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DOES CONTEXT MATTER TO ACES? THE ROLE OF STATE ECONOMIC CONTEXT AND SELECTED STATE POLICIES IN CHILDHOOD ADVERSITY

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Does Context Matter to ACEs? The Role of State Economic Context and Policies in Childhood Adversity

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Does Context Matter to ACEs? The Role of State Economic Context and Policies in Childhood Adversity

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Childhood adversity is a widespread public health problem in the United States. Half of adults experienced at least one serious adversity during childhood, and a quarter experienced two or more. Childhood adversity, often referred to as adverse childhood experiences (ACEs), has been associated with numerous negative physical and psychological health consequences across the lifespan, including heart disease, adverse mental health conditions, pediatric asthma, cancer, autoimmune disease, and early mortality. However, little is known about the determinants of childhood adversity, and in particular whether—and how—socioeconomic or policy context is related to which children experience ACEs. This dissertation addresses that gap by using the 2011-2012 National Survey of Children's Health, and state-level data from several other sources, to explore: (1) the relationship between state-level economic characteristics and public policies and ACEs, and (2) whether state-level economic characteristics and public policies moderate the relationship between family socioeconomic status (SES), race/ethnicity, and ACEs. Using multilevel logistic regression modeling, this dissertation found that several state-level economic characteristics and policies were directly correlated with ACEs, with lower state socioeconomic status and less supportive social policies resulting in higher risk of ACEs. This relationship was attenuated and in most cases disappeared with the addition of individual-level covariates. State-level characteristics and policies did moderate the relationship between ACEs, family SES, and race/ethnicity, but in an unexpected direction: some lower-SES children had *lower* odds of ACEs in low-SES states or states with higher income inequality, and non-Hispanic blacks also had *lower* odds of ACEs in states with low SES and less generous social policies. Further exploration and confirmation of these surprising results is warranted, as it will help increase understanding of the determinants of ACEs, and inform efforts to prevent and mitigate the effects of this widespread problem.

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List of Abbreviations

ACEs	Adverse Childhood Experiences
ACS	American Community Survey
AIC	Akaike's Information Criterion
BIC	Bayesian Information Criterion
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CPS	Child Protective Services
ES	Economic Status
FPL	Federal Poverty Level
FSM	Family Stress Model
HPA	Hypothalamic-Pituitary-Adrenal axis
HS	High School
NatSCEV	National Survey of Children's Exposure to Violence
NSCH	National Survey of Children's Health
OR	Odds Ratio
Q	Quartile
SCHIP	State Children's Health Insurance Program
SD	Standard Deviation
SES	Socioeconomic Status
SNAP	Supplementary Nutrition Assistance Program

TANF	Temporary Assistance to Needy Families
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

Chapter 1: Introduction

Childhood adversity is a widespread public health problem in the United States. Though definitions vary, most research indicates that around half of the U.S. population experienced at least one serious adversity during childhood, with roughly a quarter experiencing two or more (Bethell, Newacheck, Hawes, & Halfon, 2014; Felitti et al., 1998; Gilbert et al., 2015; Slopen et al., 2016). Childhood adversity, often referred to collectively as adverse childhood experiences (ACEs, a term from here on used as a synonym for childhood adversity), has been associated with a wide variety of health consequences across the lifespan, including heart disease, mental health problems, pediatric asthma, cancer, autoimmune disease, early mortality, and many others (Anda, Butchart, Felitti, & Brown, 2010; Kalmakis & Chandler, 2015; Su, Jimenez, Roberts, & Loucks, 2015; Wing, Gjelsvik, Nocera, & McQuaid, 2015). Considering the prevalence of ACEs and the long list of their short- and long-term health consequences, an author of one of the seminal studies on childhood adversity, Bob Anda, has described it as "a chronic public health disaster" (Stevens, 2012).

Despite the importance of ACEs to health across the lifespan and their high level of prevalence, there is a relative lack of research on the determinants of childhood adversity. To put it another way, it is not yet clear what puts one child at greater risk of experiencing higher ACEs than another. In particular, there is very little known about how contextual factors—such as the socioeconomic status of the state or neighborhood, or particular government policies—might affect that risk, despite increasing awareness that serious adversity seems to be related to geographic location (Starecheski, 2015). This dissertation, by pursuing two specific aims, intends to address that gap. Those specific aims are:

Specific Aim 1: Examine whether state-level economic characteristics and public policies are associated with adverse childhood experiences.

Specific Aim 2: Examine whether state-level economic characteristics and public policies moderate the relationship between family socioeconomic status, race/ethnicity, and ACEs.

Together, the answers to hypotheses posed under these specific aims will help increase understanding of the determinants of ACEs, and help direct not only future research but inform policymakers about the potential effects on childhood adversity of the laws and regulations they are considering.

This dissertation has seven chapters, including this introduction. Chapter 2 introduces the concept and definition of childhood adversity, and describes in some detail the relationship between ACEs and health. Chapter 3 digs into the research on the determinants of ACEs, with a specific focus on the (limited) work that has been done on how socioeconomic status, area-level context, and policies are related to childhood adversity or subsets of childhood adversity. Chapter 4 describes the methods used in this dissertation, including the four sources of data, the specific hypotheses to be tested, the measures, and the steps in the analysis. Chapter 5 presents the results related to specific aim 1: whether, and to what extent, state-level variables had direct effects on ACEs. Chapter 6 presents the results related to specific aim 2: how state-level variables might moderate the relationship between socioeconomic status, race, ethnicity, and ACEs. Chapter 7 concludes with a review of which hypothesis were confirmed or not confirmed, a short discussion of the results in context of the existing literature, limitations of this research, and some thoughts for future research directions.

Chapter 2: How Childhood Adversity Affects Health

2.1 Defining Childhood Adversity

"Childhood adversity" is a broad concept. It can be defined in many ways, from challenging but relatively normal problems facing every child to more serious issues that—ideally—no child should ever encounter. Much of the literature that addresses childhood adversity uses some variation of the latter definition. Similarly, this dissertation defines childhood adversity broadly, but takes "adversity" to mean experiences that are generally out of the ordinary range that we would expect for a child growing up in the United States (McLaughlin, 2016). Most definitions of childhood adversity include, but are not limited to, child maltreatment, so this section begins with a brief description of child maltreatment before addressing the more inclusive concept of childhood adversity.

The Centers for Disease Control and Prevention (CDC) defines *child maltreatment* as "any act or series of acts of commission or omission by a parent or other caregiver (e.g., clergy, coach, teacher) that results in harm, potential for harm, or threat of harm to a child" (CDC, 2017). Child maltreatment consists of two broad categories: acts of commission, such as physical or sexual abuse, and acts of omission, such as physical or emotional neglect or inadequate supervision. The concept of child maltreatment is a good starting point for understanding childhood adversity, as many measures of childhood adversity include elements of child maltreatment. However, childhood adversity is increasingly being conceptualized as a broader construct that includes, but is not limited to, child maltreatment. This section briefly examines (1) how the concept of childhood adversity emerged and has evolved, and (2) how it has been measured. As with all of the sections of this chapter, this is not meant to be a comprehensive review of how ACEs are conceptualized and measured, but rather an overview of some of the key studies and findings in this area.

2.1.1 The ACE Study

The seminal study that presented a more expansive way to define childhood adversity was, in fact, sponsored by the CDC itself: The Adverse Childhood Experiences (ACE) Study. The ACE Study is a critical starting point for understanding childhood adversity as it is studied and understood today, both by researchers and in the broader public. In the ACE Study, over 13,000 San Diego adults insured by Kaiser Permanente were asked about whether they had, before the age of 18, experienced one or more of seven types of serious abuse or household dysfunction (Felitti et al., 1998). The initial findings of this study were that 52% reported having experiences in at least one of these seven categories, and 6.2% had experienced four or more. Moreover, the authors of the study found a dose-response relationship between the number of ACEs and a wide variety of adult risk behaviors, diseases, and risk factors for diseases.

A key observation made by Felitti, Anda, and colleagues was that while numerous studies had examined the long-term effects of *single types* of childhood abuse on health, few examined the impact of more than one type of abuse at once, and none appeared to have looked at the long-term effects of both abuse and other childhood problems, such as household dysfunction (Felitti et al., 1998). The ACE Study was intended to fill those gaps—in other words, to get a more complete picture of childhood, and specifically the effects of serious childhood problems.

The questionnaire that Felitti and Anda used to measure childhood adversity was constructed using questions from three existing sources: the Conflict Tactics Scale (Straus, Hamby, Boney-McCoy, & Sugarman, 1996), the National Health Interview Survey (National Center for Health Statistics, 1991), and a study examining sexual abuse among black and white women in childhood (Wyatt, 1985). These questions fell into two broad categories: abuse (with three sub-categories: psychological, physical, and sexual) and household dysfunction (with four sub-categories: presence of substance abuse, mental

illness, violence toward the child's mother, and criminal behavior in the household). Table 1 shows these categories and the 17 questions used to create them. By creating a scale with some dissimilar categories—and by combining categories in their analysis—Felitti and colleagues took the first steps in trying to understand and measure a fuller range of childhood adversity. It is noteworthy that many questions focused on *repeated* childhood experiences rather than single events, though some particularly serious one-time events, such as sexual abuse, were included. As will be seen below, one of the distinguishing characteristics of ACEs that appears to be that they are chronic in nature, or they are single events—such as the death of a parent—that are likely to result in permanent changes in a child's living situation, perceptions, or even fundamental biology (Shonkoff et al., 2012).

Table 2.1: Childhood Adversity Categories and Questions from the ACE Study (adapted from Felitti et al., 1998)

Abuse
Psychological
Did a parent or other adult in the household …
1. Often or very often swear at, insult, or put you down?
2. Often or very often act in a way that made you afraid that you would be physically hurt?
Physical
Did a parent or other adult in the household …
3. Often or very often push, grab, shove, or slap you?
4. Often or very often hit you so hard that you had marks or were injured?
Sexual
Did an adult or person at least 5 years older ever …
5. Touch or fondle you in a sexual way?
6. Have you touch their body in a sexual way?
7. Attempt oral, anal, or vaginal intercourse with you?
8. Actually have oral, anal, or vaginal intercourse with you?
Household Dysfunction
Substance Abuse
9. Live with anyone who was a problem drinker or alcoholic?
10. Live with anyone who used street drugs?
Mental Illness
11. Was a household member depressed or mentally ill?
12. Did a household member attempt suicide?
Mother Treated Violently
Was your mother or stepmother …
13. Sometimes, often, or very often pushed, grabbed, slapped, or had something thrown at her?
14. Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard?
15. Ever repeatedly hit over at least a few minutes?
16. Ever threatened with, or hurt by, a knife or gun?
Criminal Behavior in Household
17. Did a household member go to prison?

2.1.2 After the ACE Study

Since the ACE Study, researchers have examined ACEs using a wide variety of datasets, populations, and outcomes. While Felitti, Anda and colleagues advanced the understanding of childhood adversity by expanding it beyond single categories and attempting to get at its cumulative nature, they did not propose a single unifying concept or definition for future researchers to use or test. This is understandable, given the novelty of the field in 1998, but consequently there have been substantial differences in the way

researchers have conceptualized and measured childhood adversity since the first ACE Study results were published.

Some research has hewed closely to the ACE Study. In 2010, the U.S. Behavioral Risk Factor Surveillance System (BRFSS), an annual state-based survey of non-institutionalized U.S. adults aged 18 and above, included an optional ACEs module. Ten states and Washington, DC chose to include the module, which asked 11 questions of participants that covered the same ground as the ACE Study questions, with the exception of including parental divorce or separation as an ACE, and expanding parental violence to include any violence between them (not just mother treated violently). Many of these reports do not explicitly address the concepts underlying the ACEs measure they use. For example, one report of the results from the 2010 BRFSS, focused more on discussing possible overall mechanisms linking cumulative overall adversity to poor health (such as disruption of biological mechanisms during development or increased use of risky behaviors) than on specific concepts of adversity underlying the scale (Gilbert et al., 2015). Another report linking childhood adversity with food insecurity similarly did not examine the concepts underlying the ACEs scale that was used (Sun et al., 2016). These two examples are not meant to discredit such research, but rather to point out that much research on childhood adversity often uses questions intended to represent a range of types of childhood adversity without excessive attention to the underlying concepts. This may be warranted, as there is some evidence that only one factor drives some multifaceted ACE measures (Slopen, Non, Williams, Roberts, & Albert, 2014) and the original ACE Study found the seven ACE categories were highly interrelated (Felitti et al., 1998).

Some authors, however, have attempted to tease out the underlying concepts in ACEs scales, and some have attempted to examine whether some questions from the original scale could be dropped or altered. Brandon Scott, Nadine Burke, and colleagues used exploratory factor analysis of an ACE scale (similar to the original ACE Study) administered to a sample of at-risk urban youth, finding three underlying concepts: abuse,

household dysfunction, and "mixed" (a complicated combination of neglect, one or no parents, drug use in the house, and sexual abuse) (Scott, Burke, Weems, Hellman, & Carrion, 2013). Another study examined the relationship between childhood adversity and mental and substance use disorders; using latent class analysis, four "profiles" of ACEs emerged: high multiple ACEs, high parental substance abuse, high childhood physical abuse, and low ACEs (Cavanaugh, Petras, & Martins, 2015). In examining the association between ACEs and adult heart attacks, four domains appeared (confirmed through factor analysis): childhood socioeconomic status, household structure, child maltreatment, and poor childhood health (Morton, Mustillo, & Ferraro, 2014). These studies remain rare, though, and as noted above, much research on ACEs either use variants of the ACE Study scale or instruments unique to the study or dataset (Kalmakis & Chandler, 2015).

2.1.3 Recent Trends in Defining Childhood Adversity

Several other trends have emerged since the ACE Study. First, ACEs researchers are increasingly using different scales for different populations. Most research on ACEs has come through retrospective reports, such as the ACE Study or BRFSS. However, some studies—including the National Survey of Children's Health (NSCH), the dataset used in this dissertation—have scales specifically targeted to be answered by children or their parents. Others, intending to be more sensitive to the experiences of urban populations, included the ACE Study scale along with experiences of racism, neighborhood violence, bullying, and being in foster care (Cronholm et al., 2015). Second, some researchers have explored whether the timing, frequency, and severity of adversity matters. Some have found that the age of the child when the adversity was experienced and the frequency of the exposure both appear to make a difference to the health effects (Friedman, Montez, Sheehan, Guenewald, & Seeman, 2015; Slopen, McLaughlin, Dunn, & Koenen, 2013). Third, although the ACE Study scale has been found to be reliable using test-retest methods

(Dube, Williamson, Thompson, Felitti, & Anda, 2004) others have started questioning the reliability and possibly the validity of retrospective reports of childhood adversity (Reuben et al., 2016; Susser & Widom, 2012).

Now, almost 20 years since Felitti, Anda, and colleagues published their first paper describing the ACE Study findings, it is clear that no single conceptualization or definition of childhood adversity has won out. Katie McLaughlin, reflecting on childhood adversity, wrote:

> Childhood adversity is a construct in search of a definition. Despite the burgeoning interest and research attention devoted to childhood adversity, there is a surprising lack of consistency with regard to the definition and measurement of the construct. … Childhood adversity is difficult to define but fairly obvious to most observers, making the construct an example of the classic standard of *you know it when you see it.* Although this has allowed a significant scientific knowledge base on childhood adversity to emerge within a relatively short period, the lack of an agreed-upon definition of the construct represents a significant impediment to future progress in the field (McLaughlin, 2016, pp 3-4).

McLaughlin then goes back to the dictionary for a definition and eventually defines childhood adversity as "experiences that are likely to require significant adaption by an average child and that represent a deviation from the expectable environment", where those deviations can be either exposures to things that shouldn't be there in a normal childhood (like sexual abuse) or lack of things that should be there in a normal childhood (like enough food to eat) (McLaughlin, 2016, p 4). Overall, McLaughlin's discussion of what should and should not qualify as childhood adversity is significant because it addresses many of the key issues that have emerged over the years in ACEs research, and attempts to resolve them using a core idea (deviation from the expected environment). Whether this idea will be accepted and guide future research on ACEs remains to be seen.

In sum, at the moment there is no single accepted definition of childhood adversity and no single universally accepted way to measure it. There are, however, some common ideas that run through ACEs research. *First, childhood adversity includes multiple*

domains. These domains usually include child abuse, physical and psychological neglect, and household dysfunction, but are sometimes expanded to problems in the child's neighborhood, school, difficult peer relations, and more. Many of these domains make sense on the surface—physical abuse is a different thing from having divorced parents—and research is beginning to emerge on possible concepts underlying those domains, but to date there is no single accepted set of domains that define childhood adversity. *Second, ACEs generally are seen as chronic or constant occurrences, rather than one-time traumatic events (with some exceptions).* Missing dinner once or twice is not an ACE; missing meals for years probably is. Similarly, ACEs are also often seen as inputs rather than outcomes. In other words, being significantly underweight is the outcome of having experienced childhood adversity, but is not the adversity itself. *Third, childhood adversity is both serious and not part of a "normal" childhood.* ACEs do not include algebra tests or even the loss of a family pet. They also do not include events that might be expected to build character, positive skills, or confidence if they are met and overcome, such as a losing football season. Is this sense, childhood adversity is sometimes described as "toxic", in that no dose is healthy.

Fully understanding what constitutes childhood adversity is clearly an active area of research and debate. This disagreement should not get in the way of continued research. As illustrated in the following sections, no matter the specific definition used, the negative impacts of childhood adversity on health are clear.

2.2 ACEs and Health

Study after study has shown that ACEs—however they are measured—are strongly associated with a wide variety of poor health outcomes and risky behaviors across the life course. This research effectively began with the 1998 article authored by Felitti, Anda, and colleagues, which set the tone both in how to characterize and measure childhood adversity

and in the general findings of a dose-response relationship between ACEs and adult health problems. Felitti and Anda's work is still commonly cited in public discussions of the importance of ACEs, and its results are often still used in awareness campaigns (for example, see Burke-Harris, 2014). Moreover, in the almost twenty years since that seminal study, research has left little doubt about the robustness of Felitti and Anda's core findings about the relationship between childhood adversity and adult health.

This section summarizes current knowledge on the relationship between childhood adversity and health. First, it examines what has been done on the effects of ACEs on *adult* health and health behaviors, which comprises the majority of research on childhood adversity (including the original 1998 study by Felitti, Anda, and colleagues). Second, it examines the effects of ACEs on *child* health—an area that is considerably less developed, but shows the same disturbing trends seen in research on adults. Third, this section briefly addresses some of the mechanisms and pathways through which ACEs are proposed to affect health. The relationship between childhood adversity and health has been proven again and again, in multiple populations and with varying measures. Research is now increasingly focusing on why that relationship exists, often with an eye toward designing interventions to reduce or prevent the health effects of childhood adversity. Finally, it must be noted that this section, like the previous one, is not a full literature review; it contains instead an overview of key findings and studies, as well as literature reviews that attempt to convey the current state of knowledge on the relationship between childhood adversity and health.

2.2.1 Theory: How ACEs are Thought to Affect Health

Childhood adversity can be seen as a stressor that can lead to immediate or eventual poor health. However, much like being sneezed on does not always result in catching a cold, experiencing stress does not automatically in health problems. In fact, evidence-

backed models of the stress process, such as the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), posit a complex process through which some stressors get "translated" into negative health outcomes, while others do not. If ACEs are conceptualized as stressors, there may likewise be multiple pathways through which stressors, such as ACEs, might result in poor health (Shonkoff et al., 2012). At least three pathways have been proposed: behavioral, biological, and socioeconomic. For clarity, these pathways are discussed separately below, but it is almost certain that these pathways interact with each other.

Behavioral Pathways. Both children or adults may attempt to cope with ACEs—current or past—through behaviors that are health-damaging, such as smoking, overeating, drug or alcohol abuse, or other risky behaviors (Fuller-Thomson, Filippelli, & Lue-Crisostomo, 2013). Su and colleagues found consistent strong evidence for an association between adult smoking and ACEs across numerous studies (Su, Jimenez, et al., 2015). As many have, Su and colleagues noted that smoking is both associated with immediate stress relief and poor long-term cardiovascular health. Interestingly, they also found evidence that people with a history of ACEs persist in smoking at a greater rate than those with no such history even after being diagnosed with a smoking-related illness, supporting the idea that smoking is an especially important pathway between ACEs and cardiovascular disease. However, they also found mixed evidence that smoking fully mediates that relationship, indicating that ACEs might operate through other pathways as well. Such pathways might include poor eating habits, physical inactivity, and sleeping disorders, though the evidence for each of these as mediators was likewise mixed.

Biological Pathways. ACEs are also increasingly being associated with "rewiring" of the biological systems of children, which can lead to pathologic changes that predispose them for early disease above and beyond any risky behaviors they might adopt (Danese & McEwen, 2012). In addition to exploring behavioral pathways, Su and colleagues also explored the evidence for several potential biological pathways in their review of the adult

cardiovascular consequences of ACEs (Su, Jimenez, et al., 2015). They found evidence that individuals with a history of both individual and multiple ACEs had, as adults, greater subclinical indicators of atherosclerosis, increased risk for hypertension, and changes to the structure and function of their brain that are reduced cognitive and emotional functioning. Both children and adults had increased activation of the hypothalamic-pituitary-adrenal (HPA) axis, one of the body's primary endocrine systems for dealing with stress, and greater levels of general inflammation—both of which are associated with poor cardiovascular health if sustained over time.

Socioeconomic Pathways. Finally, childhood adversity may also lead children to achieve lower levels of education, income, and earnings in adulthood, which itself is associated with poor health (Currie & Widom, 2010; Font & Maguire-Jack, 2016). There are many ways in which ACEs could be theorized to affect later life socioeconomic status, from simply preventing children from achieving key educational milestones (such as high school graduation) to interfering with the development of any number of habits, behaviors, and social connections that would later be crucial to obtaining and keeping well-paying jobs.

2.2.2 Evidence for the Relationship Between ACEs and Adult Health: The ACE Study

The Adverse Childhood Experiences (ACE) Study has taken on an almost mythical quality among researchers and practitioners, even inspiring a small online history of its origins, development, and subsequent influence (Stevens, 2012). According to this history, the impetus for the ACE Study came from an unusually high dropout rate in a San Diego obesity clinic run by Dr. Vincent Felitti. Seeking an explanation for this problem, Felitti stumbled onto a surprising issue: the majority of those patients had experienced sexual abuse as children. Eventually, Felitti would collaborate with Robert Anda and several

others at the CDC to design a study—the ACE Study—that would take advantage of Felitti's position at Kaiser Permanente in San Diego and allow them to more fully investigate the role of childhood adversity in a broader population. The first journal article to come out of the ACE Study, published in 1998 in the American Journal of Preventive Medicine, is probably the most well-known; it is certainly the most cited, with 2308 citations as of October 2016 (Felitti et al., 1998). It is with this article that we begin.

The article's findings—shocking to the authors—were that over half (52%) of respondents had experienced one or more types of serious childhood adversity. Nearly a quarter said they had experienced two or more, and slightly more than six percent had experienced four or more. The prevalence of individual adversities was equally disturbing: 11% were physically abused as children, 22% reported being sexually abused as children, and 25% grew up with someone who abused alcohol or drugs. ACE categories tended to be inter-related as well, with individuals reporting a single category of ACE having a high probability of reporting at least one other category. ACEs were also more common among younger persons, non-white or Asian ethnicities, and those who had not graduated college—trends that would be explored more, and generally supported, in subsequent research with other datasets (for example, Gilbert et al., 2015).

Adjusting for age, sex, education, and race / ethnicity, Felitti and Anda found evidence of a dose-response relationship between ACEs and ten health risk factors / behaviors (current smoking, BMI 35 or higher, no physical activity, depressed mood, suicide attempts, alcoholism, illicit drug use, injection drug use, 50 or more sexual partners, and history of sexually transmitted disease). The exact strength of this relationship tended to vary—for example, current smoking was 2.2 times more likely among those with 4 or more ACEs compared to those with no ACEs, while suicide attempts were over 12 times more likely—but the general pattern held: the greater the childhood adversity, the greater the chance of the risk factor. Likewise, a dose-response relationship existed for many disease conditions (heart disease, cancer, chronic bronchitis / emphysema, hepatitis /

jaundice, skeletal fractures, and poor self-rated health). Interestingly, no dose-response relationship was found between ACEs and stroke, and no statistical relationship at all was found between ACEs and diabetes—though a recent meta-analysis has, in fact, found evidence for a relationship between ACEs and type 2 diabetes in adulthood across multiple studies (Huang et al., 2015).

Taken together, Felitti and Anda noted in 1998, their analysis raised several important issues:

> The findings suggest that the impact of these adverse childhood experiences on adult health status is strong and cumulative. … Certain adult health outcomes may be more strongly related to unique combinations or the intensity of adverse childhood exposures than to the total breadth of exposure that we used for our analysis. However, the analysis we present illustrates the need for an overview of the net effects of a *group* [emphasis in original text] of complex interactions on a wide range of health risk behaviors and diseases (Felitti et al., 1998, 251).

Rather than address the impacts of any one specific adversity, Felitti, Anda, and colleagues were examining the health effects of having *one or more than one of any* of a group of adversities. In framing this issue in this way, this article is foundational to the modern study of childhood adversity because it conceptualizes the challenges of childhood more broadly, and attempts to measure an adversity to a much fuller extent than previous research. In short, it tries to get at what having a "bad" childhood really is, and what piling on adversity after adversity means for adult health.

Before moving on to subsequent research on the effects of childhood adversity on adult health, several observations need to be made about the ACE Study in general, and this first article in particular. First, the ACE Study population comprised overwhelmingly white (79%) and middle- or upper-class (43% graduated from college, and all had health insurance coverage) individual in the San Diego area—in other words, this is an unusually socioeconomically advantaged population located in a very specific (and prosperous) area. What might be seen as a technical shortcoming of this study, though, has actually been

turned out to be something of an advantage. One of the reasons that Felitti and Anda found their results so shocking was the high prevalence of serious childhood adversity even among this presumably low-risk group.

Second, this first article from the ACE Study actually used two sources of information—an important, and still rare, characteristic among childhood adversity studies, most of which tend to use survey self-reports. Even though both of these sources were derived from patient / participant self-reports, the chronological ordering of them may matter: patients reported health problems on a standard medical history form in the clinic first, then later received a survey asking about childhood adversities. This ordering may have removed some of the potential for self-reports on mental or physical health to influence participants' answers to questions on ACEs (or vice versa). This issue has been raised in evaluations of recent ACEs research (Reuben et al., 2016; Susser & Widom, 2012).

Third, Felitti and Anda set the tone for research on childhood adversity with their first article. The questions they used, and the concepts that they represent, became the basis for much subsequent investigation into ACES in the following twenty years. For example, a review of studies examining the relationship between adult health and childhood adversity from 2008 to 2013 found that half still used essentially the same self-report instrument that Felitti and Anda used in their 1998 article (Kalmakis & Chandler, 2015).

Fourth, the fundamental findings from both the initial article and the ACE Study in general—that serious childhood adversity is widespread, it is associated with poorer adult health, and that often more adversity results in progressively poorer health—have, for the most part, stood the test of time. The same review that showed half of studies conducted between 2008 and 2013 used Felitti and Anda's ACEs instrument also showed the literature largely supporting Felitti and Anda's dose-response finding among health behaviors, physical health, and mental health (Kalmakis & Chandler, 2015).

2.2.3 ACEs and Adult Health Since the ACE Study

Felitti and Anda's article was not the final word on childhood adversity. To the contrary, it opened up a line of questioning that continues to this day. Follow-up research with data from the ACE Study itself is part of this literature. Since the first article, the ACE Study has been used to explore the effects of childhood adversity on a wide variety of outcomes, such as early mortality, chronic obstructive pulmonary disease, autoimmune disease, alcohol abuse, and sexual victimization as an adult (Anda et al., 2008, 2010; Brown et al., 2009; Dong et al., 2004; Dube et al., 2009; Ports, Ford, & Merrick, 2016; Strine et al., 2012). Much of this research has taken advantage of the original design of the ACE Study—and the high quality of its information—by following up with patients' medical records in the Kaiser Permanente health insurance system (Anda et al., 2008; Dube et al., 2009) or by linking participant information with mortality records from the National Death Index (Brown et al., 2009). In short, the ACE Study, despite being one of the earliest sources of information on the health effects of ACEs, was—and still is—also one of the most valuable and active. More broadly, researchers over the past two decades have used a wide range of datasets and study populations to more fully explore the adult health effects of childhood adversity. In the last few years, a number of systematic reviews have sought to summarize the results of these studies and shed further light on the relationship between ACEs and adult health.

One such review examined the relationship between ACEs and five broad areas of health outcomes: physical, psychiatric, health-risk behaviors, developmental disruption, and healthcare utilization (Kalmakis & Chandler, 2015). It is worth taking a moment to describe a few aspects of this review's methodology and the resulting pool of studies from which they draw their conclusions. First, it excluded studies of single forms of adversity—for example, sexual abuse, emotional neglect, or divorce—meaning that this review adhered to one of the fundamental concepts of ACEs as used in this document: that they

must contain multiple domains. Second, it was limited to studies of U.S. populations between 2008 and 2013 (except for the 1998 study by Felitti and Anda), meaning that it is but a snapshot of the larger literature on ACEs and adult health. Third, despite these fairly strict exclusions, Kalmakis and Chandler still found 42 articles. Of those, 10 used the ACE Study dataset; 41 used adults' retrospective self-reports; 20 used Felitti and Anda's ACE instrument, with 3 others using the Conflict Tactics Scale (Straus et al., 1996) and the remainder using scattered other instruments.

