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# Racial and Ethnic Differences in Adverse Childhood Experiences and Health Outcomes in Adulthood

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# RACIAL AND ETHNIC DIFFERENCES IN ADVERSE CHILDHOOD EXPERIENCES AND HEALTH OUTCOMES IN ADULTHOOD

by

Sallie Mack

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# ABSTRACT

Racial and Ethnic Differences in Adverse Childhood Experiences and Health Outcomes in Adulthood

by

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Utah State University, 2020

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Adverse childhood experiences (ACEs) have been linked to a number of detrimental mental and physical health outcomes in adulthood. ACEs, due to their high prevalence rate and lifelong harmful impact, are a major public health concern particularly among people of color. Burke Harris (2018) proposed five factors (mental wellness, healthy relationships, physical activity, sleep and nutrition) for intervening with the effects of toxic stress resulting from ACEs. The current study aimed to investigate the influence the aforementioned factors have on health outcomes for individuals with ACEs. The National Longitudinal Study of Adolescent to Adult Health was utilized, allowing the current researcher to test the aforementioned five factors as mediators on five different racial/ethnic groups. ACEs were found to have significant direct effects on the mediating factors and multiple mediating factors were found to have significant effects on health outcomes, with differences among racial/ethnic groups. The findings show the importance of intervening with positive health behaviors to improve public health.

(84 pages)

# PUBLIC ABSTRACT

## Racial and Ethnic Differences in Adverse Childhood Experiences and Health Outcomes in Adulthood

Sallie Mack

Adverse childhood experiences (ACEs) have been linked to many negative physical and mental health disorders in adulthood. Many individuals in the United States have ACEs, and rates are higher among people of color. Less is known about how to prevent these physical and mental health disorders and symptoms for individuals with ACEs. Five different factors may help in intervening on the negative effects of ACEs. These include: mental wellness, healthy relationships, physical activity, sleep and nutrition (Burke Harris, 2018). This study investigated how these factors influence health in adulthood for individuals with ACEs. The current researcher used data from the National Longitudinal Study of Adolescent to Adult Health and looked at how the aforementioned factors worked for five different racial and ethnic groups. Results from this study showed that individuals with ACEs had worse scores related to mental wellness, healthy relationships, sleep, physical activity, and nutrition. Additionally, many of these factors were also related to physical and mental health. Some of these relationships differed among racial/ethnic groups. These results may indicate that these factors could be useful for intervening with individuals with ACEs to prevent negative health outcomes and that some factors may be more important or useful for some racial/ethnic groups.

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# CHAPTER I

## INTRODUCTION

Adverse childhood experiences (ACEs) encompass a range of negative life experiences in early life that, when repeated or continuous, can dysregulate the body's natural physiological stress response system, eliciting what the literature refers to as a toxic stress response (Bucci et al., 2016). Toxic stress, therefore, refers to stressors that dysregulate the body's adaptive and healthy responses to stress; not all stress constitutes toxic stress. ACEs can include dysfunctional parental relationships; physical, verbal, sexual abuse and neglect; lack of familial support and care; lack of access to resources (e.g., food, clean clothes); lack of parental support and supervision, unmarried parents, parental experiences of intimate partner violence; household drug/alcohol abuse; household mental health issues; and household prison involvement.

Repeated exposure or severe exposure to ACEs can lead to the development of toxic stress, a repeated or continuous activation of the stress response system. ACEs have a high prevalence rate, with population-based studies finding that approximately two-thirds of adults in the United States have experienced one ACE and 12-16.7% having experienced four or more of ACEs (Anda et al., 2009; Bucci et al., 2016; Gilbert et al., 2015). Racial and ethnic differences exist in ACE prevalence in the U.S., with 61% of Black non-Hispanic children, 51% of Hispanic children, 40% of White non-Hispanic children, and 23% of Asian non-Hispanic children having one ACE (Sacks & Murphey, 2018). In a nationally representative sample, children of color had higher rates of all ACE categories except for parental mental health and substance use disorders and had a higher ACE score in all age groups (Maguire-Jack et al., 2020). Additionally, children of color

experienced more neighborhood violence and racial discrimination than white children (Maguire-Jack et al., 2020).

A multitude of studies have linked ACEs to negative physical and mental health outcomes. Physical health outcomes include: inflammation, obesity, diabetes, cardiovascular disease, and cancer (Anda et al., 2009; Gilbert et al., 2015). Mental health outcomes include: psychological wellness and functioning, depressive disorders, suicide ideation and attempts, substance abuse/alcoholism, memory disturbance, and hallucinations (Anda et al., 2002; Brown et al., 2007; Chapman et al., 2004; Dube et al., 2001; Ogle, et al., 2013; Thompson et al., 2019; Whitfield et al., 2005). Additionally, racial/ethnic minority groups experience worse physical and mental health outcomes in the United States, as compared to White individuals (Koh et al., 2011; Natale-Pereira et al., 2011; Zhang et al., 2017).

More recently, studies have begun investigating mediating factors in the connection between ACEs and health outcomes, but the research on mediating factors, which serve as potential points of intervention, is still in its beginning stages. Additional research is needed to provide a basis for effective and comprehensive intervention efforts for preventing or reversing the effects of toxic stress. Burke Harris (2018) identified the following intervention factors for increasing resilience: mental wellness, healthy relationships, physical activity, sleep, and nutrition. Burke Harris (2018) proposes that these factors may mitigate the relations among ACEs and negative health outcomes, though individuals with ACEs likely would need specific intervention to improve the aforementioned variables.

The National Longitudinal Study of Adolescent to Adult Health (“Add Health”) is

a nationally representative, longitudinal study with currently four publicly available waves of data. The original Add Health researchers conducted Wave I in 1994-5, when participants were in grade 7 to 12 and mostly between the ages of 13 to 17 years-old. They conducted Wave IV interviews in 2008, when the majority of participants were between the ages of 24 to 32 years-old. To date, Add Health remains the most comprehensive survey of adolescents in the United States, and additionally has the largest total sample ($n > 90,000$ for Wave I's In-School Questionnaire portion) with unprecedented levels of racial and ethnic diversity (Harris et al., 2009).

This study proposes to address the following research questions:

Research Question 1: Is there a direct effect of ACEs on physical and mental health outcomes in early adulthood in the Add Health dataset?

Research Question 2: Based on the proposed model, do mental wellness, healthy relationships, physical inactivity, sleep, and meal consumption mediate the relation between ACEs and health outcomes?

Research Question 3. Do these relations vary by racial and ethnic groups?

# CHAPTER II

# LITERATURE REVIEW

The following literature review will cover adverse experiences in childhood, toxic stress, and related poor health outcomes in adulthood. The review will also cover mediating factors and points of intervention, with a focus on mental wellness, healthy relationships, physical activity, sleep, and nutrition.

## Adverse Childhood Experiences

Adverse childhood experiences (ACEs) encompass a broad range of harmful and stress-inducing occurrences, also referred to as early life adversity, early life stress, and early life trauma. The Adverse Childhood Experiences Questionnaire (Felitti et al., 1998), is commonly used to screen for ACEs in medical settings. The ten-item screener assesses for experiences of abuse, neglect, and household dysfunction before the age of 18. Abuse encompasses physical, emotional, and sexual abuse; neglect includes physical and emotional neglect; household dysfunction includes intimate partner violence in the caregiving household, parental separation/divorce, household substance use or mental health disorder, parental loss, food insecurity, and having an incarcerated member of the household (Dube et al., 2003). While not exhaustive of all experiences that contribute to toxic stress, the screener assesses for the major categories of ACEs. ACEs are often co-occurring and appear to have a strong graded relationship with worsened health outcomes, meaning that with an increase in ACEs, there are a greater number and severity of poor health outcomes (Felitti et al., 1998).

ACEs have a high prevalence rate, with population-based studies finding that approximately two-thirds of adults have experienced one ACE before the age of 18 and

between 12-16.7% having experienced four or more ACEs in the United States (Anda et al., 2009; Bucci et al., 2016; Gilbert et al., 2015). Racial and ethnic differences exist in ACE prevalence, with 61% of Black non-Hispanic children, 51% of Hispanic children, 40% of White non-Hispanic children, and 23% of Asian non-Hispanic children reporting one ACE (Sacks & Murphey, 2018). In a nationally representative sample, children of color had higher rates of all ACE categories except for parental mental health and substance use disorders and had a higher ACE score in all age groups (Maguire-Jack et al., 2020). Additionally, children of color experienced more neighborhood violence and racial discrimination than White children (Maguire-Jack et al., 2020).

Increasingly over the past two decades, researchers have linked ACEs to a myriad of negative physical and mental health outcomes, and explanatory factors behind these connections are still largely under investigation. One empirically supported theory regards the repeated activation of the body's physiological stress response system without buffering or protective factors, typically referred to as toxic stress (Burke Harris et al., 2017). While the stress response is an adaptive process for survival of acute and potentially life-threatening stressors, repeated activation can lead to maladaptive responses with lasting negative influences on health.

## The Stress Response System

Physiological responses to stress exist on a continuum, ranging from positive to tolerable to toxic (Bucci et al., 2016; Shonkoff et al., 2012; Shonkoff et al., 2009). Biological and contextual factors, including familial factors, genetics, interactions between genetics and environment, and other developmental factors influence the physiological response to a stressor (Bucci et al., 2016; Ellis & Boyce, 2008;

Schneiderman et al., 2005), and protective factors can increase resilience in response to stressors and influence physiological responses to stress (Bucci et al., 2016; Ellis & Boyce, 2008; Shonkoff et al., 2012). In positive and tolerable stress responses, individuals will return to a homeostatic state (Shonkoff et al., 2012).

