhood adversity that does not always translate to being categorized as impoverished. Understanding within-group variation of exposure to adverse childhood experiences among all SES groups is a promising future direction since there is much to be discovered (Black and Dubowitz 1999).

A higher parent educational level is generally regarded as a protective factor for risk of childhood adversity (Counts, Buffington, Chang-Rios et al. 2010). However, parent educational level showed mixed results for predicting odds of exposure to childhood adversity. Lower parent education was associated with exposure to divorce, verbal and physical abuse, parent substance use problem, parent suicide attempt, family violence, and criminal activity. The lowest rates of reported exposure to these childhood adversities were for respondents with at least one college educated parent. Specifically, exposure to divorce, parent suicide attempt, and family violence among respondents with at least one college educated parent was at least half the rate for respondents with a parent that had less than a college degree. However, additional years of education do not necessarily confer protection from exposure to childhood adversity. There was not a positive relationship between additional educational credentials and lower incidence and odds of exposure to childhood adversity as a consequence. In fact, for many of the childhood adversities examined here, respondents that had a parent with some college education (13-15 years), did not evidence lower odds of exposure to several childhood adversities, such as parental

substance use problem, witnessing domestic violence, and parent criminal activity compared to respondents with parents that had even less educational attainment (i.e., less than high school or a high school degree). This provides a point of expansion in future research that explores links between the social factors associated with pursuing but not completing a college education and how those variables might play a role in selection among families that confer greater risk of exposure to childhood adversity for children in the household.

In a separate set of analyses not included here[4], family structure (two parent, single mother, other caregiver, and step parent) stood out as a characteristic that is consistently associated with every kind of exposure to childhood adversity, although the strength of the association varied. Growing up in a household with two biological parents conferred advantage in exposure to childhood adversities, as evidenced by the lowest rates for exposure across the eleven adversities among the family structure categories. But not all two parent families were equal in showing a beneficial effect regarding exposure to adverse childhood experience. Blended families that included a biological parent and a step parent (or partner) did not confer the same advantage and actually appeared to confer certain risk for exposure to adverse experience. For example, about 1 in 5 respondents in biological two parent families reported exposure to child abuse compared to 1 in 3 from blended families. The contrast for family violence was more striking, with 1 in 10 from biological two parent families reporting exposure and 1 in 5 from blended families reporting exposure.

Yet respondents from families with any kind of two parent structure were generally better off than those with a lone parent, since respondents with a single mother or single father/other caregiver fared worse in exposure to many of the categories of adversity. Exposure rates for

[4] Analysis available upon request.

neglect and sexual abuse were at least twice as high among those with a single or non-biological parent compared to two biological parents, 1 in 10 vs. 1 in 20 and 1 in 5 vs. 1 in 25, respectively. Together these results emphasize the fact that simply having two parental figures in the household is not necessarily an advantage, which confirms other research that finds greater stress exposure among step-families (Barrett and Turner 2006) as well as greater victimization (Finkelhor, Omrad, and Turner 2007a). Perhaps blended families are unique in ways, such as risk-prone assortative mating, that increase chances for exposure for childhood adversity. Finally, given that the rate of exposure to divorce is twice as high among respondents from large families, it is possible that large size families are more likely to be a byproduct of blended families and reflect the kind of risk pattern suggested above.

This analysis also showed that the association between childhood SES circumstances and child maltreatment is distinct for each kind of maltreatment, which confirms findings of similar research using administrative data from child protective service records (Hussey, Chang and Kotch 2006). The addition of sociodemographic indicators in fully adjusted multivariate models predicting exposure to child abuse attenuated the higher odds of experiencing this adversity among both African American and Hispanic respondents. Addtionally, higher odds of witnessing family violence among Hispanic and African American respondents was attenuated with the addition of sociodemographic indicators and childhood SES predictors. This indicates that although there were significant crude relationships between select race/ethnic groups and some adverse childhood experiences, a comparison of crude and adjusted odds shows that most of these associations weaken, and many are no longer statistically significant after adjusting for childhood SES factors. This suggests that race/ethnic differences in the odds of exposure to

those select adverse childhood experiences are largely because of underlying differences in childhood SES factors rather than endemic to race or ethnicity.

In regards to age and exposure to adverse childhood experience, the rate of reporting exposure to sexual abuse increased from 1.9% at age 13 to a high of 8.5% at age 18. This four-fold increase in reported rate of exposure to rape, sexual assault, and molestation suggests adolescence as harrowing years for physical and sexual safety among adolescent girls. Also, the rate of reported exposure to parental mental illness increases from 8.1% at age 13 to a high of 16.7% at age 17. This increase may be suggestive of the role of cognitive maturity and growth in awareness of adolescents to the psychological well-being of a parent, so that mental illness symptoms may become apparent as a child gains in critical thinking over adolescence rather than parents experiencing a greater rate of onset for mental illness that coincides with their child's adolescent years.

The primary limitations of this study include a cross-sectional design which limits efforts to disentangle the cause and effect of childhood social and economic circumstances and exposure to adverse childhood experiences, and does not allow determination of the causal order of some of the associations of interest. Secondly, this study is limited by the retrospective nature of the data. The shorter period of recall is a great advantage of studies of exposure to adverse childhood experience among young people. Nonetheless it is likely that, as with reporting by adults of their own adverse experience, these results include a certain rate of false negatives. On the other hand, given the undesirable nature of eventful stressors, it is plausible to assert that false positives are likely rare. Thus, although there is some bias in retrospective reports, that bias is not great enough to invalidate retrospective studies of major adversities of an easily defined kind (Hardt and Rutter 2004). Third, the role of welfare receipt was consistently associated with

exposure to adverse childhood experience, but the proportion of "don't know" responses nonetheless compromises these results. Finally, these analyses only examine exposure to a single adverse childhood experience or a count of exposure without stipulation of occurrence of clustered types of adverse experience. This loss of important information about the co-occurrence of exposure to adverse childhood experience and the interrelationships between exposure types and childhood social and economic circumstances constrains the insight gained about differential exposure to adverse childhood experiences.

Additional steps may be taken to greatly increase our understanding of the relationship between childhood social and economic circumstances and exposure to adverse childhood experience. First, details on timing of exposure to adverse childhood experiences would allow assessment of the potential role of sensitive periods in youth development when exposure has greatest impact (Teicher, Tomoda and Andersen 2006; Andersen and Teicher 2009). A longitudinal sample that includes children and adolescents across several developmental stages is needed to examine stage-specific and age-specific differences in exposure to adverse childhood experience and to disentangle causal effects between childhood SES factors and adverse experience. Second, there is a need for improved measurement of stress exposure overall (Turner and Avison 2003; Turner and Lloyd 1999; Turner, Wheaton and Lloyd 1995), but especially for measurement of the "universe of stressors" for children (Avison 2010; Finkelhor, Shattuck, Turner and Hamby 2013). Third, future research that seeks to distinguish the role of family structure versus family functioning in shaping mental, physical, and other non-health outcomes (e.g., educational attainment) is needed. It may be that family functioning is demonstrated to be more important than family structure if the differences between children in similar family types are greater than the differences across family types (David, Demo and

Acock 1996; Hetherington 1999). Furthermore, the differences between children within the same family types can be as great, if not greater, than the differences between children in different families (O'Connor, Dunn, Jenkins et al. 2001), suggesting that children differ in their resilience and response to adversity (Hetherington and Stanley-Hagan 1999). Fourth, including indicators of social and economic status in the family context as well as a measure of exposure to economic adversity (e.g., food insecurity, foregoing extracurricular activities due to cost, money worries) might contribute to our understanding of the manifestations of family financial hardship that pose greatest risk for mental and physical health among youth. Finally, research on adverse childhood experiences should strive for analytic results that include multi-level models (i.e., neighborhood, school) to better understand the wider social context that surrounds exposure and patterns of adverse childhood.

Table 3.1: Childhood Sociodemographic Characteristics of Respondents in the National Comorbidity Survey Replication Adolescent Supplement (n=10,079)

	Overall Frequency	Weighted %
Family Size		
1-3 Children	5,653	60.3
4+ Children	4,426	39.7
Parental Education		
<12 years	1,652	15.3
12 years	3,075	29.8
13-15 years	1,994	19.5
College	3,358	35.4
Parental Work Status		
All/most	9,496	94.8
Some/a little/none	583	5.2
Poverty Level		
<1.5 times PL	1,710	14.7
3-1.5 times PL	2,011	19.1
>3-6 times PL	3,088	31.9
>6 times PL	3,270	34.3
Welfare Receipt		
No welfare receipt	7,756	78.2
Welfare receipt	1,628	15.7
Don't know	695	6.1
Sex		
Female	5,157	51.1
Male	4,922	48.9
Age		
13 Years	1,645	15.2
14 Years	2,208	20.9
15Years	1,881	20.5
16Years	2,003	21.0
17 Years	1,748	16.9
18 Years	594	5.4
Race		
White	5,616	65.6
Hispanic	1,902	14.4
African American	1,941	15.1
Other	617	5.0

Table 3.2: Respondent Reported Exposure to Individual Childhood Adversities, Overall, and by Childhood Social and Economic Characteristics (n=10,079)

	Parent Death	Parent Divorce	Parent Absence	Child Neglect	Child Abuse	Child Sex Abuse	Parent Mental Illness	Parent AOD Problem	Parent Suicide Attempt	Family Violence	Parent Criminal Activity
Overall	4.9	17.3	5.6	6.3	20.6	5.5	12.0	12.4	2.8	8.8	13.3
Family Size		***			***	***		***	***	***	***
1-4 children	4.4	11.1	5.7	6.4	18.1	3.9	11.4	10.9	2.2	6.1	9.3
4+ children	5.5	26.7	5.4	6.2	24.4	7.8	13.0	14.6	3.8	12.8	19.5
Education		***			***			***	***	***	***
< 12 years	5.7	19.4	6.3	7.0	22.6	6.2	10.1	12.2	3.1	13.1	19.2
12 years	4.8	21.0	4.9	5.1	22.9	5.8	12.9	15.5	3.8	10.7	16.5
13-15 years	5.7	20.2	4.7	6.0	24.2	6.2	13.7	15.3	3.3	10.0	15.7
16+ years	4.1	11.6	6.3	7.4	15.9	4.5	11.2	8.3	1.6	4.6	6.9
Work Status	**	***		*	*					*	***
All/Most	4.6	16.3	5.6	6.1	20.2	5.3	11.9	12.2	2.7	8.4	12.8
Some/Little/None	9.7	34.7	5.5	9.8	27.1	6.9	13.2	16.2	5.2	14.1	22.5
Poverty Status		***		*						***	***
</=1.5	5.7	24.5	5.4	4.6	20.4	5.4	11.6	12.6	3.9	12.1	20.2
>1.5-3.0	4.6	19.1	5.7	6.3	22.1	5.4	12.9	13.7	3.0	11.6	15.8
>3.0-6.0	5.3	16.5	5.8	5.9	21.6	6.3	11.8	11.8	2.9	8.3	12.7
>6.0	4.3	13.9	5.3	7.5	18.9	4.8	11.9	12.2	2.3	6.2	9.6
Welfare Receipt	***	***	**		***	***	***	***	***	***	***
Never	3.9	14.8	5.1	6.0	18.2	4.2	9.7	10.1	1.6	6.3	8.9
6+ months	9.4	28.4	7.7	7.5	33.2	11.7	24.8	24.6	8.5	20.1	32.3
Don't Know	5.8	21.0	6.2	7.2	19.2	5.5	8.2	10.9	3.3	9.5	20.7

* p<.05, ** p<.01, *** p<.001

Table 3.2(continued): Respondent Reported Exposure to Childhood Adversities, Overall, and by Childhood Sociodemographic Characteristics (n=10,079)

	Parent Death	Parent Divorce	Parent Absence	Child Neglect	Child Abuse	Child Sex Abuse	Parent Mental Illness	Parent AOD Problem	Parent Suicide Attempt	Family Violence	Parent Criminal Activity
Sex				**	*	***	**	**	**	*	
Male	5.0	16.8	5.4	7.6	21.7	1.2	10.1	11.2	2.0	7.7	13.3
Female	5.7	17.8	5.8	5.0	19.5	10.0	14.0	13.7	3.7	9.9	13.3
Age			*			***	***	*			
13 years	4.9	16.2	3.3	5.4	17.8	1.9	8.1	10.7	1.7	7.6	15.2
14 years	3.8	16.4	6.2	5.7	18.2	4.4	9.4	10.0	2.4	7.3	12.6
15 years	5.3	15.9	6.0	6.3	19.0	5.0	11.7	10.6	2.7	7.4	12.4
16 years	4.7	17.4	6.5	6.4	23.4	6.8	13.3	13.8	3.5	10.4	13.7
17 years	5.4	20.2	5.5	6.6	23.7	7.9	16.7	16.3	3.9	10.4	13.5
18 years	6.4	19.3	4.7	10.1	23.0	8.5	14.8	15.8	2.6	11.3	12.9
Race	**	***	***	**	***		**	***		***	***
White	4.0	15.2	4.4	7.0	17.9	5.4	13.2	12.5	3.0	7.4	10.5
Black/Af. Am.	8.1	26.2	7.3	4.5	27.8	6.0	8.1	9.6	1.7	11.7	19.4
Hisp./Latino	5.5	18.3	7.3	5.0	26.2	5.2	11.1	16.1	3.4	11.2	20.3
Other	4.0	14.2	10.1	6.4	18.7	4.9	11.3	8.2	2.9	11.4	11.8