Kalmakis and Chandler's findings supported much of Felitti and colleagues' work. The percentage of individuals who reported having one or more ACEs in general populations ranged from 46% to 64% (Felitti and Anda reported 52%). Kalmakis and Chandler found ACEs to be consistently associated with poor results in all five areas they examined (physical, psychiatric, behaviors, developmental disruption, and healthcare use/costs). Specifically, ACEs were associated with increased cardiovascular disease, chronic lung disease, headaches, autoimmune disease, sleep problems, early mortality (specifically, Brown et al., 2009, detailed above), obesity, and poor self-rated health. Mental health problems included depression, post-traumatic stress disorder, substance abuse, anxiety disorders, and suicidal ideation / attempts. Health risk behaviors included increased smoking, binge drinking, substance abuse, and increased risky behaviors during pregnancy. "Developmental disruption" included outcomes that Kalmakis and Chandler saw as related to healthy development, but not easily otherwise categorized, such as ACEs' associations with homelessness, adult relationship violence, and repeated abortions. A history of ACEs was also associated with increased use of prescription medications as well as increased general healthcare use. Finally, although they did not perform a meta-analysis, Kalmakis and Chandler noted that there was a tendency toward dose-response trends in the studies they examined. In short, Kalmakis and Chandler's review—which included over 30 studies that did *not* use the ACE Study data—generally supported Felitti and Anda's

initial finding of a graded relationship between number of ACEs and a variety of health behaviors and outcomes.

Additional recent research continues to support the ongoing narrative that childhood adversity is strongly associated with poor adult health across a variety of datasets, such as the Behavioral Risk Factor Surveillance System (BRFSS) (Font & Maguire-Jack, 2016) and multi-country longitudinal studies of adults (Li et al., 2015). In addition, studies examining the effects of childhood adversity on health outcomes (and health behaviors) in younger adults are relatively uncommon, though there is some evidence that ACEs exert an effect even at these ages (Slopen, McLaughlin, Dunn, & Koenen, 2013; Thompson et al., 2015).

2.2.4 A Short Example: ACEs and Cardiovascular Health

Other research on ACEs and adult health have focused on specific categories of health outcomes. One of particular interest is the relationship between ACEs and adult cardiovascular health. This is likely due to at least two reasons: first, the burden of cardiovascular disease on the health of the United States as a whole, and second, because cardiovascular disease is strongly linked to some of the common pathways through which ACEs are thought to affect health (for example, by increasing risky coping behaviors such as smoking, or elevating levels of stress hormones that might increase blood pressure).

For example, a recent review focused on the relationship between ACEs and cardiovascular disease noted that cardiovascular disease is still the major cause of health problems in the United States and worldwide, and that there is mounting evidence that adverse early life experiences may contribute to that trend (Su, Jimenez, et al., 2015). This review—which focused of both the evidence and the mechanisms that might explain it—found childhood adversity to be associated with incident cardiovascular disease during a 7-year follow-up period, early-onset cardiovascular events in women, and 10-year

coronary heart disease risk. There was also strong evidence that ACEs were associated with a number of both behavioral and biological factors that could lead to increased cardiovascular disease in adulthood; these potential mediators are explored in more detail in the final section of this chapter. In contrast, evidence on blood pressure and ACEs appears to be mixed; for example, in one study, child maltreatment (a subset of ACEs) was found to be unrelated to blood pressure in early adulthood (Gooding et al., 2014) but associated with blood pressure trajectories in later life, with higher ACEs leading to faster increases in blood pressure after age 30 (Su, Wang, et al., 2015).

2.2.5 Environment, ACEs, and Adult Health

To date, most of the research on the relationship between ACEs and adult health has not explicitly taken the larger environment or community into account. Researchers are only now starting to explore how context during adulthood might alter the later-life effects of ACEs. In a cross-sectional study of adults in Chicago, adult neighborhood affluence was found to moderate the health effects of childhood adversity (Slopen et al., 2014). In this study, childhood adversity was associated with elevated cumulative biological risk *only* among adults living in low-affluence neighborhoods, suggesting a buffering effect of neighborhood context against the potential effects of childhood adversity. A longitudinal study of adults in Finland found a similar effect, with childhood adversity only resulting in increased adult cardiovascular disease in adults who consistently lived in more disadvantaged areas (Halonen et al., 2015). Despite these intriguing findings, there appears to be no other published research that focuses on how adult context might alter the health consequences of childhood adversity.

2.2.6 ACEs and Childhood Health

Research on the more immediate effects of childhood adversity is relatively rare compared to studies of ACEs and adult health. A review of studies examining childhood adversity and biomarkers for later cardiovascular disease in children found an inconsistent relationship between the two, though the trend appeared to be positive and worthy of more examination (Slopen, Koenen, & Kubzansky, 2012). Somewhat more recent research not included in that review found childhood adversity to be associated with increased body mass index (BMI), waist circumference, and resting heart rate among children in grades 6 through 8 (Pretty, O'Leary, Cairney, & Wade, 2013). The nature of those relationships, however, was not consistent; a dose-response relationship was apparent between number of ACEs, BMI, and waist circumference—but not for resting heart rate or clinical obesity, where a threshold effect (4 or more ACEs associated with increased risk) emerged. In addition, Pretty and colleagues found no relationship between systolic blood pressure and ACEs in their sample (children aged 11-14). It is possible, they noted, that it was still too early in these children's lives for blood pressure problems to show up—and that it might be more useful to focus on indicators that typically come before such problems, like obesity. This line of reasoning is consistent with studies such as those done by Su and colleagues that found ACEs to be associated with a greater increase in blood pressure only after age 30—suggesting that for hypertension, the effects of ACEs only appear later in life (Su, Wang, et al., 2015).

Two other aspects of this research make it different than studying the relationship between ACEs and adult health. First, the directional arrow is less clear-cut: in studies of children, ACEs and health are often measured at the same time. This makes causal inference more difficult, as a child with health problems—both physical and psychological—might inflict stress on parents that then increases the chance for ACEs, rather than the ACEs causing health issues. Therefore, some studies that examine the relationship between ACEs and childhood health, or other childhood issues, measure and control for children with special health needs (Bethell et al., 2014). Second, studies that

measure adversity *during* childhood often use different questions, which often appears to result in a systematically different definition of adversity. Specifically, these questions tend to focus less on illegal activities such as abuse, and more on family disruption (such as parents divorcing or going to prison), potentially traumatic experiences such as seeing a friend or family member seriously injured, or other continuous stressors such as financial need or racial discrimination. For example, in the 2011-2012 National Survey of Children's Health (NSCH), there are nine adversities that a child could have been exposed to—but these are not the exact same as those asked in the original ACE Study. The NSCH does not ask about maltreatment or abuse by parents, but it does ask other questions about discrimination and financial need (that were not in the ACE Study questionnaire). This difference appears to be largely practical, as parents are obviously not likely to truthfully answer questions about whether they abuse their children. Other studies have had their adversity questionnaires altered by school boards as a condition of allowing the research to be done, with questions about abuse and maltreatment removed (Pretty et al., 2013). It is unclear what effects this difference in measures might have. Removing some of the questions about abuse and maltreatment may miss key relationships between childhood health and ACEs; however, research using the NSCH has still found relationships between childhood health and ACEs (Wing et al., 2015). It may be that even the systematically different questions used in studies of children capture the key aspects of adversity: multiple domains, often chronic occurrences, and departure from a "normal" childhood.

2.3 Conclusion

In summary, a great deal of research exists on the relationship between childhood adversity and health, and this relationship appears to be consistent. More adversity in childhood consistently leads to worse adult health, across many different measures of adversity and many different measures of health. However, there is still much to explore

about this relationship, from elements that are more difficult to measure, such as timing or intensity of adversity, to how adult environment might alter the trajectory of adversity's impact on health. There is also a great amount of work yet to be done on *determinants* of ACEs, especially across large, general populations. This issue is discussed in further detail in the next chapter.

Chapter 3: Determinants of Childhood Adversity

Once the association between ACEs and poor health has been established, one important next step for researchers, public health practitioners, and policymakers is to determine which children are more likely to experience ACEs. However, few published studies address what puts a child at risk for experiencing childhood adversity as defined above. As noted in chapter 2, there are a wide variety of definitions of child adversity. Scales such as those used in the ACE Study, BRFSS, the National Survey of Children's Health, and elsewhere do not contain the same items, but they all share the basic characteristics of having multiple domains, measuring chronic experiences (or those experiences, such as divorce, that have continuing effects over time), and focusing on experiences that are generally seen as departures from a "normal" childhood. In this dissertation, the focus is on understanding childhood adversity as a whole concept that encompasses as much of the experience of childhood as possible. Under this definition, and specifically addressing the concept of "ACEs", there appears to have been little research on the determinants of childhood adversity.

So why is there so little research on the determinants of ACEs? One reason may be that few studies examine adversity by directly asking children or their parents. In contrast, most studies of childhood adversity and health consist of asking adults about their childhoods, and linking remembered ACEs with current health or incident disease (Brown et al., 2009; Felitti et al., 1998; Gilbert et al., 2015). Fewer studies have taken a step back and asked what might have been the reasons that those individuals experienced ACEs in the first place. At its core, this question is difficult because it requires information about the child, the family environment, and the context within which the family exists (neighborhood, for example). Surveys of adults could be conceivably get at this, but that would require adults to also recall characteristics of their childhoods (such as family

income or wealth) that, as children, they may simply not have known, or may not be able to recall accurately.

Some studies have used datasets on children in high-risk populations (such as children rescued from human trafficking) to examine ACEs (Reid, Baglivio, Piquero, Greenwald, & Epps, 2017). Generally, these types of studies avoid the recall problem by either speaking directly with children or using existing governmental sources, such as state or national Child Protective Services (CPS) databases. These can be extremely useful, but they have at least two flaws for exploring our concept of childhood adversity. First, they often focus only on subsets of childhood adversity, such as abuse and maltreatment, and they do not explore the determinants or effects of the more expansive concept of childhood adversity. Second, these types of studies usually focus on higher-risk populations, which may well have very different sets of characteristics and determinants than the general population, making generalization difficult or inappropriate.

In fact, much of the public health importance of ACEs depends on their surprisingly high prevalence in the general population. Many children with one or more ACEs do not end up in the hospital or the care of state protective services—but that does not mean they do not suffer lifetime consequences as a result of their experiences. The best evidence for determinants, then, might come from datasets that are population-based, ask children or parents directly about ACEs, and contain rich information about the individual and contextual characteristics of those children and their families. There are two datasets that appear to meet those criteria: the 2011-2012 National Survey of Children's Health (NSCH) and the National Survey of Children's Exposure to Violence (NatSCEV). This short review of individual- and family-level determinants of childhood adversity first looks at research using these two datasets. Second, using a broader selection of research, this review focuses more closely on the role that family income, race/ethnicity, and area-level characteristics and policies might play in determining which children "get" ACEs.

3.1 Individual- and Family-Level Determinants of ACEs

As noted above, this analyses within this dissertation do not explore the determinants of individual ACEs or subsets of ACEs. However, while the literature on the determinants of ACEs is limited, there is a larger body of research on the determinants of individual components of ACEs, or subsets of ACEs. It may be helpful to examine how researchers who examine one subset of ACEs—child maltreatment—think through the potential causes of child maltreatment. One useful perspective divides the causes of child abuse and maltreatment into three levels: the parent's contribution, the child's contribution, and social context's contribution (Wulczyn, 2009). Parent-level contributions refer to research that focuses on characteristics of parents or other caregivers—including psychological predispositions and socially learned behaviors—and how those characteristics might differ between those parents who maltreat children and those who do not. Researchers who examine child-level characteristics seek to understand how aspects of the child affect parental behavior. One of the characteristics in this area is age of the child: younger children, for example, particularly infants, tend to require more effort and attention from caregivers, potentially resulting in greater strain and risk of maltreatment (Stagner & Lansing, 2009; Wulczyn, 2009). In addition, a child with greater medical needs, such as a low-birth-weight infant or a child with developmental issues such as autism, might similarly be at greater risk for maltreatment or ACEs (Bethell et al., 2014). The final category, social context, is the focus of this dissertation. Social context refers not only to area-level characteristics such as neighborhood poverty and state policies, but family income and race/ethnicity. The influence of these characteristics, in this way of categorizing causes, are distinct from those of child- and parent-level characteristics.

It is also reasonable to assume that these factors interact with each other in complex ways. For example, a temperamentally impatient parent might be more likely to maltreat an infant with special health needs, and parents living in poverty might be more likely to

have money-related relationship issues when a new child is introduced in their family than parents who are comfortably middle- or upper-class. However, in this dissertation, family- and child-level characteristics are largely used as control variables, and these more nuanced questions, while likely appropriate for further research, are not the focus of this analysis. Nonetheless, a short review of some of these child- and family-level characteristics is in order to support their inclusion in multivariate models in this dissertation.

Research using the nationally representative NSCH has confirmed the numbers from the original ACE Study, with approximately 50% of children aged 0-17 experiencing one or more ACEs and about 25% exposed to two or more (Bethell et al., 2014; Slopen et al., 2016). Bethell and colleagues found several child- and family-level characteristics to be associated with increased ACEs, including the child having chronic health conditions and health risks (Bethell et al., 2014). Natalie Slopen and colleagues, in their research using the NSCH, found associations between ACEs and household income, race / ethnicity, and immigration history of the child's family, as well as interactions between these factors (Slopen et al., 2016). Both authors controlled for age of the child (based on the presumption that he or she has a greater chance of experiencing ACEs simply through increased exposure) as well as the sex of the child and family size, in following previous research in this area (Bramlett & Blumberg, 2007; Larson, Russ, Crall, & Halfon, 2008). Slopen and colleagues added highest parental education as well in order to isolate the special effect of income from other socioeconomic factors.

Heather Turner and colleagues, using a different nationally representative dataset (the NatSCEV) and a different definition of childhood adversity, found that among children aged 10-17, 80% had experienced one or more of 34 types of victimization, with 66% experiencing more than one type, 30% experiencing more than 5 types, and 10% experiencing 11 or more types (Turner, Finkelhor, & Ormrod, 2010). Although the definition of adversity is different in in the NatSCEV than the NSCH, the general trend of a surprisingly high exposure to adversity—and particularly multiple adversities—remains.

Socioeconomic and racial / ethnic trends in this study were less clear than in Slopen's work, though there was evidence that black and Hispanic children were over-represented among those with more than 11 types of victimization, as were children of middle- and low-income families and children living in households without two parents.

3.2 Family Income as a Determinant of ACEs

More income is clearly associated with better health across the lifespan (Chetty et al., 2016; Marmot & Wilkinson, 2006). However, *why* this association exists remains an area of active research, with some authors noting that surprisingly little research has been devoted to whether this is a cause-and-effect relationship (Glymour, Avendano, & Kawachi, 2014). ACEs, as shown above, are heavily associated with poor health outcomes across the life course. Putting these observations together, one intriguing question is: could part of the well-known association between income and health at all stages of life be explained by an increased risk of ACEs among low-income children? In other words, do poorer children have more ACEs—and if so, why? This section introduces the first in three areas of social context that this dissertation examines as potential causes or determinants of ACEs: family income.

3.2.1 Theory: Why Might Family Income Matter to ACEs?

There are a wide variety of reasons that family income might affect ACEs. First, however, it is important to briefly examine some broad theories about why low levels of family income might be harmful for children. The sociologist Dalton Conley has noted that there are three categories of theories in this area (Conley, 2015). The first category are theories that have material deprivation as is the core driver, with children who grow up with less money having poorer nutrition, less educational opportunities, unsafe home

environments, poorer health care, and numerous other problems. The second category of theory includes those that propose having low income leads to increased stress on parents through a variety of other mechanisms, including poor social networks and feelings of inferiority due to class comparisons. This stress leads to certain detrimental parental behaviors and habits, such as physical punishment for children or increased arguments between parents (behaviors that are either ACEs in themselves or could easily lead to ACEs in the future). Theories in the third category share what Conley terms the "no effect" idea, where the same characteristics of parents that lead them to be low-income are also theorized to lead them to be poor parents. In essence, the relationship between low family income and poor child outcomes is spurious, so changing a family's income level will have no actual effect on child outcomes. This dissertation explores theories that are consistent with the first two broad categories, largely because of the strong relationship that appears to be present specifically between ACEs and family income, even when controlling for numerous other factors (Slopen et al., 2016).

Within the context above, the core theories that will be focused on to investigate determinants of ACEs are the Family Stress Model (FSM) (Conger & Conger, 2002), and Gallo and Matthew's Reserve Capacity Model (L. Gallo, Espinosa De Los Monteros, & Shivpuri, 2009). These two theories fall roughly into Conley's first two categories above, with the Reserve Capacity Model taking elements from both the "material deprivation" and "parenting stress" categories, and the Family Stress Model focusing more on parenting stress.

Conger and Conger's Family Stress Model was originally created to explain the process of how families reacted to economic hardship, with a focus on how hardship might affect parenting and eventually child and adolescent outcomes. The model includes a number of possible influences on whether economic hardship eventually results in poor child outcomes, including the degree of the hardship, biological, psychological, and social resources, and family resilience factors. The role of the Family Stress Model here is to

provide a theoretical foundation for the link between a family's economic conditions and childhood adversity, and is not specifically tested in this study. Rather, it operates in the background as a potential explanation for the association between state economic conditions and policies and ACEs as well as family socioeconomic status (SES) and ACEs.

The Reserve Capacity Model was originally developed to help explain relationships between stress, negative emotions, socioeconomic status, and health in individuals (L. C. Gallo & Matthews, 2003; L. Gallo et al., 2009). In this dissertation, this theory is adapted by replacing the individual with the family unit. In the Reserve Capacity Model, socioeconomic status plays multiple roles, two of which are important to this dissertation. First, it is a fundamental driver of both increased exposures to potentially stressful situations and increased appraisal of those situations as actually stressful. This exposure—conceptualized here as stress on the family itself due to income, rather than stress on individual parents—then leads to intermediate health-affecting outcomes for the child (ACEs), which then in turn lead to poor health outcomes. Second, in the Reserve Capacity Model, reduced SES can reduce an individual's ability to deal with the demands of stressors, and the depletion of this "reserve capacity" may result in people with lower SES eventually suffering greater health problems than people with higher SES. The reserve capacity model suggests a moderating effect of SES as well as a fundamental causative effect (again, for the adapted model used in this dissertation, the family is the unit that is under stress). Taken together, the Reserve Capacity model suggests that if we want to understand which children have a higher risk of ACEs, we need to examine SES as both a predictor and a moderator. Both specific aims of this dissertation examine SES in this role, though at different levels. Aim 1 examines the fundamental driver role of area-level SES in ACEs by looking at how state-level SES and inequality, as well as policies that impact SES, might affect ACEs. Aim 2, in contrast, assumes that the relationship between family-level income and ACEs exists (Slopen et al., 2016), and—consistent with predictions from

the Reserve Capacity model—probes to see if area-level SES and policies moderate that relationship.

3.2.2 Evidence: Does Family Income Affect ACEs?

Does a child's family income affect that child's chances of experiencing ACEs? The answer appears to be yes, with lower-income children experiencing more ACEs—though there are few studies that directly address this question. Using the National Survey of Children's Health (NSCH), Natalie Slopen and colleagues examined disparities in ACEs by family income, race, ethnicity, and birthplace among children in the United States (Slopen et al., 2016). In fact, greater income resulted in fewer ACEs. Moreover, this relationship showed a gradient, with higher income resulting in progressively lower odds of experiencing childhood adversity as expected. (Marmot & Wilkinson, 2006). In addition, this research found that ACEs were generally more common among non-Hispanic black and Hispanic children than non-Hispanic white children, and more common among children of U.S.-born parents than immigrants. These three characteristics interacted with each other, revealing some intriguing patterns. For example, racial/ethnic disparities in ACEs were largest among high-income individuals, and disparities in ACEs by income are actually larger among non-Hispanic whites than non-Hispanic blacks or Hispanics. In multivariable models, though, there was a strong, graded relationship between family income and whether a child experienced two or more (of nine) ACEs across all racial / ethnic categories (Slopen et al., 2016).

Other than the work from Slopen and colleagues, however, very little research has focused on elucidating and understanding disparities in ACEs by a child's family income level—or even any other socioeconomic indicator. Some of the reasons for this are explained further below (for example, often childhood poverty is treated as an ACE in itself). However, despite the lack of direct research that uses childhood poverty as a

determinant of ACEs, we can see evidence from previous studies that support the role found in Dr. Slopen's work.

Other studies of ACEs—or subsets of ACEs—that were not focused on understanding the specific role of income or SES in the United States have nonetheless found disparities in childhood adversity by those factors. In a longitudinal study of children in Georgia, decreasing childhood socioeconomic position as measured by the Hollingshead Index (a measure combining parental education and occupation) was associated with increased ACEs, even after adjustment for age, ethnicity, and sex (Su, Wang, et al., 2015). An analysis of the NatSCEV, mentioned above as one of two large-scale representative studies of children and childhood adversity in the United States—found that children aged 2-17 who were subjected to "polyvictimization" (experienced more than 10 of 37 types of victimization) were more likely to be low- or middle-SES than high SES, though this pattern did not hold for those who were subjected to one to ten types of victimization (Turner et al., 2010).

While research exploring the relationship of child adversity and SES is developing, there is substantial evidence that poverty and child maltreatment are related (Currie & Widom, 2010; Drake & Jonson-Reid, 2013; Maguire-Jack, Lanier, Johnson-Motoyama, Welch, & Dineen, 2015). In general, it appears that children from families of lower SES do have a higher risk of ACEs or, at least, subsets of ACEs such as child maltreatment. It does bear repeating, though, that the direct evidence for an income-ACEs relationship remains limited, as many studies simply controlled for income or SES rather than directly exploring it and that a relationship between income and a limited subset of ACEs does not automatically translate into a relationship between income and overall child adversity.

Studies in other countries confirm the inverse, graded relationship between ACEs and family socioeconomic status—though, as with the other studies cited above, the SES measure has not always been family income, and the ACEs measure has not always been the same. For example, one longitudinal study in Scotland examining the later-life health

effects of three types of childhood adversity (low SES, maltreatment, and social isolation) found that low-SES children were more likely to be maltreated and be socially isolated, but over 58.5% of maltreated and 70.1% of socially isolated children were not low SES (Danese et al., 2009). Corina Benjet and colleagues found similar patterns in adolescents in Mexico City, with increased adversity in 12- to 17-year-olds associated with lower parental education (Benjet et al., 2009).

3.2.3 Other Roles for Family Income

In additional to being seen as a determinant or covariate, childhood family income and/or socioeconomic status has played at least two other roles in research on childhood adversity. These include (1) being counted as an ACE, or being used as a marker for *all* ACEs; and (2) being used as a moderator of the later-life effects of experiencing adversity.

In numerous previous studies, low childhood income or SES is itself often counted as an ACE, rather than a potential determinant of abuse, neglect, household dysfunction, or other ACEs. Indeed, a large amount of literature on the effects of childhood socioeconomic status has essentially treated it as the *only* ACE—or rather, as a marker or substitute for having a difficult childhood. In fact, a great many studies have linked low childhood SES to adverse health outcomes in adulthood, such as cause-specific mortality and cardiovascular disease (Galobardes, Lynch, & Smith, 2004; Galobardes, Smith, & Lynch, 2006). Again, this dissertation does not seek to add to that already well-established literature; rather, this study follows the Reserve Capacity and Family Stress Models, and conceptualizes family income as a potential determinant of ACEs.

Childhood family income might also play a role as a moderator of childhood adversity. In this perspective, the same number of ACEs might affect a child differently based on that child's family income level. For example, children with 3 ACEs who are from low-income families might have a higher risk of health problems later in life that

children from middle- or high-income families. (Note the difference here from treating income as an ACE; if being low income is an ACE, that would mean in this example that low-income children would have four ACEs compared to three for their middle- and high-income counterparts.) If having more family income or socioeconomic status could somehow mitigate the effects of childhood adversity, this role may make sense. Instead, the relatively limited research that exists examines whether *adult* income or socioeconomic status can moderate the later-life health effects of ACEs (Font & Maguire-Jack, 2016). It is entirely possible that for the effects of individual ACEs—such as bullying—childhood income might play a moderating role, with less affluent children suffering more serious long-term problems, such as depression (Due, Damsgaard, Lund, & Holstein, 2009). However, there appear to be few if any studies of ACEs that examine whether childhood income moderates the effects of more comprehensive measures of childhood adversity, such as ACEs, on either child or later-life adult health.

It is also possible that childhood family income or SES moderates the effects of potential determinants on the risk of ACEs themselves. That is, potential determinants of ACEs might work differently for children from richer or poorer families. For example, there may be a greater risk of ACEs in poor Hispanic families than in middle- or high-income Hispanic families. In fact, Slopen and colleagues (2016) examined whether childhood income moderated the effects of race / ethnicity and family immigration status on the number of ACEs children experienced. They found family income level did moderate the relationship between race / ethnicity and ACEs, but only for children of U.S.-born parents. Specifically, the risk of experiencing two or more ACEs was higher among minority children than white children, but this risk varied widely depending on the child's family income (Slopen et al., 2016). Lower SES non-Hispanic Black children, for example, were actually *less* likely than lower income white children to experience two or more ACEs, but high-income non-Hispanic black children were *more* likely than high-income white children. Other than this study, there appear to be no other research that examines

whether childhood income or SES can modify the effects of other potential determinants of ACEs.

3.2.4 Race and Ethnicity as a Determinant of ACEs

As noted above, several authors have addressed the relationship of race, ethnicity, and ACEs. Some of this has work has been examining in examining disparities between recalled ACEs by racial or ethnic groups, with minority groups—specifically Hispanics, non-Hispanic blacks, American Indian / Alaskan natives, and multiracial Americans experiencing higher rates of multiple ACEs than non-Hispanic white Americans (Gilbert et al., 2015; Slack, Font, & Jones, 2017). Other work has examined the difference in ACEs among children of different races and ethnicities, with similar findings, though the relationship is often complicated by family immigration history and the specific ACEs included in the measure (Cronholm et al., 2015; Slopen et al., 2016). It is not entirely clear what the driving force behind the relationship between ACEs and race / ethnicity is; some proposed pathways from the literature cited above is that it could be differences in community or neighborhood quality or racism, or related to persistent racial / ethnic advantages across a larger number of social institutions such as schools or the justice system (and recall that anything that affects the parents of children would presumably affect the children as well; for example, disparities in parental incarceration rates would certainly lead to disparities in ACEs for children, if having a parent in prison is considered an ACE).

For the purposes of this dissertation, at least one theory presented above suggests potential links between race / ethnicity and ACEs: the Family Stress Model. Specifically, structural racism or other systematic issues that increase stress in families of racial / ethnic minorities may well increase the potential for ACEs in racial / ethnic minority children. Again, this dissertation does not attempt to parse out these specific pathways, but instead

uses this idea to propose why race and ethnicity might be related to ACEs. Moreover, the conceptual framework proposed by House (House, 2002) suggests that any relationship between race and ethnicity and intermediate outcomes related to health—such as ACEs—could be moderated by social, political, and economic conditions and policy (this is explained in greater detail below). For these reasons, the potential for state economic characteristics and policies to moderate race and ethnicity is explored in specific aim 2, just as those potentially moderating influences are explored for family socioeconomic status.

3.3 Context as a Determinant of ACEs

This section examines the theory and evidence for the third and final area of social context: area-level characteristics, including state-level policies. In other words, to what extent does the physical, social, or policy environment that a child lives in determine his or her risk of ACEs?

3.3.1 Theory: Why Would Context Matter to ACEs?

Family stress is a major theoretical link between family income and ACEs. Because income pressures might increase family stress, it is reasonable to hypothesize that income pressures might also increase the incidence of ACEs in low-income children. However, the list of stresses on a family need not be limited to those associated with the child, the parent, or the immediate context. In discussing how area-level context might impact ACEs, the idea of what might cause a family stress is expanded past the walls of the home. This dissertation adds elements from two other areas to provide conceptual support for why context matters to ACEs: Urie Bronfenbrenner's systems theory, one of many types of ecological models used to understand the role of the environment in education, health, and

other areas (Bronfenbrenner, 1979; Sallis, Owen, & Fisher, 2008) and James House's model for understanding social inequities in health and aging (House, 2002).

Bronfenbrenner's systems theory emphasizes the general role of the environment in influencing individuals' behavior and health. This theory asks researchers to examine at least three levels of environmental or contextual influences: the "microsystem", which includes interactions between individuals and other individuals, such as family members; the "mesosystem", referring to mid-sized environments such as workplaces or neighborhoods; and the "macrosystem", the larger cultural and policy environment in which individuals find themselves. This dissertation examines several aspects of the macrosystem in which families live: their state of residence. Here, Bronfenbrenner's theory is used to support the idea that the state-level economic and policy environment can influence the environments contained within it, and therefore should be examined in addition to family- and individual-level determinants of health.

In the conceptual framework presented by House as a way to understand social inequities in health and aging, social, political, and economic conditions and polices are theorized to act in multiple ways to influence health. One with particular importance for this dissertation is that House theorizes that environment can act as a moderator of the effects of individual socioeconomic status on several proximal determinants of health (in this context, this would be ACEs). In other words, House's model suggests that, in this case, state economic conditions and policies may result in family income having differential effects on ACEs in different states. For example, more lenient Temporary Assistance to Needy Families (TANF, or welfare) policies could relieve economic pressure on lower SES families, leading to less family stress and therefore a lower risk of ACEs in low-income families—while those same policies might have no effect on families living far above the poverty line. In such a state, one would expect the income-based disparity in ACEs to be smaller than states with stricter TANF policies.

There are many area level factors that could be explored, but this dissertation focuses on economic characteristics (state-level socioeconomic status and income inequality) and selected policies (public welfare spending, TANF benefits, and important TANF policies).

The first area-level factor explored in this dissertation is state-level socioeconomic status. In some studies, state-level rates of families who are poor or in poverty has been included as a measure of area-level socioeconomic status (McKay, Bell-Ellison, Wallace, & Ferron, 2007). It could be argued that at the state level, it is unlikely that state-level measures are relevant to the area-level context of any individual family. Every state has both very poor and very rich neighborhoods, and it is likely that an overall measure of state-level socioeconomic status masks an enormous amount of variation. In other words, someone living in a nice neighborhood in Mississippi is probably more similar to someone living in a nice neighborhood in New York than the average person in Mississippi. In fact, a more useful proxy for any effects that socioeconomic context might have might well be census tract or census block-level poverty (Oakes & Kaufman, 2006). That said, however, area-level measures of socioeconomic status have been found to interact with income inequality at the county level (Eckenrode, Smith, McCarthy, & Dineen, 2014), suggesting that if income inequality is measured, it may be prudent to include some measure of area-level socioeconomic status as well. Moreover, state socioeconomic status—especially when states are broadly divided in socioeconomic groups that are considerably different from one another—may well have an effect on individual ACEs within families; this possibility has not yet been explored in the ACEs literature.