The central and peripheral nervous systems are both activated in response to a stressor, with the two systems interacting to evaluate whether a threat is present and how to respond. The brain and spinal cord comprise the central nervous system. The CNS acts as the "command center" of the entire nervous system, as it is central in evaluating threats and interpreting cues in our environment and sending signals and commands to other parts of the body. The CNS utilizes the peripheral nervous system (PNS) to send signals. Cranial and spinal nerves comprise the PNS and relay messages between sensory organs (e.g., skin) and the CNS. The PNS is composed of the autonomic nervous system (manages involuntary control – e.g., digestion, heart rate, and energy storage) and the somatic nervous system (manages voluntary control – e.g., muscles). Of particular importance in the CNS-PNS interactions are the hypothalamic-pituitary-adrenal (HPA) axis and the sympatho-adrenomedullary (SAM) axis (Bucci et al., 2016)

The HPA and SAM axes are activated in response to a significant stressor (Bucci et al., 2016). The HPA axis regulates long-term stress and is composed of the hypothalamus, the pituitary gland, and the adrenal cortex, all of which communicate and interact via secretion and uptake of hormones, such as cortisol (Bucci et al., 2016). Cortisol assists the body in maintaining stable blood sugar levels, which allows for better response and coping with sustained stressors and return to homeostatic levels. The SAM axis is composed of sympathetic neurons and parasympathetic neurons, and its purpose is

to regulate short-term, immediate responses. Sympathetic neurons interact with the adrenal medulla and activate the body's "fight or flight" response via the excretion of epinephrine and norepinephrine. The "fight or flight" response directs energy, blood, and oxygen to vital organs through metabolism, circulation, and respiration. Individuals will become more alert and attentive, experience sharpened cognitive abilities, increased body temperature, and a decrease in nonessential bodily functioning (e.g., digestion, immune response, reproduction). With the cessation of the stressor, the parasympathetic nervous system assists in returning the body to a non-activated state, the "rest and digest" response. Thus, the parasympathetic nervous system (PSNS) is activated when the individual is no longer in the presence of the stressor, has elicited coping strategies, or has adapted to the stressor (Bucci et al., 2016). The PSNS assists in ceasing activation of the HPA and SAM axes, and the body returns to homeostasis.

**Dysregulation of the stress response system.** The stress response system can become dysregulated when chronic or prolonged stressors are present without the mitigating effects of effective coping strategies or positive caregiving support; the HPA and SAM axes become activated for prolonged periods of time and the body ceases to regulate secretion of hormones such as cortisol, as well as epinephrine, norepinephrine, and other catecholamines (Bucci et al., 2016; Habib et al., 2001; Tsigos & Chrousos, 2002). Because the brain in childhood and adolescence is particularly sensitive in its developmental stages, these changes can have a lasting effect on the architecture of brain structures and the neuroendocrine immune circuitry, involving nervous, endocrine, and immune systems (Bucci et al., 2016; McEwen, 2000). The amygdala, hippocampus, and prefrontal cortex of the brain are sensitive to stress, and repeated and prolonged

activation of the stress response system can alter the functions of these structures (Bucci et al., 2016; Cerqueira et al., 2007; McEwen, 2007; McEwen & Gianaros, 2011). When the HPA axis is chronically activated, hormonal levels (e.g., cortisol) are altered in a sustained fashion (Bucci et al., 2016; Miller et al., 2007). Additionally, HPA axis dysregulation leads to changes in inflammatory and immune responses, such that anti-inflammatory processes are slowed, leading to increases in inflammation (Bucci et al., 2016; Raison & Miller, 2003; Thayer & Sternberg, 2010; Tolmay et al., 2012; Tracey, 2002). Changes to the immune, endocrine, and nervous systems can impact different organ systems, increasing risk of chronic disease development, including cardiovascular disease, autoimmune diseases, metabolic syndrome, cognitive and behavioral disorders, and other inflammatory diseases (Bucci et al., 2016).

**Cellular aging and the stress response system.** Cells of the body are categorized into mitotic cells, which can reproduce (e.g., skin cells, organ cells), and post-mitotic cells, which cannot repair quickly or cannot repair at all (e.g., neurons, heart cells). Mitotic cells engage in the replication of deoxyribonucleic acid (DNA). Chromosomes, which are packages of DNA and protein bound together in a threadlike structure, are capped at their ends by telomeres. Telomeres protect DNA during the replication process, as each time DNA replicates, telomeres shorten in length. With enough replication, the telomere will become too short to protect DNA, which induces a DNA damage response that prevents the cell from further replication (called replicative senescence). In this stage, the cell housing the DNA becomes a senescent cell. Previously, cell senescence was understood in its protective abilities, such that it aided in hindering the development of harmful disease, such as tumor progression in cancer. Over

the past decade, however, researchers have come to find that cell senescence has differing and complex impacts on the body, some of which are helpful (tumor suppression) and some of which are harmful (tumor promotion; Rodier & Campisi, 2011). Additionally, when telomeres become too short, the cell may be programmed for death, otherwise called apoptosis (Lyon et al., 2014; Ridout et al., 2018). With the ceasing of replication and with cell death, tissue becomes increasingly less able to repair itself, leading to aging-related diseases. Researchers have linked chronic stress to shorter telomere length (Epel et al., 2004), and to the onset and progression of chronic diseases (Esch et al., 2018). Additionally, telomere length is negatively correlated with ACEs (Boeck et al., 2018; Levandowski et al., 2016; O'Donovan et al., 2011; Ridout et al., 2018; Ridout et al., 2018; Tyrka et al., 2016, 2010).

## Health Outcomes

Felitti et al. (1998) ran the first major study to investigate the links between ACEs and physical health outcomes in adulthood, and research has continued to support and find new links among ACEs and negative health outcomes. A literature review of 23 studies on adults aged 50 years old and older found a connection between childhood trauma and poor mental and physical health outcomes in later life (Maschi et al., 2013). Another meta-analysis and systematic review found that individuals who endorsed four or more ACEs were significantly more likely to endorse negative physical and mental health outcomes, as compared to individuals who endorsed no ACEs (Esch et al., 2018). Many of the connections between ACEs and health outcomes have a graded, or dose-response, relationship, where an increasing number of ACEs is related to significantly increased likelihood or severity of negative health outcomes, as detailed below.

**Physical Health**

There appears to be a dose-response relationship, such that individuals who report 4 or more ACEs are significantly more likely than those who report no ACEs to develop 6 of the 10 top leading causes of death, including ischemic heart disease, cancer, stroke, chronic bronchitis/emphysema, and diabetes; these relationships remained significant even after controlling for age, gender, race, and education (Bucci et al., 2016; Felitti et al., 1998). Another study supported the graded relationship between ACEs and diabetes risk, finding that with each additional ACEs endorsed, an individual increases their risk of diabetes by 11% (Deschênes et al., 2018).

ACEs have additionally been linked to inflammation in young adulthood and mid-adulthood with a graded relationship, even when controlling for genetic influences (Baldwin et al., 2018; Chen & Lacey, 2018) and have been linked to increased hospitalization for autoimmune disease (Dube et al., 2009). Histories of childhood maltreatment have also been linked to obesity and obesity-related illness in adulthood (Li et al., 2015).

Childhood trauma is additionally positively correlated with cardiovascular disease risk symptoms in young adults, even when accounting for other health-related behaviors and factors (Lei et al., 2018). ACEs have a graded relationship with lung cancer rates, such that individuals with 6 or more ACEs had a three times higher likelihood of having lung cancer as compared to individuals with no ACEs (Brown et al., 2010). Individuals with lung cancer with 6 or more ACEs were also approximately 13 years younger when presenting at the hospital, as compared to individuals with no ACEs (Brown et al., 2010). This correlation may only be partially explained by increased smoking behaviors in

individuals with ACEs, indicating that additional processes related to ACEs may impact the incidence of lung cancer among smokers (Brown et al., 2010). Another study found that women with a variety of ACEs had increased rates of lifetime cancer diagnosis (encompassing all cancer types except skin cancer), while men only had increased cancer rates with histories of emotional abuse (Alcalá et al., 2017).

**Mental Health**

Dysregulated stress response has been associated with the progression of mental, cognitive, behavioral, and developmental disorders both in childhood and in adulthood (Bucci et al., 2016; Gabbay et al., 2009; Keller et al., 2010; Marsland et al., 2008; Misener et al., 2008; Raison et al., 2006). Early life trauma appears to have a greater impact on psychological wellness and functioning (e.g., presence/intensity of PTSD symptoms), psychosocial functioning, subjective levels of happiness, levels of social support, and abilities to cope as compared to trauma experienced later in life (Ogle et al., 2013). ACEs have been linked to increases in psychopathology in adulthood, specifically through the pathway of HPA axis dysregulation (Bucci et al., 2016). HPA axis dysregulation has been associated with changes in different parts of the brain, including the hippocampus, amygdala, and prefrontal cortex. Changes in the prefrontal cortex affect executive functioning, which includes self-regulatory behaviors, reasoning abilities, and attention span (Bucci et al., 2016; Cerqueira et al., 2007). Changes in the amygdala affect fear conditioning, unlearned fear, and increases hypervigilance (Bucci et al., 2016; Cerqueira et al., 2007). Changes in the hippocampus affect learning and memory (Bucci et al., 2016; Cerqueira et al., 2007).