* p<.05, ** p<.01, *** p<.001

Table 3.3: Percent of Respondents Reporting Exposure to 0, 1, 2, and 3 or more Childhood Adversities by Childhood Social and Economic Circumstances (n=10,079)

Number of Exposures	0 CAs	1 CA	2 CAs	3+ CAs	p-level
Overall Sample	44.0	28.2	13.9	14.0	
Family Size					***
1-4 children	51.1	27.0	12.0	10.0	
4+ children	33.3	30.0	16.7	20.0	
Education					***
< 12 years	38.8	29.9	14.9	16.4	
12 years	39.9	28.1	14.8	17.3	
13-15 years	38.5	29.6	15.5	16.4	
16+ years	52.8	26.6	11.8	8.8	
Work Status					***
All/most	44.7	28.3	13.7	13.3	
Some/a little/none	30.9	26.7	17.2	25.3	
Poverty Status					**
<1.5 times PL	39.3	28.7	14.5	17.5	
1.5-3.0 times PL	39.3	30.5	14.2	16.0	
>3.0-6.0 times PL	43.8	27.9	14.4	13.8	
>6.0 times PL	48.8	26.8	12.9	11.5	
Welfare Receipt					***
No welfare	49.2	28.9	12.4	9.6	
Received welfare	20.1	22.9	22.0	35.0	
Don't Know	39.3	32.2	12.1	16.5	
Sex					*
Male	45.3	28.6	14.1	12.0	
Female	42.7	27.7	13.7	16.0	
Age					**
13 years	50.6	24.7	13.5	11.3	
14 years	47.5	29.7	11.4	11.3	
15 years	44.7	28.3	14.7	12.3	
16 years	40.5	29.2	14.2	16.1	
17 years	38.6	28.2	14.8	18.4	
18 years	39.5	27.4	16.9	16.2	
Race					***
White	48.5	26.4	12.3	12.8	
Hispanic	26.4	30.8	33.1	29.1	
African American	31.8	33.1	18.9	13.5	
Other	44.8	29.1	13.5	12.7	

* p<.05, ** p<.01, *** p<.001

Table 3.4: Logistic Regression of Childhood Social and Economic Circumstances and Reported Exposure to Interpersonal Loss (n=10,079)

	Interpersonal Loss																	
	Parental Divorce						Parental Death						Parental Absence					
	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)
Family Size																		
1-3 Children (ref)			—		—				—		—				—		—	
4+ Children			2.57	***	2.51	***			1.06		0.98				0.88		0.80	
Parent Education																		
College (ref)			—		—				—		—				—		—	
<12 years			1.11		1.17				1.01		0.96				0.90		0.76	
12 years			1.63	***	1.61	***			0.99		0.93				0.71		0.68	*
13-15 years			1.64	***	1.64	***			1.22		1.18				0.68		0.66	*
Parent Work Status																		
All/most (ref)			—		—				--		--				—		—	
Some/a little/none			2.19	***	2.19	***			1.79	**	1.76	**			0.87		0.83	
Poverty Level																		
>6 times PL (ref)			—		—				—		—				—		—	
>3-6 times PL			1.32	*	1.32	*			1.05		0.99				1.13		0.93	
1.5-3 times PL			1.07		1.07				0.92		0.90				1.09		1.06	
<1.5 times PL			1.06		1.07				1.21		1.22				1.13		1.16	
Welfare Receipt																		
No welfare (ref)			—		—				—		—				—		—	
6+ months receipt			1.55	***	1.51	***			2.39	***	2.22	***			1.72	***	1.60	**
Don't Know			1.16		1.18				1.46		1.42				1.33		1.28	
Sex																		
Male (ref)	—				—		—				—		—				—	
Female	1.05				1.05		1.01				1.03		1.06				1.05	
Age																	*	
13 Years (ref)	—				—		—				—		—				—	
14 Years	1.05				1.03		0.78				0.79		1.97	**			2.03	**
15Years	1.01				1.02		1.13				1.15		1.97	*			2.01	*
16Years	1.15				1.15		1.01				1.02		2.15	**			2.19	**
17 Years	1.37	**			1.34	*	1.16				1.15		1.78	*			1.81	*
18 Years	1.30				1.26		1.38				1.36		1.45				1.50	

Race												
White (ref)	—			—		—			—			—	
Hispanic	1.25			0.86		1.40			1.25		1.73	***	1.87	***
African American	2.00	***		1.25		2.10	***		1.78	**	1.75	***	1.87	***
Other	0.93			0.83		1.00			0.91		2.52	***	2.43	***

*p<.05 ** p<.01 *** p<.001

Table 3.5: Logistic Regression of Childhood Social and Economic Circumstances and Reported Exposure to Child Maltreatment (n=10,079)

	Child Maltreatment																	
	Child Neglect						Child Abuse						Child Sexual Abuse					
	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)
Family Size																		
1-3 Children (ref)			—		—				—		—				—		—	
4+ Children			0.99		1.05				1.29	**	1.20	*			1.79	***	1.80	***
Parent Education																		
College (ref)			—		—				—		—				—		—	
<12 years			0.71	*	0.78				1.28		1.15				1.01		1.21	
12 years			0.61	**	0.62	**			1.41	*	1.34	*			1.07		1.11	
13-15 years			0.67		0.68	*			1.54	***	1.50	***			1.18		1.23	
Parent Work Status																		
All/most (ref)			—		—				--		—				--		—	
Some/a little/none			1.68	**	1.63	*			1.20		1.14				0.95		1.29	
Poverty Level																		
>6 times PL (ref)			—		—				—		—				—		—	
>3-6 times PL			0.60	**	0.67	*			0.82		0.80	*			0.78		0.85	*
1.5-3 times PL			0.88		0.94				1.00		1.00				0.89		0.91	
<1.5 times PL			0.83		0.86	*			1.07		1.11				1.21		1.19	
Welfare Receipt									***		***				***		***	
No welfare (ref)			—		—				—		—				—		—	
6+ months receipt			1.43		1.50				1.99	***	1.90	***			2.70	***	2.81	***
Don't Know			1.35		1.46				0.99		1.00				1.26		1.82	*
Sex																		
Male (ref)	—				—		—				—		—				—	
Female	0.64	**			0.66	**	0.86	**			0.85	**	9.49	***			9.77	***
Age																		
13 Years (ref)	—				—		—				—		—				—	
14 Years	1.05				1.06		1.05				1.05		2.42	*			2.49	**
15Years	1.18				1.21		1.14				1.13		2.51	*			2.64	**
16Years	1.17				1.17		1.51	*			1.48	*	3.77	***			4.06	***
17 Years	1.22				1.22		1.50	*			1.45	*	4.58	***			4.66	***
18 Years	1.94	*			1.93	*	1.41				1.33		5.16	***			5.19	***

Race												
White (ref)	—			—			—			—		
Hispanic	0.69	*		0.69	*		1.66	***		0.71	0.98	0.69	*
African American	0.63	***		0.62	**		1.83	***		0.63	*	1.11	0.73	
Other	0.90			0.83			1.08			0.83	0.92	0.79	

* p<.05 ** p<.01 *** p<.001

Table 3.6: Logistic Regression of Childhood Social and Economic Circumstances and Reported Exposure to Parent Psychopathology (n=10,079)

	Parent Psychopathology																	
	Mental Illness						Alcohol or Drug Problem						Suicide Attempt					
	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)
Family Size																		
1-3 Children (ref)			—		—				—		—				—		—	
4+ Children			1.00		1.06				1.18		1.21				1.23		1.34	
Parent Education																		
College (ref)			—		—				—		—				—		—	
<12 years			0.69	**	0.76	*			1.22		1.21				1.07		1.18	
12 years			1.00		1.03				1.80	***	1.82	***			1.75	**	1.84	**
13-15 years			1.09		1.13				1.80	***	1.83	***			1.58		1.66	
Parent Work Status																		
All/most (ref)			—		—				—		—				—		--	
Some/a little/none			0.92		1.02				1.07		1.15				1.24		1.42	
Poverty Level																		
>6 times PL (ref)			—		—				—		—				—		—	
>3-6 times PL			0.80		0.91				0.72	***	0.78	**			1.02		1.18	
1.5-3 times PL			0.96		1.04				0.88		0.93				0.91		0.98	
<1.5 times PL			0.95		0.96				0.84		0.85				1.09		1.09	
Welfare Receipt																		
No welfare (ref)			—		—				—		—				—		—	
6+ months receipt			3.35	***	3.65	***			2.69	***	2.87	***			4.94	***	5.45	***
Don't Know			0.93		1.15				1.05		1.22				1.93		2.50	*
Sex																		
Male (ref)	—				—		—				—		—				—	
Female	1.45	***			1.44	***	1.27	***			1.29	***	1.83	**			1.86	**
Age																		
13 Years (ref)	—				—		—				—		—				—	
14 Years	1.16				1.16		0.91				0.90		1.38				1.47	
15Years	1.42				1.43		0.96				0.96		1.51				1.59	
16Years	1.67	**			1.64	*	1.30				1.28		2.00	*			2.12	**
17 Years	2.22	***			2.15	***	1.59	**			1.53	*	2.29	*			2.29	*
18 Years	1.93	**			1.82	*	1.52	*			1.47	*	1.51				1.51	

Race																
White (ref)	—			—			—			—			—			
Hispanic	0.84			0.74	*		1.36	*		1.14			1.18			0.77	
African American	0.58	***		0.43	***		0.74	*		0.56	***		0.56	*		0.30	***
Other	0.86			0.77			0.63	*		0.56	***		1.01			0.79	

* p<.05 ** p<.01 *** p<.001

Table 3.7: Logistic Regression of Childhood Social and Economic Circumstances and Reported Exposure to Parent Problem Behaviors (n=10,079)

	Parent Problem Behaviors											
	Domestic Violence						Criminal Activity					
	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)	Model 1	t, (P)	Model 2	t, (P)	Model 3	t, (P)
Family Size												
1-3 Children (ref)			—		—				—		—	
4+ Children			1.70	***	1.68	**			1.73	***	1.65	***
Parental Education												
College (ref)			—		—				—		—	
<12 years			1.94	***	1.95	***			1.81	***	1.64	**
12 years			1.85	***	1.84	***			1.93	***	1.87	***
13-15 years			1.79	***	1.82	***			1.94	***	1.90	***
Parental Work Status												
All/most (ref)			—		—				—		—	
Some/a little/none			1.06		1.10				1.13		1.11	
Poverty Level												
>6 times PL (ref)			—		—				—		—	
>3-6 times PL			1.23		1.29				1.35	*	1.32	
1.5-3 times PL			1.42		1.47				1.21		1.21	
<1.5 times PL			1.18		1.21				1.17		1.18	
Welfare Receipt												
No welfare (ref)			—		—				—		—	
6+ months receipt			2.95	***	2.90	***			3.61	***	3.56	***
Don't Know			1.21		1.30				2.07	***	2.02	***
Sex												
Male (ref)	—				—		—				—	
Female	1.32	*			1.30	*	0.99				0.96	
Age												
13 Years (ref)	—				—		—				—	
14 Years	0.97				0.99		0.82				0.85	
15Years	0.99				1.03		0.83				0.87	
16Years	1.47				1.55	*	0.95				0.99	
17 Years	1.46	*			1.45	*	0.91				0.90	
18 Years	1.57				1.58		0.84				0.84	

Race							
White (ref)	—		—	—		—	
Hispanic	1.61	**	1.02	2.17	***	1.44	***
African American	1.70	***	0.99	2.05	***	1.18	
Other	1.64		1.34	1.14		0.91	

* p<.05 ** p<.01 *** p<.001

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CHAPTER 4
Childhood Social and Economic Circumstances and Health Risk Behavior in Adolescence: the Role of Exposure to Adversity

Introduction

Health risk behaviors, including tobacco and alcohol use, have a damaging effect on health and were found to be the cause of close to 50% of all U.S. deaths in 2000 (Mokdad, Marks, Stroup and Gerberding 2004). Despite numerous Surgeon General Reports warning of the harmful effects of tobacco and excessive substance use and unrelenting public health campaigns urging youth to avoid their use of substances, a large percentage of adolescents use these substances. One approach to gain understanding of what social factors influence youth to engage in substance use is to examine the link between early life conditions and experiences and the adaption of health risk behaviors like these (Kuh and Ben-Shlomo 1997; Keating and Hertzman 1999). When this approach is applied to adults, research shows that tobacco and alcohol dependence and other drug disorders are more frequent among adults with a history of disadvantaged socioeconomic (SES) conditions in childhood (Poulton, Caspi, et al. 2002; Osler, Nordentoft and Andersen 2006; Osler, Godtfredsen and Prescott 2008; Melchior, Moffitt, Milne et al. 2007; Daniel, Hickman, Macleod et al. 2009). In terms of early experiences, childhood adversity, such as child maltreatment, parent mental illness, and family violence, is associated with increased likelihood of substance use in adulthood, including tobacco use, persistent smoking (i.e., heavy smoking and lower rates of cessation), alcohol use, problematic alcohol consumption, prescription drug use, illicit drug use, drug problems, and self-reported drug

addiction (Dube, Anda, Felitti et al. 2002; Dube, Felitti, Dong, 2003; Anda, Felitti et al. 2004; Dube, Miller, Brown et al. 2006; Anda, Brown, Dube et al. 2008; Ford, Anda, Edwards et al. 2011; Bellis, Lowey, Leckenby et al. 2013).