The second economic characteristic, income inequality measured on the state level, has been theorized to impact population health in a variety of ways, including by increasing stress and frustration through social comparisons (I. Kawachi & Subramanian, 2014). Income inequality may therefore increase family stress as well, as families are composed of individuals who can get frustrated and angered by the seemingly unjust differences in

income they see around them. High levels of income inequality in an area have also been theorized to lead to a breakdown in social cohesion—particularly for the less well-off—and this breakdown may well result in increased family stress and increased risk of ACEs (I. Kawachi & Subramanian, 2014). As with state socioeconomic status, state-level income inequality has not yet been examined as a potential determinant of ACEs.

Finally, the third factor, selected state policies, are included because they both vary considerably by state and could reasonably be expected to have an impact both on family stress and on socioeconomic disparities in ACEs. Levels of state spending on public welfare programs, particularly those that provide financial assistance or assistance with food, housing, or medical care, could certainly reduce the stresses felt by low-SES families. TANF (Temporary Assistance to Needy Families) is, as its name suggests, intended to provide financial assistance to poor families with children. It could be argued that policies related to providing such assistance could relieve family stress among lower-income families, and thus could both reduce the risk of ACEs in those families directly *and* reduce disparities in ACEs risks by income within states.

Taken together, these theories and models suggest that certain state economic conditions and policies may both be directly associated with ACEs, and play a moderating role in any relationship between socioeconomic status and ACEs. As with the theories used to link income and ACEs above (the Reserve Capacity theory and the Family Stress Model), the mechanisms through which those state-level characteristics and policies might be acting are *not* being tested in this dissertation. Rather, the emphasis is on the overall relationships between state context and ACEs, and the potential for state context to moderate a known relationship between family socioeconomic status and ACEs, both of which have not been examined in any previous literature.

3.3.2 Evidence: Does Context Matter to ACEs?

As with the other areas of social context, little published research explores how area-level factors might affect a child's risk of ACEs. In fact, the relatively small amount of research that explores social determinants of ACEs has focused on aspects of the child, parent, or immediate family context (such as family income). Some studies, though, have found variations in levels of ACEs between geographic areas that is not fully explained by differences in these factors.

For example, Bethell and colleagues noted that in the U.S., there is significant variation across states in the number of children with one or more ACEs, though they did not examine if state-level factors were driving those differences (Bethell et al., 2014). This same study also noted that children with higher numbers of ACEs appeared to live in poorer neighborhood conditions, though again, these differences were not a focus of the study. Similarly, a study of the relationship between ACEs and BMI in adolescents noted significant variation of ACEs by state, though again the reason for this variation was not explored (Heerman, Krishnaswami, Barkin, & McPheeters, 2016). Other than these two studies—both of which used the 2011-2012 National Survey of Children's Health—there appears to be no other published research on how context outside the family might affect which children "get" ACEs.

However, if a broader view is taken, then there have been explorations of how area-level factors influence child maltreatment. Though this dissertation is focused on ACEs, some discussion of how area-level factors and characteristics seem to influence child maltreatment is warranted, given the dearth of research on area-level childhood context and ACEs. In a review of the evidence linking neighborhood characteristics and child maltreatment, Coulton and colleagues noted a consistent relationship between maltreatment cases and neighborhood disadvantage, such as low median income, housing values, poverty, and unemployment rates (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007). Generally, the literature pointed toward that link being "real" (due to actual influences of the neighborhood, and not because of differential reporting rates or selection

effects), but the methodology of most studies appeared to be ill-designed to answer those critical questions. Later research shed some light on that process: a study that examined the relationship between young adult depression, educational attainment, and childhood community context found that poor childhood community context worked at least partially through disrupted family processes to culminate in negative young adult outcomes (Wickrama & Noh, 2010).

Moreover, childhood community context moderated the effects of family resources on young adult outcomes, suggesting a "contextual dissipation effect" where family resources diminished the impact of negative consequences in affluent communities, but not in poor or deprived communities. There is also evidence that rural/urban location matters to maltreatment—specifically, that well-documented disparities in rates of maltreatment by income are worse in cities, and disparities by race/ethnicity are worse in both densely populated areas and sparsely populated areas (Maguire-Jack et al., 2015). Taken together, these studies suggest that area context is in fact related to maltreatment rates, and that area-level characteristics might have complex effects on those rates, even potentially playing a moderating role. Whether similar effects hold for ACEs is yet unknown.

In addition, some recent research has begun to examine how more specific economic context and trends might affect levels of child maltreatment. The only study of the relationship between income inequality and child maltreatment found that increased county-level income inequality was associated with increased child maltreatment rates (Eckenrode, Smith, McCarthy, & Dineen, 2014). Moreover, increased child poverty rates at the county level was also associated with maltreatment, and the two interacted such that income inequality had a stronger positive effect on maltreatment in counties with moderate or high poverty levels. In contrast, a study of seven states aimed at measuring whether the recession in the mid-2000s might have had an effect on maltreatment rates found that increases in unemployment rates, food stamp participation, and decreases in labor force

participation did *not* have any consistent effects on maltreatment rates, in contrast to the authors' expectations (Millett, Lanier, & Drake, 2011).

3.3.3 Evidence: Do State-Level Policies Matter to ACEs?

As with the other social context research noted above, there appears to be no research that specifically focuses on the relationship between policy context and ACEs. So instead, the focus must turn to research on the policy context (specifically, those policies at the state level) and child maltreatment to scout for evidence that such a relationship might exist.

For example, a recent study examined a wide range of state policies for their potential effects on maltreatment rates (Klevens, Barnett, Florence, & Moore, 2015). Out of 11 state policies, including those focused on minimum wage increases, TANF eligibility criteria and benefits, subsidies for child care and pre-K provision, and access to health care for children, only two appeared to have any effect on maltreatment rates. The existence of a wait list to access subsidized child care in a state increased maltreatment rates, while states that chose to have default continuous Medicaid and State Children's Health Insurance Program (SCHIP) coverage for low-income child (rather than month-to-month re-enrollment) had lower child maltreatment rates. Similarly, Julia Wang examined the effects of several TANF policies on child well-being (including measures of parental stress), but found no differences between states with more "strict" TANF policies vs. those with more lenient policies (Wang, 2015).

3.3.4 Context's Other Roles

As with income and socioeconomic status more broadly, area-level context has more often been seen as an ACE in itself rather than a determinant of ACEs. For example,

an increasing number of authors are calling for witnessing neighborhood violence to be included in ACEs scales, and the 2011-2012 NSCH actually includes being a victim of neighborhood violence as an ACE (Bethell et al., 2014; Finkelhor, Shattuck, Turner, & Hamby, 2013). The lack of studies of area-level context in the ACEs literature means that area-level context has rarely been explored, controlled for, or played any other role in most ACEs studies. This is in contrast to the role of area-level context in the child maltreatment literature, which has been both explored as a potential determinant and moderator, as detailed above in at least two studies (Coulton et al., 2007; Wickrama & Noh, 2010).

3.4 A Final Note: Research on ACEs as a Whole vs. Research on Individual ACEs

It is important to note that the dearth of research on the determinants of ACEs as it is defined here is *not* meant to imply that there is nothing known about the determinants of specific adversities. One way to examine the determinants of ACEs as a whole might be to "cobble together" research on the determinants of each individual component that make up the scales, then assume that the determinants of the scale as a whole are simply the sum of those determinants. There are a few reasons that this dissertation does not take that approach.

First, the "cobbling together" approach assumes that the determinants of any ACEs scale would simply be the sum of the determinants of its parts. This may be true when speaking of *which* determinants are important—for example, poverty might be a determinant of physical child abuse, physical neglect, and a wide variety of other individual adversities—but it cannot tell us much about the *magnitude* of that determinant's effect. Poverty might increase the risk of each ACE when considered by itself, but how much does poverty matter to all of the ACEs put together? It is entirely possible that it might matter more or matter less, but there is no way to determine that without directly measuring it.

Second, each ACEs scale tends to be different from other ACEs scales—sometimes very much so, especially if the scales focus on different ages (adults vs. children) or populations (general U.S. population vs. higher risk or specific groups, like the military). "Cobbling together" determinants for one scale (here, for the NSCH 2011-2012 scale) would include only the ACEs for that scale, making the effort almost useless for understanding determinants for another scale.

Finally, third, and more practically for this dissertation, is that such a "cobbling together" would require enormous literature reviewing efforts for questionable returns. This dissertation focuses on context and policy determinants; comparing a "cobbling together" approach to a direct measurement approach is not fundamental to moving forward with this study.

Chapter 4: Methods

4.1 Datasets and Study Sample

This dissertation makes use of data from four different sources. For all individual-level data, including the measure of childhood adversity, the 2011-2012 National Survey of Children's Health is used. For state-level socioeconomic status, state-level income inequality, and state-level estimates of population (used to calculate per-capita state spending on public welfare), the 2011 American Community Survey 5-year estimates are used. For state-level estimates of spending on public welfare programs, the 2011 Annual Survey of State and Local Government Finances is used. Finally, for state Temporary Assistance for Needy Families (TANF, also informally known as welfare) policies and the maximum TANF benefit for a family of three, the 2011 Welfare Rules Database, created and maintained by the Urban Institute (and funded by the U.S. Department of Health and Human Services) is used. Each of these data sources is described briefly below, then each of the variables used in this analysis in described in detail afterwards.

4.1.1 National Survey of Children's Health

The 2011-2012 National Survey of Children's Health (NSCH) is the core dataset used in this dissertation, providing most of the variables for both specific aims. The NSCH was a cross-sectional, nationally representative survey of non-institutionalized children aged 0-17 sponsored by the Health Resources and Services Administration and conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics (National Center for Health Statistics, 2013). Households were selected through random digit dialing of both landline and cell phone numbers, with stratification by state and sample type (either landline or cell phone).

For each household reached with at least one child aged 0-17, a child was randomly selected, and a parent or guardian in the household who knew about the child's health was interviewed. Of these adults, 68.6% were the child's mother (biological, step, foster, or adoptive), 24.2% were the father, and 7.2% were some other relative or guardian. Nationwide, 187,422 households were reached that reported age-eligible children in the home. 95,677 interviews were completed, with "completed" meaning the interviewee answered all questions up to and including sections 6 (if the child was 0-5) or 7 (if the child was 6-17); this translates to having completed approximately half of the survey questionnaire. An average of about 1850 interviews were completed per state, including Washington, DC, with the exact number ranging from 1,811 in South Dakota to 2,200 in Texas. Interviews were also completed with children in the U.S. Virgin Islands, but the results of those interviews are not included in the public dataset and are therefore not used in this dissertation. The overall response rate for the survey was 23.0% for the combined dual-frame sample (38.2% for the landline sample, 15.5% for the cell-phone sample). However, the completion rate for households known after initial screening to have children was 54.1% for the landline sample and 41.2% for the cell-phone sample.

4.1.2 The American Community Survey

The American Community Survey (ACS), run by the U.S. Census Bureau, is a yearly nationwide survey containing demographic, housing, social, and economic questions intended to provide detailed information for public use (United States Census Bureau, 2013). Briefly, the ACS is sent to roughly one in every 38 U.S. households each year (every month, each address in the United States has about a 1-in-480 chance of being selected from a random sample of all addresses known to the U.S. Census Bureau). An individual from each household can fill out the survey either online or on a paper form—several follow-up attempts are made within 4 weeks of selection—and that information is

sent to the U.S. Census Bureau for aggregation and publication in the form of reports, tables, and de-identified datasets. The estimates used in this analysis are 5-year estimates, meaning that they are based on the past 60 months of information; for example, 2011 ACS 5-year estimates are based on information from 2007-2011.

4.1.3 The Annual Survey of State and Local Government Finances

Every year, the U.S. Census conducts surveys of state and local governments, focusing on finances (this survey is required by federal law; see https://www.census.gov/govs/local/). All 50 states and the District of Columbia respond to the state survey, and a representative sample of local government entities within each state are included. Together, the results of these two surveys produce estimates of total state (and local governments within states) spending and revenue for a variety of categories. The estimates used for this dissertation are from fiscal year 2011 (the fiscal year varies by state and local government, but most of the information is from July 1, 2010 to June 30, 2011).

4.1.4 Urban Institute Welfare Rules Database

The Urban Institute's Welfare Rules Database (http://wrd.urban.org/wrd/databook.cfm) is a publicly available database maintained by the Urban Institute that provides historical information on welfare programs and policies in the United States. It includes detailed information on Temporary Assistance to Needy Families (TANF) rules in place at the time measured (usually the middle of the year) in all 50 states from 1996 to 2015. Rules are gathered and coded each year by Urban Institute staff from caseworker manuals and state regulations. The project is funded by the U.S. Department of Health and Human Services, Assistant Secretary for Planning and Evaluation.

4.2 Hypotheses and Measures for Specific Aim 1

4.2.1 Hypotheses

Specific aim 1 for this dissertation is to examine whether state-level economic characteristics and public policies are associated with childhood adversity. Each specific aim for this dissertation is oriented around a hypothesis, or set of closely related hypotheses, suggested by the theories presented in chapter 3. Specific aim 1 combines core elements from Conger and Conger's Family Stress Model (Conger & Conger, 2002) and Urie Bronfenbrenner's Ecological Model (Bronfenbrenner, 1979; Sallis et al., 2008). Briefly, these theories suggest that environmental influences outside the immediate family situation may increase stress levels within the family. Subsequently, increased or decreased family stress may change the risk of childhood adversity within that family. Moreover, the Reserve Capacity Model (L. C. Gallo & Matthews, 2003) suggests that socioeconomic environment might be a major outside influence on family stress; specifically, states with lower average socioeconomic status and higher income inequality may have families with higher stress and therefore higher childhood adversity. In addition, state-level welfare policies in particular may ease or exacerbate financial stress, as they are often the source of direct financial assistance to lower-income families.

To restate, specific aim 1 and its associated hypotheses are:

Specific Aim 1: Examine whether state-level economic characteristics and public policies are associated with adverse childhood experiences.

Hypothesis 1.1: Lower state socioeconomic status will be associated with higher odds of ACEs.

Hypothesis 1.2: Higher state income inequality will be associated with higher odds of ACEs.

Hypothesis 1.3: Higher state spending on public welfare will be associated with lower odds of ACEs.

Hypothesis 1.4: Higher TANF benefits will be associated with lower odds of ACEs.

Hypothesis 1.5: Relatively stricter state TANF policies will be associated with higher odds of ACEs.

4.2.2 Key Measures

Adverse Childhood Experiences (ACEs)

For both aims, the outcome variable is adverse childhood experiences (ACEs). In the 2011-2012 National Survey of Children's Health (NSCH), this concept was measured with nine items. These items include eight dichotomous (yes/no) questions about whether the child ever:

1. Lived with a parent or guardian who got divorced or separated after the child was born,
2. Lived with a parent who died,
3. Lived with a parent who served time in jail or prison after the child was born,
4. Saw or heard any parents, guardians, or other adults in the home slap, hit, punch, kick, or beat each other up,
5. Was the victim of violence or witnessed any violence in their neighborhood,
6. Lived with anyone who was mentally ill or suicidal, or severely depressed for more than a couple of weeks,
7. Lived with anyone who had a problem with alcohol or drugs, or
8. Was treated unfairly because of his or her race or ethnicity.

The last question, if answered yes, was followed by a question asking how often in the past year the child was treated unfairly (very, somewhat, rarely, or never); this question is not used here because it asks for frequency of an established ACE. The final childhood adversity item asked since the child was born:

9. How often it has been very hard to get by on the family's income (very often, somewhat often, not very often, or never).

This final question has been dichotomized in previous research to match the other eight, so the nine can be summed to create a count ranging from 0 to 9 (Slopen et al., 2016). Similarly, childhood adversity is operationalized in this study by summing "yes" answers from each question. In previous research with this dataset, other measures of ACEs are derived from that count measure for this study (Bethell et al., 2014; Slopen et al., 2016; Turney & Wildeman, 2017). The measure used here is binary: children who experienced two or more ACEs (coded as "1") and children who experienced no or one ACE (coded as "0"). This format is warranted in studies of the NSCH because the survey contained no measure of direct abuse or neglect of the child (ACEs that in themselves are particularly serious, and would be of concern even if only one was reported). In other words, because none of the ACEs measured in the NSCH stand out as more obviously serious than the others, this dissertation makes a distinction between those children who suffered from multiple ACEs as qualitatively different from those who suffered a single ACE or none at all.

State-Level Variables

All participants in the NSCH have the child's current state of residence as a variable, allowing values for state economic characteristics and policies to be added to each individual observation. This analysis examines the effects of three different state characteristics, five state polices, and two combined variables (one representing overall state economic status, and the other representing overall state social safety net) on ACEs:

1. Proportion of the state's families living below 200% of the federal poverty level;
2. Proportion of the state's families living below 100% of the federal poverty level;
3. Income inequality within the state, as measured by the Gini coefficient;
4. State policies on the maximum length of time a family can receive TANF (time limit policies);

5. State policies on the initial penalty if a family member does not meet the work, education, or other requirements for receiving TANF (sanction policies);
6. A combination variable created from time limit and sanction policies;
7. State maximum TANF benefits for a family of three;
8. Per capita state and local spending on public welfare programs within each state;
9. A combination variable representing "state economic status" created via factor analysis of 1, 2, and 3 above; and
10. A combination variable representing "state social safety net" created via factor analysis of 4, 5, 6, 7, and 8 above.

State Economic Status

For the first two state economic characteristics, American Community Survey (ACS) 5-year estimates for family income within each state from 2007-2011 are used. Specifically, for each state, the total number of families in the state living below 200% of the federal poverty level (FPL) is divided by the total number of families living in the state. Below 200% of the federal poverty level is used here as a cut-off because families under that level are typically eligible for federal assistance programs, such as food stamps and reduced price school lunches. This measure, state-level proportion of individuals below 200% of FPL has been used as a state-level economic contextual indicator in previous research (McKay et al., 2007). For additional insight and sensitivity analyses, a similar estimate of how poor each state is using proportion of families living under 100% of FPL (in other words, living under the poverty level) was also created.

Five-year estimates are often used when precision of the estimate is more important than "currency" (the timeliness of the estimate), because the 5-year estimate pools data from the previous five years. In this case, using the five-year estimate also provides the benefit of giving a sense of the state's average economic status in the five years during and before the 2011-2012 National Survey of Children's Health (NSCH) was conducted. Because ACEs experienced by a child could have taken place any time during their lives

(the NSCH did not ask when a particular ACE was experienced by a child), it may be more useful to have a sense of the average economic status of the state they lived in over time than in just the year of or before the NSCH.

Income inequality within each state will be measured using the Gini coefficient. The Gini coefficient measures the amount of income inequality in a given area on a scale of 0 to 1, with 0 meaning that every person (or other unit of measurement, such as family) has equal income, and 1 meaning that all income went to a single person in that area (Oakes & Kaufman, 2006). Income inequality has previously been associated with lower self-rated health and increased mortality (Kondo et al., 2009). In addition, county-level income inequality has been associated with increased levels of child maltreatment—and it appears to interact with percent of children in poverty in the county as well, with income inequality mattering more in higher-poverty areas (Eckenrode et al., 2014).

For this economic characteristic, American Community Survey (ACS) 5-year estimates from 2007-2011 are used. As with the state-level socioeconomic status measures, this gives an average level of income inequality in the state over that five-year period (not just limited to 2011).

In addition, bivariate analysis revealed several strong correlations between state-level factors (see Table 4.1, below). All correlations were statistically significant at the $p<.05$ level.

Table 4.1: Pairwise (Pearson) Correlations Between State-Level Variables in the 2011-2012 National Survey of Children's Health (N=95,677)

	Poor	Poverty	Gini	Benefit	Public	Time	Sanction	Combined
Poor	1.00							
Poverty	0.96	1.00						
Gini	0.41	0.61	1.00					
Max Bene	0.70	0.67	0.30	1.00				
Public	0.12	-0.05	-0.41	0.36	1.00			
Time	0.20	0.12	-0.20	0.36	0.39	1.00		
Sanction	0.22	0.16	-0.10	0.43	0.32	0.33	1.00	
Combined	0.26	0.17	-0.19	0.48	0.44	0.85	0.78	1.00

All relationships significant at $p<.05$.
Poor: Percent Families Under 200% Federal Poverty Level; Poverty: Percent Families at or below 100% FPL; Gini: Income Inequality, as measured by Gini Coefficient; Max Bene: Maximum Temporary Assistance to Needy Families (TANF) benefit for a family of three; Public: Per capita public welfare spending; Time: TANF Time limit policy; Sanction: TANF Sanction policy; Combined: Combined time limit and sanction policy

To further explore this issue, principal factor analysis was conducted using all eight state-level variables. This analyses revealed two potential latent variables (eigenvalue for factor 1, 3.46; eigenvalue for factor 2, 2.41; all remaining eigenvalues were under one.) These two factors explained 73.4% of the variance shared between the set of these eight items. Based on the correlations above, factor loadings, and what each of the two latent factors appeared to be measuring, two factor scores were created using a regression-based approach (Acock, 2016). The first of these included the three variables listed above (percent of families in a state at or below 200% of the federal poverty level, percent of families in a state at or below the poverty line, and income inequality) and was called "state economic status." The second included the remaining five state variables, and was called "state social safety net." Both were used in their quartile forms in multivariate analyses.

State Policies

The Temporary Assistance to Needy Families (TANF, often informally called "welfare") program is designed to help low-income families achieve self-sufficiency (U.S. Department of Health and Human Services, 2016). TANF provides cash assistance to families, but in return, adults within those families must engage in one or more work activities (for example, searching for jobs or completing school) that will enable them to get employment and ideally eventually leave the program. TANF is a federal block grant, so states have considerable autonomy in setting policy within their borders. This characteristic leads to variation between states in TANF programs. Two key aspects of TANF that vary between states include how long families are able to receive benefits (time limits) and the penalties that families receive if they do not adequately meet their work requirements (often termed "sanctions") (Pavetti & Schott, 2016). Previous research has in fact examined the relationship between time limit and sanction policies of state TANF programs and several measures of child well-being using data gathered by the Urban Institute (Wang, 2015).

Similarly, state TANF policies for the variables used in this analysis are taken from the Urban Institute's Welfare Rules Databook for State TANF Policies as of July 2011 (Kassabian, Whitesell, & Huber, 2012). This data only shows welfare policies at a single point, rather than tracing the policies over time. However, on the National Survey of Children's Health, only the state in which the child lives currently is known—not where he or she lived in previous years. Therefore, the welfare policies in the child's state of residence at the time of the NSCH survey administration (mid 2011-early 2012) are used.

To operationalize welfare policies, this study uses roughly the same categorizations as Wang and colleagues (2015). For time limits, each state is placed in one of three categories: lenient (there are no limit limits to how long a family can receive TANF, or only the adult portion is subject to a time limit); standard (time limits are 60 months, and all funding for a family is cut off after that point), or strict (time limits are less than 60 months). The reason for the 60-month standard is that federal funds cannot be used to pay

for TANF benefits past 60 months for a single family, though states may elect to use their own funds to extend that time. Conversely, states may elect to have shorter lifetime limits on TANF receipt as well, as there is no minimum time limit in federal law. Specifically, time limit policies come from Table IV.C.I of the 2011 Welfare Rules Databook.

For sanction policies, a two-level variable is used: lenient (no sanctions exist for violating the work requirements, or the sanction leads to reducing only a portion of the benefit) or strict (sanctions lead to immediate loss of benefits until the work requirements are met or closing of the case entirely, often meaning that the family has to re-apply for benefits). For this variable, the penalties refer to the initial sanction—that is, this first time the family violates the work requirements for that state. These sanctions vary widely from state to state, while the most severe sanction that can be applied to a family, often for repeated violations of the work requirements, varies little from state to state (all but five states and DC either close the case entirely or reduce the family's TANF benefits to zero, sometimes with no opportunity to re-apply). Specific sanction policies for each state come from Table III.B.3 of the 2011 Welfare Rules Databook.

Along with TANF policies, the Urban Institute also tracks the maximum TANF benefits allowed for families of various sizes. As with the policies cited above, these numbers represent another aspect of the social safety net that states might provide to lower-income families, which might relieve financial stress on those families. The maximum benefit for a family of three is a figure frequently cited as an important indicator of the differences between state welfare systems (Stanley, Floyd, & Hill, 2016).

Accordingly, this study uses the 2011 maximum TANF benefit for a family of three with no other cash income, by state. These numbers are not adjusted for differences in the cost of living by state for two reasons. First, such adjustments would also miss the considerable variation within states of the cost of living in metropolitan areas vs. rural areas, which may be even more important than adjusting by state. Second, this indicator is intended to give a more general sense of the social safety net rather than focus on single-

dollar differences, which is why this indicator (like public welfare spending, below) will be split into quartiles and used as a categorical predictor rather than a continuous one.

The specific dollar values for maximum benefit are taken from Table II.A.4 of the 2011 Welfare Rules Databook. The table itself lists the benefit for a family with one adult and two children with no special needs, and living in the most populated area of the state. Where there is more than one maximum benefit listed, the benefits used in this study refer to "nonexempt" adults (those who are not excused from work requirements) and for Wisconsin, "W-2 transition" (the broadest category of people receiving TANF benefits in that state).

Finally, spending on programs to assist poor individuals and families within each state will be examined. Per capita spending by state has been used as a measure in previous research to examine the relationship between public welfare spending and mortality by state (Kim, 2016). As with maximum TANF benefits, this figure could be considered a measure of state-level support for lower-income families, as many of the programs designed to assist lower-income individuals are included in the figure for public welfare spending. As with maximum TANF benefits, this variable is not adjusted for state differences in cost of living, and will instead be used as a four-category variable to distinguish broad differences in state public welfare spending patterns.

The U.S. Census tracks public welfare spending for all states and local governments in every year through its Annual Survey of State and Local Government Finances. “Public welfare” refers to state spending on unemployment insurance, workers’ compensation, work incentive programs, public assistance programs (including TANF and the Supplementary Nutrition Assistance Program, or SNAP), and Social Security programs for the poor and people with disabilities. The figures used here are from the survey conducted during 2011.

In addition, a factor score, named "state social safety net" was constructed using the five state policy variables and a regression-based approach (described above under "state economic status").

4.2.3 Covariates

Family Socioeconomic Status Measures

Eight different socioeconomic status variables are used (in some form) in this dissertation:

1. Income
2. Highest parental education
3. Full-time parental employment
4. Home ownership
5. TANF receipt
6. Supplementary Nutrition Assistance Program (SNAP) receipt
7. Free / Reduced Lunch receipt
8. Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) receipt

How each of these was measured in the NSCH is described below.

In the NSCH, family income was measured as total combined family income during the last calendar year. The exact income is not part of the public NSCH dataset, but several categorical variables are available for use; these vary based on whether and how income data was imputed (about 9.3% of respondents did not answer the income question). The income variable used in this analysis is a four-level variable that gives income as a percentage of the poverty level, adjusted for family size, and includes singly imputed income values for any missing values in the original income data. The single imputation is from the third of five datasets created by the National Center for Health Statistics, each of

which used 47 variables to predict household income (Blumberg et al., 2012). The four income levels are poor (<100% of Federal Poverty Level (FPL)), near poor (100-199% of FPL), middle (200-399% of FPL), and high (400%+ of FPL). This dissertation uses this income variable in modeling for both specific aims, following previous research with this dataset (Slopen et al., 2016), and uses it as a factor in an overall family SES measure, described below.

The NSCH contains information on the education level of each parent or guardian of the child that lives with the child. Following previous research, the highest level of education that either parent in the household attained will be used as a covariate in this specific aim, with the three categories including less than high school, high school graduate, or more than high school (Slopen et al., 2016).

Several additional measures of family socioeconomic status were asked in the NSCH. These include whether the family owns their home, rents their home, or has some other arrangement (in this study, dichotomized to yes or no, with other arrangements being counted as no) and whether anyone in household was employed for at least 50 of the last 52 weeks (yes or no). There were also four measures of whether any child in the family had participated in one or more of several programs intended to assist lower-income families at any time in the last 12 months: Temporary Assistance for Needy Families (TANF, also known as welfare), the Supplemental Nutrition Assistance Program (SNAP, also known as food stamps), the free or reduced lunch program, or the Women, Infants, and Children (WIC) nutrition program. However, all of the program participation questions were automatically skipped in the NSCH survey if the family's household income was greater than 300% of the federal poverty level. Any skips to the program participation questions because of high income were converted to "no" answers to those questions for the analyses in this dissertation.

In addition, bivariate analysis revealed several relatively strong correlations between these eight family SES factors (see Table 4.2, below). All correlations were statistically significant at the $p<.05$ level.

Table 4.2: Pairwise (Pearson) Correlations Between Family SES Variables in the 2011-2012 National Survey of Children's Health (N=76,342)

	Income	Education	Own	Employ	TANF	SNAP	Lunch	WIC
Income	1.00							
Education	0.30	1.00						
Own	0.46	0.15	1.00					
Employ	0.37	0.16	0.21	1.00				
TANF	-0.29	-0.10	-0.20	-0.20	1.00			
SNAP	-0.59	-0.19	-0.41	-0.32	0.40	1.00		
Lunch	-0.60	-0.27	-0.33	-0.28	0.26	0.53	1.00	
WIC	-0.37	-0.13	-0.26	-0.15	0.20	0.42	0.20	1.00

Income: Family Income; Education: Highest Parental Education; Own: Did family own their home; Employ: Was one parent employed 50 out of last 52 weeks; TANF: Receipt of Temporary Assistance for Needy Families; SNAP: Receipt of Supplementary Nutrition Assistance Program benefits; Lunch: Receipt of free or reduced school lunch; WIC: Receipt of Women, Infants, and Children program benefits.

To further explore this issue, principal components analysis was conducted using all eight state-level variables. This analyses revealed one latent variable (Eigenvalue 3.22; all remaining eigenvalues were under one.) This factor explained 40.2% of the variance shared between the set of these eight items. One variable was created using a regression-based approach (Acock, 2016), which was called simply "socioeconomic status." However, this variable contained a considerable left skew most likely because six out of the eight variables making up socioeconomic status were binary, and four of those indicated government assistance. As a result, a quartile form of the variable is used in multivariate analyses.

