ADVERSE CHILDHOOD EXPERIENCES AND HEALTH OUTCOMES IN ADULTHOOD: FACTORS CONTRIBUTING TO RESILIENCE

by

Courtney R. Chorba

BS in Psychology, University of Pittsburgh 2009

Submitted to the Graduate Faculty of

Graduate School Public Health in partial fulfillment

of the requirements for the degree of

Master of Public Health

University of Pittsburgh

2014

UNIVERSITY OF PITTSBURGH

Graduate School of Public Health

This thesis was presented

by

Courtney R. Chorba

It was defended on

June 19th, 2014

and approved by

Thesis Director:
Todd Bear, MPH, PhD
Visiting Instructor
Behavioral and Community Health Sciences
Graduate School of Public Health
University of Pittsburgh

Committee Member:
Patricia Documet, MD, DrPH
Assistant Professor
Behavioral and Community Health Sciences
Graduate School of Public Health
University of Pittsburgh

Committee Member:
Elizabeth Miller, MD, PhD
Associate Professor

Todd Bear, MPH, PhD

ADVERSE CHILDHOOD EXPERIENCES AND HEALTH OUTCOMES IN

ADULTHOOD: FACTORS CONTRIBUTING TO RESILIENCE

Courtney R. Chorba, MPH

University of Pittsburgh, 2014

Abstract

Background: Adverse Childhood Experiences (ACEs) have been consistently linked to an increased risk of adult morbidity and mortality, yet little research has been conducted to identify factors that may protect the health of those exposed to ACEs, thus contributing to resiliency in those exposed to significant ACEs. **Objective:** Utilizing data from a population-based survey of adult residents of a county in Southwestern Pennsylvania, this study examines the effects that socioeconomic status and social and emotional support may have in protecting adult health following exposure to ACEs. **Methods:** Data collected in the 2009-2010 Allegheny County Health Survey was used to identify adults who had experienced great childhood adversity (defined as those reporting ACE score of 5 or higher to examine the most severe cases) and divide them based on their health outcomes. ACE score was measured using a six-item instrument adapted from a larger instrument measuring adversity. Socioeconomic status was measured by combining annual household income and educational attainment. Level of social and emotional support was gathered through a series of questions inquiring about availability of types of support. Chi-square and T-test were used to compare demographic make-up of those with significant childhood adversity and those with little to no childhood adversity. Logistic Regression analysis was used to examine the relationship between SES and social and emotional support on health outcomes. **Results:** Of the 5,442 people interviewed between August 2009 and September 2010, 735 (13.5%) reported ACE score of 5 or more. Several differences were

noted in those who reported high ACE scores: they were more likely to be younger, female, African American, and have lower SES. They were also more likely to be unhealthy. However, those reporting high ACEs with medium to high SES tended to have better health outcomes than those reporting high ACEs with low SES (O.R.=1.811, p<.0001). Social and emotional support was also associated with better overall health, especially for those in the high ACE group (O.R.=1.057 p=0.0377). **Conclusions:** ACEs are associated with poorer health outcomes in adults, and about 13% of Allegheny County residents have experienced 5 ACEs or more. Socioeconomic status may increase resilience due to broadening opportunities and resources for the individuals. Higher levels of perceived social support are associated with better health outcomes for those who have experienced great adversity; perhaps because those with high ACEs have less developed internal resources for coping, therefore the benefits of social support become more pronounced for those who have experienced significant adversity. Identifying factors associated with resilience in individuals who have experienced childhood adversity is relevant to the field of public health in that it would help service providers and other professionals to better understand the relationship between ACEs and health, and direct public health professionals to areas of intervention for those who have experienced ACEs and are thus at heightened risk for negative adult health outcomes.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PREFACE

I would like to thank Dr. Todd Bear, Dr. Patricia Documet, and Dr. Elizabeth Miller for all of their help and support in producing this thesis.

1.0   INTRODUCTION

It has become widely recognized in the past several decades that an individual's health throughout their life course is not simply a product of biology and genetics alone. We now know that a person's physical environment, social interactions and relationships, and economic circumstances bear great influence on a person's health and wellness throughout their life. One of the most important and influential environments for a person is their surroundings and experiences during infancy, childhood, and adolescence. Studies have consistently demonstrated that the environments and events one is exposed to from infancy through childhood and into adolescence have a profound impact on the health trajectory of that individual, their quality of life, and ultimately their life expectancy. Adverse childhood experiences (ACEs) are the negative experiences and environments that one is exposed to prior to the 18th birthday, including abuse, neglect, household dysfunction, trauma, and loss. There is a large body of research that has demonstrated that ACEs, depending on type and severity, are in fact associated with poorer health outcomes in adulthood, and lead to increased risk for cancer, diabetes, heart disease, obesity, and serious mental illness (Felitti et al., 1998). Provided in this document is a review of work that has been done on the topic of adverse childhood experiences and health outcomes. Included in the review is a discussion of the types of early life experiences that have an association with poor health outcomes in an individual, and subsequently a breakdown of the health outcomes that one is placed at higher risk for developing as a result of exposure to ACEs.

The background will discuss the public health significance of ACEs by exploring the range of health outcomes that are associated with exposure to ACEs, thus highlighting the need for clinicians, teachers, social service workers, and policy makers to address ACEs and their associated consequences in their work with children, adolescents, and parents. An introduction to the concept of resilience as related to ACEs is also provided. We, as public health professionals, clinicians, educators, service workers, and parents cannot prevent all ACEs from occurring, however, recognizing their existence and acknowledging the effects they have on the health of the population, can be a starting point to addressing the problem. By exploring factors that are associated with resilience and therefore protection against poor health outcomes I hope to add to the existing knowledge base around ACEs and health outcomes. I believe that increasing awareness and understanding of ACEs in the population and the consequences can be a starting point for prevention.

In this approach to exploring the relationship between ACEs, health outcomes, and factors that reduce the risk of risky behaviors and poor health outcomes, I specifically wanted to explore the concept of resiliency as related to childhood adversity. Resiliency can be conceptualized in many different ways, including psychological resiliency, physical resiliency, resiliency in the face of terminal illness, resiliency following a traumatic event, and so on. For this study, resiliency will be defined as being in good physical and mental health, despite having experienced significant adversity during the childhood years. Those who are resilient will be described as those who have experienced high amounts of adversity, but did not go on to develop cancer, diabetes, heart disease, and serious mental illness in adulthood.

This analysis will describe the proportion of adults living in Allegheny County who have experienced significant childhood adversity, the demographic makeup of those who reported

significant childhood adversity, and the proportion of those who remained healthy despite having experienced significant adversity. Additionally, I will explore socioeconomic status and perceived social support as factors that act as protectors of health and contribute to resilience in those who have experienced significant ACEs. Included at the end of the thesis are recommendations for dissemination of the results and how it can be used to inform future research on the topic. Existing evidence-based interventions that are related to the research findings are also briefly discussed.

2.0   BACKGROUND

One of the US Department of Health and Human Services Healthy People 2020 goals is to "create social and physical environments that promote good health for all" (Healthy People 2020). This goal is alluding to the social determinants of health: the numerous aspects of an individual's environment, both physical and social, that influences his/her life course toward health, happiness, success, longevity, and overall wellness. The earliest and one of the most influential environments for a person is his or her environment and experiences during infancy and early childhood years, while the brain is still developing and vulnerable. The Life Course perspective for health development (Halfon & Hochstein, 2002) provides a conceptual framework for health development over the lifespan, encompassing all factors that influence health status: biology and environment, including economic, social, and behavioral contexts. The Life Course Health Model indicates that, in addition to biology and genetics, one's environment, experiences, and behavior work to influence health status in the short and long term. These innate and external factors do not operate in isolation; they interact and influence one another to determine the health status of the individual. Included in this framework is the idea of risk factors and protective factors; not only do negative stimuli have the potential to damage one's health, but also positive stimuli have the potential to act as protective factors to improve health. The product of both of these positive and negative influences result in the overall health status of the individual (Baltes, Lindenberger, & Staudinger, 2007). The timing,

frequency, and severity of these experiences during one's life course and development is of great significance in how it affects the individual's health trajectory. In a 2002 description of the Life Course Health Development, Neal Halfon and Miles Hochstein describe proper health development as, "a lifelong adaptive process that builds and maintains optimal functional capacity and disease resistance" (Halfon & Hochstein, 2002, p. 437). A greater understanding of these biological, behavioral, and environmental relationships along the life course can significantly add insight to future research and preventative efforts.