ACEs are further related to negative mental health outcomes. For instance, ACEs

have been found to have a dose-response relationship with the likelihood of depressive disorders in adulthood (Anda et al., 2002; Chapman et al., 2004). A multitude of studies have linked ACEs to increased suicide attempts in a graded fashion in childhood, adolescence, and adulthood (Dube et al., 2001). One study found that ACEs correlated with a two to five times increase in suicide attempts as compared to individuals without ACEs, with seven ACEs being linked to a 30 times greater likelihood of attempting suicide than an absence of ACEs (Dube et al., 2001). Another study found that childhood adversity is related to suicidal ideation and suicide attempts in adulthood, such that individuals who endorsed at least three ACEs were three times as likely to seriously consider or attempt suicide (Thompson et al., 2019).

A higher number of ACEs was correlated in a graded fashion to early drug use in adolescence and drug use, substance abuse, and alcoholism in adulthood (Anda et al., 2002; Dube et al., 2003). Additionally, number of ACEs also have a graded relationship with prescriptions for psychotropic medication, such that individuals with five or more ACEs have an almost three times higher rate of these prescriptions; this includes antidepressant, mood-stabilizing, antipsychotic, and anxiolytic medications (Anda et al., 2007).

Number of ACEs has been found to have a graded relationship with childhood autobiographical memory disturbance even when controlling for age, sex, race/ethnicity, and levels of education, and adults with six or more ACEs were almost six times more likely to experience childhood autobiographical memory disturbance than adults without ACEs (Brown et al., 2007). There is also a graded relationship between childhood trauma and histories of hallucinations in adulthood, such that individuals with seven or more

ACEs were five times more likely to report histories of hallucinations; histories of hallucinations were non-specific to any disorder and findings were independent of substance use histories (Whitfield et al., 2005).

## Examining the Relations

While research has continued to shed light on the associations between ACEs and health outcomes in adulthood, a lack of research exists on how to effectively intervene on mechanisms to improve health outcomes, with even fewer studies on preventative measures (Burke Harris et al., 2017). There is research investigating the link between ACEs and negative health outcomes, including factors that strengthen the link, weaken the link, and explain the link. Many of these factors are explained below and first suggested by a model proposed by Nadine Burke Harris, M.D., in her book, *The Deepest Well*. This proposed model encompasses five components: mental wellness, healthy relationships, physical activity, sleep, and nutrition.

**Mental wellness.** Factors that have been found to increase resilience in children and adults who experienced adversity include: optimism, self-care, and sense of purpose in life (Williams et al., 2001). High self-esteem and self-efficacy are important factors in resiliency; self-esteem and self-efficacy mediate the link between ACEs and physical illness, disability, and poor mental health outcomes, such as worsened PTSD symptoms (Murphy et al., 2014; Williams et al., 2001).

**Healthy relationships.** Healthy relationships in a child's life can include those with parents, siblings, peers, teachers, coaches, and more. Adolescents with higher numbers of ACEs are less likely to have a secure attachment style, which is characterized by more collaborative, coherent, and consistent relationships with primary caregivers

(Layne et al., 2014). Attachment patterns moderate the link between ACEs and telomere length, which has implications relating to aging and aging-related disease (Dagan et al., 2018). Specifically, in individuals with poor attachment patterns, such as an insecure-dismissing attachment style, ACEs correlated with shortened telomere lengths, and this correlation was nonsignificant in individuals with other attachment styles (e.g., secure-autonomous and insecure-preoccupied; Dagan et al., 2018).

Having a supportive adult, such as a parent, teacher, coach, or mentor, in a child's life acts as a protective factor in the ACEs–negative health outcome link (Larkin et al., 2018). A systematic review of interventions for ACEs found that warm, supportive, and nurturing parenting styles and positive parenting skills improved intervention effectiveness on biological health outcomes, such as HPA axis regulation and salivary cortisol levels (Purewal Boparai et al., 2018). Social support mediates the relation between childhood abuse and adult mental and physical health (Herrenkohl et al., 2016). Mentorship programs for at-risk youth increase resilience factors, such as feelings of self-worth (Aschenbrener et al., 2017). Additionally, an intervention that included focus on improving social functioning skills improved mental and physical well-being, including symptoms and presence of illness (Cameron et al., 2018).

Finally, ACEs can influence an individual's ability to learn cognitive, behavioral, and emotional coping skills needed to be effective and successful in interpersonal matters, potentially leading to dysfunction that harms social relationships across the lifespan, amplifying emotional burden (Hammen, 2006; Turner & Lloyd, 1995).

**Physical activity.** Sports participation acts as a protective factor in the ACEs – negative health outcome link (Larkin et al., 2018). Additionally, interventions including

targets for physical activity and nutrition education alter HPA axis regulation, decreasing levels of depressive symptoms (Saxton et al., 2014). Physical activity also assists in promoting resilience (Haglund et al., 2007). In addition to the role that physical activity plays, sedentary behaviors may act uniquely upon health risks, such that increased sedentary behavior is correlated with greater mortality rates in adulthood (Thorp et al., 2011).

**Sleep.** Increased ACEs is correlated with poor sleep health and quality in adulthood, even when accounting for current levels of stress, history of depression, and other sociodemographic factors (Brindle et al., 2018). Trauma in adulthood did not have this same effect on sleep health (Brindle et al., 2018). Troubles with sleep may also exacerbate and help explain the presence of future mental health problems, such as psychotic symptoms, as opposed to ACEs alone (Andorko et al., 2018). Poor or worsening sleep quality and quantity is associated with worsened self-reported physical functioning, increased rate of developing a pain-related condition, while improving sleep quality is associated with improved physical functioning (Afolalu et al., 2018). Poor sleep quality and quantity strengthen the HPA axis's stress response and sleep quality is found to be highly influential on how cortisol impacts the body (van Dalfsen & Markus, 2018). Childhood abuse has been linked to increased body mass and decreased sleep quality in adulthood, which link to increased inflammation and, in turn, hypertension (Petrov, et al., 2016).

**Nutrition.** There is less direct research on the connections between ACEs and nutrition, nutrition and the stress response, and nutrition-based interventions for improving mental health outcomes. However, early-life nutrition, including diets low in

fruits, vegetables and fiber, correlates to health outcomes, such as increased inflammation and immune system activity, in adulthood (Giugliano et al., 2006). ACEs, such as physical, emotional, and sexual abuse, have been linked to increased risk for obesity and disordered eating in adulthood (Fuemmeler et al., 2009; Hemmingsson et al., 2014). Additionally, food insecurity, which is defined as unreliable accessibility to affordable and nutritious food, in childhood has been linked to ACEs and also to adult depressive symptoms (Sun et al., 2016). Meal deprivation, which is defined as the restriction or complete lack of consumption of food, is more common among individuals of low socio-economic status; food-insecure individuals consume significantly fewer fruits, vegetables, and fiber than food-secure individuals (Robaina & Martin, 2013). Meal deprivation also correlates with health problems into adulthood (e.g., obesity; Olson et al., 2007).

**Current Study**

ACEs have been linked to a number of detrimental mental and physical health outcomes in adulthood, and less research has focused on comprehensive and holistic approaches to enhancing resilience in the face of childhood adversity. Five factors (mental wellness, healthy relationships, physical activity, sleep and nutrition) may serve as effective intervention points for preventing longstanding negative effects stemming from toxic stress caused by ACEs. The National Longitudinal Study of Adolescent to Adult Health ("Add Health") is a publicly available, nationally representative, longitudinal data set which began data collection in 1994 and completed its fourth Wave of data collection in 2008.

**Specific Aims/Objectives**

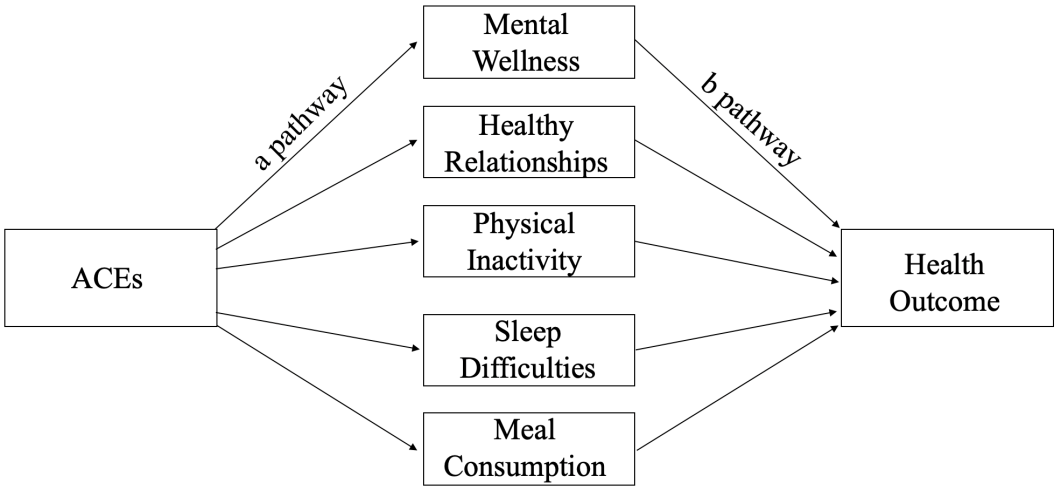
**Aim 1**: Is there a direct effect of ACEs (collected in all four Waves, pertaining to experiences from under 18 years of age) on physical and mental health outcomes in early adulthood (collected in Wave IV) in the Add Health dataset? It is hypothesized that higher number of ACEs will be related to poorer physical and mental health outcomes.