Race / Ethnicity

Race is measured in the NSCH as one or more of: White, Black or African-American, American Indian, Alaska Native, Asian, Native Hawaiian, Pacific Islander, or other. Ethnicity is measured as a dichotomous variable indicating whether the child is of

Hispanic, Latino, or Spanish origin. Following previous research with this dataset, race / ethnicity will be defined as one of three categories: Non-Hispanic white, Non-Hispanic black, and Hispanic of any racial group (Slopen et al., 2016). This categorization proceeds as follows. First, any child of Hispanic, Latino, or Spanish origin was categorized as Hispanic, regardless of his or her racial identification. Second, any non-Hispanic child categorized as "black only" was categorized as black. Third, any non-Hispanic child categorized as "white only" was categorized as white. Fourth, the remainder of individuals are placed in the "other" category. In this analysis, individuals who fall into this "other" category (or who are missing a racial / ethnic categorization) are excluded from the analysis, as that category contains a large number of disparate racial and ethnic identities, and it would be inappropriate to group them together.

Family Immigration History

Family immigration history will be used as a control variable in because of its known interactions with other variables in predicting ACEs in this dataset (Bethell et al., 2014; Colby, Lipson, & Turchin, 2012; Slopen et al., 2016). In the NSCH, immigration history is based on responses about both the child's birthplace and the parent or guardian's birthplace. The specific answers to these questions are not present in the publicly available dataset, but there is a composite variable that indicates whether the household is first, second, or third (or higher) generation. In previous research, first- and second-generation households have been combined into a single category based on evidence that children of immigrants are substantially different from children with U.S.-born parents (Marks, Ejesi, & García Coll, 2014). The resulting binary categorization (1st/2nd generation vs. 3rd generation or higher) will be used here as well.

Family Size (Children in Household)

Number of children in the household has been used in previous research with this dataset, and previous surveys of children's health, as a covariate (Bramlett & Blumberg, 2007; Larson et al., 2008; Slopen et al., 2016) In the NSCH, number of children in the

household falls into one of four categories (1, 2, 3, or 4 or more children living in the household).

Age of Child

Age of the child in the NSCH ranges from 0 to 17 years, and is used as a continuous covariate in these analyses. Age is an important covariate for ACEs research because older children have had a longer time to be "exposed" to potential adversity and is a standard covariate in research with the NSCH (Bethell et al., 2014; Slopen et al., 2016).

Sex of Child

Sex of the child in the NSCH is categorized as either male or female and is also a standard covariate in NSCH research.

Special Needs Status of Child

The NSCH dataset also includes a composite variable that indicates whether the child has special health care needs. Previous research on ACEs using this dataset has included this composite variable to account for the additional stress, financial and otherwise, that having a child with special needs places on the family, and special needs children have been found to have higher odds of two or more ACEs than children without special needs (Bethell et al., 2014). This composite variable is binary, and indicates whether the child had any of five special needs conditions: medication use, functional limitations, use of special therapies, elevated service needs, or ongoing emotional, developmental, or behavioral conditions.

4.3 Hypotheses and Measures for Specific Aim 2

4.3.1 Hypotheses

Specific aim 2 of this dissertation asks to what extent state-level economic characteristics and public welfare policies moderate the known relationship between family

SES, race/ethnicity, and childhood adversity. This relationship has previously been found in this dataset (Slopen et al., 2016), and as noted in Chapter 3, theory suggests that this relationship might be conditional on state economic characteristics or policies. Specifically, this aim explores the possibility that the relationship between family SES, race/ethnicity, and ACEs that is so strong when looking at the overall population of the United States could be different for people in different states—and that those differences might be related to state-level economic characteristics and polices.

The hypotheses under specific aim 2 rely strongly on elements from the Reserve Capacity Model and a conceptual framework from James House intended to understand and explain social inequalities in health (L. C. Gallo & Matthews, 2003; House, 2002). Specifically, the Reserve Capacity theory suggests that socioeconomic status may both generate inequalities in stress and moderate the effects of that stress on eventual health outcomes; House suggests that prevailing social, political, and economic conditions may likewise play such a moderating role by potentially exacerbating the disparities between families of lower and higher socioeconomic status. Similarly, House also suggests that the relationship between race and ethnicity and health outcomes can also be moderated by such conditions. Combined with ideas from the Family Stress Model—that increased family stress can result from financial stress and that increased family stress may lead to increased ACEs—aim 2 translates these concepts in several hypotheses. To restate, specific aim 2 and its associated hypotheses are:

Specific Aim 2: Examine whether state-level economic characteristics and public policies moderate the relationship between family socioeconomic status and ACEs.

Hypothesis 2.1: Children living in lower-socioeconomic status (SES) families will have greater odds of ACEs than children living in higher-SES families.

Hypothesis 2.2: In lower-SES states, the disparity between lower SES and higher SES children will be greater than in higher SES states.

Hypothesis 2.3: In states with higher income inequality, the disparity between lower SES and higher SES children will be greater than in states with lower income inequality.

Hypothesis 2.4: In states that spend less on public welfare, the disparity between lower SES and higher SES children will be greater than in states that spend more on public welfare.

Hypothesis 2.5: In states that have lower TANF benefits, the disparity between lower SES and higher SES children will be greater than in states that have higher TANF benefits.

Hypothesis 2.6: In states with stricter TANF policies, the disparity between lower SES and higher SES children will be greater than in states that have more lenient welfare policies.

Hypothesis 2.7: Black and Hispanic (minority) children will have greater odds of ACEs than white children.

Hypothesis 2.8: In lower-SES states, the disparity between minority and white children will be greater than in higher SES states.

Hypothesis 2.9: In states with higher income inequality, the disparity between minority and white children will be greater than in states with lower income inequality.

Hypothesis 2.10: In states that spend less on public welfare, the disparity between minority and white children will be greater than in states that spend more on public welfare.

Hypothesis 2.11: In states that have lower TANF benefits, the disparity between minority and white children will be greater than in states that have higher TANF benefits.

Hypothesis 2.12: In states with stricter TANF policies, the disparity between minority and white children will be greater than in states that have more lenient welfare policies.

4.3.2 Measures

Specific aim 2 uses the same measures as specific aim 1; descriptions of these measures will not be repeated below. However, in aim 2 these measures play different roles, as the relationships being tested are different. In aim 2, the predictor variables for all models are family socioeconomic status variables, or racial / ethnic categories, rather than state conditions and policies. Hypotheses 2.2 – 2.6, and 2.8 – 2.12, require moderating variables, which are the state economic characteristics and policies that were the predictor variables in specific aim 1.

4.4 ANALYSIS

This section describes the following five steps in the analysis: (1) weighting, (2) how missing data was handled, (3) univariate (descriptive) statistics, (4) bivariate relationships, and (5) multivariate modeling. Stata 14.2 was used for all data management and analyses.

4.4.1 Survey Weighting

The 2011-2012 National Survey of Children's Health (NSCH) was designed as a cross-sectional telephone survey of U.S. households with at least a single child (aged 0-17) living there at the time. The survey intended to get a representative sample of households by state and for the United States as a whole, and to accomplish this stratified by state and by phone type (landline or cell phone) (National Center for Health Statistics, 2013). To adjust for this survey design, and to adjust for population totals in each state (using a raking adjustment based on information from the 2011 American Community Survey), a set of weights is provided with the NSCH. When using these weights, the estimates are representative of all non-institutionalized children between the ages of 0 and 17 in the United States, and in each state. For all univariate results, weighted and unweighted results

were calculated. These weights were used in multivariate sensitivity analyses as well. However, survey weights were *not* able to be used in multilevel multivariate analyses; this is because such an analyses requires separate weights that reflect the survey design at each level (there is only a single weight provided with the public NSCH dataset that reflects all design choices as well as a raking element).

4.4.2 Missing Data

The 2011-2012 NSCH has a total of 95,677 completed interviews. This analysis, as noted in the measures section above and to match previous research (Slopen et al., 2016), limits its scope to just those individuals who are white, black, or Hispanic, excluding those who either fall into some other racial or ethnic category or who did not answer the race / ethnicity questions; this brings the initial analytic sample to a total of 82,938. However, even after limiting the sample, there are several other variables used in this analysis that contain missing values; the total number of individuals missing values for one or more of those variables was 6,596 (roughly 8% of the initial analytic sample). Any individual missing values on one or more key variables was excluded from this analysis, leaving a final analytic sample of 76,342. Table 4.3 shows some of the key demographic differences between the analytic sample ("analytic" in the table below) and those excluded through listwise deletion ("deleted" in the table below).

Table 4.3: Key Differences Between Analytic Sample (N=76,342) and Deleted Cases (N=6,596) in the 2011-2012 National Survey of Children's Health

	Deleted	Analytic
ACEs (mean)	1.65	0.77
2+ ACEs (%)	39.8	18.1
Age (years)	8.91	9.30
Female (%)	*48.3*	*48.2*
Race / Ethnicity (%)		
White	51.9	75.9
Black	23.3	9.6
Hispanic	24.8	14.5
Immigrant Family (%)	30.6	14.4
Income (%)		
0-99% FPL	35.3	13.4
100-199% FPL	26.4	17.1
200-399% FPL	22.9	31.5
400+% FPL	15.3	38.1
Highest Parental Education (%)		
Less than High School	35.6	13.5
High School	37.3	34.2
More than High School	27.1	52.3

Italics indicate no statistically significant difference between groups. All other differences between groups are significant at the p<.001 level.

All differences are statistically significant (p<.001) using t-tests (for ACEs and age) and chi-squared tests (for all other variables) except for percent female. Overall, compared to the analytic sample, those individuals who were dropped from this analysis because of missing values had higher ACEs, were slightly older, were more likely to be black or Hispanic, had parents with lower educations, and were generally lower-income. The potential effects of these differences between those who are included in the analytic sample and those who were dropped is explored more fully in the limitations discussion in Chapter 7. However, it should be noted that similar previous analyses using this dataset have found the fundamental conclusions to be unchanged whether casewise deletion or multiple imputation was used to handle missing data (Slopen et al., 2016).

4.4.3 Descriptive Statistics

Descriptive statistics were created for each variable used in the analysis. For nominal or ordinal variables counts and percentages are reported, while for continuous variables means and standard deviations (or standard errors) are reported. Weighted and unweighted results are reported. In addition, for key state-level variables, maps are provided to give visual indicators of key differences in state economic characteristics and policies.

4.4.4 Bivariate Relationships

Bivariate relationships were examined between all individual- and state-level predictor and outcome variables, and between all covariates to examine the dataset for potential issues that might arise during multivariate modeling. Most bivariate relationships between predictor and outcome variables are also provided as the first (unadjusted) model in multivariate model tables.

Bivariate relationships revealed correlations between state-level factors and between family-level socioeconomic factors, suggesting latent variables. Principal components factor analyses were performed, resulting in three new combined variables: a single family-level socioeconomic status measure, a single factor measuring state economic status, and a single factor measuring state social safety net. These correlations, and the factor analyses, were detailed above.

4.4.5 Multivariate Models

Core multivariate analysis for specific aim 1 was done using multi-level logistic regressions (allowing for random effects at the state level), unweighted for survey design. Multi-level models are intended to account for nesting of level 1 observations (here, children) in level 2 groups (here, states) that can violate the assumptions of single-level

regression models (Rabe-Hesketh & Skrondal, 2012). For each state predictor, a five-model set was run that added progressively more variables as shown below:

Model 1: State-level predictor and the binary ACEs outcome.

Model 2: Model 1 + family-level covariates that were not explicit measures of socioeconomic status (child's sex, age, race/ethnicity, and special needs status; immigration history of the family; and number of children in the family)

Model 3: Model 2 + factor family-level socioeconomic status (Family SES) variable

Model 4: Model 2 + income and parental education

Model 5: Model 2 + income, parental education, and TANF receipt in last year

Models 3, 4, and 5 each contain some measure of family socioeconomic status; in essence, each model is a slightly different perspective on the effect of adding family SES on the direct effects of state characteristics and policies.

All continuous state-level predictors were re-categorized into four-quartile ordinal variables to avoid the possibility of using continuous predictors with skewed distributions and to divide states into groupings with more meaningful and easily grasped differences. State-level predictors that were already in ordinal form (state policy variables) remained unchanged. The results for specific aim 1 are detailed in Chapter 5.

For specific aim 2, interaction terms between state-level variables, family socioeconomic status, and race / ethnicity were added to the models created for specific aim 1. Specifically:

Model 6: Model 2 + interaction term between state predictor and family SES

Model 7: Model 3 + interaction term between state predictor and income

Model 8: Model 3 + interaction term between state predictor and TANF receipt

Model 9: Model 2 + interaction term between state predictor and race / ethnic category

For any model that contained a statistically significant interaction term, stratification was performed and the model re-run to show the differences by category of state predictor.

Sensitivity analyses for all models in were performed using weighted single-level logistic regressions to examine whether the conclusions changed when introducing survey weights. All analyses were run using the weights provided with the dataset and the "subpop" command in Stata, which preserves the sampling structure of the entire dataset during the analysis. All the weighted analyses were run on the "subpopulation" that included the 76,342 individuals included after casewise deletion and limitation to non-Hispanic whites, non-Hispanic blacks, and Hispanics. In addition, both multi-level and weighting regressions were run with a "full" ACEs measure (a count that includes all nine ACEs, which was then dichotomized) and a "reduced" ACE measure (a count without the ACE that measured whether the child had ever lived in a family where it was hard to get by on family income, which was again then dichotomized). This is warranted, given that the answer to that question may be related to the socioeconomic measures that are key to this study. When sensitivity analyses produced different results from the core models, those results are noted below. Models using a count measure of ACEs were also run, but the substantive patterns of results did not differ from using a binary measure of ACEs (results not shown in chapters 5 and 6). Some initial analyses using linear regressions were run, but there was evidence of some violation of the required assumption of linear regression modeling, likely due to the severely skewed nature of the outcome variable, so this series of models was not pursued further.

Chapter 5: Specific Aim 1 Results

This chapter contains two types of sections: descriptive statistics and multivariate modeling. Section 5.1 includes descriptive statistics at the family and individual level for the 76,342 children included in the analytic sample. It also included descriptive statistics for the state-level variables that are the focus of specific aim 1 for the 50 U.S. states and the District of Columbia.

Sections 5.2 – 5.6 describe multivariate models used to examine the direct effects of state economic characteristics and policies on an individual child's odds of experiencing two or more ACEs (specific aim 1 and its hypotheses). Section 5.2 summarizes the overall patterns seen in the many multivariate model sets run to address specific aim 1, and can be read as an executive summary of the results in the remaining sections. Section 5.3 describes in detail the direct effects of the factor variable created from the economic characteristics (state economic status), while section 5.4 summarizes the direct effects of each component of that factor variable. Similarly, section 5.5 describes in detail the direct effects of the factor variable created from state policies (state social safety net) while section 5.6 summarizes the direct effects of each separate component that was included in the social safety net variable.

5.1 Descriptive Statistics

Table 5.1 shows descriptive information for the analytic sample (N=76,342). Columns show the differences when descriptive statistics are calculated with and without using sample weights.

There are several systematic differences between the raw (unweighted) analytic sample and the weighted sample. In general, weighting the sample to be representative of the U.S. population increases the percentage of children with two or more ACEs (21.5 vs.

18.1), decreases the percentage of white children while increasing the percentage of minority (black and Hispanic) children, decreases the overall socioeconomic status of the sample on all measures, increases the percentage of children from first or second generation immigrant families, and increases the average number of children in the house. The percentage of children who are female and who have special needs, on the other hand, remain relatively unchanged, as does the average age of the children included in the sample. The reason weighted and unweighted percentages are presented here is to illustrate the differences that may be driving different results in weighted and unweighted multivariate models (for more information, see the sections below, and discussion of limitations in Chapter 7).

Table 5.1: Descriptive Statistics for Individual and Family-Level Characteristics for Analytic Sample (N=76,342), Unweighted and Weighted

	Unweighted Mean (SD) or Percent	**Weighted Mean (SE) or Percent**
Mean ACEs	0.77 (1.23)	0.90 (0.01)
Two or More ACEs	18.1	21.5
Age of Child (Years, 0-17)	8.91 (5.26)	8.63 (0.04)
Female	48.3	48.6
Race / Ethnicity		
Non-Hispanic White	75.9	61.2
Non-Hispanic Black	9.6	14.1
Hispanic	14.5	24.8
First / Second Generation Immigrant Family	14.4	22.4
Family Income (% of FPL)		
0-99%	13.4	20.3
100-199%	17.1	21.3
200-399%	31.5	29.7
400%+	38.1	28.7
Highest Parental Education		
Less than High School	13.5	20.5
High School	34.2	32.7
More than High School	52.3	46.8
Family Owns Home	76.5	63.2
Family Member Employed Full-Time	89.6	85.7
Family Received TANF in Previous Year	4.4	6.5
Family Received SNAP in Previous Year	15.9	24.1
Child on Free / Reduced Lunch	20.9	31.8
Family Received WIC in Previous Year	8.3	13.7
Total Children in Household		
1	40.1	22.3
2	38.4	38.7
3	14.8	26.8
4+	6.7	12.2
Child has special needs	20.4	20.0

Tables 5.2 and 5.3 show descriptive statistics for state-level characteristics. Table 5.2 lists key aspects for five state characteristics that are measured on a continuous scale: means and standard deviations, the lowest and highest values along with the states that have those values, and quartile values. Normality and skewness tests indicated that percent poor families, percent families in poverty, and maximum welfare benefit for a family of three were normally distributed, but income inequality and per capita public welfare spending were not ($p<.05$ for both). For consistency, to eliminate the influence of outliers,

and to ensure that meaningful differences between states are measured, all continuous variables are used in quartile format in multivariate models.

Table 5.2: Descriptive Statistics for Continuous State Characteristics and Policies (N=51, includes District of Columbia), 2011

	Mean (SD)	Lowest	Highest	25th Q	50th Q	75th Q
% Poor Families	25.5 (5.2)	15.9 (NH)	37.9 (MS)	21.2	25.7	29.8
% Families in Poverty	9.9 (2.7)	5.2 (NH)	17.0 (MS)	7.6	9.6	12.0
Income Inequality (Gini Coefficient)	0.453 (0.218)	0.410 (AK)	0.533 (DC)	0.438	0.454	0.467
Maximum Welfare Benefit ($)	430 (162)	170 (MS)	923 (AK)	292	427	554
Per Capita Public Welfare Spending ($)	1.66 (0.60)	0.88 (NV)	4.77 (DC)	1.30	1.50	1.79

State abbreviations used are standard two-letter postal abbreviations.
SD: Standard Deviation; Q: Quartile
Data sources: U.S. Census American Community Survey (2007-2011 5-year estimates), U.S. Census Annual Survey of State and Local Finances 2011; Urban Institute Welfare Rules Database 2011.

Table 5.3 lists the percentage and number of states that had policies that fell into the categories described in Chapter 4. Briefly, for time limits, the standard policy is a maximum lifetime limit of 60 months on TANF; strict policies limit individuals to less, and lenient policies allow more. Strict sanction policies are those that require immediate loss of all TANF benefits on the first violation of TANF program work requirements, while lenient policies have less severe penalties. The combination variable separates states into four categories: strict (strict time limit and strict sanction policies), lenient (lenient policies on both), and intermediate categories (mixes of lenient and strict policies; for more information, see chapter 4).

Table 5.3: Descriptive Statistics for Categorical State Policies (N=51, includes District of Columbia), 2011

	Percent (N)
State Time Limit Policy	
Strict	17.7 (9)
Standard	64.7 (33)
Lenient	17.7 (9)
State Sanction Policy	
Strict	43.1 (22)
Lenient	56.9 (29)
State Combined Policy	
Strict	9.8 (5)
Somewhat Strict	41.2 (21)
Somewhat Lenient	31.4 (16)
Lenient	17.7 (9)

Data source: Urban Institute Welfare Rules Database, 2011

5.2 MULTIVARIATE MODELS

A large number of models, organized into sets, were run to examine the hypotheses in specific aim 1. Generally, these model sets started with a multilevel logistic regression model using unweighted data including only a state-level predictor and the binary measure of ACEs

(1 = child experienced two or more ACEs, 0 = child experienced one or zero ACEs). The second model included family and individual characteristics that have been found to be relevant to ACEs in previous research, but are not explicitly socioeconomic. The third, fourth, and fifth models included family socioeconomic covariates in the following order: socioeconomic status as measured by a factor variable; income and parental education as separate elements; and income, parental education, and TANF receipt as separate elements.

While the specifics of each set of models are described in the sections below, Table 5.4 shows a summary of the findings across all of the model sets. For each state predictor, the table below shows whether there were statistically significant direct effects in each of the three types of model (unadjusted for covariates, adjusted for non-SES covariates, and

adjusted for non-SES and SES covariates) as well as the direction (positive or negative) if the effect was significant. For example, for state economic status, modeling found significant negative direct effects in unadjusted models, meaning that the odds of a child experiencing two or more ACEs decreases with increasing state economic status. For percentage of families that are poor within the state, the relationship was positive in unadjusted models, meaning that children living in states with higher proportions of poor families had higher odds of experiencing two or more ACEs. For TANF policies, "-" meant that more lenient policies are associated with decreased odds of ACEs in those models. Asterisks in the table indicate that the results listed in the table below were highly sensitive to model choice—that is, using survey weights or a reduced ACEs measure resulted in different results than those listed in the table above. In some cases, sensitivity analyses found direct effects when the core analysis (an unweighted, multi-level logistic regression using a full ACEs measure) did not, and vice versa. In other cases, sensitivity analyses found direct effects, but the *direction* of those effects conflicted with the core models, which used multi-level unweighted logistic regression with a full ACEs measure. These cases are explained in further detail in the sections below.

Table 5.4: Summary of Results for Specific Aim 1: Direct Effects of State-Level Variables on Odds of Two or more ACEs in the 2011-2012 National Survey of Children's Health (N=76,342)

State Predictor	**Unadjusted**	**Adjusted, No SES**	**Adjusted, SES**
State Economic Status	Yes (-)	Yes (-)	No
Percent Poor Families	Yes (+)	Yes (+)	No
Percent Families in Poverty	Yes (+)	Yes (+)	No
Income Inequality	No	No*	Yes (-)*
Social Safety Net	Yes (-)	No	No
Maximum TANF Benefit	Yes (-)	Yes (-)	No
Public Welfare Spending	No	Yes (-)	No*
TANF Time Policy	No	No	No
TANF Sanction Policy	Yes (-)	No	No
TANF Combined Policy	Yes (-)	No	No

Yes: Statistically significant direct effects ($p<.05$)
No: No statistically significant direct effects
*: Results highly sensitive to model choice

Overall, the patterns in Table 5.4 show that most state economic characteristics and policies had direct effects in unadjusted models. Those effects persisted when non-socioeconomic family and individual characteristics were included as covariates, but in almost every case adding socioeconomic covariates reduced the state-level direct effects to statistical insignificance. The direction of state-level effects, with the exception of income inequality, were those predicted by the hypotheses under specific aim 1 (though some sensitivity analyses conflict with this conclusion).

5.3 Direct Effects of State Economic Status

Table 5.5: Odds of Ever Having Experienced 2 or more ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), by State Economic Status and Family / Individual Factors

	Model 1	Model 2	Model 3	Model 4	Model 5
State ES					
Low	1.22**	1.11	0.95	0.95	0.96
Mid Low	1.23**	1.20*	1.04	1.04	1.04
Mid High	1.01	1.02	0.99	0.99	0.98
High	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Female		1.03	1.02	1.03	1.03
Age (per year)		1.08***	1.11***	1.10***	1.11***
Special needs child		2.02***	1.91***	1.95***	1.94***
Recent Immigration		0.58***	0.45***	0.45***	0.47***
Race / Ethnicity					
White		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Black		1.99***	1.07*	1.26***	1.20***
Hispanic		2.16***	1.30***	1.44***	1.43***
Family SES					
Low			10.20***		
Mid Low			3.29***		
Mid High			1.45***		
High			1.00 (ref)		
Family Income					
0-99% FPL				8.57***	7.53***
100 – 199% FPL				5.29***	5.04***
200 – 399% FPL				2.30***	2.27***
400%+ FPL				1.00 (ref)	1.00 (ref)
Parental Education					
Less than HS				1.01	1.01
High School				0.98	0.98
More than HS				1.00 (ref)	1.00 (ref)
TANF Receipt					1.99***
Model Fit					
AIC	71893.50	67874.32	61562.78	62545.46	62275.28
BIC	71939.71	67985.24	61701.43	62702.59	62441.66

Values are odds ratios compared to reference group, except for age. Legend: * p<.05; ** p<.01; *** p<.001

ES: Economic Status; FPL: Federal Poverty Level; HS: High School; TANF: Temporary Assistance to Needy Families; AIC: Akaike's Information Criterion; BIC: Bayesian Information Criterion

Table 5.5 shows the direct effects of state economic status on a child's odds of having ever experienced two or more ACEs. Overall, the table shows that there are statistically significant direct effects in models that are unadjusted, and those effects persist when adjusting for family and individual characteristics that are not explicit measures of socioeconomic status. However, those direct effects disappear in most models when any measure of family socioeconomic status is included.

Model 1 shows the unadjusted direct effects of state economic status on the odds of a child having two or more ACEs. Compared to being in the highest status quartile of states (as measured by the factor variable created from the three state economic characteristics, described above), living in a state in the lowest status quartile carried increased odds of having experienced two or more ACEs (Odds Ratio 1.22, 95% Confidence Interval 1.08 – 1.38). This was also true of living in a second quartile state (OR 1.23, 1.08 – 1.39). There was no statistically significant difference between living in a third quartile state (OR 1.01, 0.89 – 1.15).

In adjusted models, these direct effects are first reduced, then disappear entirely. In Model 2, which adjusts for family and individual characteristics that are not explicitly measures of socioeconomic status, the relationship between state economic status and living in the lowest quartile disappears, but remains for living in a second quartile state (OR 1.20, 1.04 – 1.38). In models 3, 4, and 5, which add in different measures of family socioeconomic status, reduce all state-level direct effects to insignificance.

It is worth briefly explaining the three measures of family socioeconomic status used in Models 3-5 above, as they give slightly different perspectives on socioeconomic status. Model 3 uses the factor variable created from 8 measures of socioeconomic status in the National Survey of Children's Health, and as can be seen in Table 5.5, there are considerable differences in the odds of experiencing two or more adversities depending on family socioeconomic status. As with previous research (Slopen et al., 2016), the odds increase progressively with lower socioeconomic status, with children living in the lowest

SES families having more than ten times the odds of experiencing two or more adversities than children living in the highest SES families. For comparison, Model 4 uses the same variables that Slopen and colleagues used, with similar findings, though the differences between families as measured by income are not as great as those using the factor SES variable, perhaps indicating that the factor SES variable distinguishes the truly "poor" slightly more than using income. (The coefficient for race / ethnicity also is reduced in Model 3 compared to Models 4 and 5, perhaps indicating that the SES factor variable, which incorporates a measure of wealth through home ownership, might reflect differences in wealth between non-Hispanic whites and black / Hispanic minority groups in the United States.) Model 5 adds TANF (welfare) receipt to Model 4, and finds that even with family income in the model, TANF receipt is related to increased odds of experiencing two or more ACEs (OR 1.99, 1.83 – 2.16). Together, these three perspectives suggest that income matters to ACEs, but there are other socioeconomic factors that appear to be related to ACEs as well. Consequently, in some of the models explored in this chapter and the next, models with differing measures of family SES may not all "agree" with one another in the same way that they do in Table 5.5 above. The reason for this disagreement may be due to these differences in what each measure of family SES is actually detecting.

Model fit is shown on at the bottom of Table 5.5 above. Specifically, Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are shown. For both measures of fit, two models are compared and the AIC and BIC are calculated; the model with a lower AIC or BIC is the model that fits the data better. Both AIC and BIC impose a penalty for the number of variables in the model, thus favoring more parsimonious models. One common set of guidelines suggests that an absolute BIC score difference of 10 or more indicates very strong evidence that one model (the one with the lower BIC score) is a better fit for the data than the other (Raftery, 1995). A score of 6 to 10 indicates strong evidence, 2 to 6 positive evidence, and 0 to 2, weak evidence. Using this criteria, there is strong evidence favoring Model 3 as the best overall fit for the data

compared to Models 1, 2, 4 and 5. Standardized residuals for Model 3 showed an approximately normal distribution around zero, and no individual observation in this model had a Pregibon's Influence Statistic larger than 0.3, indicating no particular observation had a particularly high influence on the model (that is, no significant outliers were apparent in regression diagnostics).

Sensitivity analyses were conducted using single-level weighted logistic regression models. The results did not vary substantively from the patterns noted above, with one exception. In Model 2 of weighted analyses, there remained a statistically significant relationship between living in the lowest quartile of states vs. the highest quartile of states (OR 1.12, 1.00 – 1.26), a relationship that did not persist in multi-level unweighted models. In addition, in previous research with this dataset, sensitivity analyses have been conducted using an ACEs measure that did not include the ACE that asked about how hard it had been to get by on the family's income (Slopen et al., 2016). Similar analyses were conducted for both weighted and unweighted models here (referred to from here forward as "reduced" models). In unweighted reduced models, the patterns seen in Table 5.5 were not substantively different. However, in weighted reduced models, a statistically significant difference between children living in the second-lowest state economic status quartile and highest state economic status quartile persisted across all models, with increased odds of two or more ACEs among children in second quartile states (OR 1.14, 1.00 – 1.29 in Model 3, with similar effects in Models 4 and 5).

5.4 Direct Effects of Other State Economic Factors

Table 5.6: Summary of Direct Effects of State Economic Factors on Odds of Ever Having Experienced 2 or more ACEs in the 2011-2012 National Survey of Children's Health (N=76,342)

	Model 1	Model 2	Model 3	Model 4	Model 5
Percent Poor Families					
Q1 (highest state SES)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Q2	1.09	1.11	0.97	0.96	0.96
Q3	1.22***	1.19**	1.01	1.01	1.01
Q4 (lowest state SES)	1.37***	1.27***	0.99	0.98	1.00
Percent Families in Poverty					
Q1 (highest state SES)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Q2	1.07	1.08	0.99	0.99	0.98
Q3	1.26***	1.24**	1.04	1.05	1.05
Q4 (lowest state SES)	1.30***	1.18*	0.97	0.97	0.98
Income Inequality					
Q1 (most equal states)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Q2	1.02	1.00	1.00	1.02	1.02
Q3	1.06	1.00	0.97	1.00	1.00
Q4 (most unequal states)	0.97	0.88	0.90*	0.93	0.93

All values are odds ratios compared to reference group. Legend: * p<.05; ** p<.01; *** p<.001
Q: Quartile; SES: Socioeconomic Status; ref: reference group.
Model 1: Unadjusted for family or individual factors.
Model 2: Adjusted for sex, age, race / ethnicity, family immigration history, total children in family, and special needs requirements of child.
Model 3: Adjusted as Model 2 plus socioeconomic status factor score.
Model 4: Adjusted as Model 2 plus income and parental education.
Model 5: Adjusted as Model 3 plus income, parental education, and receipt of TANF.