For this analysis, the factor that I will be focusing on is environment, specifically the environment from birth to 18 years of age. An individual's childhood environment is of great importance regarding their cognitive development, and subsequently their behaviors, social interactions, and health. Additionally, I will be focusing on socioeconomic status and social support, and how they, coupled with early environment, are associated with the individual's adulthood health status. Adverse Childhood Experiences (ACEs) are negative stimuli that one is exposed to prior to the age of 18. ACEs include things like abuse, neglect, loss, trauma, and household dysfunction. One of the earliest and most notable studies examining the relationship between childhood experiences and long-term health outcomes and well-being is the 1998 Adverse Childhood Experience study conducted by Felitti, Anda, Nordenberg, Williamson, Spitz, Edwards, Koss, and Marks (Felitti at al., 1998). Conducted by the CDC together with the Kaiser Permanente's Health Appraisal Clinic in San Diego, it was the first large-scale study to examine the effects of childhood experiences on overall health, and set a foundation for future work on this topic. Data was collected from over 17,000 participants between 1995 and 1997. A retrospective cross-sectional study by design, it described the degree and frequency of reported adversities during childhood and a multitude of health outcomes, including chronic disease,

health behaviors, and psychological distress. In this study, childhood adversity was defined as abuse, neglect, and household dysfunction (which includes domestic violence, substance abuse and mental illness in the household, and having an incarcerated parent) while growing up. In this study, it was found that 64% of the population had experienced at least 1 ACE, and 12% experienced significant adversity during their childhood (defined here as an ACE score of 4 or higher) (Felitti at al., 1998). This study, and the numerous others that followed, showed that health outcomes seemed to worsen as reports of ACEs increased in severity and frequency. Health outcomes included ischemic heart disease, diabetes, cancer, liver disease, depression, and obesity, among others. Since then, many studies have been conducted, and the findings of early adversity leading to poorer health behaviors, outcomes, and subsequently earlier death have been replicated (Kessler, Davis, & Kendler,1997, Felitti et al., 1998, Anda et al., 2002, Dube, Felitti, Dong, Giles, & Anda, 2003, Brown et al., 2009, Herrenkohl, Hong, Klika, Herrenkohl, & Russo, 2013). Provided in the following four sections is a brief discussion of some of the health outcomes that have been associated with higher ACE scores in the population.

2.1.1 Mental Illness and Cognitive Impairment

Experiencing trauma during early, vulnerable years has been shown to disrupt brain development, which leads to cognitive impairments and mental illness. A retrospective cohort study found a strong, dose-response relationship between ACE score and the probability of developing a depressive disorder throughout the lifetime (Chapman et al., 2004). The study (n=9,460) found that emotional abuse in childhood increased the risk for depressive disorders in both women and men, with adjusted odds ratios of 2.7 and 2.5, respectively. Overall ACE scores

showed a graded relationship with both lifetime and recent depressive disorders. Those experiencing childhood maltreatment were also at heightened risk for post-traumatic stress disorder and other stress-related psychiatric disorders, including ADHD, borderline personality disorder, and dissociative disorder (Bremner & Vermetten, 2001, Bremner, 2003, Teicher, Anderson, Polcari, Anderson, & Navalta, 2002).

Individuals exposed to adversities during important developmental stages are at risk for disruptions and alterations in their neurobiological development, which may be the reason for a higher chance of developing cognitive and social impairments, anxiety, depression, or other psychopathologies throughout the lifespan (Heim & Nemeroff, 2001, Teicher et al., 2002, Dube et al., 2003). It is theorized that frequent stress placed on an individual early in life heightens their vulnerability to stressors later in life, which in turn increases the chances and severity of psychological distress, and other associated outcomes such as substance abuse (Bremner et al., 2001, Teicher et al., 2002, Bremner, 2003). The mechanism through which this takes place is through the stress-response system. If the developing individual feels threatened frequently, and is producing excessive stress hormones, the body will learn this as a normal reaction to stress. This excessive stress on the body can damage the cardiovascular system, leading to health problems later in life (Whitworth, Williamson, Mangos, & Kelly, 2005). Early adversities have also been associated with a decrease in cognitive functioning in childhood and adolescence, and memory and concentration in midlife (Richards & Wadsworth, 2004). Cognitive impairments of this nature then lead to social and emotional impairments that place one at greater odds for risky behavior. These risk factors leading to mal-adaptation may be buffered by protective factors, such as social support and an increased repertoire of coping skills (Heim et al., 2001).

A 2008 study of childhood maltreatment, psychiatric disorder, and suicide ideation and attempts found that as many as 50% of suicide attempts among women in the general population and 33% of suicide attempts among males might have been prevented if physical and sexual abuse, and witnessing of domestic violence during childhood had not occurred in those individuals' lives (Afifi et al., 2008). Another study found that as many as 54% of suicides in women are attributable to ACEs (Dube et al., 2001). The ACE study found that those who had experienced ACEs of any category were two to five times more likely to have attempted suicide at some point during their lives, and those who had reported four or more ACEs were 12 times as likely to report ever having attempted suicide as compared to those who reported no ACEs (Felitti et al., 1998).

2.1.2   Substance Abuse

An estimated 29% of children in the US grow up with a substance-abusing household member (CDC, 2010). A study in which the sample included families that were involved in the court system found the percentage of families with at least one parent having alleged substance abuse issues to be as high as 50% (43% of the families had a problem with alcohol or drugs that was actually documented) (Murphy et al., 1991). Children growing up with parents who have substance abuse issues and/or dependencies are at heightened risk for being exposed to other adversities, such as physical and/or sexual abuse and household dysfunction (Sheridan, 1995, Wolock & Magura, 1996). This co-occurrence of different types of adversity has been found in Kessler's 1997 study on ACEs and adult psychiatric disorders; it was found that adversities tended to cluster, meaning that if a child is being exposed to a severe adversity such as sexual abuse, they are likely to be experiencing many other adversities as well (Kessler, Davis, &

Kendler, 1997). Children of parents with substance abuse issues also have a greater chance of developing substance abuse issues throughout their own lives, thus continuing the cycle (Sheridan, 1995).

Treatment programs often target the behavior itself: smoking cessation programs, weight loss programs, rehabilitation programs for substance dependency. However it is important to note that in many cases these issues provided a solution to the problems that arose as a consequence of having experienced ACEs; drugs and smoking and food often provide relief, albeit temporarily, from the cognitive impairments and psychological impairments that resulted from exposure to trauma.

2.1.3   Chronic Disease

Not only are those who experience high ACEs at higher risk for mental illness and substance abuse, they are also at heightened risk for developing diseases such as ischemic heart disease, diabetes, obesity, cancer, lung disease, and liver disease (Felitti et al., 1998, Dube et al., 2003). There is also a graded relationship between number of adversities and self-rated health. The relationship between childhood maltreatment and lifetime occurrence of these morbidities becomes more pronounced with higher ACE scores. In one analysis of data from the Allegheny County population, the figure of population attributable risk (PAR) to of ACEs to cardiovascular disease was at 26% (Bear, 2014).

2.1.4 Premature Death

A longitudinal cohort study conducted with adults aged 18 and older aimed to study risk of death for those who have experienced severe adversities during childhood compared to those who have not. The baseline survey collected data on adversities experienced, and subsequently calculated an ACE score for each respondent between 1995 and 1997 (n=17,337). Eight categories of ACEs were covered in the survey, and the score was a cumulative measure of adversity and maltreatment experienced prior to the respondent's 18th birthday. Follow up assessments were collected until December of 2009 to identify deaths of participants, identified through review of the National Death Index. Out of the 17,337 participants, 1,539 died during follow up. It was found that those with ACE scores of six or higher died an average of 20 years earlier than those with lower ACE scores, and average years of potential life lost (YPLL) were around three times greater for those with severe adversities as compared to those with moderate to no ACEs (Brown et al., 2009).

Figure 1 below provides a visual of the life health course for individuals who have experienced severe adversities during childhood, which has been found to be a predecessor for risky behaviors and disease, and ultimately early death. Risk factors tend to be co-occurring, and not evenly distributed throughout a population; risk factors are often clustered, and those who are exposed to one risk factor are often exposed to a multitude of risk factors, increasing their odds of developing risky behaviors and disease and, in turn, are at heightened risk for not one but several morbidities (CDC, 2014). The scientific gaps represent what is unknown about the pathways in which risky behaviors and subsequent morbidities manifest. It is recognized that not all individuals who are exposed to childhood adversity are destined to a lifetime of poor health,

and there is still much to be learned regarding what separates those who are resilient following adversity from those who are not resilient.

Figure 1. Life Course ACEs

Children who are exposed to excessive conflict, disruption, and/or neglect from early periods in life are at a risk for disruptions in the development of important psychosocial skills, which can lead to mal-adaptation and risky health behaviors (Repetti, Taylor, & Seeman, 2002). Risky health behaviors then lead to greater chances of developing morbidities such as cancer, diabetes, heart disease, and hypertension. However, not all people who experience significant adversity during childhood are destined to a path toward poor physical and mental health and a shortened life span. The gaps in knowledge are around the mechanisms with which those who have experienced significant adversity develop risk behaviors, or do not, and then go on to

develop disease and early death, or are able to avoid such outcomes. Much research has been done on risk factors for health behaviors and diseases, but there is not much knowledge as to what factors act as protection for those who were exposed to known risk factors. Increased knowledge in this area can add to efforts and future research regarding prevention and early interventions for those who have experienced ACEs.

2.1.5   Resilience

The concept of resilience has been emerging in the psychological and behavioral health fields, and the definition has expanded from one focusing on mental health, to encompassing physical health as well. Even still, there are many questions about the meaning of the concept among clinicians and researchers; is resilience a personality trait or a process? Should resilience be measured in the extent to which a person is developing normally in life following a traumatic event, or the ways in which a person copes with the traumatic event itself? Is the experiencing of a traumatic event a prerequisite for one to display resilient behavior? What factors help to build resilience in an individual, in order to increase their physical and psychological wellbeing, leading to better health and longevity? One study of men living with HIV found that a positive attitude not only contributed to psychological resilience, but acted as a protector for physical health in the course of their disease as well (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). In this case, we can see that optimism and a sense of meaning and control were factors that contributed to both physical and mental resilience. A focus on building these traits in people who have experienced adversity or are at risk for poor health outcomes may be beneficial in changing their health trajectory. For this analysis, resilience will be considered as a trait: being

in good physical and mental health, despite having experienced significant adversity during the childhood years.