**Aim 2**: Based on the proposed model (*see Figure 1 below*), do mental wellness, healthy relationships, physical inactivity, sleep, and meal consumption (collected in Waves I and II) mediate the relation between ACEs and health outcomes? It is hypothesized that mental wellness, healthy relationships, and food security will buffer the impacts of ACEs on health outcomes. It is also hypothesized that physical inactivity and sleep problems may act as a risk factor in the relation between ACEs and health outcomes.

**Aim 3**. Do these relations vary by racial and ethnic groups? It is hypothesized that there will be differing importance of mediators based on racial and ethnic groups.

Figure 1

*Conceptual model of the impact of mental wellness, healthy relationships, physical inactivity, sleep, and meal consumption on the ACEs-health outcomes link.*




*Note.* Health outcomes are: CESD-10, mental health diagnosis, self-rated health, and physical health diagnosis. Each individual health outcome will be run in a separate statistical model.

# CHAPTER III

# METHOD

The current researcher used the first four waves of the National Longitudinal Study of Adolescent to Adult Health ("Add Health;" Harris et al., 2009) publicly available data set for secondary data analysis to address the research aims. Add Health is a longitudinal study, which began data collection (Wave I) during the 1994-1995 school year for adolescents in grades 7 to 12. Wave II was conducted one year after Wave I; Wave III was conducted in 2001-2, when participants were 18 to 24 years-old; Wave IV was conducted in 2008, when participants were 24 to 32 years-old. The sample has unprecedented racial and ethnic diversity, which is a primary reason the current researcher chose this data set for this analysis. Original researchers utilized questions that assessed adversity experienced before the age of 18 from all waves. The current researcher compiled questions from Waves I and II, when participants were primarily under the age of 18, for all proposed mediating variables (healthy relationships, mental wellness, sleep difficulties, physical inactivity, and meal consumption). Additionally, the current researcher compiled questions assessing mental and physical health outcomes from Wave IV.

## Participants

Unequal probability of selection was utilized in Add Health to sample from 80 high schools and 52 middle schools (Harris et al., 2009). Systematic sampling methods and implicit stratification were utilized to create a sample representative of schools in the U.S., inclusive of region, school size and type, urbanicity, and ethnic composition (Harris et al., 2009).

**Wave I.** Out of a sample frame of 26,666 schools sorted by size, type, region, urbanization level, and racial percentage (white), 80 schools were chosen. Fifty-two schools of the 80 selected agreed to participate. Similar high schools replaced the 28 remaining slots. The original researchers identified "feeder" schools as schools, such as middle or junior high schools, that would contribute at least five students to the chosen high schools. Probability for selection was proportional to how many students that "fed" into the high school. A total of 145 schools participated in data collection, with a total of 90,118 students.

**Wave II.** Participants for Wave II were drawn almost entirely from the Wave I sample. Most of the participants in twelfth grade were removed from this new sample, as they no longer fit the grade requirement for eligibility; original researchers made an exception for twelfth graders who were part of a genetic pair. The sampling included a new small additional sampling of adolescents.

**Wave III.** The sample included many of the original participants from Wave I (n = 15,170) and additional participants who were part of a genetic pair (n = 27; total n = 15,197). Additionally, it included some of the participants' romantic partners (n = 1,507). Participants must be at least 18 years of age to be eligible for Wave III. Participants' partners must be 18 years of older, of the opposite sex from their partner, and have been in a relationship with three months or longer.

**Wave IV.** All participants from Wave I were eligible for inclusion in this wave. Participants were now between the ages of 24 and 32 years of age. Original researchers were able to locate 92.5% of the Wave I sample, with 80.3% of the individuals responding. This led to a sample of 15,701.

**Current study.** The current researcher utilized the publicly available sample from Waves I-IV, specifically including all participants who participated in all Waves. The total number of respondents completing Waves I-IV in the public sample was 3709.

## Research Design

**Original study.** Add Health is a longitudinal study, which began data collection during the 1994-1995 school year for adolescents in grades 7 to 12. The purpose of the study, funded primarily by the National Institute of Child Health and Human Development (NICHD), is to investigate health and related behaviors from adolescence into young adulthood. Data collection has thus far consisted of five waves and has included responses from adolescents, parents, siblings, peers, school administrators, and romantic partners. While the majority of data was collected in-school in Wave I, the original researchers conducted four in-home respondent interviews. The original researchers utilized oversampling methods for the following populations: Black adolescents with college-educated parents, Cuban and Puerto Rican adolescents, Chinese adolescents, and adolescents with physical disabilities (Wave I).

Following school sampling in Wave I, 145 schools participated with a total of 90,118 students at these schools. Schools were additionally asked to fill out "School Administrator questionnaires." From the pool of participants, the original researchers sampled individuals for inclusion in the in-home components (In-Home Interview) of the study. These participants were interviewed in Wave I and then one year later in Wave II.

***Questionnaires.*** The in-school questionnaire collected descriptive information (e.g., background/parental background, friends, school-related information (e.g., work and activities), general health, health-related behaviors). The school administrator

questionnaire collected information pertaining to school educational setting and environment (e.g., school and student body characteristics, curriculum, services and programs). In-home assessment components were administered by a Computer-Assisted Personal Interview (CAPI) or an Audio Computer-Assisted Self Interview (ACASI) to adolescents. Parents were interviewed during Wave I and information pertaining to demographics, health, and other adolescent-focused characteristics were collected. This allowed for greater assessment of adolescent health history.

**Measures**

The current researcher utilized previously published measurements of the chosen variables (described below): adverse childhood experiences, mental wellness, healthy relationships, physical inactivity, sleep difficulties, meal consumption, mental health outcomes, and physical health outcomes. Items were pulled from each of the Wave's *In Home Questionnaire Code Book*, which is comprised of hundreds of questions, which are grouped into 30-40 different labelled sections (e.g., "Daily Activities," "Feelings Scale," and "Personality and Family" in Wave I). Appendix A contains all items utilized for each measure. Table 1 includes summary details for each measure.

***Adverse Childhood Experiences.*** The Add Health data set contains approximations of eight (Craig, 2019) of the original 10 items on the ACE screener (Dube et al., 2003): (1) physical neglect, (2) emotional abuse, (3) physical abuse, (4) sexual abuse, (5) parent binge drinking, (6) parental figures in jail, (7) family suicide attempts, and (8) loss of a parent. Each indicator was marked as present or absent before the age of 18. Items were used from waves I -IV, but items in waves III & IV were

Table 1

*Measurement Details*

| | Measure Type | Number of Items | Possible Range | Sample Range | Cronbach's Alpha | Mean (SD) |
|---|---|---|---|---|---|---|
| ACEs | discrete count | 8 | 0-8 | 0-8 | n/a | 1.81 (1.45) |
| Mental Wellness | scale | 19 | 19-95 | 39-95 | .878 | 79.21 (8.95) |
| Healthy Relationships | scale | 14 | 14-70 | 24-70 | .854 | 56.79 (7.32) |
| Physical Inactivity | weekly hours | 6 | 0-336 | 0-320 | n/a | 44.67 (35.09) |
| Sleep Difficulties | scale | 4 | 0-16 | 0-16 | .635 | 5.02 (2.94) |
| Meal Consumption | count | 3 | 0-21 | 0-21 | n/a | 16.4 (4.38) |
| Depression (CESD-10) | scale | 10 | 0-30 | 0-29 | .841 | 6.00 (4.65) |
| Mental Health Diagnoses | count | 4 | 0-4 | 0-4 | n/a | 0.37 (0.74) |
| Self-Rated Health | single item | 1 | 1-5 | 1-5 | n/a | 2.33 (0.92) |
| Physical Health Diagnoses | count | 10 | 0-10 | 0-6 | n/a | 0.80 (0.93) |

retrospective, including items about abuse. Each binary indicator was then summed for a total count of discrete ACE categories, with total scores ranging from 0-8.

***Mental Wellness.*** From Waves I & II, the current researcher included 7 items of self-esteem (as measured by Skorska & Bogaert, 2017) plus 2 items related to hope (feeling hopeful about the future and reverse coded feelings of suicidality) and one additional item (hopeful to live to age 35) for a total of 19 items. All items were summed, with higher scores indicating higher mental wellness. The Cronbach's alpha from the current sample is .878.

***Healthy Relationships.*** Seven items (as measured by Skorska & Bogaert, 2017) from Waves I and II (14 total items) measured perceived social support from adults, teachers, parents, family, and friends. Higher scores are related to higher perceived social support. The Cronbach's alpha from the current sample is .854.

***Physical Inactivity.*** Three items from Waves I & II (six items total) measured physical inactivity through weekly hours spent engaging in sedentary behaviors, (watching television, videos, playing video games; as measured by Xie et al., 2015). Higher scores are related to more hours of sedentary behaviors. The original plan was to measure physical activity, but the physical activity variables in Waves I and II were not comprehensive nor consistent across Waves.

***Sleep Difficulties.*** Two items from Waves I & II (four items total) were used to assess sleep difficulties. Items included "waking up feeling tired" and "trouble falling asleep or staying asleep." Higher scores indicate more sleep difficulties. Cronbach's alpha from the current sample is .635. We kept this measure despite its moderate to poor internal consistency as sleep circumstances can change over time and these items are

across two waves.

***Meal Consumption.*** Participants indicated how many times they ate breakfast, lunch, and supper in the past week, for a total count of up to 21 meals (reverse coded from Jackson & Beaver, 2015, measuring meal deprivation) as a way to conceptualize nutrition. The National Institute of Health has recently called for uniformity in data collection, as measures of nutrition vary greatly (NIH Nutrition Research Task Force, 2020). The Add Health dataset did ask about many nutrition items but did not consistently measure nutritional quality across Waves and varied from asking about items consumed "yesterday" to the past seven days, but without a single composite score.