Table 5.6 summarizes the direct effects of the three components of the state economic status factor variable: percentage of families that are poor (at or below 200% of the federal poverty line) in each state, percentage of families in poverty (at or below 100% of the federal poverty line) in each state, and income inequality in each state (as measured by Gini coefficient). Each of these variables is divided into quartiles, and the odds ratios shown above are in comparison to the reference group for that variable. For example, all odds ratios for "Percent Poor Families" are shown in comparison to the first quartile—the states with the lowest percentage of poor families (and therefore the states with the highest state socioeconomic status). To keep the focus on the research questions addressed in

Specific Aim 1, this table does not show the coefficients for the family and individual covariates.

Percentage of Poor Families. The first grouping in Table 5.6 shows the results of unadjusted and adjusted models examining the direct effects of the percentage of families in the state living at or below 200% of the federal poverty line on the odds of a child having two or more ACEs. Overall, the results show the same general pattern as the state factor score for state economic status: there are significant direct effects in models that are unadjusted for family socioeconomic status, but those effects disappear when any measure of family socioeconomic status is added. In addition, there appears to be somewhat of a dose-response effect in Models 1 and 2, with progressively increasing odds of two or more ACEs as state SES declines, though this effect disappears as family SES is added to models. Reduced multi-level models and weighted full models revealed the same patterns as the full multi-level models. However, weighted reduced models found that the difference between children living in the second-lowest SES states had increased odds of ACEs compared with those in the highest SES states, even when adjusting for family SES (OR 1.13, 1.00 – 1.28). This is the same pattern that emerged with state economic status in weighted, reduced models: increased odds of ACEs among children in the second-lowest SES quartile of states.

Percentage of Families in Poverty. The second grouping in Table 5.6 shows the results of models examining the direct effects of the percentage of families in the state living at or below the federal poverty line on the odds of a child having two or more ACEs. Overall, the results show the same general pattern as seen for state economic status and percentage of poor families in the state: there are significant direct effects in models that are unadjusted for family socioeconomic status, but those effects disappear when any measure of family socioeconomic status is added. Similarly, in unadjusted and adjusted models, there appears to be a dose-response effect, but this disappears when family SES measures are added. Reduced multi-level models showed the same patterns, as did

weighted full models. Weighted reduced models showed the same pattern as percentage of poor families: significant differences between children living in second-lowest SES states and highest SES states even after adjustment for family SES, with greater odds of two or more ACEs for children living in lower-SES states (OR 1.15, 1.02 – 1.30).

State Income Inequality. Finally, the last grouping in Table 5.6 shows the results of unadjusted and adjusted models examining the direct effects of state income inequality (as measured by Gini coefficient) on the odds of a child having two or more ACEs. The results with state income inequality show a somewhat different pattern than the other components of state economic status: across most models—unadjusted and adjusted—there are no significant direct effects of state income inequality on ACEs. However, in one model, there appears to be an *advantage* in living in a high-inequality state, even when controlling for individual factors (including socioeconomic factors).This exception to the observation that state income inequality does not affect a child's odds of two or more ACEs is seen in Model 3, in which children living in the most unequal quartile of states have lower odds of experiencing two or more adversities when compared to their counterparts living in the most equal quartile of states (OR 0.90, 95% CI 0.82 – 0.99). In models 4 and 5, which use different measures of family socioeconomic status, a similar pattern can be seen, though the results do not reach statistical significance (at the $p<.05$ level).

Sensitivity analyses produced some alternative results compared to Table 5.6 for state income inequality. In analyses with reduced unweighted models, the apparently protective effect of living in a high-inequality state extended to models 4 and 5 (OR 0.89, 0.80 – 1.00 and OR 0.89, 0.80 – 0.99 respectively). Weighted single-level regressions revealed more fundamental differences from the results in Table 5.6. Specifically, in weighted logistic regressions, children living in second-quartile states (second-lowest inequality) had higher odds of having two or more ACEs compared to those living in the first quartile (lowest inequality) (OR 1.15, 1.05 – 1.26), though there was no such effect for those living in even higher inequality states. This effect for only second-quartile

individuals persisted when models were adjusted for individual factors, including family socioeconomic status (odds ratios ranged from 1.10 to 1.13, depending on the family SES measure used; all were statistically significant at $p<.05$). In weighted reduced models, the *only* significant relationship was between first and second quartile children in the unadjusted model (OR 1.13, 1.02 – 1.26) and this relationship disappeared when any set of covariates was added to the model (models 2-5 showed no relationship between income inequality and ACEs).

In sum, the effects of state income inequality are somewhat unclear. In unadjusted models, income inequality does not appear to be related to ACEs, but adjusting for individual characteristics appears to lead to two different patterns depending on the type of model used. In unweighted models, it appears that there may be a small reduction in the odds (approximately 10%) of experiencing ACEs for children living in the most unequal states. Conversely, weighted models suggest that living in the second most equal quartile of states may have increased odds (5-10%, depending on the specific model) of experiencing ACEs. The sensitivity of the results to model specification suggest that results related to state-level income inequality should be interpreted with caution.

5.5 DIRECT EFFECTS OF STATE SOCIAL SAFETY NET

Table 5.7: Odds of Ever Having Experienced 2 or more ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), by State Social Safety Net and Family / Individual Factors

	Model 1	Model 2	Model 3	Model 4	Model 5
State Safety Net					
Weak	1.18*	1.09	1.01	0.98	1.02
Somewhat Weak	1.10	1.07	1.06	1.05	1.08
Somewhat Strong	1.04	1.00	0.97	0.95	0.97
Strong	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Female		1.03	1.02	1.03	1.03
Age (per year)		1.08***	1.11***	1.10***	1.11***
Special needs child		2.02***	1.91***	1.95***	1.94***
Recent Immigration		0.58***	0.45***	0.45***	0.47***
Race / Ethnicity					
White		1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Black		2.00***	1.07*	1.25***	1.20***
Hispanic		2.16***	1.30***	1.44***	1.42***
Family SES					
Low			10.20***		
Mid Low			3.29***		
Mid High			1.45***		
High			1.00 (ref)		
Family Income					
0-99% FPL				8.58***	7.54***
100 – 199% FPL				5.30***	5.04***
200 – 399% FPL				2.30***	2.27***
400%+ FPL				1.00 (ref)	1.00 (ref)
Parental Education					
Less than HS				1.01	1.01
High School				0.98	0.98
More than HS				1.00 (ref)	1.00 (ref)
TANF Receipt					1.99***
Model Fit					
AIC	71903.51	67880.20	61562.48	62544.64	62273.89
BIC	71949.73	67991.11	61701.13	62701.77	62440.27

Values are odds ratios compared to reference group, except for age. Legend: * p<.05; ** p<.01; *** p<.001

FPL: Federal Poverty Level; HS: High School; TANF: Temporary Assistance to Needy Families; AIC: Akaike's Information Criterion; BIC: Bayesian Information Criterion

Table 5.7 shows the direct effects of state social safety net (defined as a factor variable created from per capita public welfare spending, maximum welfare benefit for a family of three, state time limit policies, state sanction policies, and combined state TANF policies) on a child's odds of having ever experienced two or more ACEs. Overall, the table shows very little evidence of any direct effects of state social safety net on ACEs. The exception is in unadjusted models, where compared to children living in states with strong social safety nets, children living in states with weak social safety nets had increased odds of experiencing two or more ACEs (OR 1.18, 1.03 – 1.36). However, those effects disappear in most models when any family-level covariates are added. Odds ratios associated with family and individual-level covariates are almost exactly the same as those associated with state economic status (Table 5.5).

Model fit is shown on at the bottom of Table 5.5. Using this criteria, there is strong evidence favoring Model 3 as the best overall fit for the data compared to Models 1, 2, 4 and 5. In addition, Model 1 fit, using the Wald chi-squared statistic, was 6.35 ($p=.10$), indicating that the only model that contained a statistically significant effect of state social safety net may in fact not have been statistically significant overall. After addition of covariates, models 2-5 were statistically significant overall ($p<.001$ for all).

Sensitivity analyses with weighted full models showed some differences from Table 5.7. Weighted full analyses showed that in unadjusted models, compared to children living in states with a strong social safety net, children living in states with a weak (OR 1.24, 1.10 – 1.40) or somewhat weak (OR 1.17, 1.04 – 1.32) state social safety net had increased odds of two or more ACEs. This relationship was reduced but remained statistically significant in Model 2 (for weak safety net states, OR 1.16, 1.02 – 1.33; for somewhat weak states, OR 1.16, 1.03 – 1.32) but disappeared in models adjusted for family socioeconomic status. Reduced models, both weighted and unweighted, showed no meaningful differences from what is shown in Table 5.7.

5.6 DIRECT EFFECTS OF OTHER STATE ECONOMIC FACTORS

Table 5.8: Summary of Direct Effects of State Policies and Safety Net Components on Odds of Ever Having Experienced 2 or more ACEs in the 2011-2012 National Survey of Children's Health (N=76,342)

	Model 1	Model 2	Model 3	Model 4	Model 5
Maximum TANF Benefit					
Q1 (lowest benefits)	1.31***	1.22**	1.02	1.01	1.03
Q2	1.15*	1.13	1.04	1.03	1.04
Q3	1.15*	1.14	1.06	1.05	1.04
Q4 (highest benefits)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Public Welfare Spending					
Q1 (lowest spending)	0.97	0.96	0.95	0.92	0.95
Q2	1.14	1.15*	1.05	1.03	1.06
Q3	1.04	1.03	0.96	0.95	0.97
Q4 (highest spending)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
TANF Time Limit Policy					
Strict	1.15	1.12	1.08	1.04	1.08
Standard	1.06	1.02	1.00	0.97	1.00
Lenient	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
TANF Sanction Policy					
Strict	1.11*	1.07	1.03	1.03	1.05
Lenient	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
TANF Combined Policy					
Strict	1.22*	1.18	1.08	1.05	1.09
Somewhat Strict	1.10	1.05	1.03	1.00	1.03
Somewhat Lenient	1.01	1.00	0.99	0.95	0.97
Lenient	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)

All values are odds ratios compared to reference group. Legend: * p<.05; ** p<.01; *** p<.001
Q: Quartile; TANF: Temporary Assistance to Needy Families; ref: reference group.
Model 1: Unadjusted for family or individual factors.
Model 2: Adjusted for sex, age, race / ethnicity, family immigration history, total children in family, and special needs requirements of child.
Model 3: Adjusted as Model 2 plus socioeconomic status factor score.
Model 4: Adjusted as Model 2 plus income and parental education.
Model 5: Adjusted as Model 3 plus income, parental education, and receipt of TANF.

Table 5.8 summarizes the direct effects of the five components of the state social safety net: maximum TANF monthly benefits for a family of three, per capita public welfare spending, TANF time limit policy, TANF work requirement violation (sanction) policy, and a combined TANF policy created from time limit and work requirement policies. Maximum benefit and public welfare spending are divided into quartiles, and the

odds ratios shown above are in comparison to the reference group for that variable. To keep the focus on the research questions addressed in Specific Aim 1, this table does not show the coefficients for the family and individual covariates.

Maximum TANF Benefits. The first grouping in Table 5.8 shows the results of unadjusted and adjusted models examining the direct effects of a state's maximum welfare benefit for a family of three (one adult, two children). Overall, there are significant direct effects in unadjusted models, with greater odds of two or more ACEs for children living in states with lower levels of welfare benefits. This effect is reduced when adding non-socioeconomic characteristics to models (OR 1.22, 1.06 – 1.40 for low vs. high benefit levels only) and disappear when socioeconomic covariates are added. In addition, there appears to be a dose-response effect in Model 1, with progressively increasing odds of two or more ACEs as state SES declines, though this effect disappears as covariates are added to the models. Reduced and weighted models revealed the same general pattern shown above.

Per Capita Public Welfare Spending. The second grouping in Table 5.8 shows the results of analyses examining the direct effects of a state's per capita public welfare spending in 2011. Overall, there are no significant direct effects in any model, with the exception of statistically higher odds of two or more ACEs for children living in the second lowest quartile of states compared to those living in the highest quartile in Model 2 (OR 1.15, 1.00 – 1.33), an effect not seen in unadjusted models or models that add family SES. Reduced unweighted models showed no meaningful differences from the pattern seen in Table 5.5, nor did weighted full models. However, weighted reduced models suggested a small protective effect in states that spent *less* on public welfare, but only in models adjusted for all covariates, including socioeconomic status. Specifically, compared to states that spent the most on public welfare per capita, children living in states in the second-highest spending quartile had lower odds of ACEs (OR 0.85, 0.74 – 0.98 for both models 3 and 4). In reduced weighted model 4 (in which family SES was represented using income

and parental education only), children living in lowest quartile states actually had lower odds of ACEs as well (OR .85, 0.72 – 0.99).

TANF Time Limits Policy. The third grouping in Table 5.8 shows the direct effects of state TANF time limit policy as of July 2011. Overall, there are no significant direct effects in any model, indicating that state TANF time limit policies do not appear to be related to ACEs. Reduced unweighted models showed no meaningful differences from the pattern seen in Table 5.5, nor did reduced weighted models. However, weighted full analyses showed in unadjusted models that children living in states with strict policies (TANF lifetime limits were less than 60 months) had increased odds of two or more ACEs compared to their counterparts living in states with lenient policies (OR 1.28, 1.11 – 1.48). This effect was slightly reduced when non-SES covariates were included (OR 1.26, 1.09 – 1.46) but disappeared in all models that adjusted for family SES. In the weighted, full, unadjusted model, there were also increased odds for children living in states with a standard time limit policy (60-month lifetime limit on TANF receipt; OR 1.14, 1.01 – 1.29) but this effect disappeared with the addition of family-level, non-SES covariates.

TANF Sanctions Policy. The fourth grouping in Table 5.8 shows the direct effects of state TANF time limit policy as of July 2011. Overall, children living in states with a strict sanction policy (heavy penalties for the first time their parents did not comply with work requirements) had higher odds of experiencing two or more ACEs than their counterparts living in states with more lenient policies (OR 1.11, 1.01 – 1.23). Reduced unweighted models showed no meaningful differences from the pattern seen in Table 5.5, nor did reduced weighted models. Weighted full analyses showed that children living in states with strict policies had increased odds of two or more ACEs compared to their counterparts living in states with lenient policies even when adjusted for non-SES factors (OR 1.12, 1.03 – 1.22), but that effect disappeared in all models that adjusted for family SES.

TANF Combined Policy. The fifth and final grouping in Table 5.8 shows the direct effects of the variable combining state TANF time limit and sanction policies as of July 2011. Overall, children living in states with a strict sanction policy (both heavy penalties for the first time their parents did not comply with work requirements, and shorter lifetime limits on TANF receipt) had higher odds of experiencing two or more ACEs than their counterparts living in states with more lenient policies (OR 1.22, 1.00 – 1.48). This effect disappeared when any covariate was added to models. Reduced unweighted models showed no meaningful differences from the pattern seen in Table 5.5. Unadjusted weighted full models showed some variation, with increased odds of two or more ACEs for children in strict states (OR 1.32, 1.12 – 1.55) and moderately strict states (OR 1.20, 1.06 – 1.37) compared to children in lenient states. In adjusted models, this effect remained intact only for children in strict states, but disappeared in models 3-5, which were adjusted for family SES factors. Finally, in weighted reduced models, the only significant effect was in model 4 (adjusted for non-SES factors, income, and parental education) where living in a moderately lenient state *decreased* the odds of experiencing two or more ACEs (OR 0.85, 0.73 – 1.00) but this effect was not seen in any other model, included the unadjusted one.

Chapter 6: Specific Aim 2 Results

This chapter shows the results of multivariate modeling to test the hypotheses of specific aim 2. Specific aim 2 explored the interactions of the state-level variables with family-level socioeconomic status and race/ethnicity, with the hypotheses proposing that certain characteristics and policies would affect the disparities between children of different SES levels, as well as children of different race / ethnicities. As a group, these hypotheses proposed that in states with higher socioeconomic status, the disparities would narrow; similarly, in states with more generous social safety net policies, the disparities would also narrow.

As with chapter 5, this chapter has a short overview of the results at the beginning that serves as an executive summary of the chapter's results. Then two sections explore the results in greater depth for the state-level variables state economic status (section 6.1) and state social safety net (6.3), as these variables are combinations of several related state-level variables. Finally, two sections summarize the results of modeling interactions for the three variables that make up state economic status (6.2) and the five variables that make up state social safety net (6.4).

In each section, for each state-level variable, four models were run. Three of those models examined interactions between the state-level variable and family socioeconomic status. Each of these models includes the state variable, one measure of family socioeconomic status (the SES factor score; income and parental education; or income, parental education, and TANF receipt), and a term representing interactions between those two variables. Each of those three models is also adjusted for sex, age, race / ethnicity, generational status of the household, number of children in the family, special needs status of the child. The fourth model tested for interactions between the state variable and race / ethnicity, while adjusting for the above individual and family-level covariates as well as family socioeconomic status (using the factor variable).

To focus on the core findings, the two models explored in depth in this chapter are the interaction between state-level variables and (1) family SES as measured by the factor score, and (2) race / ethnicity. These two were the models that consistently showed the best fit as measured by Bayesian Information Criterion (BIC) scores compared to models with other family-level SES measures (only income, parental education, and TANF receipt). In essence, this means that models that do not contain the factor SES variable for family SES are treated as sensitivity models. If models containing differing family-level SES measures varied in their results, those differences are mentioned in the specific section below. In addition, in each section, all four models were run using weighted single-level models and the reduced ACEs measure. When those results varied from the multi-level, unweighted, full model, those differences are also noted in the section that covers that state variable. However, when there is considerable conflict between the two core models and these sensitivity analyses, an asterisk is placed in Table 6.1.

Table 6.1: Summary of Model Results for Specific Aim 2: Interactions between State-Level Characteristics and Policies, Family Socioeconomic Status, and Race / Ethnicity on the Odds of Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342)

State Predictor	**Family SES**	**Race / Ethnicity**
State Economic Status	Yes	Yes
Percent Poor Families	No*	Yes*
Percent Families in Poverty	No	Yes*
Income Inequality	Yes	Yes
Social Safety Net	No	Yes
Maximum TANF Benefit	No*	Yes
Public Welfare Spending	No	No*
TANF Time Policy	No	Yes
TANF Sanction Policy	No	Yes
TANF Combined Policy	No	Yes

Yes: Statistically significant interaction ($p<.05$)
No: No statistically significant interaction
*: Results highly sensitive to model choice, or other issue (explained further in relevant section).

Table 6.1 shows two clear patterns. First, there were significant interactions between family SES and the state-level variables, but this only held for state-level economic characteristics, not state social safety net variables. Second, in almost every case, there was a significant interaction of state-level variables with race / ethnic category. In some cases, stratification was needed to more fully understand the direct effects—or lack of direct effects—found in chapter 5.

However, Table 6.1 does not show the substantive results of those stratifications. In general, the results suggested that increased state economic status—or more state income equality—often conferred *higher* relative odds of two or more ACEs for certain families. This is in direct conflict with the hypotheses presented in chapter 4. Similarly, there were consistent differences in the effects by race / ethnicity for all state variables, with the broad pattern being that for non-Hispanic black children, it often was *protective* to live in lower-status, more unequal states, and in states with weaker social safety nets. Again, this is in direct conflict with the hypotheses presented in chapter 4, which predicted that disparities between whites and blacks would be greater in those states. For Hispanics, in contrast, there appears to be a slight (but often statistically insignificant) disadvantage to living in poorer, less economically equal states and in states with weaker social safety nets, which supports the hypotheses in chapter 4. The sections below present the results in greater detail, and further discussion of what these results mean is given in chapter 7.

6.1 State Economic Status (Factor Score)

The interaction between state economic status and family-level socioeconomic status was statistically significant ($p<.01$), as was the interaction with race / ethnicity ($p<.001$). These results indicate that the relationship between family SES and ACEs, and between race / ethnicity and ACEs, varied across levels of state economic status. There was a broad trend toward lower odds of ACEs in higher-status states at all SES levels,

though this difference was not always statistically significant. However, low-SES children also had lower odds of experiencing two or more ACEs when they resided in low status states as well, indicating that the disparity between low-SES children and high-SES children was reduced in both low- and high-economic status states (but not in mid-low or mid-high states). For racial and ethnic minorities, there was a narrower disparity in ACEs in low- and mid-low status states; moreover, non-Hispanic blacks living in a low-status states actually had *lower* odds of experiencing two or more ACEs than non-Hispanic whites.

The relationship between family SES and odds of experiencing two or more ACEs are shown stratified by state economic status in Table 6.2 in the top four rows. (Again, as mentioned in the introduction to this chapter, these are the stratified results for the model which used the SES factor score, as it was the best-fitting of the three models examining the interaction between state economic status and family socioeconomic status: BIC = 61704.49 vs. 62448.52 for the next best model, indicating strong evidence preferring the model using the SES factor score). The bottom four rows show the relationship between state economic status and ACEs, stratified by family SES quartile.

Table 6.2: Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by Family Socioeconomic Status and State Economic Status

	State Economic Status (compare top to bottom)			
Family SES	Low	Mid-Low	Mid-High	High
Low	**9.75 (8.41 – 11.30)**	**10.42 (9.01 – 12.04)**	**11.21 (9.70 – 12.95)**	**9.96 (8.59 – 11.55)**
Mid-Low	**3.55 (3.06 – 4.11)**	**3.24 (2.81 – 3.74)**	**3.63 (3.17 – 4.16)**	**2.78 (2.42 – 3.19)**
Mid-High	**1.63 (1.39 – 1.92)**	**1.40 (1.20 – 1.64)**	**1.48 (1.27 – 1.72)**	**1.31 (1.13 – 1.53)**
High	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	State Socioeconomic Status (compare left to right)			
	Low	Mid-Low	Mid-High	High
Low	**0.86 (0.77 – 0.96)**	0.98 (0.88 – 1.10)	0.98 (0.87 – 1.11)	1.00 (ref)
Mid-Low	1.05 (0.92 – 1.20)	1.11 (0.97 – 1.27)	1.09 (0.96 – 1.25)	1.00 (ref)
Mid-High	1.03 (0.85 – 1.24)	1.02 (0.85 – 1.23)	0.95 (0.79 – 1.14)	1.00 (ref)
High	**0.83 (0.70 - 0.99)**	0.95 (0.80 – 1.13)	0.85 (0.72 – 1.00)	1.00 (ref)

Figures are odds ratios with 95% confidence intervals.
For the upper rows, boldface indicates significant at p<.05 level when compared to high (top quartile) family SES within that state quartile.
For the lower rows, boldface indicates significant at p<.05 level when compared to high (top quartile) state economic status within that family SES quartile.
Models are adjusted for sex, age, race / ethnicity, family immigration status, number of children in family, and special needs of the child.

The top rows are meant to be read from top to bottom, as they show the effects of family SES within each state economic status quartile. For example, for states in the lowest quartile of economic status, children in low-SES families have 9.75 higher odds of experiencing two or more ACEs than children in high-SES families. The overall trend is that in high economic status states, children at all socioeconomic levels tend to have lower odds of experiencing two or more ACEs compared to their peers in other states. In addition, it can be seen that in both low-status and high-status states, low-SES children have relatively lower odds of experiencing two or more ACEs than their peers in mid-low and mid-high states (9.75 and 9.96 vs. 10.42 and 11.21 when compared to high-SES children).

The bottom rows of Table 6.2 are meant to be read from left to right, as they compare the effects of state economic status within levels of family socioeconomic status. For example, low-SES children living in low-economic status states have lower odds (0.86) of experiencing two or more ACEs compared to low-SES children living in high-economic status states. From these results, it can be seen that state economic status only has a

statistically significant effect for children in the lowest- and highest-SES households. Children living in low-SES families in low-status states have lower odds of experiencing two or more ACEs compared to low-SES children in high-status states (OR 0.86, 95% CI 0.77 - 0.96). Similarly, children living in high-SES families have lower odds of ACEs when they live in low-status states, compared to high-SES children in high-status states (OR 0.83, 0.70 – 0.99).

Together, these analyses give complementary perspectives. Generally, while family SES operates somewhat differently in states with different economic statuses, the effect of economic status of the state only reaches statistical significance for the lowest- and highest-income children. And even then, it only has a statistically significant impact for those children living in the lowest state economic status quartile, *lowering* the odds of two or more ACEs compared to children of similar family SES living in high economic status states.

Table 6.3: Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by Race / Ethnicity and State Economic Status

	State Economic Status (compare top to bottom)			
Race / Ethnicity	Low	Mid-Low	Mid-High	High
Black	**0.89 (0.80 – 0.99)**	**1.15 (1.01 – 1.32)**	**1.38 (1.17 – 1.64)**	**1.29 (1.09 – 1.52)**
Hispanic	**1.15 (1.01 – 1.31)**	**1.18 (1.04 – 1.35)**	**1.65 (1.44 – 1.88)**	**1.31 (1.13 – 1.53)**
White	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	State Economic Status (compare left to right)			
	Low	Mid-Low	Mid-High	High
Black	**0.73 (0.58 – 0.92)**	0.99 (0.77 – 1.27)	1.01 (0.78 – 1.32)	1.00 (ref)
Hispanic	0.95 (0.81 – 1.13)	0.96 (0.82 – 1.13)	1.15 (0.98 – 1.36)	1.00 (ref)
White	1.00 (0.89 – 1.13)	1.07 (0.95 – 1.20)	0.97 (0.86 – 1.09)	1.00 (ref)

Figures are odds ratios with 95% confidence intervals.
For the upper rows, boldface indicates significant at p<.05 level when compared to non-Hispanic whites within that state quartile.
For the lower rows, boldface indicates significant at p<.05 level when compared to high (top quartile) state economic status for that racial / ethnic category.
Models are adjusted for sex, age, socioeconomic status, family immigration status, number of children in family, and special needs of the child.

When stratified by state economic status, the relationship between race / ethnicity and ACEs also varies (Table 6.3). Examining the top rows in the table, in low- and mid-low status states, non-Hispanic blacks and Hispanic children appear to be more similar to non-Hispanic whites in their odds of experiencing ACEs. For example, in low-status states, Hispanic children have 15% higher odds of experiencing two or more ACEs compared to non-Hispanic whites, while in high-status states they have 31% higher odds. In fact, in low-status states, non-Hispanic black children actually have 11% *lower* odds than whites of experiencing two or more ACEs – while in all other states, they have higher odds of the same outcome.

The lower rows allow for comparisons of the odds of two or more ACEs across states of different economic status for a single racial / ethnic category. There is no clear overall pattern here, though—supporting and complementing the results from the top rows—there is an advantage for non-Hispanic black children living in the lowest economic status states when compared to non-Hispanic black children living in the highest economic status states (OR 0.73, 0.58 – 0.92).

Finally, the results in this section were somewhat sensitive to modeling. In multi-level unweighted models, each of the models containing some measure of family SES had a statistically significant interaction term. However, weighted full models found no statistically significant interactions, and weighted reduced models found only state-level interactions between factor score family SES and race / ethnicity. Unweighted, reduced models did not differ from unweighted full models.

6.2 Other State Economic Factors

In the same manner as chapter 5, results for each of the three state economic factors are summarized, rather than described in the same depth as the state economic status factor variable. Overall, for each of the economic factors, there was a statistically significant

interaction between the state factor and both family SES and race / ethnicity—but that interaction did not always translate to statistically different effects in stratified models. In addition, the results were often sensitive to model choice and family SES measure, as explained at the end of this section.

Table 6.4 shows the relationship between family SES (factor variable) and ACEs, stratified by state economic characteristic, for two state economic characteristics: percent of families at or below 200% of the federal poverty level, and percent of families at or below the federal poverty level. This is in essence the bottom rows of Table 6.2, repeated for both state characteristics and placed in a single table for easier comparison. The top four rows of Table 6.2 are not reproduced, as all of the family-SES differences were statistically significant within states ($p<.001$), and examining differences within strata of family SES allows for a clearer picture of whether the state variable makes a difference.

Table 6.4: Relationship Between Family SES and Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by State Economic Factors

	Percent Families in State at or Below 200% FPL			
Family SES	High (Low State SES)	Mid-High	Mid-Low	Low (High State SES)
Low	0.89 (0.80 – 1.01)	0.97 (0.86 – 1.09)	0.98 (0.87 – 1.11)	1.00 (ref)
Mid-Low	1.05 (0.91 – 1.20)	1.04 (0.91 – 1.19)	0.99 (0.87 – 1.13)	1.00 (ref)
Mid-High	1.09 (0.90 – 1.31)	1.00 (0.83 – 1.20)	0.94 (0.79 – 1.13)	1.00 (ref)
High	0.96 (0.80 – 1.14)	0.98 (0.83 – 1.16)	1.00 (0.85 – 1.18)	1.00 (ref)
	Percent Families in State at or Below Poverty Level			
	High (Low State SES)	Mid-High	Mid-Low	Low (High State SES)
Low	0.89 (0.80 – 1.00)	1.00 (0.89 – 1.12)	1.01 (0.90 – 1.13)	1.00 (ref)
Mid-Low	1.04 (0.91 – 1.19)	1.10 (0.97 – 1.25)	1.05 (0.92 – 1.19)	1.00 (ref)
Mid-High	1.06 (0.88 – 1.28)	1.02 (0.85 – 1.22)	0.94 (0.78 – 1.12)	1.00 (ref)
High	0.91 (0.76 – 1.09)	0.99 (0.84 – 1.18)	0.97 (0.82 – 1.14)	1.00 (ref)

Figures are odds ratios with 95% confidence intervals. Boldface indicates significant at $p<.05$ level when compared to high state economic status within that socioeconomic stratum.
Models are adjusted for sex, age, race / ethnicity, family immigration status, number of children in family, and special needs of the child.