The figure below provides a visual of how protective factors have the potential to counter balance the risk factors, ultimately leading to greater health and well being throughout the life course. This concept raises a multitude of questions regarding the importance of timing of exposure to risks and protectors, and which protectors have the ability to mitigate the harmful effects of which risk factors.
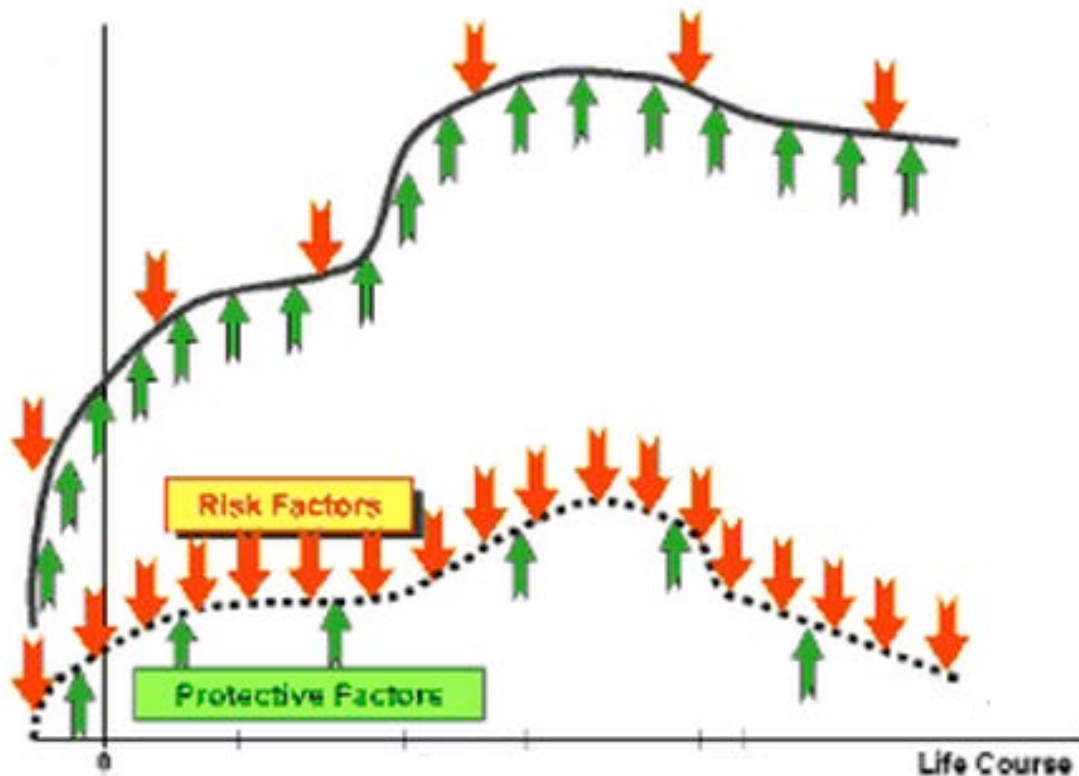
Adapted from Lu and Halfon, *Racial and ethnic disparities in birth outcomes: a life-course perspective*, 2003

Figure 2. Risk Factors and Protective Factors

The first step in translating this theory into practice is discovering which characteristics, behaviors, and resources are associated with resilience, and how and when protective factors made available to people who are experiencing or had experienced adversity can change their health trajectory. If factors that are associated with improved health behaviors and outcomes can be made available to those who have experienced great adversity, we may be able to aid in resilience building in those who otherwise may be subject to poorer health trajectories.

Resiliency can be conceptualized in many ways. For the purposes of this study, physical and mental health outcomes will be used as an indicator of resiliency in individuals who have experienced significant adversities during their childhood. Therefore, resiliency is a process throughout the lifespan; after being exposed to significant ACEs, the individual did not develop poor health trajectories. Resilient individuals are those who have remained healthy during their life course despite having experienced great adversity. This secondary data analysis will explore socioeconomic status (annual household income and educational attainment) and social support as factors associated with good health, and therefore providing protection from the heightened risk that was imposed on individuals by their early experiences of adversity and maltreatment. Which of these attributes increase the odds of an individual with a high ACE score of developing healthy behaviors and outcomes? One found, future studies can ask; are these attributes modifiable, and if so, can that be a focus of interventions for those who have experienced great adversity during their childhood? This secondary data analysis will explore socioeconomic status and social support as moderators to the relationship between ACEs and health outcomes, hypothesizing that strong levels of social support and higher SES will contribute to resilience in those who have experienced significant adversity.

The questions I sought answers for with this data were as follows:

1.) Is higher socioeconomic status associated with better health outcomes in those who have experienced five or more ACEs?

2.) Is stronger social support associated with better health outcomes in those who have experienced five or more ACEs?

3.) How does this association compare with the rest of the general population (those reporting an ACE score of four or less)? If an association between SES and health outcomes and support and health outcomes is found, is the strength of this association similar among those with little to no ACEs and those with high ACEs?

The population addressed in the first two questions are those adults 18 years or older, living in Allegheny County in 2009-2010, who endorsed five or more childhood adversities on the ACE portion of the ACHS. The third question includes all adults 18 and older living in Allegheny County in 2009-2010, regardless of score on ACE scale. From these questions I derived the hypothesis that those with higher levels of social support and higher SES will demonstrate resiliency (report none of the outlined morbidities) in spite of having experienced severe adversity. I also hypothesized that if an association is found between SES and health outcomes, and social and emotional support and health outcomes, there will not be a significant difference in this association when comparing those with severe ACEs to those with little to no ACEs.

3.0   METHODS

The data used in this analysis was gathered during the 2009-2010 Allegheny County Health Survey (ACHS), collected between August 2009 and September 2010. The ACHS was a health survey conducted in Allegheny County, Pennsylvania, modeled after the Center for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (CDC-BRFSS). It was conducted by the Evaluation Institute in the Department of Behavioral and Community Health Sciences at the University of Pittsburgh, together with the Allegheny County Health Department.   The ACHS was funded by the Allegheny County Health Department, the University of Pittsburgh Graduate School of Public Health, and several other community partners. Interviews were administered by a team of trained interviewers and supervisors over the telephone spanning a 13-month period (August 2009-September 2010), with the use of CATI (computer-assisted telephone interviewing). Both listed numbers and unlisted numbers were called throughout the interviewing period. The listed telephone numbers were sampled at a higher rate to increase productivity. Unlisted numbers consisted of random digit dialing (RDD) which is a random generation of the last for digits of a phone number, beginning with a valid area code and prefix corresponding to the target geographical locations. Of all people contacted during the interviewing period, 66% completed the survey, resulting in 5,442 completed interviews.

Questions on the ACHS included a wide range of topics related to health: health behaviors, incidence of disease, life experiences, self-rated health, environment, and demographics. The data used for this analysis included several sections of the ACHS, including demographic information, adverse childhood experiences, lifetime diagnosis of chronic disease, the Kessler Scale of Psychological Distress, and a scale measuring social and emotional support. Demographic information included age, race, ethnicity, gender, location of residency within Allegheny County, annual household income, and educational attainment of both the respondent and their parents. Educational attainment of the respondent's parent was gathered to indicate lifetime socioeconomic status.

3.1.1 Measures

Adverse childhood experiences were measured by a series of six questions that were adopted from Felitti's 1998 study. Included are questions about physical, sexual, and emotional abuse, domestic violence, and mental illness and substance abuse in the household. Respondents were instructed to answer according to their experiences prior to their 18th birthday. Responses provided for the questions were in the form of a Likert Scale, ranging from "never" to "very often." Answers for each of the questions were then combined to create an "ACE score"; in this instrument, those with higher ACE scores are presumed to have experienced more childhood adversity. For purposes of this analysis, an ACE score of four or less was classified as little to no adversity, and an ACE score of five or more was classified as having experienced high levels of adversity (CDC, 2010). Listed below are the questions used to assess ACE score in the ACHS.

- When you were growing up, was anyone living in your home depressed, mentally ill, or suicidal? (yes/ no)

- When you were growing up, did you live with anyone who was a problem drinker, alcoholic, or drug user? (yes/ no)

- When you were growing up, how often did a parent or adult living in your house hit, beat, kick, or physically hurt you? (Never/ once or twice/ sometimes/ often/ very often)

- …swear at you, insult you, or put you down? (Never/ once or twice/ sometimes/ often/ very often)

- …push, grab, slap, or throw something at your mother? (Never/ once or twice/ sometimes/ often/ very often)

- …touch you sexually or try to make you touch them sexually? (Never/ once or twice/ sometimes/ often/ very often)

It should be noted that this is a smaller version of the ACE scale, and does not include all adversities that are included in the CDC's BRFSS. The CDC uses a ten-question scale, as compared to the six-question scale used in the ACHS. The scale used in the ACHS is also limited in that it asks only about experiences and interactions with someone living in the household, and neglects to include experiences and interactions with people not living in the household.

The variable of socioeconomic status was a composite of the respondent's educational attainment and annual household income, and was separated into three levels for this analysis: low, medium, and high. Perceived social support was measured by a validated instrument that consisted of a series of questions inquiring as to the availability of others for assistance and other

types of support, when they need it (Gjesfjeld, Greeno, & Kim, 2008). The questions used to measure social support are as follows:

"People sometimes look to others for companionship, assistance, and other types of support. How often is each of the following supports available to you if you need it?"