Gaining better understanding of what early life factors influence youth to engage in substance use is important because adolescence is the critical period for the initiation of many health risk behaviors. This is especially important regarding substance use (Green and Palfrey 2000), since substance use patterns that emerge in adolescence are recognized as important determinants of the substance use behaviors that are associated with excess preventable morbidity and mortality in adulthood (Grant, Stinson, and Harford 2001; Jefferis, Graham, Manor and Power 2003; Merline, O'Malley, Schulenberg et al. 2004; Chen, O'Brien, and Anthony 2005; Pitkänen, Lyyra, Pulkkinen 2005; Behrendt, Wittchen, Höfler et al. 2009; Guttmannova, Bailey, Hill et al. 2011). As such, adolescent tobacco, alcohol, and other drug use are considered priority health risk behaviors (Eaton, Kann, Kinchen et al. 2011). Specifically, cigarette smoking, binge drinking, and marijuana use among high school students significantly contribute to the primary causes of death, disability, and social problems among youth.

Research provides conflicting evidence for the role of SES as an explanatory factor in the likelihood of substance use in adolescence (Hanson and Chen 2007a). Four patterns could potentially characterize the relationship between SES and adolescent health risk behaviors. First, it may mirror the pattern of adults, with lower SES associated with higher odds of health risk behaviors. Second, it may be reversed. In this scenario, higher SES adolescents engage in more health risk behaviors. Third, the relationship may be null or weak, with no association between adolescent SES and health risk behaviors. A fourth possibility is that the relationship may be U-

shaped, so that both low and high SES are more strongly associated with health risk behaviors than mid-range SES.

Exposure to stress is one mechanism that may help explain different patterns of adolescent substance use by childhood SES, since research shows associations between SES and stress exposure on the one hand, and between stress exposure and adolescent substance use on the other. Multidisciplinary science has recently posited exposure to stress in childhood as a causal mechanism that links early adverse experiences to a range of compromised functioning over the life course (Thoits 2010; Shonkoff and Garner 2012; Evans and Schamberg 2009; Evans and Kim 2012). In this vein, studies have reported consistent findings that adolescents who experience high levels of environmental stress are more likely to use alcohol or drugs, and to escalate the quantity and frequency of their use over time (Aseltine and Gore, 2000; Chassin, Curran, Hussong and Colder 1996; Hoffman, Cerbone and Su, 2000; Wills, Vaccaro, McNamara and Hirky, 1996). Although children with socioeconomically disadvantaged backgrounds are found to experience greater exposure to a variety of stressful circumstances (Sameroff, Gutman and Peck 2003; Evans and Kim 2010), stress exposure in childhood is linked to adolescent substance use for both lower and higher SES groups.

However, the potential U-shaped relationship between childhood SES, stress exposure among both lower and higher SES groups, and adolescent substance use may be due to studies that examine psychological stress as a subjective assessment, rather than stress exposure as an experience. Psychological stress is demonstrated to be associated with adolescent substance use for both low-income and affluent youth (Luthar and D'Avanzo 1999; Luthar and Becker 2002; Luthar and Latendresse 2005), but we do not know if this is the case for exposure to stressors. Expansive checklists can include a wide variety of items cognitively appraised as stressful by

adolescents (e.g., change in appearance, breakup of romance), but such checklists have limited use for evaluating variation in stress exposure meaningfully because checklist items most often focus on recent life events rather than eventful stressors and include many measures that rely on subjective assessment (McLean and Link 1994; Wheaton 1994).

Exposure to a stressor has the greatest impact when the experience is uncontrollable and undesirable (Turner, Wheaton and Lloyd 1995). Research based on a disaggregated life events checklist that focus on uncontrollable and undesirable life events demonstrates significant links between negative life events and adolescent substance use (Wills, McNamara, Vacarro 1995; Chassin, Curran, Hussong and Colder 1996; Newcomb and Harlow 1986; Simantov, Schoen, and Klein 2000; Tuner and Lloyd 2003). In particular, exposure to adverse experience in childhood, such as child maltreatment and family violence, is a form of stressor that is consistently shown to be strongly associated with adolescent substance use (Downs and Harrison 1998; Dube, Miller, Brown et al. 2006). However, identification of contextual factors that are considered salient in the lives of children at risk for exposure to adverse childhood experiences is often left out of research models. Economic disadvantage is one of a broad range of risk factors for both adolescent substance use and exposure to the kind of stressor that includes child maltreatment and parent problem behaviors (Hawkins, Catalano and Miller 1992).

This study will assess relationships between childhood social and economic circumstances and substance use in adolescence and the mediating role of exposure to childhood adversity between childhood SES and substance use in adolescence. Data come from the National Comorbidity Survey Replication Adolescent Supplement (NCS-A), a nationally representative face-to-face survey of 10,123 adolescents aged 13 to 18 in the continental United States. Patterns of adolescent substance use and exposure to adverse childhood experiences are

explored and placed in social and economic context, and the potential pathways through which exposure to childhood adversity lead to differences in adolescent substance use is examined. The research presented here is distinguished from previous work on the link between stress and adolescent substance use by examining patterns of exposure to adverse childhood experience as eventful stressors, including social and economic circumstances in multivariate models, and utilizing a population sample that is representative of adolescents in the U.S. Additionally, the analyses include certain childhood adversities that generally receive less attention in existing research, namely parent suicide attempt and parent involvement in crime. Inclusion of a measure of child neglect in a non-administration sample that uses a uniform definition designed to promote and improve consistency of child maltreatment surveillance and research (Leeb, Paulozzi, Simon and Arias 2008) is also rare.

Background

Past Research Linking Social and Economic Background to Adolescent Substance Use

The relationship between social and economic circumstances and adolescent substance use is complex and varies across indicators of SES and measures of use (Lowry, Kann, Collins et al. 1996; Winkleby, Cubbin, Ahn and Kraemer 1999; Goodman and Huang 2002; Galea, Nandi, and Vlahov 2004; Hanson and Chen 2007a; Hanson and Chen 2007b; Humensky 2010). A limited body of research that includes exposure to stress as a psychosocial factor that is part of the causal pathway linking SES to adolescent substance use suggests that exposure to early stressors is associated with greater odds of substance involvement, over and above other psychosocial factors (Goodman and Huang 2002; Barrett and Turner 2006; Skeer, McCormick, Normand et al. 2009; Keyes, McLaughlin, Koenen et al. 2012; Benjet, Borjes, Medina-Mora and Méndez 2013) but this varies by sociodemographic characteristics (Lloyd and Turner 2007).

Numerous studies demonstrate that exposure to adverse childhood experiences is associated with increased likelihood of earlier initiation, regular use, and abuse of tobacco, alcohol, and other drugs but do not include measures of SES in their multivariate models (Anda, Croft, Felitti et al. 1999; Kilpatrick, Acierno, Saunders et al. 2000; Acierno, Kilpatrick, Resnick et al. 2000; Simantov, Schoen and Klein 2000; Conwell, O'Callaghan, Andersen et al. 2003; Gilbert, Widom, Browne et al. 2009; Benjet, Borjes, Medina-Mora and Méndez 2013).

Family background characteristics can protect against adolescent alcohol and other drug (AOD) use and abuse (for a review, see Vakalahi 2001), or they can place an individual at risk. Family history factors that increase the risk of adolescent alcohol and drug use include parental conflict, poor family management and monitoring practices, weak family communication (Feldstein and Miller 2006), larger family size (Reinherz, Giaconia, Hauf et al. 2000) and family alcohol and drug use (Biederman, Faraone, Monuteaux and Feighner 2000; Guo, Hawkins, Hill and Abbott 2001; Guo, Hawkins, Hill and Abbott 2002; Hill, Hawkins, Catalano et al. 2005). Family violence is correlated with youth substance use. More specifically, children who are maltreated or those exposed to interparental violence are likely to engage in substance use during adolescence (Downs and Harrison 1998). Dube et al.'s (2006) retrospective study found that those who were physically or emotional abused and neglected were significantly more likely to initiate and consume alcohol by age 14. Children with alcoholic and drug-abusing parents are at greater risk than their peers for alcohol and other drug use (Su, Hoffmann, Gerstein, and Johnson 1997; Kilpatrick, Acierno, Saunders et al. 2000; Tarter and Vanyukov 2001).

Among types of adverse childhood experience, child abuse has received the most public attention and investigation in relation to adolescent substance use (Downs and Harrison 1998; Moran, Vuchinich and Hall 2004), while neglect and parent involvement in crime has received

much less scientific attention (Slack, Holl, Altenbernd et al. 2003; Gilbert, Widom. Browne et al. 2009). Child maltreatment has been commonly identified in the life histories of adolescents in treatment for substance use disorders (Funk, Mcdermeit, Godley and Adams 2003; Schumacher, Coffey and Stasiewicz 2006). Studies of non-treatment populations that include a wider range of exposures to adverse experiences in childhood beyond child maltreatment, such as traumatic events and parental problem behavior, has added to the support of adverse childhood experiences as a risk factor for adolescent substance use.

Theoretical Approaches

Principles of the life course perspective and the Stress Process Model (SPM) provide a framework for examining whether the relationship between childhood SES and adolescent substance use is mediated by exposure to adverse childhood experience as a stressor. A life course perspective directs attention toward examining the early life circumstances that lead to health-related outcomes, suggesting that different health behavior trajectories of the more and less disadvantaged socioeconomic groups are a result of preceding conditions (Pearlin, Schieman, Fazio, and Meersman 2005). The SPM acknowledges that stressors may take many forms, but calls attention to life events and more chronic, repeated strains with the potential to exert a powerfully disruptive effect on an individual's life, such as loss events and trauma, rather than events cognitively appraised as stressful (Pearlin 1999). A central tenet of the SPM is that the risk of exposure to stressors is distributed unequally so that those with the most disadvantaged social status will have the greatest chance of exposure to stress and that exposure to many stressors are rooted in social circumstances. Additionally, the social context of daily life is considered a natural origin of risk that shapes exposure to stressors.

The stress coping model (Wills 1986) is a competing perspective that may be distinguished from the stress process model (Pearlin, Menaghan, Lieberman and Mullan 1981).

While the stress coping model is commonly included in research on substance use, it is characterized by an emphasis on negative cognitive appraisal following exposure to stress. In contrast, the stress process model is characterized by an emphasis exposure to stressors that are considered unwanted and unscheduled major adversities of an easily defined kind (Hardt and Rutter 2004), the ramifications of exposure, and the social and economic circumstances surrounding exposure. Thus, the stress process perspective combined with a life course lens is best suited for this study because together they direct attention to understanding whether more or less disadvantaged early circumstances and experience contribute to increased likelihood of adolescent substance use. Applying the SPM to this project pinpoints the family as a natural origin of risk that shapes exposure to stressors in childhood, since the social context of childhood is centered on daily life in a family. Thus, membership in a family with more or less social and economic resources shapes the content of childhood experiences, which has potential consequences for substance use in adolescence that operates through more or less exposure to adverse childhood experience.

The purpose of the current study is to present and test a conceptual model that posits possible direct and indirect relationships among childhood SES, exposure to adverse experiences in childhood, and use of tobacco, alcohol, marijuana, prescription drugs, and other drugs in adolescence. The general hypothesis is that exposure adverse childhood experience mediates the relationship between childhood SES and adolescent substance use. This hypothesis rests on three assumptions: (1) that exposure to stressors is related to substance use; (2) that, compared to higher SES groups, members of lower SES groups experience higher levels of exposure to stressors; and (3) that greater exposure to stressors accounts for differences in adolescent substance use. The goals of this paper are to assess whether: 1) disadvantaged childhood SES is

associated with increased likelihood of adolescent substance use; 2) exposure to adverse childhood experiences is associated with increased likelihood of adolescent substance use; and 3) exposure to adverse childhood experiences mediates the relationship between childhood SES and adolescent substance use.

Methods

Data

The National Comorbidity Survey Replication Adolescent Supplement (NCS-A) is a national survey of DSM-IV mental disorders among English-speaking adolescents ages 13-17 years (n=10,148). The NCS-A was designed to provide national data on the prevalence, correlates, and patterns of service use for mental disorders among adolescents living in households in the contiguous United States. The NCS-A extends the age range of the NCS-R by using a modification of the NCS-R interview schedule administered to adolescents who resided in households identified in the NCS-R plus a school sample. The survey was fielded between February 2001 and January 2004. Information on the survey design and field procedures, including details of the weighting procedure, is available elsewhere (Kessler, Avenevolli, Costello, et al. 2009).