State Percentage of Poor Families and Family SES. The interaction for family SES and state percentage of poor families was significant ($p<.05$). However, as can be seen above, in no set of models stratified by family SES did this state variable have a statistically significant effect (for low-SES families in highly poor states, $p=.064$; this could be seen as borderline, though that model included 18,097 children). The significant interaction result may be an artifact of the modeling technique, in which both family SES quartile and state percentage of poor individuals were entered as continuous variables in the interaction term. This technique was chosen to avoid multiple categorical interaction terms, which in these models would total ten or more (and which risk producing a significant interaction term by chance due simply to the number of comparisons). In any case, stratification here showed that the effects of the state percentage of poor families does not vary by family SES in models that include the full array of covariates—and that, indeed, in those models there is no significant effect of the state variable at all.

State Percentage of Families in Poverty and Family SES. The interaction for family SES and state percentage of families in poverty was significant ($p<.01$). However, as can be seen above, in no set of models stratified by family SES did this state variable have a statistically significant effect (for low-SES families in highly poor states, $p=.051$; possibly borderline, though that model included 18,097 children). Stratification here showed that the effects of the state percentage of poor families do not vary by family SES in models that include the full array of covariates—and that, indeed, in those models there is no significant effect of the state variable at all.

Table 6.5: Relationship Between Family SES and Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by State Income Inequality Quartile

	State Income Inequality (compare top to bottom)			
Family SES	High	Mid-High	Mid-Low	Low
Low	**8.64 (7.46 – 10.01)**	**10.89 (9.43 – 12.59)**	**11.58 (10.00 – 13.40)**	**10.07 (8.72 – 11.64)**
Mid-Low	**3.35 (2.90 – 3.87)**	**3.54 (3.07 – 4.07)**	**3.74 (3.25 – 4.30)**	**2.69 (2.35 – 3.09)**
Mid-High	**1.54 (1.31 – 1.81)**	**1.45 (1.24 – 1.70)**	**1.56 (1.33 – 1.82)**	**1.29 (1.11 – 1.50)**
High	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	State Income Inequality (compare left to right)			
Family SES	High	Mid-High	Mid-Low	Low
Low	**0.87 (0.77 – 0.97)**	0.97 (0.87 – 1.08)	0.99 (0.89 – 1.11)	1.00 (ref)
Mid-Low	0.99 (0.87 – 1.13)	1.06 (0.93 – 1.20)	1.11 (0.98 – 1.26)	1.00 (ref)
Mid-High	0.93 (0.77 – 1.12)	0.91 (0.76 – 1.10)	0.96 (0.80 – 1.15)	1.00 (ref)
High	**0.78 (0.66 – 0.94)**	**0.79 (0.67 – 0.94)**	**0.79 (0.67 – 0.94)**	1.00 (ref)

Figures are odds ratios with 95% confidence intervals.
For the upper rows, boldface indicates significant at p<.05 level when compared to high (top quartile) family SES within that state quartile.
For the lower rows, boldface indicates significant at p<.05 level when compared to high (top quartile) state economic status within that family SES quartile.
Models are adjusted for sex, age, race / ethnicity, family immigration status, number of children in family, and special needs of the child.

State Income Inequality and Family SES. The interaction for family SES and state percentage of families in poverty was significant (p<.001). Table 6.5, above, is set up in the same way as Table 6.2—to show both comparisons within and across states. This is done for here because stratification results in changes in more than one family SES level, resulting in somewhat complex effects on disparities. From the table above, it can be seen that in stratified models, state income inequality matters most for children in the highest quartile of family socioeconomic status, where living in states with higher inequality lowers the odds of experiencing two or more ACEs by slightly more than 20% (compared to high-SES children living in the most equal states). In addition, living in a state in the most unequal quartile also decreased the odds of two or more ACEs among low-SES children when compared to their counterparts in states with the lowest inequality (OR 0.87, 0.77 – 0.97). This result expands on Table 5.6, Model 3, which found that in a non-stratified model, there was a protective effect of living in states with more income inequality on the odds of two or more ACEs. Stratified models indicate that this effect appears to be driven by reduced odds largely in high-SES children and in low-SES children in highly unequal

states. The sum total of these effects is that the disparity between low- and high-SES children is narrower in the *highly unequal states*, which is opposite to what was predicted in hypotheses under specific aim 2.

Table 6.6: Relationship Between Race / Ethnicity and Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by State Economic Factors

	Percent Families in State at or Below 200% FPL (compare left to right)			
Race / Ethnicity	High (Low State SES)	Mid-High	Mid-Low	Low (High State SES)
Black	**0.80 (0.65 – 0.98)**	1.09 (0.88 – 1.34)	1.19 (0.94 – 1.51)	1.00 (ref)
Hispanic	0.97 (0.81 – 1.15)	0.95 (0.81 – 1.12)	1.09 (0.93 – 1.29)	1.00 (ref)
White	1.07 (0.95 – 1.20)	1.01 (0.90 – 1.13)	0.95 (0.85 – 1.07)	1.00 (ref)
	Percent Families in State at or Below Poverty Level (compare left to right)			
	High (Low State SES)	Mid-High	Mid-Low	Low (High State SES)
Black	0.82 (0.66 – 1.02)	1.12 (0.89 – 1.41)	1.22 (0.95 – 1.56)	1.00 (ref)
Hispanic	0.95 (0.80 – 1.13)	0.96 (0.82 – 1.13)	1.09 (0.93 – 1.28)	1.00 (ref)
White	1.04 (0.92 – 1.17)	1.06 (0.95 – 1.19)	0.97 (0.87 – 1.09)	1.00 (ref)
	State Income Inequality (compare left to right)			
	High	Mid-High	Mid-Low	Low
Black	**0.70 (0.54 – 0.92)**	**0.71 (0.54 – 0.93)**	0.92 (0.69 – 1.22)	1.00 (ref)
Hispanic	0.88 (0.75 – 1.03)	1.00 (0.86 – 1.17)	1.10 (0.94 – 1.29)	1.00 (ref)
White	0.94 (0.84 – 1.07)	0.99 (0.88 – 1.11)	0.99 (0.88 – 1.11)	1.00 (ref)

Figures are odds ratios with 95% confidence intervals. Boldface indicates significant at p<.05 level when compared to High State Economic Status for that racial / ethnic category.
Models are adjusted for sex, age, family socioeconomic status, family immigration status, number of children in family, and special needs of the child.

State Percentage of Poor Families and Race / Ethnicity. The interaction for race / ethnicity and state percentage of poor families was significant (p<.001). However, in only one model stratified by race / ethnic category did this state variable have a statistically significant effect: non-Hispanic black children in highly poor states had *lower* odds of experiencing two or more ACEs compared to non-Hispanic black children in states with the lowest percentage of poor families (OR 0.80, 0.65 – 0.98). Because this is the only significant effect in stratified models, this indicates that the disparity between non-Hispanic black children and non-Hispanic white children narrowed in states with the highest percentages of poor families (opposite to what was predicted in the hypotheses).

State Percentage of Families in Poverty and Race / Ethnicity. The interaction for race / ethnicity and state percentage of poor families was significant (p<.001). However, in no model stratified by race / ethnic category did this state variable have a statistically significant effect, though the p-value for non-Hispanic black children in highly poor states could be seen as borderline (p=.081, with N=7,337).

State Income Inequality and Race / Ethnicity. The interaction for family SES and race / ethnicity was significant (p<.001). When stratified by race and ethnicity, it can be seen that income inequality has a statistically significant effect for non-Hispanic black children, but not for non-Hispanic white or Hispanic children. Specifically, non-Hispanic black children living in states with higher inequality had lower odds experiencing two or more ACEs by almost 30% compared to their peers in the lowest-inequality states. Again, because the odds of no other racial / ethnic category was affected by stratification, this means that the disparity between non-Hispanic black and non-Hispanic white children was reduced in states with high or moderately high income inequality—the opposite of the predicted effect.

Sensitivity Analyses. In all cases, reduced unweighted models that tested for interactions produced the same results as full unweighted models. However, for percent poor families and percent families in poverty, weighted models—both full and reduced—found no statistically significant interactions with the state variable and either family SES or race / ethnicity. It should be noted that this result actually agrees with the results of the stratified analyses with unweighted full models shown in the tables above, which found no statistically significant differences in the effects of these state-level variables. The only exception was that in reduced weighted models for percent families in poverty, family SES interactions remained significant (p=.045).

In contrast, weighted full models for income inequality showed consistent interactions between state-level income inequality, family SES, income, and race/ethnicity, but not for TANF receipt. Reduced weighted models showed only interactions for family

SES and income (but not for TANF receipt or race / ethnicity). In other words, sensitivity analyses for income inequality fully support the results presented in the tables above.

6.3 State Social Safety Net (Factor Score)

The interaction between state social safety net (the factor score including five state-level elements) and family-level socioeconomic status was statistically significant ($p<.05$), as was the interaction with race / ethnicity ($p<.001$). These results indicate that the relationship between family SES and ACEs, and between race / ethnicity and ACEs, varied across state social safety net quartiles. Unlike state economic status, there was no discernable broad trend toward lower odds of ACEs in states with weaker or stronger social safety nets in models stratified by family SES. Similarly, no strong broad trend was apparent when models were stratified by race / ethnicity, though there is some indication that in most cases non-Hispanic black and Hispanic children had higher odds of two or more ACEs than their white counterparts—with one notable exception.

The relationship between family SES and odds of experiencing two or more ACEs are shown stratified by state social safety net in Table 6.7 in the top four rows. The bottom four rows show the relationship between state social safety net and ACEs, stratified by family SES quartile.

Table 6.7: Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by Family Socioeconomic Status and State Social Safety Net

	State Social Safety Net (compare top to bottom)			
Family SES	Weak	Somewhat Weak	Somewhat Strong	Strong
Low	**9.93 (8.57 – 11.49)**	**9.96 (8.62 – 11.51)**	**10.78 (9.33 – 12.45)**	**10.26 (8.84 – 11.90)**
Mid-Low	**3.47 (3.00 – 4.01)**	**3.10 (2.70 – 3.56)**	**3.40 (2.96 – 3.90)**	**3.16 (2.74 – 3.64)**
Mid-High	**1.56 (1.33 – 1.83)**	**1.46 (1.26 – 1.70)**	**1.31 (1.12 – 1.53)**	**1.47 (1.25 – 1.71)**
High	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	State Social Safety Net (compare left to right)			
	Weak	Somewhat Weak	Somewhat Strong	Strong
Low	0.96 (0.85 – 1.07)	1.06 (0.95 – 1.20)	1.00 (0.89 – 1.12)	1.00 (ref)
Mid-Low	1.05 (0.92 – 1.20)	1.04 (0.91 – 1.19)	1.01 (0.89 – 1.16)	1.00 (ref)
Mid-High	1.01 (0.84 – 1.21)	1.05 (0.88 – 1.25)	0.84 (0.71 – 1.01)	1.00 (ref)
High	0.99 (0.83 – 1.18)	1.08 (0.91 – 1.28)	0.96 (0.81 – 1.14)	1.00 (ref)

Figures are odds ratios with 95% confidence intervals.
For the upper rows, boldface indicates significant at p<.05 level when compared to high (top quartile) family SES within that state quartile.
For the lower rows, boldface indicates significant at p<.05 level when compared to strong (top quartile) state social safety net within that family SES quartile.
Models are adjusted for sex, age, race / ethnicity, family immigration status, number of children in family, and special needs of the child.

In general, there is no discernable pattern in Table 6.7, other than the previously known relationship between higher family SES and lower odds of two or more ACEs. This relationship is consistent across states with all types of social safety nets; this is confirmed by the lack of significant effects in the bottom four rows of Table 6.7. For no level of family SES does state social safety net make a statistically significant difference to the odds of two or more ACEs.

Table 6.8: Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by Race / Ethnicity and State Social Safety Net

	State Social Safety Net (compare top to bottom)			
Race / Ethnicity	Weak	Somewhat Weak	Somewhat Strong	Strong
Black	**0.84 (0.76 – 0.94)**	**1.23 (1.07 – 1.43)**	1.13 (0.98 – 1.31)	**1.53 (1.28 – 1.83)**
Hispanic	**1.17 (1.02 – 1.33)**	**1.50 (1.32 – 1.70)**	**1.31 (1.15 – 1.51)**	**1.25 (1.08 – 1.45)**
White	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
	State Social Safety Net (compare left to right)			
	Weak	Somewhat Weak	Somewhat Strong	Strong
Black	**0.64 (0.51 – 0.81)**	0.83 (0.64 – 1.07)	0.78 (0.60 – 1.01)	1.00 (ref)
Hispanic	1.05 (0.89 – 1.23)	**1.21 (1.03 – 1.42)**	1.07 (0.90 – 1.26)	1.00 (ref)
White	1.09 (0.97 – 1.22)	1.06 (0.94 – 1.19)	0.98 (0.87 – 1.10)	1.00 (ref)

Figures are odds ratios with 95% confidence intervals.
For the upper rows, boldface indicates significant at p<.05 level when compared to non-Hispanic whites within that state quartile.
For the lower rows, boldface indicates significant at p<.05 level when compared to high (top quartile) state economic status for that racial / ethnic category.
Models are adjusted for sex, age, socioeconomic status, family immigration status, number of children in family, and special needs of the child.

When stratified by state social safety net, the relationship between race / ethnicity and ACEs also varied, as predicted by the significant interaction term (Table 6.8). When compared to non-Hispanic white children, the odds of experiencing two or more ACEs for non-Hispanic black and Hispanic children are generally higher than for non-Hispanic white children, though this relationship is not wholly consistent. For example, in states with weak social safety nets, non-Hispanic black children have *lower* odds of ACEs compared to non-Hispanic white children (OR 0.84, 0.76 – 0.94) but Hispanic children have higher odds (OR 1.17, 1.02 – 1.33). In states with somewhat weak safety nets, though, the relationship for non-Hispanic black children reverses direction, as they have *higher* odds in those states (OR 1.23, 1.07 – 1.43) while Hispanic children continue to have higher odds (OR 1.50, 1.32 – 1.70). In states with somewhat strong and strong safety nets, there appears to be a consistent disparity between racial and ethnic minorities and white children, though that did not always reach statistical significance.

However, if one examines the effect of social safety net within groups of the same racial or ethnic group, there are three separate trends. For non-Hispanic black children, living in states with weaker social safety nets appears to lower the odds of two or more

ACEs, with this relationship reaching statistical significance for children living in states with the weakest social safety net compared to non-Hispanic black children living in states with the strongest social safety nets (OR 0.64, 0.51 – 0.81). On the other hand, for Hispanic children, the broad trend appears to be that with weaker social safety nets comes increasing odds of experiencing two or more ACEs, with this reaching statistical significance for Hispanics in states with somewhat weak safety nets (OR 1.21, 1.03 – 1.42). Finally, for non-Hispanic white children, there was no discernible pattern.

Sensitivity analyses were remarkably consistent: in all models—reduced unweighted, full weighted, and reduced weighted—only the interaction between race/ethnicity and social safety net remained significant. In none of these models did the interaction between any measure of family SES and state social safety net remain significant.

6.4 Other Social Safety Net Variables

Results for each of the five social safety net factors are summarized in this section, rather than described in the same depth as the overall social safety net variable (in a similar manner as section 6.2, above). However, in models incorporating each social safety net / policy variable and an interaction term (state variable and family SES) there was practically no model that contained a statistically significant interaction term. Therefore, stratified models are not shown in a separate table; details about those models are discussed briefly below.

In contrast, there was a consistent interaction with race / ethnicity for all state-level social safety net variables (except per capita public welfare spending, though that result was not consistent in sensitivity modeling). In general, this analysis found social safety net variables to have no effect for non-Hispanic white or Hispanic children—but for non-Hispanic black children, living in states with weaker social safety nets generally resulted

in *lower* odds of experiencing two or more ACEs. In contrast to other sections, most of these results were not sensitive to model choice, with the exception of public welfare spending.

State Maximum Welfare Benefit and Family SES. The interaction for family SES and maximum welfare benefit for a family of three was not significant (p=.62). However, in stratified models, there were two areas where odds ratios rose to statistical significance: for low-middle SES children, the odds of experiencing two or more ACEs increased in states with low (OR 1.14, 1.01 – 1.29) or mid-high (OR 1.22, 1.08 – 1.38) welfare benefits compared to low-middle SES children in high-benefit states. For no other SES group did the maximum welfare benefit in their state of residence have an effect on ACEs.

State Per Capita Public Welfare Spending and Family SES. The interaction term for family SES and public welfare spending per capita was not significant (p=.86).

State TANF Time Limit Policy and Family SES. Interactions were run for TANF policies using the continuous version of family SES, but categorical versions of TANF policies, producing several interaction terms; none were statistically significant (lowest p=.33).

State TANF Sanction Policy and Family SES. Interactions were run for TANF policies using the continuous version of family SES, but categorical versions of TANF policies, producing several interaction terms; none were statistically significant (lowest p=.063; stratified models, run to confirm this result, showed no evidence within family SES levels of any statistically significant effect of TANF sanction policies).

State TANF Combined Policy and Family SES. Interactions were run for TANF policies using the continuous version of family SES, but categorical versions of TANF policies, producing several interaction terms; only one was statistically significant (p=.042). Stratified models showed very little effect of combined TANF policy, with only a somewhat lenient policy producing reduced odds of ACEs among mid-high SES children (OR 0.81, 0.67 – 0.97) compared to mid-high children living in states with a lenient policy.

No other statistically significant increases or reductions in odds ratios were apparent in these models.

Table 6.9: Relationship Between Race / Ethnicity and Odds of Experiencing Two or More ACEs in the 2011-2012 National Survey of Children's Health (N=76,342), Stratified by State Social Safety Net Factors

	Maximum Welfare Benefit			
Race / Ethnicity	Low	Mid-Low	Mid-High	High
Black	**0.75 (0.59 – 0.96)**	0.92 (0.70 – 1.20)	0.93 (0.71 – 1.22)	1.00 (ref)
Hispanic	1.11 (0.94 – 1.31)	1.09 (0.93 – 1.28)	1.15 (0.98 – 1.36)	1.00 (ref)
White	1.07 (0.95 – 1.21)	1.04 (0.92 – 1.18)	1.04 (0.93 – 1.17)	1.00 (ref)
	Per Capita Public Welfare Spending			
	Low	Mid-Low	Mid-High	High
Black	0.83 (0.64 – 1.07)	0.89 (0.68 – 1.17)	0.81 (0.63 – 1.05)	1.00 (ref)
Hispanic	1.04 (0.89 – 1.22)	1.03 (0.87 – 1.21)	1.03 (0.86 – 1.22)	1.00 (ref)
White	0.94 (0.84 – 1.06)	1.09 (0.98 – 1.22)	0.96 (0.86 – 1.07)	1.00 (ref)
	TANF Time Limit Policy			
	Strict	Standard	Lenient	
Black	**0.72 (0.52 – 1.00)**	**0.74 (0.56 – 0.97)**	1.00 (ref)	
Hispanic	1.14 (0.95 – 1.38)	1.09 (0.94 – 1.28)	1.00 (ref)	
White	1.12 (0.98 – 1.29)	1.02 (0.91 – 1.14)	1.00 (ref)	
	TANF Sanction Policy			
	Strict	Lenient		
Black	**0.80 (0.67 – 0.96)**	1.00 (ref)		
Hispanic	1.02 (0.91 – 1.15)	1.00 (ref)		
White	1.07 (0.99 – 1.17)	1.00 (ref)		
	TANF Combined Policy			
	Strict	Somewhat Strict	Somewhat Lenient	Lenient
Black	**0.68 (0.48 – 0.97)**	**0.71 (0.54 – 0.94)**	0.82 (0.61 – 1.10)	1.00 (ref)
Hispanic	1.04 (0.83 – 1.31)	1.15 (0.98 – 1.35)	1.07 (0.89 – 1.27)	1.00 (ref)
White	1.15 (0.99 – 1.35)	1.06 (0.94 – 1.19)	0.99 (0.87 – 1.11)	1.00 (ref)

Figures are odds ratios with 95% confidence intervals. Boldface indicates significant at p<.05 level when compared to the reference group within that racial / ethnic category.
Models are adjusted for sex, age, socioeconomic status, family immigration status, number of children in family, and special needs of the child.

State Maximum Welfare Benefit and Race / Ethnicity. The interaction for race / ethnicity and maximum welfare benefit for a family of three was significant (p<.001). However, in only one model stratified by race / ethnic category did this state variable have a statistically significant effect: non-Hispanic black children in states with low benefits had *lower* odds of experiencing two or more ACEs compared to non-Hispanic black children in states with the highest benefits (OR 0.75, 0.59 – 0.96). This is part of a general trend

that for non-Hispanic black children, the odds of two or more ACEs were lower in states with lower benefits, though in the other states the relationship did not reach statistical significance. In contrast, for non-Hispanic whites and Hispanics, living in states with lower benefits generally increased the odds of two or more ACEs, though in no case did this relationship reach statistical significance.

State Per Capita Public Welfare Spending and Race / Ethnicity. The interaction for race / ethnicity and maximum welfare benefit for a family of three was not statistically significant (p=.08). In none of the models stratified by race does state public welfare spending exert an effect on the odds of experiencing two or more ACEs.

State TANF Time Limit Policy and Race / Ethnicity. Interactions were run for TANF policies using categorical versions of race / ethnicity and categorical versions of TANF policies, producing several interaction terms; at least one was statistically significant (lowest p<.001). State TANF time limit policies only appear to make a difference for non-Hispanic black children; compared to those in states with lenient TANF time limit policies, non-Hispanic black children in states with strict time limits, or standard time limits, have lower odds of two or more ACEs. This effect was not present for non-Hispanic white or Hispanic children.

State TANF Sanction Policy and Race / Ethnicity. Interactions were run for TANF policies using categorical versions of race / ethnicity and categorical versions of TANF policies, producing several interaction terms; at least one was statistically significant (lowest p<.001). State TANF sanction policies only appear to make a difference for non-Hispanic black children; compared to those in states with lenient TANF time limit policies, non-Hispanic black children in states with strict sanction policies have lower odds of two or more ACEs than non-Hispanic black children in states with lenient sanction policies. This effect was not present for non-Hispanic white or Hispanic children.

State TANF Combined Policy and Race / Ethnicity. Interactions were run for TANF policies using categorical versions of race / ethnicity and categorical versions of TANF

policies, producing several interaction terms; at least one was statistically significant (lowest p<.001).

As expected based on time limit and sanction policies, state combined TANF policies only appear to make a difference for non-Hispanic black children; compared to those in states with lenient combined policies, non-Hispanic black children in states with strict (OR 0.68, 0.48 – 0.97) or moderately strict (OR 0.71, 0.54 – 0.94) policies have lower odds of two or more ACEs than non-Hispanic black children in states with lenient sanction policies. This effect was not present for non-Hispanic white or Hispanic children.

Sensitivity Analyses. For the most part, sensitivity analyses supported the results seen in the tables above. The only exception of note was for per capita public welfare spending, in which all other models other than those shown in the tables above found a significant interaction between per-capita public welfare spending and race / ethnic category. To examine this interaction, stratified weighted models were run for public welfare spending (using the full ACEs measure). In these models, for non-Hispanic white children, living in a state in the second-lowest quartile of public spending resulted in increased odds of two or more ACEs (OR 1.17, 1.01 – 1.36). Hispanic children showed nearly the same pattern (OR 1.31, 1.00 – 1.72; p=.054). For non-Hispanic black children, however, living in states with lower public welfare spending consistently resulted in lower odds of ACEs compared to living in states with the highest spending (ORs ranged from 0.66 to 0.62, all significant at p<.05). These results are consistent with the findings from models using the other four state-level variables above. No other consistent pattern that challenged the results presented in the tables above was seen in sensitivity models.

Chapter 7: Discussion / Limitations / Conclusions

This chapter contains four major sections: first, a review of the hypotheses that were being tested, along with a discussion of to what extent they were confirmed or not confirmed. Second, the results are compared and contrasted to the relatively small amount of past research on this topic. Third, the strengths and limitations of this analysis are listed. The fourth and final section concludes with brief overall observations and suggestions for further research.

7.1 Specific Aims and Hypotheses

7.1.1 Hypotheses Related to Specific Aim 1: Direct Effects of State Characteristics and Policies

Specific aim 1 explored the potential direct effects of state characteristics and policies on ACEs. These effects were formulated as five separate hypotheses that incorporated predictions of the direction of those effects based on elements of existing theories—the Family Stress Model, Reserve Capacity Model, and frameworks suggested by House (Conger & Conger, 2002; L. Gallo et al., 2009; House, 2002). Each of those five hypotheses, and to what extent it was confirmed or not confirmed based on the results in chapter 5, is shown below.

Hypothesis 1.1: Lower state socioeconomic status will be associated with higher odds of ACEs. PARTIALLY CONFIRMED.

This hypothesis suggested that living in an area of higher socioeconomic status (SES) would result, through a variety of mechanisms that were not directly tested in the analyses presented in this dissertation, in children experiencing lower odds of ACEs. Results from three separate models were relevant to this hypothesis: the relationship

between ACEs and state economic status (the factor variable), state percentage of poor families, and state percentage of families in poverty. Each of these serves as an area-level indicator of socioeconomic status, and in unadjusted models, lower state socioeconomic status was associated with increased odds of ACEs. For each of these three measures of state socioeconomic status, there was an effect in unadjusted models, and this relationship persisted when individual and family-level covariates that were not explicitly socioeconomic measures were added to the models, though the relationship was often reduced in magnitude. However, when a variety of family-level socioeconomic factors were added to the models, the direct effects of state socioeconomic status disappeared. While this analyses did not directly test the *reason* for this, it is possible that any effects of state SES are mediated by family-level socioeconomic status, or that family-level SES confounds the relationship between area-level SES measures and ACEs. Given that the direct effects were reduced, then eliminated entirely, by the addition of covariates, this hypothesis is considered "partially confirmed."

Hypothesis 1.2: Higher state income inequality will be associated with higher odds of ACEs. NOT CONFIRMED.

This hypothesis suggested that living in an area of higher income inequality would result in children experiencing higher odds of ACEs. Results from models examining the relationship between state-level Gini coefficient and odds of two or more ACEs were relevant to this hypothesis. In unadjusted models, and in most models adjusting for non-socioeconomic covariates, no relationship between these two variables was seen.

However, once family-level socioeconomic factors are taken into account, the relationship shifted somewhat—and in an unexpected direction. In some models, children living in states with the highest level of inequality were actually *less* likely (about 10% less) to report two or more ACEs than their counterparts in states with the lowest levels of income inequality. Possible reasons for this result are explored in more detail below—

including the sensitivity of these conclusions to modeling, particularly using survey weights—but given that the unadjusted results found no effects, and that some adjusted models found the opposite effect as predicted, this hypothesis is considered "not confirmed."

Hypothesis 1.3: Higher state per capita spending on public welfare will be associated with lower odds of ACEs. NOT CONFIRMED.

This hypothesis suggested that living in states that spent more on public welfare programs (broadly defined) per capita would result in children experiencing lower odds of ACEs. Results indicated that in most unadjusted and adjusted models, no relationship between these two variables was seen. Given that most of the models found no direct effects, and no pattern was seen even among the non-significant findings, this hypothesis is considered "not confirmed."

Hypothesis 1.4: Lower state maximum welfare benefits will be associated with higher odds of ACEs. PARTIALLY CONFIRMED.

This hypothesis suggested that living in states that had lower welfare benefits would result in children in those states experiencing higher odds of ACEs. Results in unadjusted models supported this hypothesis, with children who lived in states with the lowest benefits having a 31% increase in odds of experiencing two or more ACEs. In addition, children living in states with the second- and third-lowest benefits also had increased odds of two or more ACEs (15% for both). However, the direct effects of this state-level variable were mitigated when adding non-SES individual characteristics and adding individual SES covariates caused the relationship between this state-level policy and individual ACEs to disappear. As with the economic status variables above, it is entirely possible that individual SES mediates or confounds the direct effects found in unadjusted and partially adjusted models. Given that some models showed direct effects, but the effects were

reduced and then eliminated in adjusted models, this hypothesis is considered "partially confirmed."

Hypothesis 1.5: Relatively stricter state TANF policies will be associated with higher odds of ACEs. PARTIALLY CONFIRMED.

This hypothesis suggested that living in states with relatively stricter TANF policies (defined here in three ways: shorter lifetime time limits, harsher penalties for not meeting program work requirements, and a combination of the two) would result in children experiencing higher odds of ACEs. Examining the results across adjusted and unadjusted models using all three variables intended to measure these state-level policies, there is some evidence of a relationship in unadjusted models, and a broad pattern across all models, though this pattern did not rise to statistical significance (even with the large sample examined in this analysis). Given that only unadjusted models found direct effects, and that there appears to be something of a consistent (though statistically non-significant) pattern in the policy measures, this hypothesis is considered "partially confirmed."

Finally, though a specific hypothesis was not formulated for the overall social safety net variable, it should be noted that based on existing theory, and consistent with the other hypotheses, a stronger social safety net would be expected to lower the odds of two or more ACEs for children living in those states. By the standards applied above, this hypothesis was not confirmed, or at best weakly confirmed, by the results shown in chapter 5. In unadjusted models, children in states with the weakest social safety nets did have higher odds of experiencing two or more ACEs than children in states with the strongest social safety nets, and there was a gentle (though statistically insignificant) dose-response pattern, with increasingly stronger safety nets indicating showing lower relative odds of ACEs. However, adding any covariates eliminated this pattern, suggesting that the relationship is either spurious or mediated by individual factors.

7.1.2 Hypotheses Related to Specific Aim 2: Moderation of Socioeconomic Status and Race / Ethnicity by State Characteristics and Policies

Specific aim 2 examined whether state-level economic characteristics and public policies moderated the relationship between family socioeconomic status and ACEs. Specifically, there were 12 separate hypotheses under this specific aim, each of which is described as confirmed, partially confirmed, or not confirmed below. The first six involve the interaction between state-level variables and family socioeconomic status (SES) of the child, and the second set of six describe interactions between state-level variables and race / ethnicity of the child.

Hypothesis 2.1: Children living in lower-socioeconomic status (SES) families will have greater odds of ACEs than children living in higher-SES families. CONFIRMED.