- Someone to help with daily chores if you were sick? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

- Someone to turn to for suggestions about how to deal with a personal problem? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

- Someone to do something enjoyable with? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

- Someone to love and make you feel wanted? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

The social support scale ranged from 0 at the lowest end to 16 at the highest, indicating the highest level of social support. A score less than 11 on the social support scale was defined as having low social support. For this analysis, the dichotomous, dependent variable of healthy or unhealthy was used as a proxy measure of resiliency. Those defined as unhealthy reported one or more of the following morbidities: cardiovascular disease, cancer, obesity, diabetes, or serious mental illness. Those respondents classified as healthy did not report any of those morbidities. Cardiovascular disease, cancer, and diabetes were measured through yes/no questions asking about the lifetime diagnosis made by a doctor or other health professional of the disease for each participant. Obesity was defined as having a BMI of 30 or higher (World Health Organization, 1995, 1997), measured by the respondent's self-reported weight and height.

19

Serious mental illness is defined as having a score of 13 or higher on the K6- an abbreviated version of Kessler's Scale of Psychological Distress (Kessler et al., 2003). Please see table 1 below for a list of the variables included in this analysis.

Table 1. Independent and Dependent Variables

Independent Variables	Dependent Variable	Dependent Variables- Dimensions
Social support	Resilient (healthy)/Non-resilient(unhealthy)	CVD- Lifetime prevalence (yes/no)
		Diabetes- Lifetime prevalence (Yes/No)
Socioeconomic Status (composite of educational attainment and annual household income)		Cancer- Lifetime incidence (yes/no)
		Obesity- BMI (30 or higher-yes/<30-no)
		Serious Mental Illness-(score of 13 or higher on K6-yes/score <13-no)

Please see Appendix A to view all questions from the ACHS that were used in this analysis.

3.1.2   Analysis

Chi-square tests were used to ascertain differences in demographics (age, race, gender, educational attainment, and income) in the high ACE group and the low ACE group. Chi-square tests were also used to assess the odds of being healthy with higher levels of SES, despite having

experienced severe childhood adversity. Multi-variate logistic regression analysis was used to assess the odds of being healthy with each increase on the social support scale, despite having experienced high levels of childhood adversity. In the adjusted odds ratio analysis, age, race, and gender were controlled for to obtain a more complete understanding of the association between SES, social support, and health outcomes.

4.0   RESULTS

Overall, 51% of respondents reported having experienced at least one adversity in the ACE section of the survey, and 13.6% endorsed an ACE score of five or higher. Considering the categories of ACEs separately, 13% of the respondents reported physical and/or mental abuse often or very often, or being sexually abused once or more than once during their childhood. Violence against the mother was reported by 16% of the survey participants. This percentage was significantly lower for those over the age of 65, with an average of 19% for those respondents under age 65, and 9% for respondents 65 years or older. Those with lower household income, lower educational attainment, and those under the age of 65 were more likely to report abuse than those with higher income, education, and those over 65 years old. This lower percentage for adults 65 and older was also seen in the report of mental illness and substance abuse, with 22% of older adults reporting mental illness and/or substance abuse, and an average of 37% under the age of 65 reporting experiencing this type of adversity in the home while growing up. Considering the population overall, 33% reported having grown up in a household with someone who was depressed, mentally ill, suicidal, or with a substance abuse issue.

Of the 5,442 adults interviewed, 735 respondents reported an ACE score of five or more (13.6% of the total sample, see Figure 3 below). Of those with ACE scores of five or higher, 39% were healthy, compared to the rest of the population, where 48% fell into the "healthy"

category (characterized by no reports of CVD, diabetes, obesity, or serious mental illness). This was a significant difference in health between high-adversity respondents and low-adversity respondents (p < .0001). Those reporting significant adversity (ACE score of 5 or higher) were more likely to be female, African American, younger, less likely to be healthy, and more likely to be from a lower SES. There were no significant differences in educational attainment between those with high ACEs and those with little to no ACEs. The demographic percentages for the severe ACE group were 70% female, 24% black, and a mean age of 50.4 years. This compares with the low ACE group at 66%, 19%, and 57.1 years, respectively. Figure 3 below illustrates the distribution of ACE scores in the population. Table 2 below shows the demographic makeup of those reporting high ACEs and medium to low ACEs.
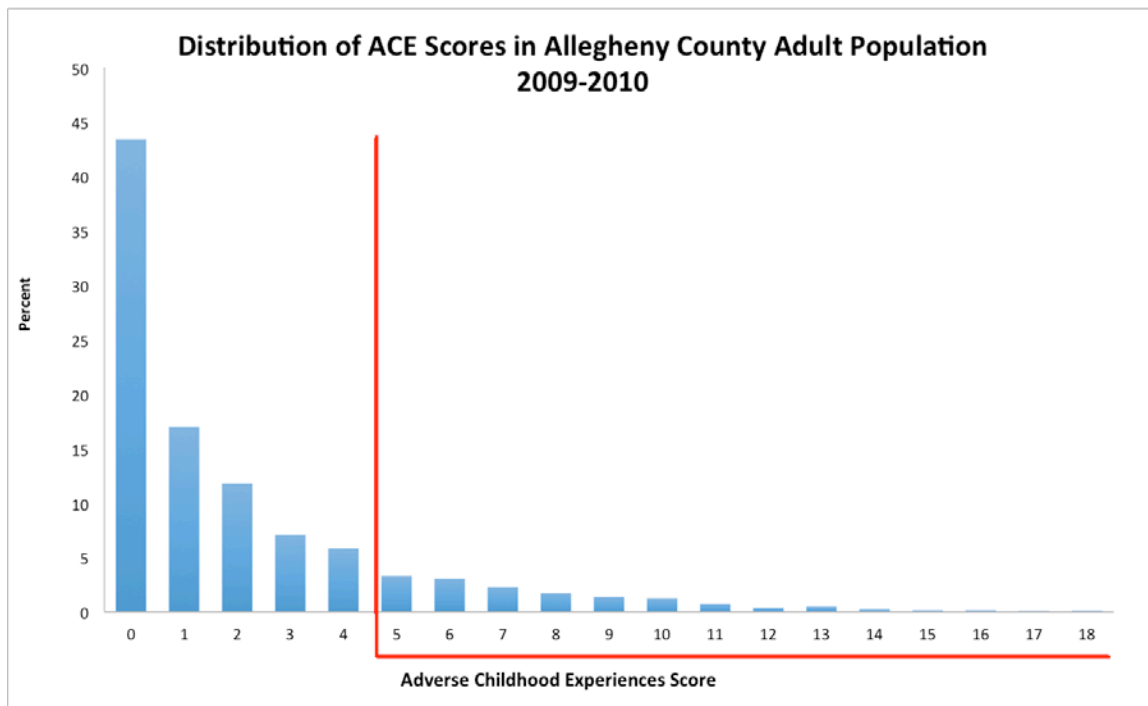
High adversity is defined in this analysis of having an ACE score of five or higher, and included about 13.6% of the survey respondents (n=735), shown here to the right of the red line. To the left of the red line are those who reported an ACE score of 4 or less (n=4,707).

Figure 3. Distribution of ACE Scores in Allegheny County Population, 2009-2010

Table 2. Comparison of high ACE and low ACE groups in Allegheny County

	High Adversities ACE>=5, N=735	Few to no Adversities ACE<5, N=4,707	p
Gender (female)	71%	66%	.0191†
Age- mean	50.4	57.1	<.0001*
Race (Black)	24%	19%	.0015†
Education Level (high school or less)	38%	38%	.7679†
HH Income (less than $35,000)	54%	44%	<.0001†
Health Status (unhealthy)	60%	52%	<.0001†

†Chi-Square   *T-test

.

Respondents who were classified as unhealthy and therefore non-resilient reported one or more of the following morbidities: cardiovascular heart disease, obesity, cancer, and/or serious mental illness, and included about 58% of those in the high ACE group (about 437 people). Those in the healthy, resilient group reported none of these conditions, and totaled 290 people. Statistical Analysis System (SAS) 9.2 was then used to measure the association of socio-economic status in adulthood and social and emotional support with resilient or non-resilient outcomes in adulthood.

Table 3 is a display of the proportion of individuals who are resilient (healthy) and non-resilient (unhealthy) in both the high ACE and few to no ACE group. The proportions of resilient and non-resilient are broken down into categories of those reporting high social support and high socioeconomic status. Percentages displayed below are not adjusted for demographic

variables such as age, race, and gender. In this table, social support was analyzed as a dichotomous variable: low and high. A score greater than 11 on the social support scale was considered to be high social support, and a score of 11 or less was defined as low social support (a score of 11 or below was chosen as the cutoff point for low social support because this will include the lowest quartile of respondents by reported social support). This table presents the proportions of the respondents who reported high social support and high SES in both the resilient and non-resilient groups. Figure 4 below provides a simple visual comparison of social support levels and SES level between the high ACE and low ACE group. Also, in both groups, a greater percentage of those who are resilient reported high social support and high SES (Figure 5).