The NCS-A is based on a dual-frame design in which one sample was recruited from NCS-R households and another from a representative sample of schools in the same sample counties as the NCS-R households. The number of adolescents residing in NCS-R households was too small to satisfy the desired sample size of 10,000 respondents, so a school-based sample was added. Selection of NCS-R households was based on a three-stage clustered area probability sampling design that was representative of households in the continental United States. Details about the NCS-R design and field procedures are available elsewhere (Kessler,

Berglund, Chui, et al. 2004). In the household sample, if more than one adolescent resided in the household, a single adolescent was randomly selected by computer program. If by chance more than one adolescent per household was selected in the school sample both were invited to participate.

The school sample was selected from a government issued list of all licensed schools in the country. A representative sample of middle schools, junior high schools, and high schools in each of the counties or county clusters that made up the primary sampling units (PSUs) of the NCS-R was selected from the government list with probabilities proportional to the size of the student body in the classes that corresponded to the target sample of youths aged 13 to 17 years. All school types (i.e., public and private, schools for gifted children, therapeutic schools, residential schools) were eligible and included according to their true population proportions. In cases where a geographic area had several small schools, the schools were combined to form a cluster that was treated as a single school for sampling purposes. Student recruitment was based on rosters provided by participating schools with district and school principal approval. A stratified probability sample of 40 to 50 students was selected from each school to participate in the survey.

A total of 320 schools participated in the survey. Due to variation in school and district policies against releasing student information, those that stipulated a requirement of parental written consent were rejected for sample selection because active initial consent of this kind has been shown to result in a very low response rate (Johnston, O'Malley, Bachman and Schulenberg 2007). This was the case in approximately 15% of the schools in the sample referred to as blinded schools because the identities of the sample students was concealed until after signed consent was obtained from parents by the school Principals. Additionally, due to low-initial

school-level response rates and frequent extended time periods for recruitment, several replacement schools were recruited to replace refusal schools. Replacement schools were selected through standard procedures to match the original refusal schools in terms of school size, geographic area, and demographic characteristics.

The NCS-A used a modification of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) Version 3.0 instrument that was administered to adults in the NCS-R. Detailed information about the modifications made to the CIDI for use with adolescents is available elsewhere (Merikangas, Avenevoli, Costello, et al. 2009). The CIDI includes assessment of adolescent substance use within the broad class of DSM-IV substance use disorders. Interviews were completed face-to-face with adolescents in their home using computer-assisted personal interview (CAPI) methods. Parents were asked to complete paper and pencil self-administered questionnaires (PSAQ) while adolescent respondents were being interviewed. Principals and Mental Health Coordinators were asked to complete a self-administered questionnaire (SAQ) that described the school and its mental health resources. School staff was offered an alternative to provide the information in a telephone interview or in-person interview in cases where completed SAQ information could not be obtained.

The overall adolescent response rate was 75.6%, for a total of 10,148 complete interviews. The particulate response rates were 85.9% (n=904) in the household sample, 81.8% (n=8,912) in the unblinded school sample, and 22.3% (n=332) in the blinded school sample. Non-response was primarily due to refusal (21.3% total across households, unblinded schools, and blinded schools), which in the household and unblinded school samples came chiefly from parents rather than adolescents (72.3% and 81.0%, respectively). The refusals in the blinded school sample came largely from parents failing to return active written consent (98.1%).

Likewise, the response rate to the parent SAQ was substantially lower than in the adolescent survey (63.0% and 75.6%, respectively).

The data were weighted to adjust for differential probabilities of selection of respondents within household and school samples, differential nonresponse, and residual differences between the sample and the U.S. population on the cross-classification of sociodemographic variables. Additional details on the weighting procedures are available elsewhere (Kessler, Avenevoli, Costello, et al., 2009). 69 survey interview records were omitted from the analysis because of missing information on key variables, resulting in a final analytic sample of n=10,059 respondents.

Independent Variables

Family Size. Membership in a family with four or more children living at home is routinely considered a contextual risk factor (Rutter 1979; Werner and Smith 1982; Sameroff, Seifer, Zax and Barocas 1987). The number of children present in the home is shown to have a negative impact on the availability of both interpersonal parental resources and economic resources in a family (Downey 1995). Family size was measured using the number of children in the household reported by the respondent. The number of children reported was dichotomized to reflect an average size family (1-3 children) and a large size family (4 or more children).

Parent Education. Level of parent education was measured by the number of years of schooling completed by a male and/or female that was the head of the household for most of the respondent's childhood. The highest level of education for any male or female head of the household was used to indicate parental education. Responses were categorized into four

groups: less than high school (<12 years), high school graduate (12 years), some education or training beyond college (13-15 years), college degree or advanced degree (16 or more years).

Parent Work Status. Respondents were asked:

> "How much of your childhood did (your father/mother MALE HEAD/FEMALE HEAD) either work for pay or in a family business – all, most, a little, or none of your childhood?"

The highest amount of work for any parental figure in the household was used to indicate parent work status. Responses were dichotomized into those respondents that reported a parent worked all or most and those respondents that reported a parent worked less than all or most (some, a little, or none) because a large majority of respondents reported that at least one parent worked all or most of the time.

Poverty Level. The poverty index ratio (PIR) was defined in relation to the 2001 federal poverty line and is based on family size and the ratio of family income to the family's poverty threshold level (Proctor and Dalaker 2002). Responses were coded into four categories: poor was less than or equal to 1.5 times the poverty line, low average income was more than 1.5 but less than 3.0 times the poverty line, high average income was more than 3.0 but less than 6.0 the poverty line, and high income was more than 6.0 times the poverty line.

Welfare Receipt. Respondents were asked:

> "Was there ever a time when your family received money from government assistance programs like welfare, Aid to Families with Dependent Children, General Assistance, or Temporary Assistance for Needy Families?"

Responses were coded into three categories: those that reported yes, their family had received welfare; no, their family had never received welfare; and don't know, for respondents that did not report a definitive answer to whether their family had received welfare.

Interpersonal Loss. Interpersonal Loss includes three kinds of experiences that entail either losing a parent permanently through death, reduction of daily contact through divorce, or not seeing a parent for an extended amount of time (6 or more months) due to a parent's temporary absence. Respondents were asked:

"Have you lived continuously with your biological father/mother for your whole life?" A response of no to living continuously with a father and/or mother was followed by asking respondents:

> "Why (didn't you ever live with/did you stop living with) your biological father/mother? Did your father/mother die, were your parents separated or divorced, or was there some other reason?"

Parental Death. Responses were dichotomized into those that reported yes, a father and/or mother died, and no, both parents were alive at the time of interview.

Parental Divorce: Responses were dichotomized into those that reported yes, their father and mother had divorced, and no, both parents remained married at the time of interview.

Parental Absence. A response of yes for a respondent that lived continuously with a father and/or mother was followed by asking respondents:

> "Was your father/mother ever away from home for six months or longer, like in the armed forces, in a hospital or jail, or on a business trip?"

Responses were dichotomized into those that reported yes, their father and/or mother had been absent for six months or more, and no, neither parent had been absent for six months or more.

Child Maltreatment: Child maltreatment assessed a respondent's report of having ever experienced neglect in care, verbal threats of aggression and physical abuse by a caregiver, or rape, sexual assault or molestation at the time of interview.

Child Neglect. Five questions used in child welfare investigations (Courtney, Piliavin, Grogan-Kaylor, and Nesmith 1998) were used to assess the frequency (often, sometimes, not very often, never) of neglectful care as follows:

9. "How often were you made to do chores that were too difficult or dangerous for someone your age?"
10. "How often were you left alone or unsupervised when you were too young to be alone?"
11. "How often did you go without things you need like clothes, shoes, or school supplies because your parents or caregivers spent the money on themselves?"
12. "How often did your parents or caregivers make you go hungry or not prepare regular meals?"
13. "How often did your parents or caregivers ignore or fail to get you medical treatment when you were sick or hurt?"

An additional question asked:

14. "Did he/she often fail to take care of his/her family?"

A positive response to any of the five questions above with a frequency of "often" or "sometimes" in combination with a positive answer to the "fail to take care" question was coded 1 as an indication of neglect.

Neglectful supervision was measured using a threshold age plus frequency to determine the occurrence of neglectful supervision in accord with prevailing U.S. child welfare laws (Straus and Kantor 2005) and developmental stage (Kantor, Holt, Mebert et al. 2004). Neglectful supervision was measured by asking:

15. "How old were you when you were first allowed to stay home by yourself without supervision from an adult or older brother or sister?"

If respondents indicated an age younger than 11 years, they were asked:

16. "How often were you left alone when you were (the age younger than 11) - just about every day, a few days a week, a few days a month, or less than once a month?"

If the age reported was 8 years old or younger, and the frequency was "just about every day", the response was coded 1 as an indication of neglectful supervision.

Coding follows the recommendation of the uniform definitions for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi, Simon and Arias 2008). Responses to the six indicators of neglect described above were summed. A total of one or more was coded 1 as an indication of reporting experience of neglect during childhood. Otherwise, responses were coded as child neglect not reported.

Child Abuse. Physical and emotional abuse of the respondent by parents or a caregiver was assessed using a modified version of the Conflict Tactics Scale (Straus 1979) as follows:

5. "When you were growing up, how often did (the man and/or woman who raised you) do any of these things (insulted or swore; shouted, yelled, or screamed; threatened to hit) to you – often, sometimes, not very often, or never?"
6. "When you were growing up, how often did (the man and/or woman who raised you) do any of these things (pushed, grabbed or shoved; threw something; slapped or hit) to you – often, sometimes, not very often, or never?"
7. "When you were growing up, how often did (the man and/or woman who raised you) do any of these things (kicked, bit or hit with a fist; beat up; choked; burned or scalded; threatened with a knife or gun) to you – often, sometimes, not very often, or never?"
8. "Were you ever badly beaten up by your parents or the people who raised you?"

Coding follows the recommendation of the uniform definitions for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi, Simon and Arias 2008). A response of often or sometimes to the first and second question, or a response of often, sometimes, or not very often to the third question, or a response of yes to the fourth question was coded 1 as an indication of reporting experience of physical abuse during childhood. Otherwise, responses were coded as child abuse not reported.

Child Sexual Abuse. Experience of rape, sexual assault, or molestation reported by the respondent was assessed using items from the National Comorbidity Survey (Kessler, Davis, and Kendler 1997) as follows:

3. "The next two questions are about sexual assault. The first is about rape. We define this as someone either having sexual intercourse with you or penetrating your body with a

finger or object when you did not want them to, either by threatening you or by using force. Did this ever happen to you?"

4. "Other than rape, were you ever sexually assaulted or molested?"

Coding follows the recommendation of the uniform definitions for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi, Simon and Arias 2008). A response of yes to either of these two questions was coded 1 as an indication of reporting experience of sexual abuse during childhood. Otherwise, responses were coded as child sexual abuse not reported.

Parent Psychopathology. Parent psychopathology assessed a respondent's report of ever experiencing a parent that had depression, Generalized Anxiety Disorder (GAD), or panic disorder. History of parent mental illness was measured using items from the Family History Research Diagnostic Criteria Interview (Andreasen, Endicott, Spitzer and Winokur 1977) and its extensions (Kendler, Silberg, Neale, et al. 1991).

Parent Mental Illness. Parent history of depression, generalized anxiety disorder (GAD), and panic disorder was assessed as follows:

5. "Did (the man/woman who raised you) ever have times lasting two weeks or more where he/she was sad or depressed most of the time?"
6. "Did (the man/woman who raised you) ever have times lasting a month or more when he/she was constantly nervous, edgy, or anxious?"
7. "Did (the man/woman who raised you) ever have anxiety attacks where all of a sudden he/she felt frightened, anxious, or panicky?"
8. "How much did his/her (depression/nervousness/anxiety attacks) ever cause problems in his/her life or keep him/her from doing his/her regular activities – a lot, some, a little, or not at all?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of yes for any of the first three questions for any parental figure and a response of "a lot" or "some" for the fourth question was coded 1 as an

indication of reporting experience of a parent with mental illness during childhood. Otherwise, responses were coded as parent mental illness not reported.

Parent Alcohol or Other Drug (AOD) Problem. Parent history of a problem with alcohol or drug use was assessed using items from the Family History Research Diagnostic Criteria Interview (Andreasen, Endicott, Spitzer and Winokur 1977) and its extensions (Kendler, Silberg, Neale, et al. 1991) as follows:

4. "Did (the man/woman who raised you) ever have a problem with drinking alcohol?"
5. "Did he/she ever have a problem with drugs?"
6. "How much did his/her substance use every cause problems in his/her life or keep him/her from doing his/her regular activities – a lot, some, a little, or not at all?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of yes for either of the first two questions for any parental figure and a response of "a lot" or "some" for the third question was coded 1 as an indication of reporting experience of a parent with an AOD problem. Otherwise, responses were coded as parent AOD problem not reported.

Parent Problem Behavior. Parent problem behavior included measures of ever witnessing family violence and parent criminal activity.