***Mental Health Outcomes.*** *Depression Symptoms* were measured with the 10-item subscale of the Center for Epidemiologic Studies Depression scale (CESD-10; Musliner & Singer, 2014) in Wave IV, with higher scores indicating more symptoms of depression. The Cronbach's alpha from the current sample is .841. In Wave IV, participants indicated if they had been diagnosed with anxiety, depression, ADHD, or PTSD (inclusive of all mental health diagnoses included) for a count of 0-4 for *Mental Health Diagnosis*.

***Physical Health Outcomes.*** *Self-rated health* was measured from a single self-report rating of the participant's general health from Excellent (1) to poor (5) in Wave IV, as used by Skorska & Bogaert, 2017. Additionally, in Wave IV, participants indicated if they had been diagnosed with cancer, high cholesterol, high blood pressure, diabetes, heart disease, breathing disorder, migraines, seizure disorder, hepatitis c, or a sexually transmitted disease for a count of 0-10 for *Physical Health Diagnosis*.

***Missing Data.*** Participants who completed at least 80% of the items for each measure were included. Single subject average imputation was used for any missing data

points up to the 20% cutoff.

**Analytic Plan**

To evaluate the relation between adverse childhood experiences and health outcomes (physical and mental) along with possible mediators (mental wellness, healthy relationships, physical inactivity, sleep difficulties, and meal consumption; *see Figure 1*). The current researcher used parallel multiple mediation models through Hayes' (2013) PROCESS to provide bootstrapping confidence intervals, model estimations, and conditional and direct effect computations (Hayes, 2013). The current researcher ran separate stratification models for each racial/ethnic group for the four outcome variables (CESD-10, mental health diagnosis, self-rated health, physical health diagnosis).

**Human Subjects/Institutional Approvals**

**Original study.** The original Add Health study was approved by the University of North Carolina School of Public Health Institutional Review Board, in accordance with their guidelines and the Code of Federal Regulations of Human Subjects 45CFR46. Consent varied by school, as dictated by their guidelines and desires. Parental consent was necessary for researchers to access student names via directory and for student participation in the study. The original researchers used passive consent forms in schools (where allowed), meaning parental permission was assumed unless indicated by a signed, returned form indicating a desire to exclude the student from participation. Active consent was requested by some schools, meaning parents had to return signed consent forms to allow student inclusion in the research. For individuals sampled for inclusion in the in-home interviews, original researchers collected written informed consent from parents or legal guardians and adolescent participants. In Wave III, an additional consent

form was given and signed for participants willing to provide urine and saliva samples. Additionally, in Wave III, parental consent was no longer necessary, as all participants were 18 years old or older. Participants gave written informed consent and received incentive payment for their participation.

Participant responses are unable to be linked to identifiable information, especially names of individual participants. Additionally, the identification numbers assigned to participants allow researchers to track responses across the different waves but are not included in distribution of data.

**Current study.** The current researcher submitted this research project to Utah State University's Institutional Review Board for formal review as a secondary data analysis project prior to beginning data analysis. This project was determined exempt from approval requirements due to the data set's public availability, absence of identifiable participant information, and previous IRB approval, as noted above.

# CHAPTER IV

# RESULTS

## Participant Characteristics

The sample for the current study was 54.2% female and 45.8% male. Participants at Wave IV were between the ages of 24-32. In this nationally representative sample (n = 3677), 69.1% of participants identified as "White" (n = 2549), 23.1% identified as "Black or African American" (n = 843), 3.5% identified as "Asian or Pacific Islander" (n = 127), 3.9% identified as "American Indian or Native American" (n = 141), and 10.5% identified as having "Hispanic or Latino" origin (n = 386). Table 2 shows means and standard deviations for all measures by racial/ethnic group and overall sample. Statistical comparisons are not made across groups as a participant could identify with more than one racial/ethnic group, thus, categorization is not mutually exclusive.

## ACEs Relations to Mediators ("a" pathways)

In the total sample, ACEs were significantly correlated with all mediating variables ($p < .05$; See Table 3), such that as types of ACEs increased, healthy relationships, mental wellness, and meal consumption decreased, and physical inactivity and sleep difficulties increased. For all racial and ethnic groups, similar, significant patterns emerged for healthy relationships and mental wellness. Pathways were similarly significant from ACEs and sleep difficulties and meal consumption for all racial/ethnic groups, except Native American (though it approached significance for ACEs to sleep difficulties, $p = .0761$). ACEs to physical inactivity was not statistically significant for any individual racial/ethnic group. The magnitude of the relation of ACE's to sleep difficulties was double for the Asian American sample, as compared to all other

Table 2

*Means and Standard Deviations of Measures by Racial/Ethnic Group and Total Sample*

| | Latinx Mean (SD) | White Mean (SD) | Black Mean (SD) | Native American Mean (SD) | Asian Mean (SD) | Overall Mean (SD) |
|---|---|---|---|---|---|---|
| ACEs | 1.99 | 1.73 | 2.02 | 2.26 | 1.92 | 1.81 |
| | (1.51) | (1.45) | (1.41) | (1.48) | (1.36) | (1.45) |
| Mental | 77.87 | 79.02 | 80.54 | 77.96 | 75.57 | 79.21 |
| Wellness | (9.33) | (9.06) | (8.36) | (9.15) | (10.05) | (8.95) |
| Healthy | 56.53 | 56.94 | 56.59 | 56.10 | 55.61 | 56.79 |
| Relationships | (7.69) | (7.18) | (7.51) | (7.90) | (7.81) | (7.32) |
| Physical | 44.26 | 40.09 | 58.87 | 48.17 | 42.09 | 44.67 |
| Inactivity | (30.61) | (31.24) | (42.16) | (39.80) | (27.65) | (35.09) |
| Sleep | 4.64 | 5.24 | 4.49 | 5.56 | 5.13 | 5.02 |
| Difficulties | (3.00) | (2.93) | (2.94) | (3.14) | (2.79) | (2.94) |
| Meal | 16.12 | 16.84 | 15.18 | 15.91 | 16.73 | 16.4 |
| Consumption | (4.53) | (4.20) | (4.73) | (4.69) | (3.87) | (4.38) |
| CESD-10 | 6.42 | 5.69 | 6.75 | 6.30 | 7.01 | 6.00 |
| | (4.83) | (4.56) | (4.85) | (4.56) | (4.46) | (4.65) |
| Mental | 0.29 | 0.44 | 0.21 | 0.36 | 0.20 | 0.37 |
| Health | (0.65) | (0.80) | (0.55) | (0.77) | (0.59) | (0.74) |
| Diagnoses | | | | | | |
| Self-Rated | 2.50 | 2.27 | 2.45 | 2.47 | 2.48 | 2.33 |
| Health | (0.96) | (0.89) | (0.97) | (0.91) | (0.85) | (0.92) |
| Physical | 0.77 | 0.75 | 1.01 | 1.07 | 0.58 | 0.80 |
| Health | (0.96) | (0.92) | (0.95) | (0.99) | (0.78) | (0.93) |
| Diagnoses | | | | | | |

Table 3

*Parameter estimates for the coefficients of the mediators regression on ACEs (" a" pathways)*

| | Native Am n = 141 | Asian Am n = 127 | Black n = 843 | White n = 2549 | Latinx n = 386 | Total n = 3677 |
|---|---|---|---|---|---|---|
| Healthy Relationships | -1.39* [-2.25, -.52] | -1.45* [-2.43, -.47] | -.98* [-1.33, -.62] | -1.29* [-1.48, -1.10] | -1.16* [-1.66, -.66] | -1.20* [-1.36, -1.04] |
| Mental Wellness | -1.28* [-2.29, -.27] | -1.44* [-2.73, -.16] | -.93* [-1.33, -.53] | -1.28* [-1.52, -1.04] | -1.41* [-2.02, -.81] | -1.18* [-1.37, -.98] |
| Sleep Difficulties | .30 [-.05, .65] | .63* [.29, .97] | .22* [.08, .36] | .31* [.24, .39] | .34* [.14, .53] | .28* [.21, .34] |
| Physical Inactivity | .35 [-4.15, 4.84] | -1.80 [-5.39, 1.78] | -.36 [-2.40, 1.68] | .81 [-.03, 1.65] | .51 [-1.53, 2.56] | .98* [.20, 1.77] |
| Meal Consumption | -.03 [-.56, .50] | -.52* [-1.02, -.03] | -.28* [-.51, -.06] | -.41* [-.52, -.30] | -.36* [-.66, -.06] | -.43* [-.53, -.33] |

*Note.* * $p < .05$, 95% confidence intervals

racial/ethnic samples and the total sample (0.63, as compared to 0.22-0.34). The ACEs to mediator coefficients are the same for all outcome models discussed below.

**CESD-10**

***Direct Effect of ACEs on CESD-10***

ACEs was significantly related to depression symptoms (direct effect = .48, p <.001) for the total sample, such that as types of ACEs increased, depression symptoms increased. For individual racial/ethnic groups, the direct effect was significant in the Asian American, Black, and White samples and approached significance in the Latinx sample (p = .079). The direct effect was not significant in the Native American sample. The direct effects are located in Table 4.