Table 3. Proportions of Resilient Individuals by ACE Group, High Social Support, and Adult SES

	High ACEs			**Few to no ACEs**		
	Resilient (healthy)	Non-Resilient (unhealthy)	p	Resilient (healthy)	Non-Resilient (unhealthy	p
High Social Support	64.2%	54.2%	.06	80.4%	70.0%	<.0001
High SES	29.7%	16.4%	.0004	40.6%	26.1%	<.0001

Table 3 shows the proportion of resilient and non-resilient individuals in each group: those with high ACE scores and low ACE scores, and those reporting high social support and high SES.
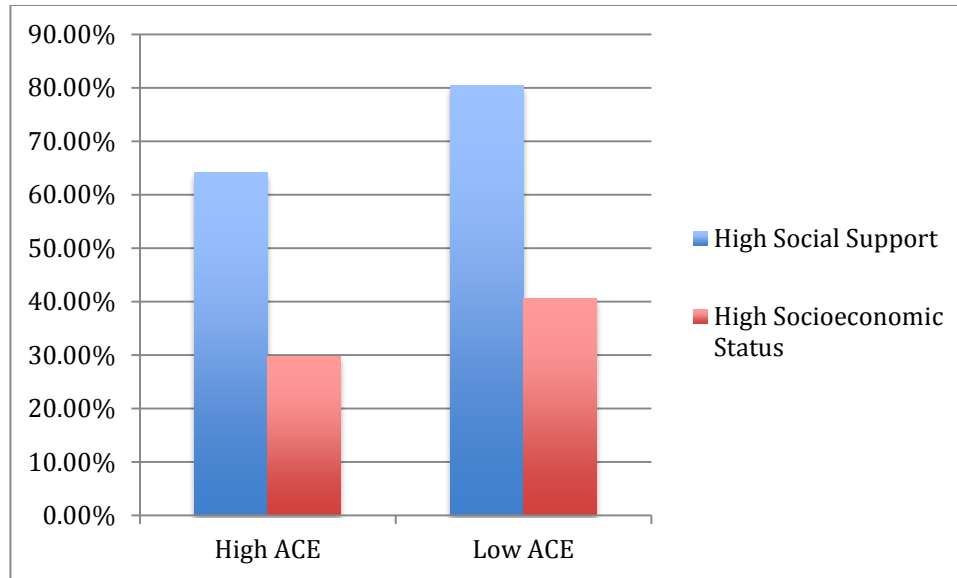
In this simple comparison between those in the high ACE group and low ACE group, we see that a higher percentage of people in the low ACE group report high SES and high social support.

Figure 4. Comparison of Social Support and SES Between High ACE and Low ACE Group
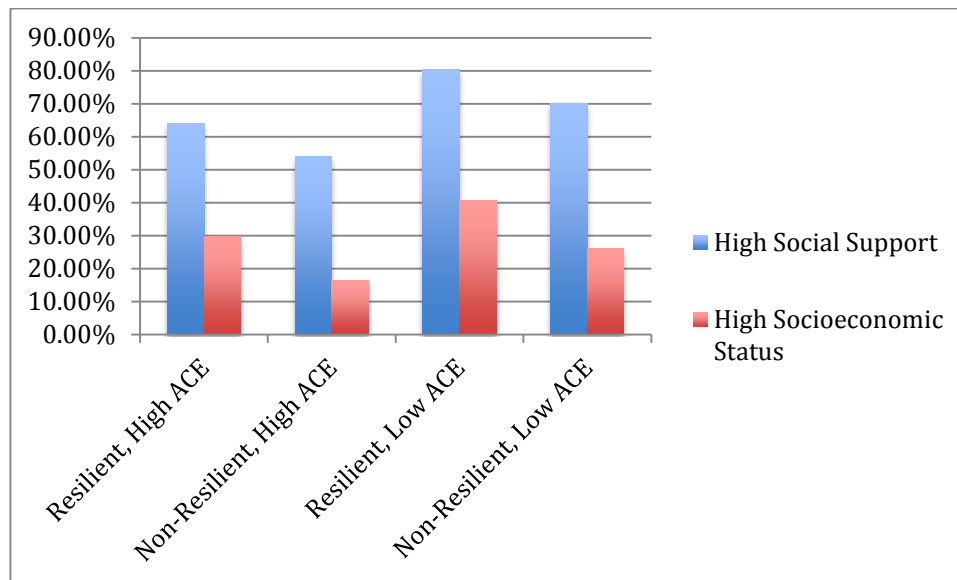
When comparing those who are resilient with those who are not resilient, we can see that resilient individuals report high social support and high socioeconomic status at higher rates than those who are not resilient. Also, comparing those with high ACE scores and those with low ACE scores, we see that less people in the high ACE group report high social support and socioeconomic status than those in the low ACE group. The difference in social support between resilient and non-resilient in the high ACE group was not found to be significant.

Figure 5. Comparison of High SES and High Social Support in Resilient and Non-Resilient Groups

In order to explore in better detail the association between SES and social support and health outcomes for those with high ACE scores, logistic regression analysis and chi-square were used. For every one-unit increase in the social support scale, there was found to be an 8% increase in odds of resiliency (reporting good health, none of the aforementioned morbidities) using logistic regression analysis. Tables 3 and 4 below show the odds ratios and the upper and lower confidence intervals for both the bivariate and multivariate analyses. The bivariate analysis found a significant increase in the odds of good health for both social support and adult SES, in both the high adversity group and the few-no adversity group. When controlling for age, race, and gender, social support was no longer significant in its association with health outcomes for those in the low ACE group. However, the odds ratio for adult SES in the high adversity group becomes more pronounced.

The social support scale consisted of 17 points, ranging from a score of 0, indicating the lowest level of social support, to 16, indicating the highest level of social support for each individual. Considering first the bivariate analysis, in which the relationship between socioeconomic, social support, and health outcomes were examined without controlling for age, race, or gender (Table 4), SES and social support were significant for both those with high ACE scores and those with low ACE scores. The odds ratio analysis of social support indicated that, for those with high ACE scores, for each point increase in reported social support, there would be an 8% increase in the odds of that individual reporting healthy outcomes. For example, if a person in the high ACE group reported a score of 10 on the social support scale, their odds of resiliency would be 80%, as compared to odds of 8% for someone who reported a score of 1 on the social support scale.

The association with socioeconomic status and better health outcomes in those with high ACE scores was even stronger. The composite scale of socioeconomic status was divided into three levels: low, medium, and high. For every increase on the composite scale (i.e. moving from low to medium, or medium to high) there is a 62% increase in the odds of being healthy for those in the group with high ACE scores.

Table 4. Bivariate Odds Ratio Analysis—Association between Social Support and SES with Healthy Outcomes for those with high and low ACE Scores

		OR	95% CI	P
High	**SS Scale**	1.080	1.028-1.136	.0025
Adversities	**Adult SES**	1.623	1.195-2.204	.0019
Few/No	**SS Scale**	1.042	1.020-1.065	.0001
Adversities	**Adult SES**	1.666	1.504-1.846	<.0001

Table four displays the bivariate odds ratio analysis of the association between social and emotional support and healthy outcomes (no reports of morbidity), both for those with high adversities (ACE score of five or more) and those with little to no adversities (ACE score less than five).

Table 5. Adjusted Odds Ratio Analysis—Association between Social Support and SES with Healthy

Outcomes for those with high and low ACE Scores

		OR	95% CI	P
High Adversities	**SS Scale**	1.057	1.003-1.114	0.0377
	Adult SES	1.811	1.383-2.371	<.0001
Few or No Adversites	**SS Scale**	1.008	0.983-1.033	.5542
	Adult SES	1.381	1.228-1.553	<.0001

Table five displays the multivariate analysis, controlling for age, race, and gender. Given is the odds ratio of the association between social support and adult SES on the odds of reporting good health for those with high adversities and those with little to no adversities (ACE score less than five).

The adjusted odds ratio analysis, which controlled for age, race, and gender, brought several changes to the relationship between SES, social and emotional support, and odds of good health outcomes (Table 5). Considering those with high adversities, the effects of adult SES become stronger in the multivariate analysis, changing from a 62% increase in odds of being healthy with higher SES to an 81% increase in the odds of being healthy. When considering the multivariate analysis for social and emotional support we can see that the odds ratio is stronger for those who have experienced high adversity than for those who experienced few to no adversities. In fact, when controlling for these factors, the odds ratio of the effect of social and emotional support on health outcomes in those with few to no adversities is no longer significant. The effect of adult SES on health for those in the few or no adversity group decreased in the multivariate analysis, from 68% to 38%.

5.0   DISCUSSION

Adverse Childhood Experiences and the associated health outcomes remains a complex topic, with much still to be learned. These reports underscore the need for policy makers and those providing services to parents, infants, children, and adolescents to recognize the prevalence of ACEs in the populations with which they are working, and the effects they are likely to have on the health of the individual. A greater understanding of the nature of this relationship will help to guide the ongoing conversation about child maltreatment and health outcomes and point public health professionals and policy makers in the direction toward areas of prevention to mitigate the effects of ACEs.

When comparing these figures with data from the CDC's Morbidity and Mortality Weekly Report of Adverse Childhood Experiences reported by adults in the states of Arkansas, Louisiana, New Mexico, Tennessee, and Washington in 2009 (n=26,229) (CDC, 2010), we find that there are both similarities and differences. Overall, in the CDC's MMW Report, 59.4% of respondents reported at least one ACE, and 8.7% reported five or more ACEs. In Allegheny County, a slightly lower percentage of adults reported one or more ACE, at 51%. However, the percentage of adults reporting five or more ACEs was higher in Allegheny County, at 13.6%, suggesting that co-occurring ACEs may be more prevalent in this region. Also, the scale used by the CDC's version of the study was more extensive than the one used in the ACHS. Therefore,

we may be underestimating the percentage of the population with 1 or more ACEs and 5 or more ACEs here.