Family Violence. Whether a respondent had ever witnessed violence between their caregivers was assessed using a modified version of the Conflict Tactics Scale (Straus 1979) and an item from the trauma section of the CIDI as follows:

5. "How often did (your parents/the couple who raised you) do any of these things (insulted or swore; shouted, yelled, or screamed; threatened to hit) to each other while you were growing up – often, sometimes, not very often, or never?"
6. "How often did (your parents/the couple who raised you) do any of these things (pushed, grabbed or shoved; threw something; slapped or hit) to each other while you were growing up – often, sometimes, not very often, or never?"

7. "How often did (your parents/the couple who raised you) do any of these things (kicked, bit or hit with a fist; beat up; choked; burned or scalded; threatened with a knife or gun) to each other – often, sometimes, not very often, or never?"
8. "Did you ever witness serious physical fights at home, like when your father beat up your mother?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of often or sometimes to the first and second question, a response of often, sometimes, or not very often to the third question, or a response of yes to the fourth question was coded 1 as an indication of reporting experience of household violence during childhood. Otherwise, responses were coded as witnessing family violence not reported.

Parent Criminal Activity. Parental history of crime and incarceration was assessed with questions from the National Comorbidity Survey (Kessler, Davis, Kendler 1997) as follows:

3. "Was (the man/woman who raised you) ever involved in criminal activities like burglary or selling stolen property?"
4. "Was (the man/woman) who raised you ever arrested or sent to prison?"

Coding follows the U.S. Behavioral Risk Factor Surveillance System (BRFSS) ACE Module that was developed for use in national surveys of psychosocial risk factors that affect children (Bynum, Griffin, Ridings et al. 2010). A response of yes for either of these questions for any parent or caregiver was coded 1 as an indication of reporting experience of parent criminal activity during childhood. Otherwise, responses were coded as parent criminal activity not reported.

Dependent Variables

Adolescent substance use was assessed within the broad class of DSM-IV substance use disorders using the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) Version 3.0 instrument modified for use with adolescents.

Tobacco Use. Tobacco use was assessed by asking the following question:

"Are you a current smoker, ex-smoker, or have you never smoked?"

Respondents that indicated they were a current, ex-smoker, or volunteered that they only smoked a few times were coded as reporting tobacco use. Respondents that indicated they never smoked were coded as reporting no tobacco use. Respondents that indicated they did not know or refused to answer were coded as missing.

Alcohol Use. Alcohol use was assessed using several questions to discern whether respondents had ever consumed alcohol. The first question asked:

"How old were you when you first had at least 12 drinks in a year?"

Respondents that provided a numerical age or answered "as long as I can remember" were coded as reporting alcohol use. Respondents that answered "never" were coded as reporting no alcohol use. Respondents that did not provide an age or responded "don't know" were asked:

"Can you remember what grade you were in at school?"

Respondents that provided a grade were coded as reporting alcohol use. Respondents that did not provide a grade were asked:

"Was it before you first started school?"

Respondents that answered yes or no were coded as reporting alcohol use. Respondents that answered "don't know" were asked:

"Was it before you were a teenager?"

Respondents that answered yes or no were coded as reporting alcohol use. Respondents that answered "don't know" or refused to answer were coded as missing.

Marijuana Use. Marijuana use was assessed by asking respondents:

"Have you ever used marijuana or hashish, even once?"

Respondents that answered yes were coded as reporting marijuana/hashish use. Respondents that answered no were coded as reporting no marijuana/hashish use. Respondents that responded "don't know" were asked:

"Can you remember what grade you were in at school?"

Respondents that provided a grade were coded as reporting marijuana/hashish use. Respondents that did not provide a grade were asked:

"Was it before you first started school?"

Respondents that answered yes or no were coded as reporting marijuana/hashish use. Respondents that answered "don't know" were asked:

"Was it before you were a teenager?"

Respondents that answered yes or no were coded as reporting marijuana/hashish use. Respondents that answered "don't know" or refused to answer were coded as missing.

Prescription Drug Use. Prescription drug use was assessed by asking respondents:

> "Have you ever used tranquilizers, stimulants, pain killers, or other prescription drugs either without the recommendation of a health professional, or for any reason other than a health professional said you should use them?"

Respondents that answered yes were coded as reporting prescription drug use. Respondents that answered no were coded as reporting no prescription drug use. Respondents that answered "don't know" were asked:

"Can you remember what grade you were in at school?"

Respondents that provided a grade were coded as reporting prescription drug use. Respondents that did not provide a grade were asked:

"Was it before you first started school?"

Respondents that answered yes or no were coded as reporting prescription drug use. Respondents that answered "don't know" were asked:

"Was it before you were a teenager?"

Respondents that answered yes or no were coded as reporting prescription drug use. Respondents that answered "don't know" or refused to answer were coded as missing.

Other Drug Use. Other drug use was assessed by asking respondents two questions:

1) "Have you ever used cocaine in any form, including powder, crack, free based, coca leaves or paste?"
2) "Have you ever used any other drug – such as heroin, opium, glue, LSD, peyote, or any other drug [among those listed on Page 24 in the respondent booklet]?

Respondents that answered yes to either question or both questions were coded as reporting other drug use. Respondents that answered no to both questions were coded as reporting no use of other drugs. Due to missing data in the ICPSR public use file, no additional questions could be used to discern cocaine use. Respondents that did not provide an answer to the question about other drug use were asked:

"How old were you the first time you used one or more of the drugs on page 24?"

Respondents that did not provide an age or responded "don't know" were asked:

"Can you remember what grade you were in at school?"

Respondents that provided a grade were coded as reporting other drug use. Respondents that did not provide a grade were asked:

"Was it before you first started school?"

Respondents that answered yes or no were coded as reporting other drug use. Respondents that answered "don't know" were asked:

"Was it before you were a teenager?"

Respondents that answered yes or no were coded as reporting other drug use. Respondents that answered "don't know" or refused to answer were coded as missing.

Analysis Plan

Descriptive analyses were conducted first. Next, the association among each of the pairs of independent and dependent variables, independent and mediating variables, and mediating variables and dependent variables were examined. The relationship between childhood social and economic circumstances and substance use in adolescence and the mediating role of exposure to childhood adversity between childhood SES and substance use in adolescence were examined. Logistic regression coefficients were exponentiated and are reported as odds ratios (ORs). All models included controls for sex, age at interview, and race-ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic/Latino, and Other). First, the basic relationships are presented for the logistic regression of each demographic variable. Three models were estimated for each of the five substances. The first model (M1) estimates an association between the demographic control indicators and adolescent substance use. The second model (M2) adds each family social and economic predictor variable to estimate the associations with adolescent substance use, net of sociodemographic indicators. The third model (M3) tests the direct association between exposure to childhood adversity and adolescent substance use. The fourth model (M4) includes all sociodemographic control indicators, family social and economic predictors, and childhood adversity count to test for a mediating effect of exposure to adversity. Logistic Regression was used to examine the relationship between family social and economic factors, quantity of exposure to childhood adversity, and adolescent substance use.

All analyses were conducted using STATA v.12 (Stata Press 2011). Taylor series linearization was used to estimate the sampling variance of each parameter estimate, and the unique covariances between the parameter estimates. These estimated variances and covariances are then used to develop Wald χ^2 test statistics required to test hypotheses. All analyses controlled for sex (male, female), race (White, Black, Hispanic, Other), and age 13-18 years). Finally, only data without missing values on the variables of interest were included in this analysis for a complete case sample of n=10,059 records. Cases with missing data were not deleted, but rather a subclass of complete cases was created using the subpop command in Stata 12. Subpop preserves the sample-to-sample variability of the full complex design and thus maintains the integrity of any variance estimation procedures.

Results

Childhood circumstances, exposure to adversity, and substance use

Table 4.1 presents descriptive information about the prevalence of use for each kind of substance for the overall sample and by sociodemographic characteristics. The sample had about equal representation by gender, age range of high school students, and race/ethnicity. Respondents were representative of the U.S. population in most sociodemographic characteristics and socioeconomic components, except parent educational level which had a higher proportion of those with16 or more years of education compared to the general population, 35.4% vs. 27% respectively (Stoop 2004). Alcohol was the substance most commonly used among respondents, followed by tobacco, marijuana, prescription drugs, and other drugs. The rate of use for each substance increased for every additional year of age. White respondents reported the highest rate of tobacco and prescription drug use, Hispanics reported the highest rate of marijuana and other drug use, and African American respondents reported the

highest rate of alcohol use. Welfare receipt was the only childhood SES component that was associated with significantly greater use of every kind of substance in adolescence. Family size was associated with significantly greater use of all substances in adolescence except prescription drugs. Parent educational level was associated with greater use of tobacco and marijuana only.

Table 4.2 presents descriptive information about the prevalence of exposure to each kind of childhood adversity for the overall sample and by sociodemographic characteristics. Early exposure to adverse experience is common, and select childhood SES components, including welfare receipt, family size, and parent educational level, are associated with exposure to adverse childhood experiences. For this sample, about 1 in 5 respondents reported exposure to child abuse, followed by almost 1 in 7 reporting exposure to parent divorce. About 1 in 8 respondents reported exposure to parent criminal activity, parent substance use problem, or parent mental illness. A smaller proportion of respondents reported exposure to family violence, child neglect, parent absence, child sexual abuse, parent death, or parent suicide attempt.

Family size was associated with exposure to several specific kinds of childhood adversity, such that exposure rates were almost twice as high for respondents from large families compared to respondents from average size families. Having a parent with at least a college education was an advantage in regards to exposure to adverse childhood experiences, as these respondents reported rates of exposure to several adversities at close to half the rate of respondents with parents that had less than a college education. Among respondents with a parent that worked only some, a little, or none, 1 in 3 reported exposure to divorce, which was more than double that for respondents with a parent that worked all or most the time. Additionally, 1 in 5 respondents with a parent that worked only some, a little, or none reported

exposure to parent criminal activity, compared to about 1 in 10 among respondents with a parent that worked all or most the time.

1 in 4 respondents in the highest poverty status category (≤ 1.5 PL) reported exposure to parental divorce, which was substantially higher than any of the other poverty status categories. Respondents in the highest poverty category reported rates of exposure to parent criminal activity and exposure to family violence (separately) at twice the amount for those in the lowest poverty category (approximately 1 in 5 vs. 1 in 10 and 1 in 10 vs. 1 in 20, respectively). Among respondents from families that received welfare, 1 in 3 reported exposure to child abuse or parent criminal activity, 1 in 4 reported exposure to parent divorce, parent mental illness, or parent substance use problem, 1 in 5 reported exposure to family violence, and 1 in 10 reported exposure to parent death, parent absence, child sexual abuse, or parent suicide attempt. The prevalence of reported exposure to adverse childhood experience among respondents from families that received welfare is at least twice that for every kind of adversity, except parent absence, compared to respondents from families that did not receive welfare. In the case of parent suicide attempt, family violence, and parent criminal activity, respondents from families that received welfare reported exposure that was 3-4 times that for non-welfare recipients.

It is notable that females reported exposure to child sexual abuse at a rate 9 times that of males in this sample. Additionally, African American and Hispanic respondents reported higher rates of exposure to select childhood adversities, including about 1 in 4 reporting exposure to child abuse and 1 in 5 reporting exposure to parent criminal activity. In contrast, more white respondents reported exposure to child neglect and parent mental illness than other racial/ethnic groups. Finally, Hispanic respondents reported a remarkably higher rate of exposure to parent

substance use problem, while respondents that identified their race/ethnicity as Other reported a higher rate of exposure to parent absence.

Table 4.3 presents prevalence of tobacco, alcohol, marijuana, prescription drug, and other drug use by the overall sample and exposure to each kind of adverse childhood experience. Exposure to adverse childhood experiences is associated with adolescent substance use and the prevalence of use for each substance among respondents exposed to most any adverse experience is higher than that for each type of substance in the sample overall. Except for interpersonal loss experiences (parent death, divorce, or absence), exposure each kind of childhood adversity was associated with a higher likelihood of reporting use for each type of substance. However, only select interpersonal loss experiences were associated with use of certain substances. Parent death was associated with a higher likelihood of alcohol and marijuana use and parent divorce was associated with greater tobacco and marijuana use, and slightly so with alcohol and prescription drug use. Respondents exposed to child sexual abuse, parent suicide, or family violence had at least double the likelihood of marijuana use compared to the overall sample. This relationship was especially pronounced for use of prescription and other drugs, such that respondents that reported exposure to any adverse experience other than interpersonal loss had rates of use for these two substances that were 2-3 times the rate of use for the overall sample.

Tobacco Use

Table 4.4 shows the results of multivariate models of the association between childhood social and economic circumstance, exposure to adverse childhood experiences, and odds of tobacco use. Model 1 shows that the odds of tobacco use increased four-fold from age 14 to 18, net of gender and race/ethnicity. However, African American respondents were about half as

likely to use tobacco compared to their adolescent peers. Results for Model 2 show that among respondents with disadvantaged SES components, including large family size, having a parent with less than a college education, and ever receiving welfare, the odds of tobacco use are about 1.5 times higher compared to respondents with more advantaged SES, net of sociodemographic characteristics and other childhood SES components. Model 3 shows that exposure to 3 or more adverse childhood experiences increases the odds of smoking by about 1.5 times compared to respondents that reported no exposure to adverse experiences. Respondents that reported 1 or 2 exposures to adverse childhood experiences had lower odds of ever smoking compared to respondents that reported no exposure. Adjusting for childhood SES and sociodemographic characteristics, Model 4 shows that exposure to adverse childhood experiences mediates the relationship between welfare receipt and tobacco use, net of other childhood SES components and sociodemographic characteristics. Additionally, the odds of tobacco use among respondents exposed to adverse childhood experiences is about 2-4 times the odds of use for respondents that reported no exposure to adverse experiences. Finally, this model shows that accounting for exposure to adverse childhood experiences slightly attenuates the odds of tobacco use for respondents from large families and whose parents had less than a college education.