In all multivariate models run for this dissertation, a child's family socioeconomic status was related to the odds of that child experiencing two or more ACEs, even when state- and other individual-level variables were included in those models. This relationship was always inverse—that is, as socioeconomic status increased, the odds of two or more ACEs decreased. It also had a dose-response character—that is, with each step increase in socioeconomic status, the odds decreased. This relationship held for both the factor variable for socioeconomic status and income (though in models with income, parental education did not have a relationship to ACEs). This confirms past research with this dataset, which also found a similar relationship between income and ACEs (Slopen et al., 2016). This disparity forms the basis for the next five hypotheses, in that hypotheses 2.2 – 2.6 examine the effects of state characteristics on that disparity.

Hypothesis 2.2: In lower-SES states, the disparity between lower SES and higher SES children will be greater than in higher SES states. NOT CONFIRMED.

In multivariate models, there was an interaction between state economic status and family SES. However, in contrast to expectations, the disparity between lower and higher SES children was actually *lower* in lower-SES states than in higher-SES states. This can be seen most clearly in the factor variable, with both low-SES children and high-SES children enjoying reduced odds of two or more ACEs in comparison to children in high-SES states. Hence, the disparities between children of different family SES levels in low-SES states is less pronounced than in higher SES states. It should be noted, though, this difference did not reach statistical significance in models examining percent of poor families in the state or percent of families in poverty in isolation as indicators of state SES.

Hypothesis 2.3: In states with higher income inequality, the disparity between lower SES and higher SES children will be greater than in states with lower income inequality. NOT CONFIRMED.

There was a significant interaction between state income inequality and family SES; however, the direction again was opposite to what was predicted in this hypothesis. For high-SES children and the low SES children, odds of two or more ACEs actually *decreased* in high-inequality states. This combination actually led to the disparity between the highest- and lowest-SES children to be the *smallest* in the most highly unequal states.

Hypothesis 2.4: In states that spend less on public welfare, the disparity between lower SES and higher SES children will be greater than in states that spend more on public welfare. NOT CONFIRMED.

There was not a significant interaction between state per capita spending on public welfare and family SES, indicating that family SES disparities did not vary across levels of spending.

Hypothesis 2.5: In states that have lower maximum TANF benefits, the disparity between lower SES and higher SES children will be greater than in states that have higher TANF benefits. NOT CONFIRMED.

There was not a significant interaction between state maximum welfare benefits and family SES, indicating that family SES disparities did not vary across levels of spending.

Hypothesis 2.6: In states with stricter TANF policies, the disparity between lower SES and higher SES children will be greater than in states that have more lenient welfare policies. NOT CONFIRMED.

Each of the individual TANF policies showed no significant interactions with family SES, indicating that disparities did not vary across levels of those policies. The conclusion was the same using the factor variable ("social safety net") created from the five state policy variables. There appeared to be a possible interaction in combined policy and family SES models, however, and in stratified models it appears that families with mid-high SES experienced lower odds of two or more ACEs, but only in somewhat lenient states compared to children in lenient states. It cannot be said that this appreciably changes the overall disparity picture between higher and lower SES children; it merely notes that the disparity between high- and mid-high children in moderately lenient states is less pronounced than the disparity between those two groups in lenient states.

Hypothesis 2.7: Black and Hispanic (minority) children will have greater odds of ACEs than white children. CONFIRMED.

As with family socioeconomic status, across all models race and ethnicity were associated with ACEs. Specifically, minority children (non-Hispanic black and Hispanic) had increased odds of two or more ACEs in every multivariate model, regardless of covariates. This confirms earlier research on this topic with this dataset (Slopen et al.,

2016), though in earlier research immigration history of the family also played a key role, with minority children of families that were not recent immigrants facing higher odds of experiencing ACEs than their immigrant counterparts.

Hypothesis 2.8: In lower-SES states, the disparity between minority and white children will be greater than in higher SES states. NOT CONFIRMED.

In all cases, the disparity between minority children and white children appeared to be lower in lower-status states, rather than higher. In fact, for non-Hispanic black children living in low-economic status states—as measured by the factor variable for state economic status—the odds of experiencing two or more ACEs was actually *lower* than the odds for non-Hispanic white children. This pattern was similar in models examining two of the individual components of that factor variable (percent of families at or below 200% of the FPL, and percent of families at or below poverty in the state), though the odds ratios did not reach statistical significance at the $p<.05$ level for state-level poverty. The disparity between non-Hispanic white children and Hispanic children did not differ across state-level categories.

Hypothesis 2.9: In states with higher income inequality, the disparity between minority and white children will be greater than in states with lower income inequality. NOT CONFIRMED.

As with hypothesis 2.8, this hypothesis was not only disconfirmed, but it appears that the relationship goes in the opposite direction. Specifically, the disparity between non-Hispanic black children and white children was *narrowed* in states with high or moderately high income inequality, rather than exacerbated, as was predicted in this hypothesis. The disparity between non-Hispanic white children and Hispanic children did not differ across state-level categories.

Hypothesis 2.10: In states that spend less on public welfare, the disparity between minority and white children will be greater than in states that spend more on public welfare. NOT CONFIRMED.

There was not a significant interaction between race / ethnicity and per capita public welfare spending in a state, indicating that there was no difference in disparities by this variable. However, sensitivity analyses showed that in alternative models, there was a narrowing of the disparity between non-Hispanic blacks and non-Hispanic whites in states with lower per capita spending—a conclusion consistent with the other patterns seen in these hypotheses. The disparity between non-Hispanic white children and Hispanic children did not differ across state-level categories.

Hypothesis 2.11: In states that have lower TANF benefits, the disparity between minority and white children will be greater than in states that have higher TANF benefits. NOT CONFIRMED.

As with hypothesis 2.8, this hypothesis was not only disconfirmed, but it appears that the relationship goes in the opposite direction. Specifically, the disparity between non-Hispanic black children and white children was *narrowed* in states with lower welfare benefits for a family of three, rather than exacerbated, as was predicted in this hypothesis. The disparity between non-Hispanic white children and Hispanic children did not differ across state-level categories.

Hypothesis 2.12: In states with stricter TANF policies, the disparity between minority and white children will be greater than in states that have more lenient welfare policies. NOT CONFIRMED.

Finally, as with hypothesis 2.8, this hypothesis was disconfirmed and the relationship once again goes in the opposite direction than expected. Specifically, the disparity between non-Hispanic black children and white children was *narrowed* in states

with stricter policies, rather than exacerbated, as was predicted in this hypothesis. The disparity between non-Hispanic white children and Hispanic children did not differ across state-level categories.

7.2 Interpretation / Results in Context

While there are many ways to parse the results in chapters 5 and 6, this section focuses on two broad trends that emerged from the analysis. The first is the general trend toward mostly non-significant direct effects for state-level variables in multivariate models, as well as the trend toward few or no interactions between state-level variables and family socioeconomic status. There were exceptions, but the core finding here was that many of the predicted relationships were not present, or even went slightly in the opposite direction as predicted. Put more simply, the first trend is that the vast majority of hypotheses were not supported.

The second broad trend was the consistent interaction of race / ethnicity (usually non-Hispanic black) with state-level variables of all types. This is remarkable not only for its consistency, but for its unexpected direction: in many cases, state-level qualities that would have been expected to *increase* disparities between racial / ethnic groups actually *decreased* them, at least when comparing non-Hispanic blacks to non-Hispanic whites. These two trends are discussed in greater detail below.

7.2.1 Trend One: Limited Effects of State-Level Variables

For the most part, state-level variables did not affect the odds of ACEs in this study, once individual factors were accounted for. The implications of this pattern are explored separately later on in this subsection, but first the findings for three broad state-level

areas—state economic status, state income inequality, and state social safety net / policies—are discussed in turn below.

The effect of state-level economic status—at least in unadjusted models or models adjusted for non-SES factors—followed a familiar pattern seen in much research on socioeconomic status and health-related factors (Glymour et al., 2014). Specifically, living in states of lower economic status increased the odds of ACEs, and in some cases there was a gradient, in that with each step up the state economic ladder, there came lower odds of experiencing multiple ACEs. Given the history of much neighborhood- and area-level research, which has found a consistent though modest relationship between low area-level socioeconomic status and negative health outcomes (Diez Roux et al., 2010; MacIntyre & Ellaway, 2003) the finding that there is a relationship in some models is not particularly surprising. This is the first time, however, that state economic characteristics have been used to predict individual-level ACEs. However, other studies have found that state-level economic characteristics often have difficulty predicting individual-level outcomes for children, including child maltreatment. One study found that in a sample of seven states, increased unemployment, higher food stamp usage, and lower labor force participation—all potential indicators of worsening economic status—were not associated with child maltreatment rates over time, even in unadjusted models (Millett et al., 2011). Other studies looking at state-level characteristics and children's outcomes have found somewhat conflicting effects, with no association between state poverty level and physical activity—but a positive association between state poverty level and BMI (meaning that children living in higher-poverty states tended to have higher BMIs as well, even after adjustment for individual-level factors) (McKay et al., 2007). The results of this analysis sit somewhere in between these studies, at least for state-level economic factors. Further research is needed to explore what the possible mechanisms for this relationship might be, and why the modest effects tend to diminish or disappear with the addition of individual-level covariates.

State-level income inequality presented something of a special case in these analyses, compared to the patterns seen for the overall factor variable and the other two measures of state economic status. There was no effect of income inequality in unadjusted models, but with the addition of individual covariates—particularly family-level socioeconomic status—there did appear to be a *protective* effect of living in a highly unequal state compared to the ones with the lowest levels of income inequality. This appears counterintuitive, as income inequality has largely been seen as a negative influence on health-related outcomes and in particular on stress among lower-income families (I. Kawachi & Subramanian, 2014; Kondo et al., 2009). This tendency is supported even within the limited literature on the relationship between income inequality and child maltreatment, with increased income inequality at the county level being associated with increased child maltreatment rates (Eckenrode et al., 2014). However, when examining stratified models, there may be some indication of why this is. In fact, state income inequality appears to have a protective effect mostly for high-socioeconomic status children, to a limited extent for some low-SES children, but not at all for middle-SES children. This might make sense in that higher-income children (and their families) may benefit from reduced stress (financial or otherwise) from comparisons with others—in short, rather than trying to "keep up with the Joneses", they *are* the "Joneses", and in a highly unequal state that may matter more—at least to ACEs—than in a more equal one. It also may make sense in that higher-income children living in more unequal states may live in families that are able to essentially separate themselves, physically and socially, from lower-income families. This separation can benefit those higher-income families while actively damaging lower-income families through separate schools, public services, and other mechanisms (Stiglitz, 2012). However, this explanation does not seem to account for the protective effect that high income inequality seems to provide for the lowest SES children as well. It is possible that some of the effects described above that benefit the highest-SES families—and that might inflict stress on families at other levels—do not

affect the lowest-SES families. Low-SES families might not bother to compare themselves to the higher SES families, seeing that lifestyle as well out of reach, and thus avoid the stress of those comparisons. Or the separation of higher-income families described above might not affect the lowest-SES families, as they might live in areas already burdened with poor services in schools—no matter what the overall level of income inequality in the state. If those were true, however, one would expect to see no significant variation among low-SES individuals from state to state, rather than a protective effect. It remains to be seen in future research what the mechanism behind that unexpected and potentially beneficial effect might be.

As for social safety net policies, there was only a trace of any direct effects among any of the five policies that were tested in these models, and any direct effects tended to fade quickly with the addition of individual-level covariates. Again, though no other study has yet examined the relationship between state policies and ACEs, the findings of this dissertation's analyses in light of previous related work are not surprising. One of the only studies examining the relationship between state policies and child maltreatment rates found no relationship between child maltreatment rates and several policies that could reduce poverty (minimum wage and state income rates), TANF policies (including maximum welfare benefit for a family of three), and access to health care (Klevens et al., 2015). In fact, the policies that did appear to reduce maltreatment rates were only tangentially related to economic issues or assisting explicitly low-income individuals: providing continuous eligibility for children on Medicaid or other children's health programs, and the absence of a waitlist for child care assistance. Other research has found that less stringent state TANF policies have resulted in some positive effects on children, such as decreased chances of repeating a grade, but was unrelated to other measures such as parenting stress reduction and overall child well-being (Wang, 2015). In general, the scant literature in this area seems to indicate that policies that support or strengthen the social safety net might have a measurable effect in reducing child maltreatment rates, but

the evidence appears mostly mixed. This is consistent with what was found in this study: there are hints that state-level policies might impact ACEs, but their effects tend to dissipate quickly in multivariate models. It is entirely possible that family stress is a conduit through which state-level policies might impact ACEs, but there may be numerous other factors that impact family stress—some of which are more immediate and telling for many families, such as neighborhood quality, employment issues, or other stressors. These factors may well outweigh the overall influence of state policies on family stress, and therefore ACEs.

Finally, as noted at the beginning of this section, one overarching pattern was the tendency for direct effects of state variables to be present in unadjusted models, but for those effects to disappear upon adding family- and individual-level covariates. In fact, of the ten separate model sets, seven found direct effects in unadjusted models, five "survived" the addition of non-SES covariates, but only one had direct effects in fully adjusted models (and even those effects were sensitive to model choice). It is not clear from statistical modeling *why* this progressive loss of significance occurred; it could be that individual-level factors serve as confounders, or they may in fact be on a causal pathway between state-level variables and ACEs. This point has been made by some of the most experienced neighborhood researchers: "to the extent that neighborhood processes affect individual health *via* individual socioeconomic achievement, then controlling for individual socioeconomic status in multilevel models will adjust away the variation of interest" (Kawachi & Berkman, 2003, 9). Insofar as the state-level variables used in this study might work through family- or individual-level factors—particularly family socioeconomic status—to influence ACEs, it is possible that controlling for those factors would be including mediators rather than confounders. If those family- and individual-level factors are thought of as confounders, then it can be assumed that controlling for them is appropriate in investigating whether the direct effects of state variables are "real" rather than artifacts of confounding. However, if those state-level variables are theorized to work

through some of the individual-level factors, then those individual-level factors would be better thought of as mediators, and treated as such. This study does not directly address that issue, leaving it for future analyses. The overall point, however, is that the progressive loss of significant direct effects may represent the addition of confounders *or* the addition of mediators.

7.2.2 Trend Two: The Greater Effects of State Variables on Black Children

The second trend that emerged in these analyses was the consistent interaction, across many models and types, of state-level variables and race / ethnicity. More specifically, for most state-level economic policies and characteristics, while there was often little direct effect overall, in models stratified by race, there were effects for non-Hispanic blacks. Surprisingly, these effects were often in the opposite direction than theory would suggest, with non-Hispanic black children in poorer states, more unequal states, and states with generally weaker social safety nets experiencing *lower* odds of two or more ACEs than their counterparts in other states. As with the trend above, there is little existing research to compare these findings to, but there are several potential explanations.

It could simply be that non-Hispanic black parents in certain states are less likely to admit in a survey that their children have experienced some of these adversities. Some studies have found non-Hispanic blacks are less likely to report some types of ACEs (Lee & Chen, 2017) and adult non-Hispanic female blacks were significantly less likely to report having experienced four or more ACEs in their lifetime that women of other races / ethnicities (Liu et al., 2013), though this conflicts with other research that has found greater reporting of ACEs among non-Hispanic blacks (Gilbert et al., 2015). In the United States, it is also well-documented that there is a disparity between confirmed maltreatment reports, with the rate twice as high among non-Hispanic blacks (20% have a report before the age of 18) than that of non-Hispanic whites (10%) (Wildeman et al., 2014). It is entirely

possible that non-Hispanic black parents in certain states, especially those with higher levels of disparities, could fear reporting certain ACEs, based on the assumption that they will somehow be reported to child protective services (even though the ACEs on the NSCH did not include abuse or neglect). It is unclear why such state-level characteristics would be related to answering ACEs questions fully; perhaps states with stricter TANF laws, or lower benefits, also have stricter child welfare systems that some non-Hispanic black parents perceive as more threatening.

Another explanation is that there may be differences in social capital or social support among non-Hispanic blacks that in states with lower socioeconomic status, more inequality, and weaker social safety nets. Social capital has been seen as either "bonding" (where people of similar backgrounds offer support or assistance to each other) or "bridging" (where people of differing backgrounds interact and offer support or assistance), with each type bringing with it benefits and potential drawbacks (Kawachi & Berkman, 2014). In fact, bonding within groups of lower socioeconomic status or racial minority status—particularly non-Hispanic blacks—has been offered as an explanation for why some groups seem to have strong social support yet do not seem to have the corresponding health or other benefits (Stack, 1974). It is possible that, within these states, there is a type of social capital or social support among groups of non-Hispanic blacks that is uniquely positioned to reduce ACEs among their children. The same bonding social capital that tends to keep non-Hispanic black adults from fully benefiting (from a health or upward mobility perspective) might well help non-Hispanic black children avoid multiple ACEs, at least compared to their peers in other states. This support could have something to do with differences in involvement in churches in states with lower economic status or stricter safety net policies as well, as church involvement among non-Hispanic blacks in the United States is associated with increased informal social support (Taylor, 2017). Alternatively, others have offered up the possibility that more generous welfare policies tend to "crowd out" the benefits of social support or social capital by replacing them with

explicit government services (McKnight, 1995). In this line of thinking, it would be expected that if ACEs are lowered through increased social support within states or communities, then anything that potentially reduced social support—such as a more development welfare state—would be expected to increase ACEs. This may serve as a possible explanation for the results seen above, though it is unclear why it would only be present for non-Hispanic blacks; in addition, McKnight's ideas appear to be contradicted by other evidence which has found stronger social support and cohesion in countries with stronger welfare systems (Kawachi & Berkman, 2014).

Another, broader explanation is that within certain states, non-Hispanic black families could be systematically experiencing less stress than their counterparts in states with higher economic status, more income equality, or stronger social safety nets. As one source of stress for non-Hispanic black families could be systematic discrimination, it might be that in those states, non-Hispanic black families experience less discrimination. However, this does not seem likely, given that seven of the of the states in the highest quartile of income inequality (for example) are in the South and have histories of systematic discrimination against non-white minorities, particularly African-Americans (Alabama, Florida, Georgia, Louisiana, Mississippi, Tennessee, and Texas). It is also possible that non-Hispanic black families in lower-status states avoid the "John Henryism" phenomenon, where members of low-status groups (particularly non-Hispanic blacks) who strive to achieve upward social and economic status encounter greater stress and health problems than those who do not (James, 1994). However, it is not apparent here whether families within these states actually experienced more or less stress relative to their counterparts in other states, and from where that stress might have originated. To answer the broader question of whether non-Hispanic black families in different states experienced differing levels of stress—and whether that stress translates into additional ACEs—more fine-grained research is needed.

7.3 LIMITATIONS

Cross-Sectional Data. A major limitation of this analysis is that it uses cross-sectional data. Hence, the relationships seen here cannot be taken to be causal, even those that confirm what has been found in previous research (such as the strong inverse relationship between family socioeconomic status and ACEs). It is altogether possible that increased adverse childhood experiences might affect the socioeconomic status of the child's family in some way, though controlling for special needs of the child in the models above is meant to at least partially address that issue. Still, the results in this study must not be taken as evidence of a causal relationship between any state-level variable and ACEs, or even any family- or individual-level variable and ACEs.

Perhaps a larger issue with using cross-sectional data in this study has to do with the state-level economic conditions and policies. Just because a state had a certain policy in place in 2011 does not mean that condition or policy was in place for the entire length of a child's life—meaning that the "snapshot" of 2011 might not accurately reflect the conditions under which that child, and that child's family, lived over the long term. This becomes a larger issue as the child ages, and if state policies saw a great deal of change over the course of the child's life (for example, if a state's economic status was good in 2011, but consistently poor in the 10 years before that, it is possible that those 10 years before 2011 mattered much more to the financial stress of the family than the single year measured in this study). Moreover, the state of residence in the National Survey of Children's Health was *current* state of residence—there is no way to know if the child had lived in that state for their entire life, or had just moved there recently. It is entirely possible that a 15-year-old child living in a low-SES state, for example, had just moved there after living his or her entire life to that point in a high-SES state. Given those limitations, however, it seems that the best approximation for the state economic and policy environment for any one child surveyed in the 2011-2012 NSCH is the current one for their

present state of residence (the technique used in this study). This technique assumes that (1) children do not move extensively, at least not between states, and (2) that the economic characteristics and policies of states did not change significantly in the years before the 2011-2012 NSCH. Both of these seem reasonable assumptions—or at least more reasonable that assuming that children move extensively, or that policies change extensively from year to year.

Defining "Economic Characteristics", "Social Safety Net" and Finding the "Right" Policies / Characteristics. There are several limitations to this analyses oriented around the state-level variables themselves. The first is that the state-level variables used in this study may not fully capture the underlying concepts of "state economic characteristics" or "social safety net." For example, while percentage of families living under 200% of the federal poverty level has been used as an area-level measure of state socioeconomic status (McKay et al., 2007), that is not necessarily the most accurate measure of a state's economic condition. Other options might include unemployment rates, business start-ups, or any number of other additional factors; future research might include those in a more sophisticated factor variable to better evaluate the economic status of a state. This issue is perhaps even more salient when trying to define a state's social safety net (even if one attempts to keep that definition narrowly confined to economic safety net). Though the term "social safety net" is often used in public discourse, there does not appear to be a single broadly accepted definition of what it actually means, and what programs should be included, particularly on a state-by-state level—though some have attempted to define it on a national level (Bitler, Hoynes, & Kuka, 2017). The programs, spending totals, and policies used in this analyses are only one of a number of definitions that could be used. That said, the factor variable "social safety net" was created in these analyses to attempt to measure a single latent variable that appeared to be linked to all five state-level policy variables.

Finally, it should also be noted that because a policy is in place ("on the books") does not mean that policy is implemented equally or effectively across all parts of the state. It is entirely possible that even in states with relatively high welfare benefits, for example, that some families are unaware that they might be entitled to those benefits. States with strict work requirements may or may not have the ability to adequately enforce those requirements. This analysis did not attempt to discern the extent to which states implemented or enforced TANF policies,

Missing Data. As can be seen in Table 4.3, there are considerable differences between the analytic sample and the deleted cases in this analysis. Broadly speaking, children with any missing data on the variables of interest in this dissertation—and who were dropped from the analysis—tended to be worse off than those who were included. They had more ACEs on average, and a much higher percentage of them had two or more ACEs (40% vs. 18%). They were also more likely to be poorer, black or Hispanic, from recently immigrated families, and have parents with lower education levels. This is potentially a significant limitation of this analysis, as this is exactly the population that might be expected to be more affected by state policies intended to help poorer families. Excluding them from this analysis may well have contributed to the general findings in multivariate models that state policies had little effect on ACEs. Future analyses with this dataset may benefit from techniques such as multiple imputation so this group can be re-integrated into the analysis. It should be noted, however, that previous research with this dataset found little difference in results between analyses using multiple imputation and casewise deletion (Slopen et al., 2016).

Weighted vs. Unweighted Data. A similar issue arises when examining the use of survey weights in these analyses. As can be seen in Table 5.1, weighted totals on many variables of interest are different from unweighted totals—and again, without weights, the analytic sample appears higher income, with fewer minority and immigrant children, than a weighted sample. This difference might account for some of the differences seen in the

unweighted multivariate models vs. the weighted models. Though overall the differences between weighted models and unweighted models was not large, there was no consistent effect of weighting the data—in some cases, it strengthened the relationships, while in others it weakened it (or, as in the case of state income inequality, actually produced a conflicting result with the unweighted models). However, it would be expected, if the weighting makes the sample "appear" poorer and with a higher percentage of minority children, that weighted models would find greater effects in particular of state social safety net policies, though that did not seem to be the case. When combined with the potential direction of the missing data, there is some reasonable concern that using unweighted models might work in that same direction, making the analytic sample look both higher income and less ethnicity diverse than the United States actually is. However, it must also be noted that because there was only a single weight provided in the NSCH, and that weight incorporated both design issues and was meant to make the sample representative (used raking techniques), it is not possible to do weighted, multi-level analyses with this dataset—or, at least, it is not within the skill set of the author of this dissertation. As a result, the weighted and unweighted models give different perspectives on what might be happening: the weighted models might be more representative, but the multi-level (unweighted) models account for potential clustering in ACEs by state (all multi-level models were, in fact, equal to or superior in model fit than single-level models using the same data; results not shown above).

Defining and Measuring ACEs. To return briefly to defining ACEs: it should be mentioned that some research in recent years has focused on changing or expanding the definition of ACEs, especially for children in low-income or urban settings (Finkelhor et al., 2013). The proponents of such a change argue that the "original" ACEs were developed in a mostly white, mostly middle- to high-income population, and that they do not really adequately measure the concept that they were supposed to—the full set of serious negative experiences that a child might encounter. For example, difficulty surviving on the family's

income during childhood was *not* considered an ACE in Felitti and Anda's original ACE Study, though it was included in the 2011-2012 NSCH; similarly, witnessing neighborhood violence as a child was not included in the ACE Study, but it was on the NSCH. might also be shown as examples. It could be, as McLaughlin noted, that many of the children in the NSCH experienced severe deviations from the normal course of development (McLaughlin, 2016), but because those deviations were not specifically asked about—in particular, such questions as abuse and neglect—that the number of ACEs was under-estimated across the entire population of children. In that case, if the primary concern is whether children have multiple (two or more) ACEs, not including entire categories could considerably underestimate the percentage of children with two or more ACEs. For example, a child who was both physically abused and lived with a parent with sustained mental health issues would be categorized as having only one ACE in the NSCH.

Social Desirability Bias. Another issue is that the questions on the NSCH were asked of parents or guardians, not of the children themselves. Because several of the questions on the ACEs scale could be construed as indirect—or direct—questions about the quality of parenting, or the parent's ability to provide a "good" childhood, there may have been a threat of social desirability bias (Singleton & Straits, 2010). This bias refers to the tendency of some respondents to provide answers that are not wholly truthful, but instead to give answers that are in line with social expectations, or the respondent's perception of proper or expected behavior. In other words, it may be that the nine ACEs asked about in the NSCH were under-reported, as parents and guardians would not have wanted to admit (to researchers, or perhaps even to themselves) that their children were growing up in a less-than-perfect environment. The NSCH did attempt to minimize social desirability bias in several ways: limiting the topic areas (no abuse or maltreatment questions were asked) and phrasing the questions in such a way as to try to avoid implicit or explicit accusations (in particular, asking about the child's experiences rather than asking directly about the parent's behavior). However, to the author's knowledge, there

has been no specific research with the NSCH that attempts to address this potential social desirability bias. One method would be to follow up with children who were subjects of the NSCH who have since become adults to compare their recollections of their ACEs with those of their parents or guardians (such a comparison would also allow researchers to ask the more sensitive ACEs questions on abuse and neglect to the former children themselves, to examine to what extent additional ACEs existed in this population that were not asked about in the 2011-2012 NSCH). Another might be to attempt to match other datasets, particularly Child Protective Services histories, with individual children in the 2011-2012 NSCH, though this would carry with it privacy considerations.

Nonresponse Bias. As noted in Chapter 4, there are several response rates cited in the documentation accompanying the 2011-2012 NSCH. These rates vary based on the assumptions made about eligibility among households which did not answer the survey. Dividing the households into groups at each stage, and estimating response rate at each stage, resulted in a response rate of 38.2% for the landline sample, and 15.5% for the cell phone sample—with a combined rate of 23.0% (details on these calculations in the 2011-2012 NSCH were not available at the time of this writing). However, if the response rate is calculated as the proportion of households known to contain children that actually completed the survey, the response rate was 54.1% for the landline sample and 41.2% for the cell phone sample (National Center for Health Statistics, 2013). Nonresponse in surveys can result in considerable bias, for the basic reason that those who are interviewed might vary so much from the intended sample that the actual sample no longer accurately represents the intended population (Singleton & Straits, 2010). Moreover, this bias typically varies in predictable ways, with lower-income, female, racial / ethnic minorities, non-English speakers, and younger individuals often responding at lower rates (Schneider, Clark, Rakowski, & Lapane, 2012; Singleton & Straits, 2010). Depending on the method of calculation, the NSCH may have either a lower response rate than other national surveys such as the Behavioral Risk Factor Surveillance Survey (BRFSS), which was 51% in 2005,

or about the same (though there has been a larger trend toward decreased participation in national / epidemiologic studies over the past few decades) (Galea & Tracy, 2007). Documentation accompanying the 2011-2012 NSCH notes that while weights were included to adjust for nonresponse, there were some patterns in where non-responders lived: urban, more dense areas with lower overall income levels and lower percentage of non-Hispanic white persons. As noted, weights were included to try to adjust for nonresponse, though weighting does assume that non-responders are "missing completely at random"—that is, that those who responded are similar to those who did not (Schneider et al., 2012). This may or may not be an appropriate assumption, and though lower response rates do not guarantee bias, particularly low response rates can be cause for concern.

State as Masking Important Variation. Finally, must be stated clearly here that assigning a single proportion or policy to an entire state masks an enormous amount of potential variability within that state. Just because a state has 30% of its families living below 200% of the federal poverty line does *not* mean that every family lives in a neighborhood, or even a county, where 30% of the families are relatively poor. Instead, this measure was meant to give a more general sense of the average economic status of the state in the same time period as when the 2011-2012 National Survey of Children's Health was conducted. It is possible that key area-level effects on ACEs happened at a level below the state—county, census tract, or even neighborhood or city block—and those effects were not able to be measured in this analysis.

7.4 Final Thoughts and Further Research

Although a combination of theories seemed to predict that state-level economic characteristics and policies would influence which children experienced ACEs, this did not seem to clearly be the case. And although some of those same state-level elements did slightly moderate the relationship between both socioeconomic status and ACEs and race

/ ethnicity and ACEs, they often did so in unexpected ways. Some final thoughts on these results, and where to go from here, comprise the final section of this dissertation.

In the years since Felitti and Anda's initial study, childhood adversity has taken on an increasingly important role in public health. ACEs are common—again, most studies find that at least half of adults experienced at least one, even in well-off populations—and have a clear negative impact on a wide variety of health outcomes. Preventing them, and mitigating both their immediate and lifelong effects, could help reduced the incidence of a wide variety of physical and psychological diseases. In fact, recent research argues that differences in childhood adversity may account for some adult health disparities by race (Slack et al., 2017).