This analysis explored social support and socioeconomic status as factors contributing to resiliency in people who have experienced significant adversity during childhood. The association between social support and odds of good health was found to be significant in the bivariate analysis for both those in the high ACE and low ACE group. Interestingly, when controlling for age, race, and gender, the association between social support level and odds of good health was no longer significant for those with few or no ACEs, but remained significant for those with high ACEs, suggesting social supports may be more important for those who have experienced severe adversity during childhood. One theory for why this may be is that those who have not experienced significant adversity have more developed internal coping sources, whereas those exposed to high ACEs have not, and therefore the supports of others has become a more important resource for them. A future study can investigate this association further, perhaps through focusing on the dynamics of support systems in those who have experienced adversity as compared to those who have not. The results presented here point to the importance for healthy support systems for children and adolescents who are exposed to adversity. Programs and interventions that offer a safe, judgment-free space for children and adolescents to talk and build relationships may be beneficial. After school programs such as mentoring programs provide a good space to implement this type of support.

Socioeconomic status (annual household income and educational attainment) also had a significant association with good health outcomes for those who have experienced severe ACEs. This is consistent with existing literature that shows a graded association between socioeconomic status and health in all stages of life (Adler et al. 1994 & Adler & Ostrove 1999, Anderson &

Armstead, 1995, Bradley & Corwyn, 2002). Along with higher educational attainment comes improved literacy, which enables one to navigate health-related resources, which may be one explanation why those with higher SES are more resilient despite having experienced significant adversity. Also, higher income enables the individual to access resources, such as preventative care, that will lead to better health outcomes. Higher educational attainment leads to higher income. Therefore encouraging education in those who have experienced great adversity may lead to improved health and wellness outcomes. At a policy level, initiatives to reduce income inequality and the associated effects would also help to mitigate the effects of ACEs.

5.1.1   Limitations

The ACEs covered by the ACE scale used in the ACHS, although relevant, are limited. An abbreviated version of Felitti's adversity scale was used for this study, and therefore there is a chance that if an extended scale with a greater scope of ACEs had been used, there would be a greater percentage of people with higher ACE scores. Abuse and Household dysfunction were the main factors inquired about in the ACHS, whereas the full version of the scale would include other adversities such as parental loss, witnessing of traumatic events, parental divorce, incarceration of a parent, and homelessness. Although an abbreviated version of Felitti's scale is shown to be a valid measure of ACEs, it would be useful for future research to perform this analysis with a more detailed scale. As noted earlier, another limitation to the ACE scale is the premise of experiences; the questions asked about experiences and interactions with people living in their childhood home, failing to include abuse that may have been perpetuated by someone living outside the home. This may have resulted in an underreporting of ACEs by the Allegheny County population.

Another approach to measuring the relationship between ACEs, outcomes, and protective factors is separating protective factors by type of adversity, to explore any differences that may be evident, or to look at clustering by adversity type. This points to another limitation; the scale used to measure ACE score assumed a simple graded relationship, with two reported ACEs being twice as bad as one reported ACE, with no consideration to the type of ACE and timing the ACE occurred during the physical and mental developmental period of the respondent. For example, does social support provide the same protection for an individual who was exposed to parental divorce as a child as it does for an individual who was exposed to physical abuse? The same can be asked of SES.

There is some question as to the additive effect of adversity that was assumed by the ACE scale used here. A steady, cumulative dose-response relationship was used in many of the analyses (e.g. a respondent with five reported ACEs is placed at risk one unit higher than one with four ACEs). There has been evidence to show that the added effect of adversity does not always follow a simple graded effect pattern, but one that is sub-additive with a sort of "tipping point" toward poor health outcomes (Miller, Breslau, Chung, Greif Green, McLaughlin, & Kessler, 2011). In addition, there tends to be clustering around types of adversity; it would be beneficial to conduct a similar analysis, looking at adversity type and clustering, and whether associations with resiliencies and health outcomes differ by adversity type and frequency. Timing of the occurrence of each adverse event was also overlooked in this instrument. The effects of an adverse event may change depending on the stage of development the individual was in when exposed; for example, adversities experienced at 4 years of age, when the brain is still developing, may be of greater significance on the health trajectory of that individual than an adverse event experienced at 17 years of age.

Perceived social support was measured on a 17-point scale (ranging from 0-16), and the analysis measured the increase in odds of being healthy with each one-point increase on the scale (8% increase in the odds of being healthy in the bivariate analysis, 5% increase in the multivariate analysis for those in the high ACE group). It may be more useful in a future analysis to divide the scale into three levels: low, medium, and high. In doing so, we may see a stronger association between social support and odds of good health.

A limitation is also imposed with the possibility of recall bias on part of the survey participant, as questions were asked to adults regarding their childhood experiences. A prospective cohort study beginning at birth, although more complex and expensive, would be a good way to address this issue. This type of study would also address the issue of temporal relationships; this study is presuming social and emotional support to be a moderator in the relationship between ACEs and health outcomes, however because this study was cross-sectional in design, we cannot state that social and emotional support preceded health. The exception to this is the outcome of psychological distress. The questions measuring this outcome were asked according to how the respondent felt in the past 30 days, therefore a temporal relationship is more likely here.

Additionally, using health status as a measure of resilience is imperfect. In order to truly measure the associations presented here, the genetics of the individual need to be taken into account.

5.2   IMPLICATIONS FOR FUTURE RESEARCH

This analysis explored relationships between ACE score and health outcomes, with the goal of adding to the current knowledge base surrounding ACEs, health outcomes, and resiliencies. The ACE score was obtained by adding up responses as to how frequently six types of adversity occurred prior to the respondent's 18th birthday. A future analysis could break down adversity by type (e.g. physical abuse analyzed separately from mental illness in household) to analyze whether the protective effect of social and emotional support and SES differ. It would also be beneficial to examine clustering trends by adversity type. Such analyses may lend some more guidance as to what children and adolescents in the region are experiencing.

Resiliency was defined as having good health outcomes by standards of the ACHS; those who were classified as resilient did not report any of the morbidities that this analysis defined as having "poor health". This represents just one of many ways to study the concept of resilience. Future studies could inquire about other measures of resiliency, such as anxiety and ways of reacting to stress (Connor & Davidson, 2003), and ability to function in day-to-day life. Optimism and future outlook can also be measured, as these things have been identified as contributing to resiliency in a study of health outcomes in HIV-positive men (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). Because the ACHS was not conducted for purposes of studying resiliency, these constructs were not included.

New Questions:

Are those in medium-high childhood SES (as measured by parental educational attainment), who were exposed to severe ACEs, likely to attain a lower, equal, or higher SES in their own adulthood? This question would provide more insight into the notion of educational attainment as a factor contributing to resiliency in those who have experienced significant ACEs.

How does future outlook correlate with resiliency in those who have experienced significant adversity during their childhood? Referencing again the study involving men living with HIV, a positive outlook and a sense of purpose was associated with psychological resiliency and better health outcomes through the course of their disease (Taylor et al., 2000). Does this positive mental state also contribute to resiliency following ACEs?

What combinations and frequencies of ACEs have the strongest association with poor health outcomes? Do some factors act as protection for certain combinations of ACEs but not others?

5.3   MOVING FORWARD

The goal of this research was to increase the knowledge base of the relationship between adverse childhood experiences and health outcomes in adulthood, by exploring factors that contribute to resiliency in those reporting significant ACEs. The association between ACEs and poor health behaviors and morbidities has been demonstrated in numerous studies, and much is still to be learned regarding the pathways with which these risks manifest later in life. However, not all individuals who have experienced ACEs are destined to a path of poor health and early mortality. This analysis of the ACHS specifically looked at factors that are associated with resiliency as measured by good health outcomes in those adults who have experienced severe adversity prior to their 18th birthday. Socioeconomic status, including educational attainment and annual household income, as well as social and emotional support were found to be associated with greater odds of resiliency in those with five or more ACEs. These results can be used to add strength to conversations advocating for provision of these types of resources to at-

risk youth and parents, and in the development of new programs that focus on building healthy and safe social support systems, as well as initiatives to reduce income inequality.

Teachers, pediatricians, and any others who work with children and parents should be made aware of the rates of childhood adversity in their communities. Providing this information may help them to develop better insight into the backgrounds of the people with whom they are working. Results presented here are those reported by adults in 2009 and 2010, but they can be used as a snapshot into the current situation regarding ACEs and health outcomes in Allegheny County. Additionally, the current Healthy Allegheny Teen Survey (HATS) can be another resource for ascertaining the prevalence of ACEs in our region, once completed, as the focus is on youth ages 14-19. This population has less likelihood of recall bias in answering these questions. Results from these surveys, together with previous research done on the health and behavior effects of childhood adversities, can be used to highlight the importance of this issue.

Careful attention should be paid to the means with which information of this nature is disseminated to those who can use it most. These findings point to the importance of protective factors. Additionally, a key message about exposure to adversities is that individuals are not simply "doomed" to a lifetime of poor health and early death, and results should be presented along with resources for prevention on behalf of all stakeholders. When developing a knowledge translation plan for these results, one should consider the community's strengths, existing resources, as well as constraints and shortcomings.