Alcohol Use

Table 4.4 shows that exposure to adverse childhood experiences has a mediating effect on the odds of alcohol use for respondents with some disadvantaged childhood SES components, including large family size, having a parent with some college education, and ever receiving welfare. Model 1 shows that the odds of adolescent alcohol use increase exponentially each year from age 14 to 18, net of gender and race/ethnicity. Compared to White respondents, African American and Other racial/ethnic respondents had lower rates of alcohol use. Compared to

women, the odds of alcohol use were lower for men. Model 2 shows that some SES components predict increased odds of alcohol use, including large family size, having a parent with some college education, and ever receiving welfare, net of sociodemographic characteristics and other childhood SES components. Model 3 shows that exposure to 1 or 2 adverse childhood experiences is associated with decreased odds of alcohol use compared to respondents that reported no exposure to childhood adversity. In contrast, respondents that reported exposure to 3 or more adverse childhood experiences had increased odds of using alcohol. Model 4 shows that exposure to adverse childhood experiences mediates the association between large family size, having a parent with some college education, and ever receiving welfare and higher odds of alcohol use, net of other childhood SES components and sociodemographic characteristics. Moreover, after accounting for SES of family, the odds of alcohol use increase for each exposure to adverse childhood experience so that those reporting even 1 exposure have higher odds of alcohol use and those reporting 3 or more exposures have about triple the odds of alcohol use compared to respondents that report no exposure.

Marijuana Use

Table 4.4 shows that exposure to adverse childhood experiences has a mediating effect on the odds of marijuana use for respondents with select disadvantaged childhood SES characteristics, including large family size and receipt of welfare. Model 1 shows that the odds of adolescent marijuana use increased by seven-fold from age 14 to 18, net of gender and race/ethnicity. African American and Other racial/ethnic respondents had lower odds of marijuana use compared to White respondents in this sample. Model 2 shows that adolescents from large families, or that had a parent with less than a college education, or ever received welfare, had higher odds of ever using marijuana compared to respondents with more advantaged

childhood SES, net of sociodemographic characteristics and other childhood SES components. Model 3 shows that exposure to exactly 1 adverse experience was associated with lower odds of marijuana use, compared to respondents that reported no exposure to adverse experience, but that exposure to 2 or 3 or more adverse childhood experiences increased the odds of marijuana use. Model 4 shows that among respondents from large families, the odds of adolescent marijuana use are mediated by exposure to adverse childhood experience, net of sociodemographic characteristics and other childhood SES components. Additionally, the increased odds of marijuana use for adolescent respondents whose parent had less than a college education or ever received welfare was attenuated by exposure to adverse experience, after adjusting for childhood social and economic circumstances. Moreover, the odds of marijuana use increase for each exposure to adverse childhood experience so that those reporting even 1 exposure have almost two-fold odds of marijuana use and those reporting 3 or more exposures have almost five-fold greater odds of marijuana use compared to respondents that report no exposure.

Prescription Drug Use

Table 4.5 shows that welfare receipt is the sole childhood SES component that is associated with increased odds of prescription drug use and that exposure to adverse childhood experience mediates this relationship, net of other SES and sociodemographic variables. Model 1 shows that the odds of prescription drug use increased by a factor of 5-6 from age 14 to 18, net of gender and race/ethnicity. In comparison to White respondents, African American adolescents in this sample had lower odds of prescription drug use. Model 2 shows that among childhood SES components, only receipt of welfare was associated with increased odds of ever using prescription drugs in adolescence, net of sociodemographic characteristics and other childhood SES components. Model 3 shows that exposure to exactly 2 or 3 or more adverse childhood

experiences increases the odds of prescription drug use compared to respondents that reported no exposure to adverse experiences. The odds for prescription drug use increased incrementally for exactly 2 and 3 or more exposures to adverse experiences, but were lower for just one exposure to adverse experience, compared to respondents that reported no exposure to adverse childhood experiences. Model 4 shows that the increased odds of prescription drug use for adolescents from large families is mediated by exposure to adverse childhood experiences, net of other childhood SES components and sociodemographic characteristics. Exposure to adverse experience significantly increases the odds of prescription drug use, such that 1 reported exposure doubles the odds of use, exactly 2 reported exposures increases odds of use by almost five-fold, and 3 or more reported exposures increases the odds of use by more than six-fold, compared to respondents that reported no exposure to adverse experience.

Other Drug Use

Table 4.5 shows that select disadvantaged childhood SES components are associated with higher odds of other drug use in adolescence, and that exposure to adverse childhood experience mediates this relationship. Model 1 shows that the odds of other drug use increased seven-fold from age 14 to 18, net of gender and race/ethnicity. African American and Other racial/ethnic respondents had lower odds of other drug use compared to White respondents in this sample. Model 2 shows that some childhood SES components predict increased odds of other drug use, including large family size, having a parent with some college education, and ever receiving welfare, net of sociodemographic characteristics and other SES components. Model 3 shows that reported exposure to exactly 2 or 3 or more adverse childhood experiences increases the odds of other drug use compared to respondents that reported no exposure to adverse experiences. The odds of other drug use increased incrementally for exactly 2 and 3 or more

reported exposures to adverse childhood experiences, but were lower for just one reported exposure to adverse experience, compared to respondents that reported no exposure to adverse experience. Model 4 shows that exposure to adverse childhood experiences mediates the association between large family size, having a parent with some college education, and ever receiving welfare and the odds of other use, net of sociodemographic characteristics and other childhood SES components. The odds of other drug use increase for each additional exposure to adverse childhood experience so that those reporting only 1 exposure have double the odds of use, exactly 2 reported exposures more than triples the odds , and reported exposure to 3 or more adverse experiences increases the odds of other druge use by almost five-fold compared to respondents that report no exposure to adverse experience.

Discussion

The goal of this study was to assess whether: 1) disadvantaged childhood SES is associated with increased likelihood of adolescent substance use; 2) exposure to adverse childhood experiences is associated with increased likelihood of adolescent substance use; and 3) exposure to adverse childhood experiences mediates the relationship between childhood SES and adolescent substance use. Large-scale surveys and national surveillance of adolescent substance use tend to report prevalence of use by sociodemographic characteristics (e.g., age, gender, race/ethnicity, geography), but often leave out mention of important social and economic circumstances, such as family income and parent educational level. The results provided partial support for the hypothesis that disadvantaged childhood SES increases the odds of adolescent substance use. Only select components that reflect disadvantaged childhood social and economic status demonstrated a consistent association with increased odds of substance use, otherwise the association between childhood SES components and adolescent substance use

varied. Welfare receipt stood out as the one childhood SES component that was associated with increased odds of use for every of the five substances included in the analyses. Large family size was associated with increased odds of use for each substance except prescription drugs. Parent educational level conferred mixed advantage for odds of substance use. Having a parent with less than a college education was a disadvantage for odds of tobacco and marijuana use only. Moreover, respondents that had a parent with some college education had a particular disadvantage for odds of alcohol and other drug use in additional to the association with tobacco and marijuana use.

Most research on the link between exposure to adverse childhood experiences and adolescent substance use focuses on child maltreatment as the exposure of interest among youth and has used treatment samples or administrative data from child protective service agencies. This study of exposure to adversity among a nationally representative sample provided consistent support for the hypothesis that exposure to adverse childhood experiences increases the odds of adolescent substance use. For most every kind of adverse childhood experience, except parent absence, exposure was associated with substance use of one kind or another, or for every of the substances altogether. Additionally, the rate of substance use among respondents that reported exposure to adverse childhood experience was higher in comparison to respondents that reported no exposure. This association was more pronounced when childhood SES and sociodemographic factors were taken into account. Net of these family background factors, exposure to one adverse childhood experience was associated with increased odds of use for each type of substance studied, but double the odds for use in the case of prescription drugs. Respondents that reported exposure to two adverse childhood experiences had two- to five-fold increased odds of substance use. Three or more reported exposures to adverse childhood

experiences equated to three- to more six-fold odds of substance use, compared to those with none.

Additionally, the results provided partial support for the hypothesis that exposure to adverse childhood experiences mediates the relationship between childhood SES and adolescent substance use. The association between welfare receipt and increased odds of substance use was consistently mediated by exposure to adverse childhood experience for every type of substance. The association between family size and increased odds of substance use was mediated by exposure to adverse childhood experience for alcohol, marijuana, and other drugs specifically. The association between parent educational level and increased odds of substance use was mediated by exposure to adverse childhood experience only among the respondents with a parent that had some college education and only for alcohol and other drug use.

The research presented here is distinguished from previous work on the link between stress and adolescent substance use because I examine patterns of exposure to adverse childhood experience as stressors and account for childhood social and economic circumstances. This provides valuable insights regarding social patterning of exposure to childhood adversity and its links to future substance use. For example, the analyses include certain childhood adversities that generally receive less attention in existing research – especially research that uses a nationally representative sample of youth – such as parent suicide attempt and parent involvement in crime. Parent suicide attempt was found to be more common among respondents from a large family and respondents with a parent that had less than a college education. Notably, parent suicide attempt was reported four times more often among those from families that received welfare compared to those that did not receive welfare. In turn, respondents that reported exposure to parent suicide attempt used tobacco, alcohol, marijuana, prescription drugs,

and other drugs in greater numbers than those that did not report this adverse experience. Moreover, those exposed to parent suicide attempt used prescription drugs in numbers five times as great as for youth without this exposure and used other drugs in numbers three times as great as those for youth without this exposure.

Inclusion of a measure of child neglect in a non-administration population sample is rare. Using a uniform definition of neglect for child maltreatment surveillance issued by the Centers for Disease Control (Leeb, Paulozzi, Simon and Arias) demonstrated that prevalence of neglect in this population sample (6.3%) is lower than that found in administrative data from child protective service agencies (7.2%). However it is remarkable that for this sample, respondent report of neglect was highest (7.5%) for those in the lowest poverty status category (e.g., the highest income group). It may be that children in higher income households are left home alone as a child more often (indicating possible supervision neglect) than generally assumed among groups with economic advantage (Hussey, Chang and Koch 2006). This speculation is consistent with research on affluent youth that report subjective distress due to the emotional and physical unavailability of parents (Luthar and Becker 2002; Luthar and Latendresse 2005).

The primary limitations of this study include a cross-sectional design which limits efforts to disentangle the cause and effect of childhood social and economic circumstances, exposure to adverse childhood experiences, and adolescent substance use and does not allow determination of the causal order of some of the associations of interest. Secondly, this study is limited by the retrospective nature of the data. The shorter period of recall is a great advantage of studies of young people, but it is likely that, as with reporting by adults of their own adverse experience, these results include a substantial rate of false negatives. On the other hand, given the undesirable nature of eventful stressors, it is plausible to assert that false positives area likely

rare. Thus, although there is some bias in retrospective reports, that bias is not great enough to invalidate retrospective studies of major adversities of an easily defined kind (Hardt and Rutter 2004). Third, the role of welfare receipt was consistently associated with exposure to adverse childhood experiences and adolescent substance use, but the proportion of "don't know" responses nonetheless compromises these results. Finally, these analyses only examine adolescent involvement with substance with a crude measurement: any use, rather than level of use, abuse, or dependence. This constrains the insight gained about whether exposure to adverse childhood experiences is associated with worse outcomes for substance using youth.

Overall, these results demonstrate the importance of examining the role of exposure to adverse childhood experience in social context by including socioeconomic and sociodemographic characteristics as part of basic research efforts. Although beyond the scope of this project, the results presented here would have benefited from a more careful examination of the interrelationships of different measures of family social and economic circumstances. In this study, including childhood social and economic circumstances in the multivariate models showed that net of childhood SES and sociodemographic characteristics, the effect of reported exposure to adverse experiences greatly increased the odds of use for every substance. This association especially increased the odds of the kind of drugs most likely to lead to dependence and overdose, e.g. prescription and other drugs. The results reported here suggest that a connection between family size and depletion of parental resources, including responsive care, parental monitoring, and parent-child relationship quality, are social factors that warrant closer attention in research on adolescent substance use.