***Coefficients of Mediators on CESD-10 ("b" paths)***

Parameter estimates for the "b" paths are listed in Table 5 (*see Appendix B1 for visual representation*). All pathways were significant in the total sample (p < .02), such that as healthy relationships, mental wellness, and meal consumption increased, depression symptoms decreased and as sleep difficulties and physical inactivity increased, depression symptoms increased. For individual racial/ethnic groups, the most frequently significant pathway was between mental wellness and CESD-10, and was significant for all groups except Native American. Sleep difficulties to CESD-10 was significant in the Native American, White, and Latinx samples, but not the Black and Asian American samples. This path weight was more than double for Native Americans, as compared to the total sample. Healthy relationships to CESD-10 was significant in the Black sample, but not other racial/ethnic group samples. Physical inactivity to CESD-10 was significant in the White sample, but not the Native American, Asian American,

Black, or Latinx samples. Meal consumption to CESD-10 was significant for Native Americans, but not for Asian Americans, Blacks, Whites, or Latinx.

***Indirect Effects of ACEs on CESD-10 ("a" path x "b" path)***

The unstandardized indirect effects of ACEs on CESD-10 through each mediator are listed in Table 4. The indirect effects of ACEs on CESD-10 through all five mediators were statistically significant ($p < .05$) in the total sample. When testing racial/ethnic groups individually, the indirect effect of ACEs on CESD-10 through mental wellness was significant in the Asian American, Black, White, and Latinx samples and not the Native American sample. The indirect effect of ACEs on CESD-10 through sleep difficulties was significant in the White and Latinx samples, and not the Native American, Asian American, and Black samples. The indirect effect of ACEs on CESD-10 through healthy relationships was significant in the Black sample and no other racial/ethnic groups. The indirect effects of physical inactivity and meal consumption was non-significant in any individual racial/ethnic groups.

For the Black, White, and total samples, the total indirect effect accounts for 30-35% of the variance in CESD-10 scores, while for the Latinx sample, the total indirect effect accounts for 52%. Similar to the total sample, Asian American, Black, and White samples had the indirect effect of mental wellness accounting for 17-21% of the variance in the outcome. The variance was 40% for the Latinx sample. The indirect effect through healthy relationships was only significant for the Black sample (10%). The indirect effect of sleep difficulties was only significant for the Latinx and White samples (14%, 9%). In the total sample, the total indirect effect accounted for 32% of the variance in CESD-10. Mental wellness accounted for 18%. Sleep difficulties accounted for 6%; healthy

relationships accounted for 5%; meal consumption accounts for 2.5%; physical inactivity accounted for 1%.

### *Total Effect of the 5 Factor Mediation Model on CESD-10*

The total effect (0.70) was significant for the total sample ($p < .001$). The total effect was significant in the Asian American, Black, White, and Latinx samples, and not significant in the Native American sample (see Table 4 for details).

Table 4

*Unstandardized Indirect Effects of ACEs on CESD-10 (" axb" pathways)*

| | Native Am n = 141 | Asian Am n = 127 | Black n = 843 | White n = 2549 | Latinx n = 386 | Total n = 3677 |
|---|---|---|---|---|---|---|
| Healthy Relationships | .07 [-.08, .22] | -.03 [-.23, .13] | .06* [.01, .12] | .03 [-.01, .07] | -.03 [-.13, .05] | .03* [.004, .06] |
| Mental Wellness | .02 [-.11, .19] | .20* [.02, .46] | .11* [.05, .18] | .13* [.09, .18] | .22* [.10, .38] | .13* [.10, .16] |
| Sleep Difficulties | .12 [-.01, .29] | .07 [-.16, .30] | .01 [-.01, .05] | .06* [.04, .09] | .08* [.01, .17] | .04* [.02, .06] |
| Physical Inactivity | .002 [-.05, .07] | -.03 [-.11, .03] | -.001 [-.02, .01] | .01 [-.0001, .02] | -.001 [-.03, .01] | .01* [.001, .02] |
| Meal Consumption | .004 [-.09, .10] | .08 [-.04, .25] | .002 [-.02, .02] | .01 [-.01, .03] | .02 [-.02, .08] | .02* [.002, .03] |
| Direct Effect | .01 [-.49, .50] | .65* [.08, 1.22] | .43* [.21, .66] | .46* [.34, .58] | .27 [-.03, .58] | .48* [.38, .58] |
| Total Effect | .22 [-.29, .73] | .95* [.39, 1.50] | .62* [.39, .85] | .70* [.59, .82] | .56* [.25, .87] | .70* [.60, .80] |

*Note.* * $p < .05$, 95% confidence intervals

Table 5

*Coefficients of Mediators on CESD-10 (" b" pathways)*

| | Native Am n = 141 | Asian Am n = 127 | Black n = 843 | White n = 2549 | Latinx n = 386 | Total n = 3677 |
|---|---|---|---|---|---|---|
| Healthy Relationships | -.05 [.16, .06] | .02 [-.09. 14] | -.06* [-.11, -.02] | -.02 [-.05, .01] | .03 [-.04, .10] | -.03* [-.05, -.005] |
| Mental Wellness | -.02 [-.12, .09] | -.14* [-.23, -.05] | -.12* [-.16, -.07] | -.10* [-.13, -.08] | -.16* [-.22, -.10] | -.11* [-.13, -.09] |
| Sleep Difficulties | .39* [.13, .65] | .11 [-.17, .40] | .06 [-.05, .18] | .20* [.14, .26] | .23* [.07, .39] | .15* [.10, .20] |
| Physical Inactivity | .01 [-.01, .03] | .02 [-.01, .04] | .005 [-.003, .01] | .01* [.002, .01] | -.004 [-.02, .01] | .01* [.004, .01] |
| Meal Consumption | -.17* [-.33, -.01] | -.16 [-.35, .03] | -.01 [-.07, .06] | -.03 [-.07, .01] | -.06 [-.16, .04] | -.04* [-.07, -.01] |

*Note.* * $p < .05$, 95% confidence intervals

## Mental Health Diagnosis

### *Direct Effect of ACEs on Mental Health Diagnosis*

ACEs was significantly related to mental health diagnoses for the total sample and for all individual racial/ethnic groups, such that endorsing more types of ACEs was related to more mental health diagnoses. The direct effects are located in Table 6.

### *Coefficients of Mediators on Mental Health Diagnosis ("b" paths)*

Parameter estimates for the "b" paths are listed in Table 7 (*see appendix B2 for visual representation*). For the total sample, mental wellness, sleep difficulties, and physical inactivity were statistically significantly related to mental health diagnoses. Healthy relationships and meal consumption were not significant. For individual racial/ethnic groups, sleep difficulties to mental health diagnosis was significantly related in the Native American, White, and Latinx samples and not the Asian American and Black samples. Mental wellness was related to mental health diagnosis in the Black, White, and Latinx samples and not the Native American and Asian American samples. No pathways were significant in any racial/ethnic group for healthy relationships, physical inactivity and meal consumption.

### *Indirect Effects of ACEs on Mental Health Diagnosis ("a" path x "b" path)*

The unstandardized indirect effects of ACEs on Mental Health Diagnosis are listed in Table 6. In the total sample, the indirect effects of ACEs on Mental Health Diagnosis were statistically significant ($p < 0.05$) through mental wellness, sleep difficulties, and physical inactivity, and not for healthy relationships or meal consumption. When testing racial/ethnic groups individually, the indirect effect of ACEs on Mental Health Diagnosis through mental wellness was significant in the Black, White,

and Latinx samples and not the Native American or Asian American samples. The indirect effect of ACEs on Mental Health Diagnosis through sleep difficulties was significant in the White and Latinx samples and not the Native American, Asian American, or Black samples. The indirect effects of healthy relationships, physical inactivity, and meal consumption were not significant for any individual racial/ethnic group.

In the total sample, the total indirect effect accounted for 32% of the variance in mental health diagnosis. The indirect effect of mental wellness accounted for 18%; the indirect effect of sleep difficulties accounted for 6%. For the Latinx sample, the total indirect effect accounted for more (43%) than the Black, White, and Total samples (21-26%).

### *Total Effect of the 5 Factor Mediation Model on Mental Health Diagnoses*

The total effect was significant for the total sample and for all individual racial/ethnic groups (see Table 6 for details).

Table 6

*Unstandardized Indirect Effects of ACEs on Mental Health Diagnosis (" axb" pathways)*

| | Native Am n = 142 | Asian Am n = 127 | Black n = 843 | White n = 2548 | Latinx n = 386 | Total n = 3677 |
|---|---|---|---|---|---|---|
| Healthy Relationships | -.01 [-.04, .02] | -.0001 [-.03, .03] | -.001 [-.01, .004] | -.001 [-.01, .01] | -.001 [-.01, .01] | -.001 [-.01, .004] |
| Mental Wellness | .02 [-.01, .05] | .0003 [-.01, .01] | .01* [.003, .02] | .01* [.01, .02] | .05* [.01, .01] | .01* [.01, .02] |
| Sleep Difficulties | .02 [-.002, .04] | .001 [-.02, .02] | .002 [-.001, .01] | .01* [.01, .02] | .01* [.003, .03] | .01* [.01, .01] |
| Physical Inactivity | -.001 [-.02, .02] | -.001 [-.01, .01] | -.0003 [-.002, .001] | -.001 [-.002, .0002] | .0002 [-.003, .003] | -.001* [-.002, -.0000] |
| Meal Consumption | .0000 [-.01, .01] | .003 [-.01, .02] | .001 [-.001, .005] | .002 [-.001, .01] | .005 [-.001, .01] | .0001 [-.002, .002] |
| Direct Effect | .09* [.01, .18] | .15* [.08, .23] | .04* [.02, .07] | .08* [.05, .10] | .05* [.01, .09] | .06* [.04, .08] |
| Total Effect | .11* [.03, .20] | .16* [.09, .23] | .06* [.03, .08] | .10* [.08, .12] | .08* [.04, .12] | .08* [.06, .10] |