One barrier to creating an action plan based on these findings is access to resources. The literature has shown that lower SES is associated with higher risk of several ACEs in this population (Documet, et al. 2012) as well as other populations (CDC, 2014, Felitti et al., 1997). On top of the added risk, lower SES often means being located geographically in an area with

fewer resources and funding than those on the higher end of the socioeconomic scale. This presents a challenge in advocating, for example, for better educational opportunities. This is why the issue of childhood adversity and related health outcomes should be addressed at the policy level for large-scale change. One way to approach this endeavor and to capture the attention of policy makers is to highlight the proportion of illnesses and poor health behaviors within the population that are attributable to adverse childhood experiences, and the estimated amount of money spent treating these outcomes (Bear, 2014).

A more feasible, smaller-scale way to effect change would be at the community level, involving collaboration with stakeholders such as teachers, mentors, and youth group leaders, as well as other service providers who work closely with parents and children of all ages, such as health care workers and church leaders. These community members should be informed as to the incidence of ACEs in their communities and the health risk associated with them, and then trained to recognize at-risk youth. They could use their familiarity and rapport with the community to circulate information in an appropriate and accessible way about healthy parenting skills and existing resources, and the importance of healthy support systems and education for children. It would be beneficial also for those who have daily interaction with children to keep in mind the prevalence of trauma and maltreatment in this population and the behavioral effects associated with such exposures in individuals.

5.3.1 Existing Related Interventions

Interventions can be implemented at a primary, preventative level, with education and supports for pregnant women and couples or women and couples who may be planning a family in the future. Primary levels of intervention are ideal; reducing the amount of ACEs in the

population has the potential to significantly reduce the disease burden that is attributable to childhood adversity. Programs can also be implemented at the secondary level for children who are being exposed to adversity, and families who are in need of support. Interventions at this level may help to mitigate the effects of adversity and prevent future adversity from occurring. Tertiary interventions would occur later in life, and are more likely to treat morbidities that have already manifested. This level does provide a good opportunity to begin primary prevention efforts for those adults who have experienced adversities as children, and whose children may be at heightened risk for experiencing adversities as well.

Primary prevention approaches that focus on supporting new or soon-to-be parents in order to prevent abuse, neglect, and other adversities from occurring in the first place would be ideal. One approach to this is parenting education programs, which provide new parents or parents-to-be with tools for coping with the challenges of parenting, and alternative disciplining techniques. Some examples of this are the Triple-P Positive Parenting Program (Shapiro, Pinz, & Sanders, 2012, Hahlweg, et al., 2010, Wiggins, Sofronoff, & Sanders, 2009), or nurse visitation programs (Heekerens, 2008). Factors that have been cited as affecting implementation and adherence of such programs are adequate training, resources, and agency quality characteristics such as organization (Asgary-Eden & Lee, 2012). This finding can also be used to advocate for the provision of these resources and funding to where it is needed most.

The analysis found that higher socioeconomic status increased the odds of resiliency in those who have experienced high levels of childhood adversity. Evidence-based interventions that focus on education in those who may not be receiving encouragement elsewhere may be effective in building resiliency and altering the health trajectory for at risk youth. The Personal Growth Class (Eggert, Thompson, Herting, Nicholas, & Dicker, 1994) is an in-school program

aimed at improving school performance, increasing self-esteem, decreasing absence rates and drop out rates, and decreasing drug and alcohol use in students. A randomized control trial testing the Personal Growth Class conducted in an urban, setting in the northwest found that the program was indeed effective at increasing school performance, school bonding, and self-esteem, and decreasing drug control problems and consequences. The program is a semester-long (five month) class taken as part of the students' regular course schedule. The class includes life-skills training and integrated group support.

Increased social support was also found to increase the odds of resiliency in those who have reported significant ACEs, with an 8% increase in odds of resiliency with every point increase on the social support scale, when controlling for age, race, and gender. Considering that this relationship was not found to be significant in the group with little to no ACEs, we can ask new questions about the mechanisms of social support and resiliency following childhood adversity; does this association become stronger or weaker with different types of adversity? Are there certain kinds of social supports that are more effective than others in building resiliency?

Existing programs that focus on building healthy social support systems for at risk youth include mentoring programs such as Big Brothers, Big Sisters (Herrera, Grossman, Kauh, & McMaken, 2011). Results indicated that perceived social support remained significant for those with high ACE scores, therefore interventions that involve a trustworthy, available support to those in need may be helpful in resilience-building. This approach can be implemented through schools, youth groups, or other extra-curricular activities.

Due to the length of time between exposure to adversity during childhood and incidence of morbidity in adulthood, the relationship between the two is likely to be omitted in adult

medical care. At this point, in addition to addressing the health behaviors and problems the person may have, it may be better to address prevention strategies to adults with children, to hinder or stop the cycle of child maltreatment. A challenge with this is identifying adults whose children are at risk of experiencing adversity. Commonly, medical professionals do not inquire as to childhood experiences, and the attitude toward the issue is one of dismissal: these are things that happened in the past and have no relevance in the present. It would be interesting to explore whether acknowledgment of ACEs in adults and opportunities to process the experience and provision of resources for coping would affect the health outcomes of those individuals who have experienced multiple ACEs.

As in other areas of public health, preventative efforts are particularly salient in efforts to address the issue of childhood adversity and the associated health issues. Many existing interventions address behaviors that may have been the result of ACEs, such as smoking cessation programs, weight loss programs, and treatment programs for substance abuse, while failing to acknowledge that these problems might have occurred originally as solutions to the problems that arose from the ACEs. Research should be done to identify other factors contributing to resiliency in those who have experienced significant adversity. Then, programs that build healthy coping skills and resiliencies can be developed to mitigate the ill effects of ACEs. This analysis explored social support and socioeconomic status as factors contributing to resiliency in adults who have experienced significant adversity during childhood. These results can be used to inform future studies examining the concept of resiliency as related to childhood adversity, and to strengthen the argument for interventions seeking to encourage education, income equality, and to build healthy support systems. It is argued that ACEs are the strongest common driver of physical, mental, and behavioral health costs in the population. A 2012 study

estimated the average lifetime cost per victim of child maltreatment to be $1,272,900, including

health care costs, productivity losses, special education costs, and criminal justice costs (Fang et

al., 2012). Considering the high proportion of health and behavioral issues that are attributable

to childhood adversity, a better understanding of this relationship and ways to mitigate the

effects of ACEs, and to prevent childhood adversity from happening is necessary from a moral,

medical, social, and economic standpoint.

APPENDIX: ACHS QUESTIONS INCLUDED IN THIS ANALYSIS

Section 12: Demographics

12.1 What is your age?

12.2 Are you Hispanic or Latino?

12.3 Which one or more of the following would you say is your race? White? Black/African

American? Asian? Native Hawaiian or Pacific Islander? American Indian or Alaska Native?

12.8 What is the highest grade or year of school you completed?

12.10 Is your annual household income from all sources…

        <$10,000

        $10,000-$14,999

        $15,000-$19,999

        $20,000-$24,999

        $25,000-$34,999

        $35,000-$49,999

        $50,000-$74,999

        $75,000+

12.11 About how much do you weigh without shoes?

12.12 How tall are you without shoes?

12.15 Indicate sex of respondent.

Section 20B: Adverse Childhood Experiences

20B.1 When you were growing up, was anyone living in your home depressed, mentally ill, or suicidal? (Yes or No)

20B.2 When you were growing up, did you live with anyone who was a problem drinker, alcoholic, or drug user? (Yes or No)

20B.3 When you were growing up, how often did a parent or adult living in your house hit, beat, kick, or physically hurt you? (Never, Once or twice, Sometimes, Often, Very Often)

20B.4 …swear at you, insult you, or put you down? (Never, Once or twice, Sometimes, Often, Very Often)

20B.5 …push, grab, slap, or throw something at your mother? (Never, Once or twice, Sometimes, Often, Very Often)

20B.6 …touch you sexually or try to make you touch them sexually? (Never, Once or twice, Sometimes, Often, Very Often)

Section 22: Social Support

22.1 *People sometimes look to others for companionship, assistance, and other types of support. How often is each of the following supports available to you if you need it?*

Someone to help with daily chores if you were sick? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

22.2 Someone to turn to for suggestions about how to deal with a personal problem? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

22.3 Someone to do something enjoyable with? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

22.4 Someone to love and make you feel wanted? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

Section 23: Kessler Scale

23.1 In the past 30 days, did you feel nervous? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

23.2 …feel hopeless? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

23.3 …feel restless or fidgety? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

23.4 …feel so depressed that nothing could cheer you up? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

23.5 …feel that everything was an effort? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

23.6 …feel worthless? (None of the time, A little of the time, Some of the time, Most of the time, All of the time)

BIBLIOGRAPHY

Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health. The challenge of the gradient. *Am Psychol, 49*(1), 15-24.

Adler, N. E., & Ostrove, J. M. (1999). Socioeconomic status and health: what we know and what we don't. *Ann N Y Acad Sci, 896*, 3-15..

Afifi, T. O., Enns, M. W., Cox, B. J., Asmundson, G. J., Stein, M. B., & Sareen, J. (2008). *Population attributable fractions of psychiatric disorders and suicide ideation and attempts associated with adverse childhood experiences.* (98). Available from NLM (5).

Anda, R. F., Whitfield, C. L., Felitti, V. J., Chapman, D., Edwards, V. J., Dube, S. R., & Williamson, D. F. (2002). Adverse childhood experiences, alcoholic parents, and later risk of alcoholism and depression. *Psychiatric services (Washington, D.C.), 53*(8), 1001-1009. doi: 10.1176/appi.ps.53.8.1001.