Although the results presented here advances research on the link between childhood social and economic circumstances, exposure to childhood adversity, and adolescent

substance use, future research might include several extension to this work. First, including stages of substance use (i.e., substance abuse and dependence, or cessation) would increase our understanding of the impact of exposure to childhood adversity on the progression of substance use over time. Additionally, it is important to look at clusters of substance use behaviors since multiple substance use is common. Second, details on timing of exposure to adverse childhood experiences would allow assessment of the potential role of sensitive periods in youth development when exposure has greatest impact (Teicher, Tomoda and Andersen 2006; Andersen and Teicher 2009). A longitudinal sample that includes children and adolescents across several developmental stages is needed to examine stage-specific and age-specific differences and to disentangle causal effects between SES and adversity. Third, additional research should examine moderators of adolescent substance use to achieve better understanding of the interrelations among risk and protective factors and adolescent outcomes. Fourth, there is a need for improved measurement of stress exposure overall (Turner and Avison 2003; Turner and Lloyd 1999; Turner, Wheaton and Lloyd 1995), but especially for measurement of the "universe of stressors" for children (Avison 2010; Finkelhor, Shattuck, Turner and Hamby 2013). Finally, the results presented here suggests that research, policy, and interventions to address the important impact of exposure to adverse childhood experiences should strive to carefully consider kind, co-occurrence, and amount of exposure to any study of exposure to adverse childhood experience.

Table 4.1: Childhood Sociodemographic Characteristics and Lifetime Substance Use in the National Comorbidity Survey Replication Adolescent Supplement (n=10,059)

	Overall Sample	Tobacco Use	Alcohol Use	Marijuana Use	Rx Drug Use	Other Drug Use
Overall Sample	—	35.9	60.7	23.3	5.4	4.3
Family Size		***	***	***		**
1-3 Children	60.3	32.7	59.2	20.8	5.1	3.4
4+ Children	39.7	40.8	62.9	27.2	5.7	5.7
Parental Education		***		***		
<12 years	15.3	35.7	60.9	18.0	4.7	4.1
12 years	29.8	41.7	61.3	26.1	6.0	4.0
13-15 years	19.5	39.4	63.3	27.3	5.6	5.8
College	35.4	29.4	58.6	25.0	5.0	3.9
Parental Work Status						
All/most	94.8	35.8	60.5	23.1	5.4	4.3
Some/a little/not at all	5.2	38.0	63.7	28.3	5.3	4.4
Poverty Level						
<1.5 times PL	14.7	38.5	59.1	22.7	3.7	4.7
3-1.5 times PL	19.1	38.9	59.6	23.1	4.7	4.3
>3-6 times PL	31.9	34.1	60.7	23.7	5.6	4.6
>6 times PL	34.3	35.3	61.9	23.5	6.2	3.2
Welfare Receipt		***	***	***	*	*
No welfare	78.2	34.2	60.0	20.8	4.9	3.7
Welfare receipt	15.7	46.1	67.2	37.2	7.9	7.5
Don't know	6.1	32.1	53.3	20.3	4.3	4.1
Sex						
Female	48.9	37.0	60.3	22.3	5.0	4.4
Male	51.1	34.7	61.0	24.4	5.8	4.2
Age			***	***	***	***
13 Years	15.2	17.2	33.4	5.5	0.9	1.0
14 Years	20.9	23.6	50.6	11.4	1.7	1.5
15Years	20.5	32.5	59.8	21.1	4.6	2.6
16Years	21.0	44.4	71.8	31.5	7.5	6.2
17 Years	16.8	54.9	77.6	40.1	10.5	8.4
18 Years	5.4	56.8	81.9	44.7	10.6	11.1
Race		***	***	**	***	***
White	65.6	38.1	63.0	24.3	6.3	4.9
Hispanic	15.1	37.7	63.8	26.6	2.1	5.9
African American	14.4	25.9	50.3	18.3	4.6	0.5
Other	4.9	31.7	52.2	17.8	4.8	4.0

* p<.05, ** p<.01, *** p<.001

Table 4.2: Respondent Reported Exposure to Individual Childhood Adversities, Overall, and by Childhood Sociodemographic Characterstics (n=10,059)

	Parent Death	Parent Divorce	Parent Absence	Child Neglect	Child Abuse	Child Sex Abuse	Parent Mental Illness	Parent AOD Problem	Parent Suicide Attempt	Family Violence	Parent Criminal Activity
Overall	4.9	17.3	5.6	6.3	20.6	5.5	12.0	12.4	2.8	8.8	13.3
Family Size		***			***	***		***	***	***	***
1-4 children	4.4	11.1	5.7	6.4	18.1	3.9	11.4	10.9	2.2	6.1	9.3
4+ children	5.5	26.7	5.4	6.2	24.4	7.8	13.0	14.6	3.8	12.8	19.5
Education		***			***			***	***	***	***
< 12 years	5.7	19.4	6.3	6.3	22.5	6.2	10.1	12.2	3.1	13.1	19.2
12 years	4.8	21.0	4.9	5.0	22.9	5.8	12.9	15.5	3.8	10.7	16.5
13-15 years	5.7	20.2	4.7	5.5	24.1	6.2	13.7	15.3	3.3	10.0	15.7
16+ years	4.1	11.6	6.3	7.9	15.9	4.5	11.2	8.3	1.6	4.6	6.9
Work Status	**	***		*	*					*	***
All/Most	4.6	16.3	5.6	6.1	20.3	5.4	12.0	12.2	2.7	8.4	12.8
Some/Little/None	9.7	34.7	5.5	9.8	27.1	7.0	13.2	16.1	5.2	14.1	22.6
Poverty Status		***		*						***	***
</=1.5	5.7	24.5	5.4	4.6	20.3	5.4	11.6	12.5	3.9	12.1	20.2
>1.5-3.0	4.6	19.1	5.7	6.3	22.1	5.4	12.9	13.7	3.0	11.6	15.8
>3.0-6.0	5.3	16.5	5.8	5.9	21.6	6.3	11.8	11.8	2.9	8.3	12.7
>6.0	4.3	13.9	5.3	7.5	19.0	4.8	11.9	12.2	2.3	6.2	9.6
Welfare Receipt	***	***	**		***	***	***	***	***	***	***
Never	3.9	14.8	5.1	6.0	18.2	4.2	9.8	10.1	1.6	6.3	9.0
6+ months	9.4	28.4	7.7	7.5	33.1	11.7	24.8	24.6	8.5	20.1	32.3
Don't Know	5.8	21.0	6.2	7.2	19.2	5.5	8.2	10.9	3.3	9.5	20.7

* p<.05, ** p<.01, *** p<.001

Table 4.2 (continued): Respondent Reported Exposure to Individual Childhood Adversities, Overall, and by Childhood Sociodemographic Characteristics (n=10,059)

	Parent Death	Parent Divorce	Parent Absence	Child Neglect	Child Abuse	Child Sexual Abuse	Parent Mental Illness	Parent AOD Problem	Parent Suicide Attempt	Family Violence	Parent Criminal Activity
Sex				**	*	***	**	**	**	*	
Male	4.8	16.8	5.4	7.6	21.7	1.2	10.1	11.2	2.0	7.7	13.4
Female	5.0	17.8	5.8	5.0	19.5	10.0	14.0	13.7	3.7	9.9	13.3
Age			*			***	***	*			
13 years	4.9	16.2	3.3	5.4	17.9	1.9	8.1	10.7	1.7	7.7	15.2
14 years	3.7	16.4	6.2	5.7	18.2	4.4	9.4	10.0	2.4	7.3	12.6
15 years	5.3	15.9	6.0	6.3	19.0	5.0	11.7	10.6	2.7	7.4	12.4
16 years	4.7	17.4	6.5	6.4	23.4	6.8	13.3	13.8	3.5	10.4	13.7
17 years	5.4	20.3	5.5	6.6	23.7	7.9	16.8	16.3	3.9	10.5	13.5
18 years	6.4	19.4	4.7	10.0	22.8	8.5	14.8	15.7	2.6	11.3	12.9
Race	**	***	***	**	***		**	***		***	***
White	4.1	15.2	4.4	7.1	17.9	5.4	13.2	12.6	3.0	7.4	10.5
African American	8.1	26.2	7.3	4.5	27.7	6.0	8.1	9.5	1.7	11.8	19.5
Hisp./Latino	5.5	18.3	7.3	5.0	26.2	5.2	11.0	16.1	3.4	11.2	20.3
Other	4.0	14.2	10.1	6.4	18.7	4.9	11.3	8.2	2.9	11.4	11.8

* p<.05, ** p<.01, *** p<.001

Table 4.3: Exposure to Childhood Adversity and Lifetime Ever Use of 5 Substances in the National Comorbidity Survey Replication Adolescent Supplement (n=10,059)

	Tobacco Use	Alcohol Use	Marijuana Use	Rx Drug Use	Other Drug Use
Overall Sample Use	35.9	60.7	23.3	5.4	4.3
Parent Death		**	***		
Yes	37.1	71.2	32.2	5.2	5.4
No	35.9	60.1	22.9	5.3	4.3
Parent Divorce	***	*	***	**	
Yes	43.2	64.1	31.5	7.6	5.8
No	34.4	60.0	21.7	4.9	4.0
Parent Absent					
Yes	41.7	61.7	27.2	6.8	3.6
No	35.6	60.6	23.2	5.3	4.4
Child Neglect	*	***	*	**	**
Yes	42.3	71.9	30.3	10.8	11.2
No	35.5	59.9	22.9	5.0	3.9
Child Abuse	***	***	***	***	***
Yes	50.6	72.3	39.3	10.1	8.9
No	32.1	57.6	19.2	4.1	3.1
Child Sex Abuse	***	***	***	***	***
Yes	66.5	81.1	52.3	14.2	14.3
No	34.1	59.5	21.7	4.9	3.7
Parent Mental Illness	***	***	***	***	***
Yes	52.7	76.7	40.2	12.3	10.4
No	33.6	58.5	21.1	4.4	3.5
Parent AOD Problem	***	***	***	***	***
Yes	55.2	73.7	43.7	12.2	10.4
No	33.2	58.8	20.5	4.4	3.5
Parent Suicide Attempt	***	***	***	**	*
Yes	66.2	81.9	57.6	13.5	12.8
No	35.0	60.0	22.4	5.1	4.1
Family Violence	***	***	***	***	***
Yes	58.4	77.5	45.7	13.7	11.1
No	33.8	59.0	21.2	4.6	3.7
Parent Criminal Activity	***	***	***	***	***
Yes	54.4	72.4	41.3	9.8	9.0
No	33.1	58.9	20.6	4.7	3.6

* p<.05, ** p<.01, *** p<.001

Table 4.4: Logistic Regression of Childhood Sociodemographic Characteristics, Exposure to Childhood Adversity, and Respondent Reported Lifetime Substance Use in Adolescence (n=10,059)

	Tobacco								Alcohol								Marijuana							
	M_1	t, (P)	M_2	t, (P)	M_3	t, (P)	M_4	t, (P)	M_1	t, (P)	M_2	t, (P)	M_3	t, (P)	M_4	t, (P)	M_1	t, (P)	M_2	t, (P)	M_3	t, (P)	M_4	t, (P)
Family Size																								
1-3 Children (ref)	—		—		—		—		—		—		—		—		—		—		—		—	
4+ Children			1.43	***			1.28	**			1.12	**			1.08				1.32	***			1.13	
Parent Education																								
College (ref)	—		—		—		—		—		—		—		—		—		—		—		—	
<12 years			1.39	*			1.36	*			1.18				1.16				1.62	**			1.59	**
12 years			1.73	***			1.64	***			1.11				1.04				1.65	***			1.54	***
13-15 years			1.60	***			1.47	**			1.23	*			1.14				1.51	***			1.35	*
Parent Work																								
All/most (ref)	—		—		—		—		—		—		—		—		—		—		—		—	
Some/little/none			1.00				0.97				1.18				1.11				1.08				0.97	
Poverty Level																								
>6x PL (ref)	—		—		—		—		—		—		—		—		—		—		—		—	
>3-6x PL			1.18				1.20				0.99				1.00				0.86				0.87	
1.5-3x PL			1.11				1.09				0.99				0.97				0.92				0.91	
<1.5x PL			0.94				0.91				1.02				1.00				1.02				0.97	
Welfare Receipt																								
None (ref)	—				—		—		—		—		—		—		—		—		—		—	
Received			1.57	***			1.13				1.40	**			1.07				2.28	***			1.56	***
Don't Know			1.19				1.08				1.07				1.00				1.39				1.22	
Adversities																								
0 (ref)					—		—						—											
1					0.50	***	1.60	***					0.47	***	1.59	***					0.68	***	1.86	***
2					0.93	***	2.47	***					0.75	***	2.15	***					1.31	***	3.48	***
3+					1.45	***	3.79	***					1.18	***	3.06	***					1.78	***	4.92	***
Sex																								
Female (ref)	—		—		—		—		—		—		—		—		—		—		—		—	
Male	0.89		0.88				0.84	*	1.02		1.02				0.99		0.86		0.86				0.81	*
Age																								
13 Years (ref)					—		—						—		—				—		—		—	
14 Years	1.47	*	1.50	*			1.50	*	1.96	***	1.97	***			1.99	***	2.17	**	2.26	**			2.32	**
15Years	2.31	***	2.39	***			2.34	***	2.84	***	2.89	***			2.85	***	4.60	***	4.86	***			4.83	***
16Years	3.80	***	3.97	***			3.79	***	4.86	***	4.91	***			4.75	***	7.84	***	8.33	***			8.05	***
17 Years	5.82	***	6.01	***			5.75	***	6.64	***	6.68	***			6.40	***	11.42	***	12.10	***			11.71	***
18 Years	6.26	***	6.47	***			6.33	***	8.71	***	8.69	***			8.58	***	13.68	***	14.50	***			14.58	***