One way to try to prevent ACEs in the United States is to address their determinants. Although research remains in its early stages, it appears that race, ethnicity, and socioeconomic status are intimately tied to the risk of ACEs (Slopen et al., 2016). If there is a causal pathway linking these "fundamental causes" (Link & Phelan, 1995) to ACEs, addressing these causes may pay off in reduction or prevention of ACEs, and in the reduction of disparities in ACEs along the lines of socioeconomic status, race, and ethnicity. Indeed, concentrating on these fundamental causes might be more effective in preventing and reducing ACEs, because, as one author put it, "social disadvantage is like a hydra's head: interrupting any single mechanism between a fundamental cause and health is futile because it will only be replaced by another pathway" (Glymour, 2014, p 456). Some of the policies that could be seen as addressing fundamental causes—TANF policies, public welfare spending—were examined in this dissertation, as were some potential indicators of state-level economic conditions. The results, as noted above, were somewhat mixed—and perhaps underwhelming—in their effects. It is entirely possible, however, that other policies that are either explicitly meant to address disparities in income, race, or ethnicity, or that have the "side effect" of reducing those disparities, could reduce disparities in ACEs as well. Such policies might include statewide income tax restructuring

or improved employment training for socioeconomic disparities, or a re-examination of the criminal justice system or rules to discourage discrimination in schools or workplaces. Of course, there are numerous other policies that do not directly address fundamental causes that could still have powerful effects in reducing or preventing ACEs, such as parenting training programs or increased funding and reach for alcohol and addiction programs, especially for parents (Karr-Morse & Wiley, 2012). Such programs and policies may well be more politically palatable for many as they do not typically involve such far-reaching changes as tax or justice system change.

Finally, the study of how area-level characteristics and policies might impact ACEs is still largely untouched in the literature. While there are many directions this research might go, there are a few that may be particularly rewarding. First, this dissertation did not examine the effects of *changes* in policies over time on ACEs. For example, it may be worth examining the effects on families—and ACEs—of proposed changes in some states to implement TANF-style work requirements and sanction policies for programs such as the Supplementary Nutrition Assistance Program or Medicaid (Lowrey, 2017). It is possible that in the analyses in this dissertation, few families were actually affected by the TANF policies examined—but if those policies become more common across more programs that impact socioeconomic disparities, more families might be affected, and the effects may become more pronounced. Second, greater tracking of population rates of ACEs at different points in time in different states is needed. This issue is currently being addressed by the National Survey of Children's Health, as future waves of the study from 2016 on will include ACEs and be repeated yearly (the 2011-2012 NSCH was the first one to include ACEs questions). Having a repeated yearly rate of ACEs both nationally and in each state would facilitate policy study, as changes in policies could conceivably be linked with increases or decreases in child adversity over time. Finally, more research on the mechanisms that might link not only state-level variables to ACEs, but also family-level SES and race / ethnicity to ACEs is needed. Good policies depend on understanding causes

and effects, and it is clear from the relatively scant literature on ACEs that we do not yet fully understand the pathways between socioeconomic status, race, ethnicity, and ACEs. One potentially promising area, based on the results in this dissertation, could be further examining the role of family stress, social capital, and social support on ACEs—in particular, among non-Hispanic black families in the United States. Another could be focusing on economic status, school quality, amenities, or other characteristics of smaller areas, such as neighborhoods, to examine their relationship with ACEs, perhaps through affecting family stress (or other potential mechanisms). Further research in this important, but yet unexplored, area has great potential to contribute to the critical goal of reducing and preventing serious childhood adversity.

References

Acock, A. C. (2016). *A Gentle Introduction to Stata* (5th ed.). College Station: Stata Press.

Anda, R. F., Brown, D. W., Dube, S. R., Bremner, J. D., Felitti, V. J., & Giles, W. H. (2008). Adverse Childhood Experiences and Chronic Obstructive Pulmonary Disease in Adults. *American Journal of Preventive Medicine*, *34*(5), 396–403. https://doi.org/10.1016/j.amepre.2008.02.002

Anda, R. F., Butchart, A., Felitti, V. J., & Brown, D. W. (2010). Building a Framework for Global Surveillance of the Public Health Implications of Adverse Childhood Experiences. *American Journal of Preventive Medicine*, *39*(1), 93–98. https://doi.org/10.1016/j.amepre.2010.03.015

Benjet, C., Borges, G., Medina-Mora, M. E., Zambrano, J., Cruz, C., & Méndez, E. (2009). Descriptive Epidemiology of Chronic Childhood Adversity in Mexican Adolescents. *Journal of Adolescent Health*, *45*(5), 483–489. https://doi.org/10.1016/j.jadohealth.2009.03.002

Bethell, C. D., Newacheck, P., Hawes, E., & Halfon, N. (2014). Adverse childhood experiences: Assessing the impact on health and school engagement and the mitigating role of resilience. *Health Affairs*, *33*(12), 2106–2115. https://doi.org/10.1377/hlthaff.2014.0914

Bitler, M., Hoynes, H., & Kuka, E. (2017). Child Poverty, the Great Recession, and the Social Safety Net in the United States. *Journal of Policy Analysis and Management*, *36*(2), 358–389. https://doi.org/10.1002/pam.21963

Blumberg, S., Foster, E., Frasier, A., Satorius, J., Skalland, B., Nysse-Carris, K., … O'Connor, K. (2012). Design and Operation of the National Survey of Children's Health, 2007. *Vital Health Statistics*, *55*(1).

Bramlett, M. D., & Blumberg, S. J. (2007). Family structure and children's physical and mental health. *Health Affairs*, *26*(2), 549–558. https://doi.org/10.1377/hlthaff.26.2.549

Bronfenbrenner, U. (1979). *The Ecology of Human Development*. Cambridge: Harvard University Press.

Brown, D. W., Anda, R. F., Tiemeier, H., Felitti, V. J., Edwards, V. J., Croft, J. B., & Giles, W. H. (2009). Adverse Childhood Experiences and the Risk of Premature Mortality. *American Journal of Preventive Medicine*, *37*(5), 389–396. https://doi.org/10.1016/j.amepre.2009.06.021

Burke-Harris, N. (2014). How childhood trauma affects health across a lifetime. Retrieved October 28, 2016, from https://www.ted.com/talks/nadine_burke_harris_how_childhood_trauma_affects_health_across_a_lifetime?language=en

Cavanaugh, C. E., Petras, H., & Martins, S. S. (2015). Gender-specific profiles of adverse childhood experiences, past year mental and substance use disorders, and their

associations among a national sample of adults in the United States. *Social Psychiatry and Psychiatric Epidemiology*, *50*(8), 1257–1266. https://doi.org/10.1007/s00127-015-1024-3

CDC. (2017). Child Abuse and Neglect: Definitions. Retrieved May 24, 2017, from https://www.cdc.gov/violenceprevention/childmaltreatment/definitions.html

Chetty, R., Stepner, M., Abraham, S., Lin, S., Scuderi, B., Turner, N., … Cutler, D. (2016). The Association Between Income and Life Expectancy in the United States, 2001-2014. *Jama*, *315*(16), 1750–1766. https://doi.org/10.1001/jama.2016.4226

Colby, M. S., Lipson, D. J., & Turchin, S. R. (2012). Value for the money spent? Exploring the relationship between expenditures, insurance adequacy, and access to care for publicly insured children. *Maternal and Child Health Journal*, *16*(SUPPL. 1), 51–60. https://doi.org/10.1007/s10995-012-0994-y

Conger, R. D., & Conger, K. J. (2002). Resilience in Midwestern families: Selected findings from the first decade of a prospective, longitudinal study. *Journal of Marriage and Family*. https://doi.org/10.1111/j.1741-3737.2002.00361.x

Conley, D. (2015). Poverty. In *You May Ask Yourself: An Introduction to Thinking Like a Sociologist* (4th ed., pp. 370–405). New York: W.W. Norton.

Coulton, C. J., Crampton, D. S., Irwin, M., Spilsbury, J. C., & Korbin, J. E. (2007). How neighborhoods influence child maltreatment: A review of the literature and alternative pathways. *Child Abuse and Neglect*, *31*(11–12), 1117–1142. https://doi.org/10.1016/j.chiabu.2007.03.023

Cronholm, P. F., Forke, C. M., Wade, R., Bair-Merritt, M. H., Davis, M., Harkins-Schwarz, M., … Fein, J. A. (2015). Adverse Childhood Experiences: Expanding the Concept of Adversity. *American Journal of Preventive Medicine*, *49*(3), 354–361. https://doi.org/10.1016/j.amepre.2015.02.001

Currie, J., & Widom, C. S. (2010). Long-term consequences of child abuse and neglect on adult economic well-being. *Child Maltreatment*, *15*(2), 111–20. https://doi.org/10.1177/1077559509355316

Danese, A., Moffitt, T. E., Harrington, H., Milne, B. J., Polanczyk, G., Pariante, C. M., … Caspi, A. (2009). Adverse childhood experiences and adult risk factors for age-related disease: depression, inflammation, and clustering of metabolic risk markers. *Archives of Pediatrics & Adolescent Medicine*, *163*(12), 1135–43. https://doi.org/10.1001/archpediatrics.2009.214

Diez Roux, A. V, Mair, C., Roux, A. V. D., Mair, C., Diez Roux, A. V, & Mair, C. (2010). Neighborhoods and health. *Annals of the New York Academy of Sciences*, *1186*(1), 125–145. https://doi.org/10.1111/j.1749-6632.2009.05333.x

Dong, M., Giles, W. H., Felitti, V. J., Dube, S. R., Williams, J. E., Chapman, D. P., & Anda, R. F. (2004). Insights into causal pathways for ischemic heart disease: Adverse childhood experiences study. *Circulation*, *110*(13), 1761–1766. https://doi.org/10.1161/01.CIR.0000143074.54995.7F

Drake, B., & Jonson-Reid, M. (2013). Poverty and child maltreatment. In J. Korbin & R. Krugman (Eds.), *Handbook of child maltreatment (Vol 2)*. Netherlands: Springer.

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

Dube, S. R., Williamson, D. F., Thompson, T., Felitti, V. J., & Anda, R. F. (2004). Assessing the reliability of retrospective reports of adverse childhood experiences among adult HMO members attending a primary care clinic. *Child Abuse and Neglect*, *28*(7), 729–737. https://doi.org/10.1016/j.chiabu.2003.08.009

Due, P., Damsgaard, M. T., Lund, R., & Holstein, B. E. (2009). Is bullying equally harmful for rich and poor children: A study of bullying and depression from age 15 to 27. *European Journal of Public Health*, *19*(5), 464–469. https://doi.org/10.1093/eurpub/ckp099

Eckenrode, J., Smith, E. G., McCarthy, M. E., & Dineen, M. (2014). Income inequality and child maltreatment in the United States. *Pediatrics*, *133*(3), 454–61. https://doi.org/10.1542/peds.2013-1707

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., … Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine*, *14*(4), 245–258. https://doi.org/10.1016/S0749-3797(98)00017-8

Finkelhor, D., Shattuck, A., Turner, H., & Hamby, S. (2013). Improving the adverse childhood experiences study scale. *JAMA Pediatrics*, *167*(1), 70–5. https://doi.org/10.1001/jamapediatrics.2013.420

Font, S. A., & Maguire-Jack, K. (2016). Pathways from childhood abuse and other adversities to adult health risks: The role of adult socioeconomic conditions. *Child Abuse and Neglect*, *51*, 390–399. https://doi.org/10.1016/j.chiabu.2015.05.013

Friedman, E. M., Montez, J. K., Sheehan, C. M., Guenewald, T. L., & Seeman, T. E. (2015). Childhood Adversities and Adult Cardiometabolic Health. *Journal of Aging and Health*, *27*(8), 1311–1338. https://doi.org/10.1177/0898264315580122

Galea, S., & Tracy, M. (2007). Participation Rates in Epidemiologic Studies. *Annals of Epidemiology*, *17*(9), 643–653. https://doi.org/10.1016/j.annepidem.2007.03.013

Gallo, L. C., & Matthews, K. A. (2003). Understanding the association between socioeconomic status and physical health: Do negative emotions play a role? *Psychological Bulletin*, *129*(1), 10–51. https://doi.org/10.1037/0033-2909.129.1.10

Gallo, L., Espinosa De Los Monteros, K., & Shivpuri, S. (2009). Socioeconomic Status and Health: What Is the Role of Reserve Capacity? *Current Directions in Psychological Science : A Journal of the American Psychological Society*, *18*(5), 269–274. Retrieved from

http://cdp.sagepub.com/content/18/5/269.abstract%5Cnpapers://5860649b-6292-421d-b3aa-1b17a5231ec5/Paper/p56869

Galobardes, B., Lynch, J. W., & Smith, G. D. (2004). Childhood socioeconomic circumstances and cause-specific mortality in adulthood: Systematic review and interpretation. *Epidemiologic Reviews*, *26*, 7–21. https://doi.org/10.1093/epirev/mxh008

Galobardes, B., Smith, G. D., & Lynch, J. W. (2006). Systematic review of the influence of childhood socioeconomic circumstances on risk for cardiovascular disease in adulthood. *Annals of Epidemiology*, *16*(2), 91–104. https://doi.org/10.1016/j.annepidem.2005.06.053

Gilbert, L. K., Breiding, M. J., Merrick, M. T., Thompson, W. W., Ford, D. C., Dhingra, S. S., & Parks, S. E. (2015). Childhood adversity and adult chronic disease: An update from ten states and the District of Columbia, 2010. *American Journal of Preventive Medicine*, *48*(3), 345–349. https://doi.org/10.1016/j.amepre.2014.09.006

Glymour, M. M. (2014). Policies as Tools for Research and Translation in Social Epidemiology. In L. Berkman, I. Kawachi, & M. Glymour (Eds.), *Social Epidemiology* (pp. 452–477). New York: Oxford University Press.

Glymour, M. M., Avendano, M., & Kawachi, I. (2014). Socioeconomic Status and Health. In L. F. Berkman, I. Kawachi, & M. M. Glymour (Eds.), *Social Epidemiology* (2nd ed., pp. 17–62). New York: Oxford University Press.

Gooding, H. C., Milliren, C., McLaughlin, K. A., Richmond, T. K., Katz-Wise, S. L., Rich-Edwards, J., & Austin, S. B. (2014). Child maltreatment and blood pressure in young adulthood. *Child Abuse and Neglect*, *38*(11), 1747–1754. https://doi.org/10.1016/j.chiabu.2014.08.019

House, J. (2002). Understanding Social Factors and Inequalities in Health : 20th Century Progress and 21st Century Prospects. *Journal of Health and Social Behavior*, *43*(2), 125–142.

Huang, H., Yan, P., Shan, Z., Chen, S., Li, M., Luo, C., … Liu, L. (2015). Adverse childhood experiences and risk of type 2 diabetes: A systematic review and meta-analysis. *Metabolism: Clinical and Experimental*, *64*(11), 1408–1418. https://doi.org/10.1016/j.metabol.2015.08.019

James, S. (1994). John Henryism and health of African-Americans. *Cult Med Psychiatry*, *18*(2), 163–182.

Kalmakis, K. A., & Chandler, G. E. (2015). Health consequences of adverse childhood experiences: A systematic review. *Journal of the American Association of Nurse Practitioners*, *27*, 457–465. https://doi.org/10.1002/2327-6924.12215

Karr-Morse, R., & Wiley, M. (2012). *Scared Sick: The Role of Childhood Trauma in Adult Disease*. New York: Basic Books.

Kassabian, D., Whitesell, A., & Huber, E. (2012). *Welfare Rules Databook: State TANF Policies as of July 2011, OPRE Report #2012-57*. Washington, DC.

Kawachi, I., & Berkman, L. F. (2003). Introduction. In I. Kawachi & L. F. Berkman (Eds.), *Neighborhoods and Health* (pp. 1–19). New York: Oxford University Press.

Kawachi, I., & Berkman, L. F. (2014). Social Capital, Social Cohesion, and Health. In L. F. Berkman, I. Kawachi, & M. M. Glymour (Eds.), *Social Epidemiology* (2nd ed., pp. 290–319). New York: Oxford University Press.

Kawachi, I., & Subramanian, S. V. (2014). Income Inequality. In L. Berkman, I. Kawachi, & M. Glymour (Eds.), *Social Epidemiology* (2nd ed., pp. 126–152). New York: Oxford University Press.

Klevens, J., Barnett, S. B. L., Florence, C., & Moore, D. W. (2015). Exploring policies for the reduction of child physical abuse and neglect. *Child Abuse and Neglect*, *40*, 1–11. https://doi.org/10.1016/j.chiabu.2014.07.013

Kondo, N., Sembajwe, G., Kawachi, I., van Dam, R. M., Subramanian, S. V, & Yamagata, Z. (2009). Income inequality, mortality, and self rated health: meta-analysis of multilevel studies. *BMJ (Clinical Research Ed.)*, *339*, b4471. https://doi.org/10.1136/bmj.b4471

Larson, K., Russ, S. a., Crall, J. J., & Halfon, N. (2008). Influence of Multiple Social Risks on Children's Health. *Pediatrics*, *121*(2), 337–344. https://doi.org/10.1542/peds.2007-0447

Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. New York: Springer.

Lee, R. D., & Chen, J. (2017). Adverse childhood experiences, mental health, and excessive alcohol use: Examination of race/ethnicity and sex differences. *Child Abuse & Neglect*, *69*(January), 40–48. https://doi.org/10.1016/j.chiabu.2017.04.004

Link, B., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*, 80–94.

Liu, Y., Croft, J. B., Chapman, D. P., Perry, G. S., Greenlund, K. J., Zhao, G., & Edwards, V. J. (2013). Relationship between adverse childhood experiences and unemployment among adults from five US states. *Social Psychiatry and Psychiatric Epidemiology*, *48*(3), 357–369. https://doi.org/10.1007/s00127-012-0554-1

Lowrey, A. (2017, May). The People Left Behind When Only the "Deserving" Poor Get Help. *The Atlantic Monthly*. Retrieved from https://www.theatlantic.com/business/archive/2017/05/the-people-who-are-left-behind-when-only-the-deserving-poor-get-help/528018/

MacIntyre, S., & Ellaway, A. (2003). Neighborhoods and Health: An Overview. In I. Kawachi & L. Berkman (Eds.), *Neighborhoods and Health* (1st ed., pp. 20–42). New York: Oxford University Press.

Maguire-Jack, K., Lanier, P., Johnson-Motoyama, M., Welch, H., & Dineen, M. (2015). Geographic variation in racial disparities in child maltreatment: The influence of county poverty and population density. *Child Abuse and Neglect*, *47*, 1–13. https://doi.org/10.1016/j.chiabu.2015.05.020

Marks, A. K., Ejesi, K., & García Coll, C. (2014). Understanding the U.S. immigrant paradox in childhood and adolescence. *Child Development Perspectives*, *8*(2), 59–64. https://doi.org/10.1111/cdep.12071

Marmot, M., & Wilkinson, R. G. (Eds.). (2006). *Social Determinants of Health* (2nd ed.). Oxford: Oxford University Press.

McKay, C. M., Bell-Ellison, B. A., Wallace, K., & Ferron, J. M. (2007). A multilevel study of the associations between economic and social context, stage of adolescence, and physical activity and body mass index. *Pediatrics*, *119*, S84–S91. https://doi.org/10.1542/peds.2006-2089M

McKnight, J. (1995). *The careless society: community and its counterfeits*. New York: Basic Books.

McLaughlin, K. A. (2016). Week 1 Future Directions in Childhood Adversity and Youth Psychopathology. *Journal of Clinical Child & Adolescent Psychology*, *4416*(February), 1–22. https://doi.org/10.1080/15374416.2015.1110823

Millett, L., Lanier, P., & Drake, B. (2011). Are economic trends associated with child maltreatment? Preliminary results from the recent recession using state level data. *Children and Youth Services Review*, *33*(7), 1280–1287. https://doi.org/10.1016/j.childyouth.2011.03.001

Morton, P. M., Mustillo, S. A., & Ferraro, K. F. (2014). Does childhood misfortune raise the risk of acute myocardial infarction in adulthood? *Social Science and Medicine*, *104*, 133–141. https://doi.org/10.1016/j.socscimed.2013.11.026

National Center for Health Statistics. (1991). *Exposure to alcoholism in the family: United States, 1988*. Washington, DC.

National Center for Health Statistics. (2013). 2011-2012 National Survey of Children's Health Frequently Asked Questions. Retrieved March 8, 2017, from http://www.cdc.gov/nchs/slaits/nsch.htm

Oakes, J. M., & Kaufman, J. S. (Eds.). (2006). *Methods in Social Epidemiology*. San Francisco: Jossey-Bass.

Pavetti, B. L., & Schott, L. (2016). *TANF at 20 : Time to Create a Program that Supports Work and Helps Families Meet Their Basic Needs*. Washington, DC. Retrieved from www.cbpp.org

Ports, K. A., Ford, D. C., & Merrick, M. T. (2016). Adverse childhood experiences and sexual victimization in adulthood. *Child Abuse & Neglect*, *51*, 313–322. https://doi.org/10.1016/j.chiabu.2015.08.017

Pretty, C., O'Leary, D. D., Cairney, J., & Wade, T. J. (2013). Adverse childhood experiences and the cardiovascular health of children: a cross-sectional study. *BMC Pediatrics*, *13*(2010), 208. https://doi.org/10.1186/1471-2431-13-208

Rabe-Hesketh, S., & Skrondal, A. (2012). *Multilevel and Longitudinal Modeling Using Stata vol. II: Categorical Responses, Counts, and Survival*. *Stata Press* (Vol. II).

Raftery, A. E. (1995). Bayesian model selection in social research. *Sociological Methodology*, *25*, 111–163. https://doi.org/10.2307/271063

Reid, J. A., Baglivio, M. T., Piquero, A. R., Greenwald, M. A., & Epps, N. (2017). Human Trafficking of Minors and Childhood Adversity in Florida. *American Journal of Public Health*, *107*(2), 306–311. https://doi.org/10.2105/AJPH.2016.303564

Reuben, A., Moffitt, T. E., Caspi, A., Belsky, D. W., Harrington, H., Schroeder, F., … Danese, A. (2016). Lest we forget: comparing retrospective and prospective assessments of adverse childhood experiences in the prediction of adult health. *Journal of Child Psychology and Psychiatry*, *57*(10), 1103–1112. https://doi.org/10.1111/jcpp.12621

Sallis, J., Owen, N., & Fisher, E. (2008). Ecological Models of Health Behavior. In K. Glanz, B. Rimer, & K. Viswanath (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (4th ed., pp. 465–485). San Francisco: Jossey-Bass.

Schneider, K. L., Clark, M. a, Rakowski, W., & Lapane, K. L. (2012). Evaluating the impact of non-response bias in the Behavioral Risk Factor Surveillance System (BRFSS). *Journal of Epidemiology and Community Health*, *66*(4), 290–5. https://doi.org/10.1136/jech.2009.103861

Scott, B. G., Burke, N. J., Weems, C. F., Hellman, J. L., & Carrion, V. G. (2013). The Interrelation of Adverse Childhood Experiences within an At-Risk Pediatric Sample. *Journal of Child & Adolescent Trauma*, *6*(3), 217–229. https://doi.org/10.1080/19361521.2013.811459

Shonkoff, J. P., Garner, a. S., Siegel, B. S., Dobbins, M. I., Earls, M. F., Garner, a. S., … Wood, D. L. (2012). The Lifelong Effects of Early Childhood Adversity and Toxic Stress. *Pediatrics*, *129*(1), e232–e246. https://doi.org/10.1542/peds.2011-2663

Singleton, R. A., & Straits, B. C. (2010). *Approaches to Social Research* (5th ed.). New York: Oxford University Press.

Slack, K. S., Font, S. A., & Jones, J. (2017). The complex interplay of adverse childhood experiences, race, and income. *Health and Social Work*, *42*(1), e24–e31. https://doi.org/10.1093/hsw/hlw059

Slopen, N., Koenen, K. C., & Kubzansky, L. D. (2012). Childhood adversity and immune and inflammatory biomarkers associated with cardiovascular risk in youth: A systematic review. *Brain, Behavior, and Immunity*, *26*(2), 239–250. https://doi.org/10.1016/j.bbi.2011.11.003

Slopen, N., McLaughlin, K. A., Dunn, E. C., & Koenen, K. C. (2013). Childhood adversity and cell-mediated immunity in young adulthood: Does type and timing matter? *Brain, Behavior, and Immunity*, *28*, 63–71. https://doi.org/10.1016/j.bbi.2012.10.018

Slopen, N., Non, A., Williams, D. R., Roberts, A. L., & Albert, M. a. (2014). Childhood adversity, adult neighborhood context, and cumulative biological risk for chronic diseases in adulthood. *Psychosomatic Medicine*, *76*(7), 481–9. https://doi.org/10.1097/PSY.0000000000000081

Slopen, N., Shonkoff, J. P., Albert, M. A., Yoshikawa, H., Jacobs, A., Stoltz, R., & Williams, D. R. (2016). Racial Disparities in Child Adversity in the U.S.: Interactions with Family Immigration History and Income. *American Journal of Preventive Medicine*, *50*(1), 47–56. https://doi.org/10.1016/j.amepre.2015.06.013

Stack, C. (1974). *All our kin: strategies for survival in a black community*. New York: Harper & Row.

Stagner, M. W., & Lansing, J. (2009). Progress toward a prevention perspective. *Future of Children*, *19*(2), 19–38. https://doi.org/10.1353/foc.0.0036

Stanley, M., Floyd, I., & Hill, M. (2016). *TANF Cash Benefits Have Fallen by More Than 20 Percent in Most States and Continue to Erode*. Washington, DC.

Starecheski, L. (2015). A Sheriff and a Doctor Team Up to Map Childhood Trauma. Retrieved May 30, 2017, from http://www.npr.org/sections/health-shots/2015/03/10/377566905/a-sheriff-and-a-doctor-team-up-to-map-childhood-trauma

Stevens, J. (2012). The Adverse Childhood Experiences Study — the largest, most important public health study you never heard of — began in an obesity clinic. Retrieved October 28, 2016, from https://acestoohigh.com/2012/10/03/the-adverse-childhood-experiences-study-the-largest-most-important-public-health-study-you-never-heard-of-began-in-an-obesity-clinic/

Stiglitz, J. (2012). *The price of inequality*. New York: Norton.

Straus, M. A., Hamby, S. L., Boney-McCoy, S., & Sugarman, D. B. (1996). The Revised Conflict Tactics Scale (CTS2): Development and Preliminary Psychometric Data. *Journal of Family Issues*, *17*(3), 283–316. https://doi.org/0803973233

Strine, T. W., Dube, S. R., Edwards, V. J., Prehn, A. W., Rasmussen, S., Wagenfeld, M., … Croft, J. B. (2012). Associations between adverse childhood experiences, psychological distress, and adult alcohol problems. *American Journal of Health Behavior*, *36*(3), 408–423. https://doi.org/10.5993/AJHB.36.3.11

Su, S., Jimenez, M. P., Roberts, C. T. F., & Loucks, E. B. (2015). The Role of Adverse Childhood Experiences in Cardiovascular Disease Risk: a Review with Emphasis on Plausible Mechanisms. *Current Cardiology Reports*, *17*(10). https://doi.org/10.1007/s11886-015-0645-1

Su, S., Wang, X., Pollock, J. S., Treiber, F. A., Xu, X., Snieder, H., … Harshfield, G. A. (2015). Adverse childhood experiences and blood pressure trajectories from childhood to young adulthood the georgia stress and heart study. *Circulation*, *131*(19), 1674–1681. https://doi.org/10.1161/CIRCULATIONAHA.114.013104

Sun, J., Knowles, M., Patel, F., Frank, D. A., Heeren, T. C., & Chilton, M. (2016). Childhood adversity and adult reports of food insecurity among households with children. *American Journal of Preventive Medicine*, *50*(5), 561–572. https://doi.org/10.1016/j.amepre.2015.09.024

Susser, E., & Widom, C. S. (2012). Still searching for lost truths about the bitter sorrows of childhood. *Schizophrenia Bulletin*, *38*(4), 672–675. https://doi.org/10.1093/schbul/sbs074

Taylor, R. J. R. J. (2017). Church-Based Exchanges of Informal Social Support among African Americans. *Race and Social Problems*, *9*(1), 53–62. https://doi.org/10.1007/s12552-017-9195-z

Turner, H. A., Finkelhor, D., & Ormrod, R. (2010). Poly-Victimization in a National Sample of Children and Youth. *American Journal of Preventive Medicine*, *38*(3), 323–330. https://doi.org/10.1016/j.amepre.2009.11.012

Turney, K., & Wildeman, C. (2017). Adverse childhood experiences among children placed in and adopted from foster care: Evidence from a nationally representative survey. *Child Abuse & Neglect*, *64*, 117–129. https://doi.org/10.1016/j.chiabu.2016.12.009

U.S. Department of Health and Human Services. (2016). About TANF. Retrieved March 20, 2017, from https://www.acf.hhs.gov/ofa/programs/tanf/about

United States Census Bureau. (2013). *American Community Survey Information Guide*. Washington, DC. Retrieved from https://www.census.gov/programs-surveys/acs/about/information-guide.html

Wang, J. S. H. (2015). TANF coverage, state TANF requirement stringencies, and child well-being. *Children and Youth Services Review*, *53*, 121–129. https://doi.org/10.1016/j.childyouth.2015.03.028

Wickrama, K. A. S., & Noh, S. (2010). The long arm of community: The influence of childhood community contexts across the early life course. *Journal of Youth and Adolescence*, *39*(8), 894–910. https://doi.org/10.1007/s10964-009-9411-2

Wildeman, C., Emanuel, N., Leventhal, J. M., Putnam-Hornstein, E., Waldfogel, J., & Lee, H. (2014). The Prevalence of Confirmed Maltreatment Among US Children, 2004 to 2011. *JAMA Pediatrics*, *168*(8), 706. https://doi.org/10.1001/jamapediatrics.2014.410

Wing, R., Gjelsvik, A., Nocera, M., & McQuaid, E. L. (2015). Association between adverse childhood experiences in the home and pediatric asthma. *Annals of Allergy, Asthma and Immunology*, *114*(5), 379–384. https://doi.org/10.1016/j.anai.2015.02.019

Wulczyn, F. (2009). Epidemiological perspectives on maltreatment prevention. *Future of Children*, *19*(2), 39–66. https://doi.org/10.1353/foc.0.0029

Wyatt, G. (1985). The sexual abuse of Afro-American and White-American women in childhood. *Child Abuse & Neglect*, *9*, 507–519.

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