Anderson, N. B., & Armstead, C. A. (1995). Toward understanding the association of socioeconomic status and health: a new challenge for the biopsychosocial approach. *Psychosom Med, 57*(3), 213-225.

Asgary-Eden, V., & Lee, C. M. (2012). Implementing an evidence-based parenting program in community agencies: what helps and what gets in the way? *Adm Policy Ment Health, 39*(6), 478-488. doi: 10.1007/s10488-011-0371-y.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (2007). Life Span Theory in Developmental Psychology *Handbook of Child Psychology*: John Wiley & Sons, Inc.

Bear, Todd M (2014) Childhood Adversity and its Effects on Health Over the Lifespan: Analysis of the Allegheny County Health Survey. Doctoral Dissertation, University of Pittsburgh.

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annu Rev Psychol, 53*, 371-399. doi: 10.1146/annurev.psych.53.100901.135233.

Bremne, J. D., & Vermetten, E. (2001). Stress and development: behavioral and biological consequences. *Dev Psychopathol, 13*(3), 473-489.

Bremner, J. D. (2003). Long-term effects of childhood abuse on brain and neurobiology. *Child Adolesc Psychiatr Clin N Am, 12*(2), 271-292.

Briggs, E. S., & Price, I. R. (2009). The relationship between adverse childhood experience and obsessive-compulsive symptoms and beliefs: the role of anxiety, depression, and experiential avoidance. *Journal of anxiety disorders, 23*(8), 1037-1046. doi: 10.1016/j.janxdis.2009.07.004

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. *Am J Prev Med, 37*(5), 389-396. doi: 10.1016/j.amepre.2009.06.021

Center for Disease Control and Prevention. Adverse Childhood Experiences (ACE) Study. *The ACE Pyramid.* 2014.

Center for Disease Control and Prevention. Morbidity and Mortality Weekly Report. *Adverse Childhood Experiences Reported by Adults- Five States, 2009.* (2010). Retrieved from http://www.cdc.gov/mmwr/

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

Connor, K. M., & Davidson, J. R. (2003). Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety, 18*(2), 76-82. doi: 10.1002/da.10113

Dore, M.M., J.M. Doris, and P. Wright, *Identifying substance abuse in maltreating families: a child welfare challenge.* Child Abuse Negl, 1995. **19**(5): p. 531-43.

Dube, S. R., Felitti, V. J., Dong, M., Giles, W. H., & Anda, R. F. (2003). The impact of adverse childhood experiences on health problems: evidence from four birth cohorts dating back to 1900. *Prev Med, 37*(3), 268-277..

Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *Jama, 286*(24), 3089-3096.

Documét PI, Bear TM, Green HH. *Results from the 2009-2010 Allegheny County Health Survey (ACHS): Measuring the Health of Adult Residents*. Pittsburgh: Allegheny County Health Department, The Evaluation Institute; 2012.

Eggert, L. L., Thompson, E. A., Herting, J. R., Nicholas, L. J., & Dicker, B. G. (1994). Preventing Adolescent Drug Abuse and High School Dropout Through an Intensive

School-Based Social Network Development Program. *American Journal of Health Promotion, 8*(3), 202-215. doi: 10.4278/0890-1171-8.3.202.

Fang, X., Brown, D. S., Florence, C. S., & Mercy, J. A. (2012). The economic burden of child maltreatment in the United States and implications for prevention. *Child Abuse Negl, 36*(2), 156-165. doi: 10.1016/j.chiabu.2011.10.006.

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. *Am J Prev Med, 14*(4), 245-258.

Fryers, T., & Brugha, T. (2013). Childhood determinants of adult psychiatric disorder. *Clin Pract Epidemiol Ment Health, 9*, 1-50. doi: 10.2174/1745017901309010001.

Gjesfjeld CD GC, Kim KH. A confirmatory factor analysis of an abbreviated social support instrument: The MOS-SSS. Research on Social Work Practice 2007;November.

Green, B. L., Furrer, C. J., Worcel, S. D., Burrus, S. M., and Finigan, M. W. (2009). Building the Evidence Base for Family Drug Treatment Courts: Results from Recent Outcome Studies. Drug Court Review, 6(2), 53-82

Hahlweg, K., Heinrichs, N., Kuschel, A., Bertram, H., & Naumann, S. (2010). Long-term outcome of a randomized controlled universal prevention trial through a positive parenting program: is it worth the effort? *Child Adolesc Psychiatry Ment Health, 4*, 14. doi: 10.1186/1753-2000-4-14.

Halfon, N., & Hochstein, M. (2002). Life Course Health Development: An Integrated Framework for Developing Health, Policy, and Research. *Milbank Quarterly, 80*(3), 433-479. doi: 10.1111/1468-0009.00019.

Heekerens, H. P. (2008). [Effectiveness of in-home family-focused interventions]. *Prax Kinderpsychol Kinderpsychiatr, 57*(2),130-146. doi: 10.13109/prkk.2008.57.2.130.

Heim, C., & Nemeroff, C. B. (2001). The role of childhood trauma in the neurobiology of mood and anxiety disorders: preclinical and clinical studies. *Biol Psychiatry, 49*(12), 1023-1039..

Herrenkohl, T. I., Hong, S., Klika, J. B., Herrenkohl, R. C., & Russo, M. J. (2013). Developmental Impacts of Child Abuse and Neglect Related to Adult Mental Health, Substance Use, and Physical Health. *J Fam Violence, 28*(2). doi: 10.1007/s10896-012-9474-9

Herrera, C., Grossman, J. B., Kauh, T. J., & McMaken, J. (2011). Mentoring in schools: an impact study of big brothers big sisters school-based mentoring. *Child Dev, 82*(1), 346-361. doi: 10.1111/j.1467-8624.2010.01559.x.

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., . . . Zaslavsky, A. M. (2003). Screening for serious mental illness in the general population. *Arch Gen Psychiatry, 60*(2), 184-189..

Kessler, R. C., Davis, C. G., & Kendler, K. S. (1997). Childhood adversity and adult psychiatric disorder in the US National Comorbidity Survey. *Psychol Med, 27*(5), 1101-1119.

Lu, M. C., & Halfon, N. (2003). Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J, 7*(1), 13-30.

Marie-Mitchell, A., & O'Connor, T. G. (2013). Adverse childhood experiences: translating knowledge into identification of children at risk for poor outcomes. *Acad Pediatr, 13*(1), 14-19. doi: 10.1016/j.acap.2012.10.006

Miller, E., Breslau, J., Chung, W. J., Green, J. G., McLaughlin, K. A., & Kessler, R. C. (2011). Adverse childhood experiences and risk of physical violence in adolescent dating relationships. *J Epidemiol Community Health, 65*(11), 1006-1013. doi: 10.1136/jech.2009.105429.

Min, M., Farkas, K., Minnes, S., & Singer, L. T. (2007). Impact of childhood abuse and neglect on substance abuse and psychological distress in adulthood. *J Trauma Stress, 20*(5), 833-844. doi: 10.1002/jts.20250.

Murphy, J. M., Jellinek, M., Quinn, D., Smith, G., Poitrast, F. G., & Goshko, M. (1991). Substance abuse and serious child mistreatment: prevalence, risk, and outcome in a court sample. *Child Abuse Negl, 15*(3), 197-211.

Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: family social environments and the mental and physical health of offspring. *Psychol Bull, 128*(2), 330-366.Richards, M. and M.E. Wadsworth, *Long term effects of early adversity on cognitive function.* Arch Dis Child, 2004. **89**(10): p. 922-7.

Semidei, J., Radel, L. F., & Nolan, C. (2001). Substance abuse and child welfare: clear linkages and promising responses. *Child Welfare, 80*(2), 109-128.

Shapiro, C. J., Prinz, R. J., & Sanders, M. R. (2012). Facilitators and barriers to implementation of an evidence-based parenting intervention to prevent child maltreatment: the Triple P-Positive Parenting Program. *Child Maltreat, 17*(1), 86-95. doi: 10.1177/1077559511424774.

Sheridan, M. J. (1995). A proposed intergenerational model of substance abuse, family functioning, and abuse/neglect. *Child Abuse Negl, 19*(5), 519-530.

Taylor, S. E., Kemeny, M. E., Reed, G. M., Bower, J. E., & Gruenewald, T. L. (2000). Psychological resources, positive illusions, and health. *Am Psychol, 55*(1), 99-109.

Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., & Navalta, C. P. (2002). Developmental neurobiology of childhood stress and trauma. *Psychiatr Clin North Am, 25*(2), 397-426, vii-viii.

Wiggins, T. L., Sofronoff, K., & Sanders, M. R. (2009). Pathways Triple P-positive parenting program: effects on parent-child relationships and child behavior problems. *Fam Process, 48*(4), 517-530. doi: 10.1111/j.1545-5300.2009.01299.

Wittouck, C., Dekkers, A., De Ruyver, B., Vanderplasschen, W., & Vander Laenen, F. (2013). The impact of drug treatment courts on recovery: a systematic review. *ScientificWorldJournal, 2013*, 493679. doi: 10.1155/2013/493679.

Wolock, I., & Magura, S. (1996). Parental substance abuse as a predictor of child maltreatment re-reports. *Child Abuse Negl, 20*(12), 1183-1193

World Health Organization Expert Committee. *Physical Status: The Use and Interpretation of Anthropometry*, WHO Tech. Rep. Ser. no. 854 (World Health Organization, Geneva, 1995).

World Health Organization. *Obesity: Preventing and Managing the Global Epidemic* (World Health Organization, Geneva, 1997).