Race																						
White (ref)					—		—					—		—				—		—		—
Hispanic	1.02		0.80				0.77	*	1.10		0.98			0.93		1.21		0.92				0.90	
African Am.	0.59	***	0.42	***			0.40	***	0.62	***	0.54	***		0.51	***	0.75	*	0.54	***			0.52	***
Other	0.78		0.73	*			0.74	*	0.66	**	0.63	**		0.62	***	0.70	*	0.61	**			0.62	**

* p<.05, ** p<.01, *** p<.001

Table 4.5: Logistic Regression of Childhood Sociodemographic Characteristics, Adversity Exposure Category, and Respondent Reported Lifetime Substance Use in Adolescence (n=10,059)

	Prescription Drugs								Other Drugs							
	M_1	t, (P)	M_2	t, (P)	M_3	t, (P)	M_4	t, (P)	M_1	t, (P)	M_2	t, (P)	M_3	t, (P)	M_4	t, (P)
Family Size																
1-3 Children (ref)	—		—		—		—		—		—		—		—	
4+ Children			1.17				0.97				1.73	**			1.47	
Parent Education																
College (ref)	—		—		—		—		—		—		—		—	
<12 years			1.14				1.08				0.90				0.90	
12 years			1.25				1.10				0.91				0.81	
13-15 years			1.18				1.02				1.46	*			1.30	
Parent Work																
All/most (ref)	—		—		—		—		—		—		—		—	
Some/a little/not at all			1.01				0.88				0.87				0.75	
Poverty Level																
>6 times PL (ref)	—				—		—		—		—		—		—	
>3-6 times PL			0.65				0.64				0.73				0.74	
1.5-3 times PL			0.80				0.77				1.05				1.06	
<1.5 times PL			0.94				0.89				0.96				0.92	
Welfare Receipt																
No welfare (ref)	—		—		—		—		—		—		—		—	
6+ months receipt			1.91	***			1.18				2.42	***			1.51	
Don't Know			1.52				1.26				1.99				1.72	
Adversities																
0 (ref)	—		—		—		—		—		—		—		—	
1					0.71	**	2.06	**					0.18		1.10	
2					1.54	***	4.69	***					1.20	***	2.95	***
3+					1.92	***	6.17	***					1.80	***	4.56	***
Sex																
Female (ref)	—		—		—		—		—		—		—		—	
Male	1.17		1.18				1.13		0.95		0.94				0.90	
Age																
13 Years (ref)	—		—		—		—		—		—		—		—	
14 Years	1.92		1.95				1.94		1.49		1.52				1.51	
15Years	5.37	***	5.39	***			4.97	***	2.69	*	2.78	*		*	2.60	*
16Years	8.96	***	8.94	***			7.72	***	6.50	***	6.80	***		***	6.11	***
17 Years	13.10	***	12.97	***			11.09	***	9.10	***	9.39	***		***	8.34	***
18 Years	13.43	***	13.08	***			11.37	***	12.20	***	12.30	***		***	10.88	***

Race															
White (ref)	—		—		—		—		—		—		—		
Hispanic	0.74		0.66			0.67		1.25		1.04			1.06		
African American	0.34	***	0.29	***		0.29	***	0.10	***	0.07	***	***	0.08	***	
Other	0.79		0.73			0.80		0.85		0.76			0.84		

* p<.05, ** p<.01, *** p<.001

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CHAPTER 5
Conclusion

A primary purpose of this project was to put together a portrait of the childhood social and economic circumstances associated with exposure to adverse childhood experiences and to explore the links between circumstances, exposure, and health risk behavior. The goal was to contribute to developing a general understanding of the social factors that bubble to the surface as most important in shaping exposure to adverse experiences because such evidence can put together a broader base for research to inform policy and program that are needed for children experiencing toxic stress.

Chapter 2 assessed the following research questions: (1) Are disadvantaged childhood social and economic circumstances associated with increased likelihood of exposure to childhood adversity? (2) Is exposure to adverse childhood experiences associated with increased likelihood of current smoking in adulthood? and (3) Does exposure to adverse childhood experiences mediate the relationship between childhood social and economic circumstances and adult smoking status? This study bridges a gap in existing research on the association between childhood social and economic circumstances, exposure to adversity, and adult smoking status by utilizing nationally representative survey data with a life course data design. Previous findings that indicate remarkable high rates of exposure to childhood adversity were confirmed here and results may be generalized to populations beyond this sample. Additionally, this study

extends current knowledge about the effects of exposure to childhood adversity by examining its association with stages of a smoking career, never smoking, current smoking, and former smoking. As such, this represents an improvement on previous studies of exposure to childhood adversity and health risk behavior since it makes comparison of the odds being in one health behavior status versus another, net of other factors. These results also provide new clues about of heterogeneity in outcomes.

Chapter 3 explored whether: 1) disadvantaged childhood SES is associated with increased likelihood of exposure to adverse childhood experience; 2) disadvantaged childhood SES is associated with increased likelihood of exposure to co-occurring adverse childhood; and whether 3) non-disadvantaged childhood SES is associated with increased likelihood of exposure to non-victimization types of adverse childhood experiences (parent psychopathology, parent problem behavior). Results suggest that receipt of welfare is the sole disadvantaged childhood SES measure associated with a higher prevalence of exposure to adverse childhood experiences, a greater likelihood of reporting exposure to multiple adverse childhood experiences, and increased odds of exposure to almost every of the eleven adverse childhood experiences studied here. Child neglect was the only experience not associated with welfare receipt in childhood. Family size emerged as important, being the second most consistent childhood SES predictor. This was followed by parent educational level. Parent employment and family poverty level were each associated with a more limited set of the same adverse childhood experiences.

Chapter 4 examined whether: 1) disadvantaged childhood SES is associated with increased likelihood of adolescent substance use; 2) exposure to adverse childhood experiences is associated with increased likelihood of adolescent substance use; and 3) exposure to adverse childhood experiences mediates the relationship between childhood SES and adolescent

substance use. The results provided partial support for the hypothesis that disadvantaged childhood SES increases the odds of adolescent substance use. Only select components that reflect disadvantaged childhood social and economic status demonstrated a consistent association with increased odds of substance use, otherwise the association between childhood SES components and adolescent substance use varied. Welfare receipt stood out as the one childhood SES component that was associated with increased odds of use for every of the five substances included in the analyses. Large family size was associated with increased odds of use for each substance except prescription drugs. Parent educational level conferred mixed advantage for odds of substance use. Having a parent with less than a college education was a disadvantage for odds of tobacco and marijuana use only. Moreover, respondents that had a parent with some college education had a particular disadvantage for odds of alcohol and other drug use in additional to the association with tobacco and marijuana use.

Additionally, the results provided partial support for the hypothesis that exposure to adverse childhood experiences mediates the relationship between childhood SES and adolescent substance use. The association between welfare receipt and increased odds of substance use was consistently mediated by exposure to adverse childhood experience for every type of substance. The association between family size and increased odds of substance use was mediated by exposure to adverse childhood experience for alcohol, marijuana, and other drugs specifically. The association between parent educational level and increased odds of substance use was mediated by exposure to adverse childhood experience only among the respondents with a parent that had some college education and only for alcohol and other drug use.

Future research on applications of the Stress Process Model can extend the concept in a few important ways. First, inclusion of a measure of total stress that operationalizes stressors as

an amalgam of events, chronic strains, and traumas, as well as environmental stress, would contribute to maximizing the explanatory power of differential exposure to stress (Turner 2010). The notion of total stress can be examined in terms of the "cumulative burden" of stressors and would improve our understanding of the effects of childhood stress on health across the lifespan by including both aggregated and disaggregated measures (Thoits 2010). Second, the contribution of stress proliferation in youth-relevant social context could be assessed by examining "chains of risk" across multiple contexts (Rutter 1989). Third, the effect of social and economic resources as a moderating factor between stress exposure and health risk behavior would assessing the indispensible role of buffering (Kuh, Power, Blane, Bartley 1997; Pearlin 1999).

Moreover, research that seeks to distinguish the role of family structure versus family functioning in outcomes is needed. In terms of outcomes, family functioning may be demonstrated to be more important than family structure if the differences between children in similar family types are greater than the differences across family types (Demo and Adcock, 1996 cited in Mackay, 2005). Furthermore, the differences between children within the same family types can be as great, if not greater, than the differences between children in different families (O'Connor et al., 2001), suggesting that children differ in their resilience and response to adversity (Hetherington and Stanley-Hagan, 1999). Toward this end, research on the relationship between family, socioeconomic, and demographic factors as independent variables, exposure to childhood adversity as a mediating factor, and health-risk behavior as an outcome would begin to provide clues to these important issues.

Results may be relevant to healthcare practice and public health policy efforts to find strategic ways to engage and care for patients with a history of exposure to childhood adversity

and improve health outcomes among those exposed. These findings can be useful to those in positions of advocacy by providing information to physicians about the populations most at risk for a history of exposure to adversity, the effects of adversity on physical, mental, and behavioral health, how to detect exposure to adversity, and what steps to take once identified. This is especially valuable in educating pediatricians and other sentinels (e.g., teachers, childcare workers) in position to assist children.

APPENDIX A

Appendix A: Tetrachoric Correlations of Eleven Childhood Adversities, National Comorbidity Survey Replication (n=5,625)

	Interpersonal Loss	Child Neglect	Child Abuse	Child Sex Abuse	Parent Mental Illness	Parent AOD Problem	Family Violence	Parent Criminal Activity
Interpersonal Loss	1.00							
Child Neglect	0.3357	1.00						
Child Abuse	0.3022	0.5299	1.00					
Child Sex Abuse	0.2294	0.3444	0.4157	1.00				
Parent Mental Illness	0.1263	0.4039	0.3967	0.3014	1.00			
Parent AOD Problem	0.1300	0.3782	0.3645	0.2896	0.4503	1.00		
Family Violence	0.3754	0.4967	0.6560	0.4081	0.3873	0.5423	1.00	
Parent Criminal Activity	0.2970	0.3242	0.4374	0.2994	0.3341	0.6261	0.5029	1.00

APPENDIX B

Appendix B: Tetrachoric Correlations of Eleven Childhood Adversities, National Comorbidity Survey Adolescent Supplement (n=10,079)

	Parent Death	Parent Divorce	Parent Absent	Child Neglect	Child Abuse	Child Sexual Abuse	Parent Mental Illness	Parent AOD Problem	Parent Suicide Attempt	Family Violence	Parent Criminal Activity
Parent Death	1.00										
Parent Divorce	-0.1358	1.00									
Parent Absence	-0.0747	-0.1928	1.00								
Child Neglect	0.0472	0.0403	0.0944	1.00							
Child Abuse	0.0869	0.1026	0.1393	0.2040	1.00						
Child Sex Abuse	0.1274	0.1576	0.0761	0.1836	0.2832	1.00					
Parent Mental Illness	0.0841	0.0435	0.1303	0.1426	0.3318	0.3705	1.00				
Parent AOD Problem	0.1401	0.1060	0.1669	0.1129	0.3077	0.2579	0.4492	1.00			
Parent Suicide Attempt	0.1988	0.1788	0.1156	0.1765	0.2443	0.3792	0.5346	0.4787	1.00		
Family Violence	0.1838	0.2500	0.1375	0.1756	0.4666	0.4110	0.3403	0.4414	0.3859	1.00	
Parent Criminal Activity	0.1383	0.1270	0.2746	0.1564	0.3262	0.2378	0.3338	0.6123	0.4061	0.5040	1.00

APPENDIX C

Appendix C: Tetrachoric Correlations of Eleven Childhood Adversities, National Comorbidity Survey Adolescent Supplement (n=10,079)

	Parent Death	Parent Divorce	Parent Absent	Child Neglect	Child Abuse	Child Sexual Abuse	Parent Mental Illness	Parent AOD Problem	Parent Suicide Attempt	Family Violence	Parent Criminal Activity
Parent Death	1.00										
Parent Divorce	-0.1358	1.00									
Parent Absence	-0.0747	-0.1928	1.00								
Child Neglect	0.0472	0.0403	0.0944	1.00							
Child Abuse	0.0869	0.1026	0.1393	0.2040	1.00						
Child Sex Abuse	0.1274	0.1576	0.0761	0.1836	0.2832	1.00					
Parent Mental Illness	0.0841	0.0435	0.1303	0.1426	0.3318	0.3705	1.00				
Parent AOD Problem	0.1401	0.1060	0.1669	0.1129	0.3077	0.2579	0.4492	1.00			
Parent Suicide Attempt	0.1988	0.1788	0.1156	0.1765	0.2443	0.3792	0.5346	0.4787	1.00		
Family Violence	0.1838	0.2500	0.1375	0.1756	0.4666	0.4110	0.3403	0.4414	0.3859	1.00	
Parent Criminal Activity	0.1383	0.1270	0.2746	0.1564	0.3262	0.2378	0.3338	0.6123	0.4061	0.5040	1.00