*Note.* * $p < .05$, 95% confidence intervals

Table 7

*Coefficients of Mediators on Mental Health Diagnosis (" b" pathways)*

| | Native Am n = 142 | Asian Am n = 127 | Black n = 843 | White n = 2548 | Latinx n = 386 | Total n = 3677 |
|---|---|---|---|---|---|---|
| Healthy Relationships | .01 [-.01, .03] | .0001 [-.02, .02] | .001 [-.004, .01] | .001 [-.005, .01] | .001 [-.01, .01] | .001 [-.003, .005] |
| Mental Wellness | -.01 [-.03, .01] | -.0002 [-.01, .01] | -.01* [-.02, -.01] | -.01* [-.02, -.01] | -.01* [-.02, -.01] | -.01* [-.01, -.01] |
| Sleep Difficulties | .05* [.01, .10] | .002 [-.04, .04] | .01 [-.002, .02] | .04* [.03, .05] | .04* [.01, .06] | .04* [.03, .04] |
| Physical Inactivity | -.003 [-.01, .001] | .0003 [-.003, .004] | .001 [-.0001, .002] | -.001 [-.002, .0001] | .0003 [-.002, .002] | -.001* [-.001, -.0001] |
| Meal Consumption | -.001 [-.03, .03] | -.01 [-.03, .02] | -.004 [-.01, .004] | -.004 [-.01, .003] | -.01 [-.03, .001] | -.0002 [-.006, .005] |

*Note.* * p < .05, 95% confidence intervals

## Self-Rated Health

### *Direct Effect of ACEs on Self-Rated Health*

ACEs was significantly related to self-rated health for the total sample, such that as types of ACEs increased, self-rated health was rated more poorly (higher score is poorer self-rated health). For individual racial/ethnic groups, the direct effect was significant in the Asian American, Black, and White samples. The direct effect was not significant in the Native American s and Latinx samples. The direct effects are located in Table 8.

### *Coefficients of Mediators on Self-rated Health ("b" paths)*

Parameter estimates for the "b" paths are listed in Table 9 (*see appendix B3 for visual representation*). For the total sample, mental wellness, physical inactivity, and meal consumption were significantly related to self-rated health and healthy relationships and sleep difficulties were not significant. For individual racial/ethnic groups, mental wellness pathways were significant in the Asian American, Black, and White samples and approached significance for Latinx participants ($p = .08$). Mental wellness was not significant in the Native American sample. Physical inactivity to self-rated health was significant in the Asian American and White samples and not the Latinx, Black, or Native American samples. Meal consumption was significant to self-rated health in the Black and White samples, but not the Asian American, Native American, or Latinx samples. Sleep difficulties to self-rated health was not significant for any group, but it approached significance for Native Americans ($p = .056$), Asian Americans ($p = .062$), and Latinx ($p = .080$). Healthy relationships to self-rated health was not significant for any group.

### *Indirect Effects of ACEs on Self-Rated Health ("a" path x "b" path)*

The unstandardized indirect effects of ACEs on self-rated health are listed in Table 8. In the total sample, the indirect effects of ACEs on self-rated health were statistically significant ($p < 0.05$) through mental wellness, physical inactivity, and meal consumption, but not for healthy relationships or sleep difficulties. When testing racial/ethnic groups individually, the indirect effect of ACEs on self-rated health through mental wellness was significant in the Asian American, Black, and White samples and not the Native American or Latinx samples. The indirect effect of ACEs on self-rated health through meal consumption was significant in the Black and White samples, and not the Native American, Asian American, or Latinx samples. The indirect effects of healthy relationships, sleep difficulties, and physical inactivity were not significant in any individual racial/ethnic group.

In the total sample, the total indirect effect was not significant, though indirect effects of mental wellness, meal consumption, and physical inactivity were significant. The indirect effect of mental wellness accounted for 20% of the variance in self-rated health; meal consumption accounted for 10% of the variance; physical inactivity accounted for 2%.

### *Total Effect of the 5 Factor Mediation Model on Self-Rated Health*

The total effect was statistically significant for the total sample. For individual racial/ethnic groups, the total effect was significant in the Asian American, Black, White, and Latinx samples, but not the Native American sample (see table 8 for details)

Table 8

*Unstandardized Indirect Effects of ACEs on Self-rated Health (" axb" pathways)*

| | Native Am n = 142 | Asian Am n = 127 | Black n = 843 | White n = 2549 | Latinx n = 386 | Total n = 3678 |
|---|---|---|---|---|---|---|
| Healthy Relationships | .01 [-.02, .05] | -.02 [-.06, .02] | .0004 [-.01, .01] | .004 [-.004, .01] | .01 [-.005, .03] | .003 [-.005, .01] |
| Mental Wellness | -.0001 [-.03, .03] | .03* [.0003, .07] | .01* [.004, .03] | .02* [.02, .03] | .02 [-.002, .04] | .02* [.01, .03] |
| Sleep Difficulties | .02 [-.003, .05] | -.03 [-.07, .01] | .004 [-.001, .01] | .001 [-.003, .01] | .01 [-.002, .02] | .002 [-.001, .005] |
| Physical Inactivity | .0001 [-.02, .01] | -.01 [-.05, .01] | -.0002 [-.003, .002] | .002 [-.0001, .004] | .001 [-.004, .01] | .002* [.0004, .004] |
| Meal Consumption | .0001 [-.01, .01] | .01 [-.01, .03] | .01* [.001, .01] | .01* [.005, .01] | .005 [-.004, .02] | .01* [.01, .01] |
| Direct Effect | .04 [-.06, .14] | .16* [.05, .27] | .07* [.02, .12] | .06* [.04, .08] | .03 [-.03, .10] | .06* [.04, .08] |
| Total Effect | .07 [-.03, .17] | .13* [.02, .24] | .09* [.05, .14] | .10* [.07, .12] | .08* [.01, .14] | .10* [.08, .12] |

*Note.* * $p < .05$, 95% confidence intervals

Table 9

*Coefficients of Mediators on Self-rated Health (" b" pathways)*

| | Native Am n = 142 | Asian Am n = 127 | Black n = 843 | White n = 2549 | Latinx n = 386 | Total n = 3678 |
|---|---|---|---|---|---|---|
| Healthy Relationships | -.01 [-.03, .01] | .01 [-.01, .03] | -.0004 [-.01, .01] | -.003 [-.01, .003] | -.01 [-.03, .003] | -.003 [-.01, .002] |
| Mental Wellness | .0001 [-.02, .02] | -.02* [-.04, -.003] | -.01* [-.02, -.01] | -.02* [-.02, -.01] | -.01 [-.02, .002] | -.02* [-.02, -.01] |
| Sleep Difficulties | .05 [-.002, .11] | -.05 [-.11, .003] | .02 [-.005, .04] | .005 [-.01, .02] | .03 [-.004, .06] | .01 [-.004, .02] |
| Physical Inactivity | .0001 [-.004, .004] | .01* [.003, .01] | .001 [-.001, .002] | .002* [.001, .003] | .002 [-.001, .01] | .002* [.001, .003] |
| Meal Consumption | -.002 [-.04, .03] | -.02 [-.05, .02] | -.02* [-.04, -.01] | -.02* [-.03, -.01] | -.01 [-.03, .01] | -.02* [-.03, -.01] |

*Note.* * p < .05, 95% confidence intervals

## Physical Health Diagnosis

### *Direct Effect of ACEs on Physical Health Diagnosis*

ACEs was significantly related to physical health diagnosis for the total sample, such that as types of ACEs increased, the number of physical health diagnoses increased. The direct effect was significant for Native American, White, and Latinx groups. The direct effect approached significance for Black participants ($p = .08$) and was not significant for Asian Americans. Direct effects are located in Table 10.

### *Coefficients of Mediators on Physical Health Diagnosis ("b" paths)*

Parameter estimates for the "b" paths are listed in Table 11 (*see appendix B4 for visual representation*). In the total sample, sleep difficulties and meal consumption were statistically significantly related with physical health diagnosis, and healthy relationships, mental wellness, and physical inactivity were not significant. Sleep difficulties and meal consumption to physical health diagnosis was significant in the White and Latinx samples, but not the Native American, Asian American, or Black samples. Mental wellness to physical health diagnosis was significant in the Black sample, but not any of the other groups. Physical inactivity to physical health diagnosis was significant in the Latinx participants, but not any other group. Healthy relationships to physical health diagnosis was not significant for any individual racial/ethnic group.

### *Indirect Effects of ACEs on Physical Health Diagnosis ("a" path x "b" path)*

The unstandardized indirect effects of ACEs on physical health diagnosis are listed in Table 10. In the total sample, the indirect effects of ACEs on physical health diagnosis were statistically significant ($p < 0.05$) through sleep difficulties and meal consumption, but not healthy relationships, mental wellness, or physical inactivity. When

testing racial/ethnic groups individually, the indirect effect of ACEs on physical health diagnosis through sleep difficulties and meal consumption was significant in the White and Latinx samples, but not the Native American, Asian American, or Black samples. The indirect effects of healthy relationships, mental wellness, and physical inactivity were not significant for any individual racial/ethnic group.

In the total sample, the total indirect effect accounted for 16% of the variance in physical health diagnosis. Meal consumption accounted for 7%; sleep difficulties accounted for 5%.

### *Total Effect of the 5 Factor Mediation Model on Physical Health Diagnosis*

In the total sample, the total effect was statistically significant. Total effects were significant for Native American, Black, White, and Latinx groups, but not Asian Americans (see table 10 for details).

Table 10

*Unstandardized Indirect Effects of ACEs on Physical Health Diagnosis (" axb" pathways)*

| | Native Am n = 142 | Asian Am n = 127 | Black n = 843 | White n = 2549 | Latinx n = 386 | Total n = 3678 |
|---|---|---|---|---|---|---|
| Healthy Relationships | -.01 [-.05, .03] | .01 [-.03, .04] | .002 [-.01, .01] | .0002 [-.01, .01] | .01 [-.004, .03] | .002 [-.004, .01] |
| Mental Wellness | .01 [-.03, .05] | -.01 [-.05, .03] | .01 [.0000, .02] | .004 [-.003, .01] | .005 [-.01, .03] | .002 [-.003, .01] |
| Sleep Difficulties | .01 [-.01, .04] | .03 [-.01, .08] | .002 [-.004, .01] | .01* [.004, .01] | .01* [.003, .03] | .01* [.003, .01] |
| Physical Inactivity | -.0002 [-.01, .02] | .0002 [-.01, .01] | .0000 [-.002, .002] | -.001 [-.002, .0004] | .002 [-.01, .01] | .001 [-.0003, .002] |
| Meal Consumption | -.001 [-.01, .01] | -.001 [-.02, .03] | .0000 [-.005, .005] | .01* [.003, .01] | .01* [.0004, .02] | .01* [.004, .01] |
| Direct Effect | .19* [.08, .31] | .06 [-.06, .17] | .04 [-.005, .09] | .09* [.07, .12] | .10* [.04, .17] | .09* [.07, .11] |
| Total Effect | .20* [.10, .31] | .08 [-.02, .18] | .06* [.01, .10] | .11* [.09, .14] | .15* [.08, .21] | .11* [.09, .13] |

*Note.* * $p < .05$, 95% confidence intervals

Table 11

*Coefficients of Mediators on Physical Health Diagnosis (" b" pathways)*

| | Native Am n = 138 | Asian Am n = 124 | Black n = 805 | White n = 2492 | Latinx n = 374 | Total n = 3573 |
|---|---|---|---|---|---|---|
| Healthy Relationships | .01 [-.02, .03] | -.004 [-.03, .02] | -.002 [-.01, .01] | -.0001 [-.01, .01] | -.01 [-.03, .005] | -.001 [-.01, .004] |
| Mental Wellness | -.01 [-.03, .02] | .01 [-.01, .02] | -.01* [-.02, .0000] | -.003 [-.01, .002] | -.003 [-.02, .01] | -.002 [-.01, .003] |
| Sleep Difficulties | .03 [-.02, .09] | .05 [-.01, .10] | .01 [-.01, .03] | .03* [.02, .04] | .04* [.01, .07] | .02* [.01, .03] |
| Physical Inactivity | -.001 [-.01, .003] | -.0001 [-.01, .01] | .0001 [-.002, .002] | -.001 [-.002, .0004] | .004* [.001, .01] | .001 [-.0003, .001] |
| Meal Consumption | .01 [-.03, .05] | .002 [-.04, .04] | .0000 [-.01, .01] | -.02* [-.03, -.01] | -.02* [-.05, -.003] | -.02* [-.02, -.01] |

*Note.* * $p < .05$, 95% confidence intervals

# CHAPTER V

# DISCUSSION

To our knowledge, this is the first empirical study of the conceptual model based on the work of Nadine Burke Harris's resilience factors for mitigating the negative effects of toxic stress from adverse childhood experiences. This paper assessed how a holistic group of resilience factors, encompassing aspects of physical health behaviors to social health and mental well-being, influences the relationship between ACEs and negative health outcomes, and how these relations vary by racial/ethnic group. Utilizing the Add Health data set, the researchers were able to assess the influence of ACEs and the proposed mediators longitudinally, up until participants were between the ages of 24-32 in the fourth wave of data collection. Considering that a wide range of health problems increase in frequency with the increase in age, these findings indicate the presence of trends that will likely strengthen as individuals age.

The results for the "a" pathways indicated that ACEs are significantly related to healthy relationships, mental wellness, sleep difficulties, and meal consumption, such that the greater the number of ACEs, the more likely individuals of most any race/ethnicity (except Native American for sleep difficulties and meal consumption) were to report lower healthy relationships, worse mental wellness (e.g., self-esteem, sense of hope), fewer meals consumed during the week, and greater difficulty sleeping. The resilience variables were measured when the participants were under the age of 18 and do not represent how much participants engage in these behaviors in adulthood. Therefore, the results show how a child's experience with ACEs impacted their ability to engage in healthy, protective behaviors while growing up. The results suggest that a child

experiencing adversity is less likely to be able to develop healthy behaviors, social support, or mental wellness, which are some of the very factors that are known to increase resilience to toxic stress (Burke Harris, 2018; Murphy et al., 2014; Williams et al., 2001).

The results for the "b" pathways did not have as many statistically significant relations as were present in the A pathways. However, the results still reveal valuable information. Unlike the A pathways, the B pathways represent relations existing across an approximately 12-year time span, which for some participants is half of their lifespan. Considering the long period in between these factors from adolescence and adulthood and considering that mental and physical health worsens throughout middle age (beyond the ages of participants in the final Wave of data collection in this analysis), the impact of the variables do have may point to a longstanding influence on health outcomes.

The findings are significant practically because they indicate that protective, healthy behaviors can influence health even into early adulthood (ages 24 to 32-years old) and therefore might be important points of intervention and prevention in childhood. Since the results from the A pathways show that ACEs are detrimental to a child's ability to engage in protective behaviors, the results from the "b" pathways can help illuminate the ways targeting the identified factors can improve health in adulthood.

Continuing to dissect the B pathways, it appears that mental wellness has the most significant relations as compared to any other mediating variable for CESD-10, mental health diagnosis, and self-rated health. While it is not significant for every group, it is significant for the majority of the different racial/ethnic groups. Therefore, mental wellness, which the current researcher conceptualized as self-esteem and sense of hope,

has a stronger connection to adult health than many other variables studied here. Sleep difficulties also appear to have positive relations with CESD-10 and mental health for many groups, while meal consumption and physical inactivity have more significant relations to the physical health outcomes. Interestingly, healthy relationships are largely not significant for all groups, which is inconsistent with previous research that supports the important health benefits of perceived social support broadly (Taylor, 2011).

There were multiple instances where only one racial/ethnic minority group had a statistically significant effect. Healthy relationships is negatively related to CESD-10 for the Black group (and combined sample) only. Mental wellness is also negatively related to physical health diagnosis in Blacks only, (and not the combined sample). Meal consumption negatively relates with CESD-10 for Native Americans and not any other racial/ethnic group. Physical inactivity is positively related to physical health diagnosis for Latinx group only, even including the combined sample. This many point to potentially unique and/or more important or powerful factors for the stated racial/ethnic groups, though more research is needed to fully understand the significance.

A pattern arose in the results of the indirect effects of ACEs on health outcomes, in which mental wellness had the greatest number of statistically significant relations, specifically with CESD-10, mental health diagnosis, and self-rated health as outcomes. It is significant for most but not all groups and for the total sample, highlighting the importance of self-esteem and sense of hope in adolescence on a range of health-related outcomes in adulthood. Sleep difficulties act as a partial mediator for ACEs and CESD-10, mental health diagnosis, and physical health diagnosis for Whites and Latinx and not other racial/ethnic groups and not for self-rate health. Meal consumption mediates the

link between ACEs and self-rated health and physical health diagnosis for Whites and Latinx and no other groups or outcomes. Interestingly, healthy relationships is only statistically significant as a partial mediator for Black participants with CESD-10 as an outcome.

**Direct and Total Effect Comparisons**

The Asian American group had the strongest direct and total relation for CESD-10, mental health diagnosis, and self-rated health, and was the only racial/ethnic group that did not have statistically significant direct or total effect related to physical health diagnosis. Interestingly, the direct effect of ACEs to CESD-10 and self-rated health were not significant for Native Americans, while the direct effect to mental and physical health diagnoses were statistically significant. In fact, the Native American group had the strongest direct and total relation to physical health diagnosis. The relation coefficients for direct and total relations for the Black group were below the combined sample in every category, making them the only racial/ethnic group to have lower relation coefficients for total and direct effects in all outcome categories.

**Limitations**

One potential limitation of the study is the use of self-report and occasionally retrospective questionnaires (e.g., questions regarding childhood abuse in Wave III). As is the nature of secondary data analyses, the current researcher is limited by the assessments provided in the original study, and the questions utilized in Add Health may or may not be the best measurements of the constructs related to the research aims. Despite these potential limitations, this is the first study to examine the proposed model and the findings have the potential to greatly inform intervention efforts.

One notable limitation is that some racial/ethnic group samples, namely Native Americans and Asian Americans, were numerically smaller and therefore perhaps did not contain the same power to detect significant, but small relations as the other groups. Future research is needed with a larger sample size, which could better investigate the effects of the mediating variables in the Native American and Asian American groups. Additionally, the current researcher followed suit in measuring ACEs as numerous previous researchers have done in Add Health (e.g., Thompson et al., 2019). However, the measures do not fully encompass adversity that children of color may be more likely to experience, such as discrimination and immigration. Future research is needed to evaluate the impacts of additional stressors on the mediating variables and overall health outcomes.

In addition, the current researcher was limited by not having data points for all participants. While retention was high, unknown variables could explain why certain participants dropped out and may be more likely to have characteristics that influence both A and B pathways. For example, participants who dropped out with high ACEs, including poverty-related distress, may be less likely to have stable contact information over the course of 12 years. Wave IV did not collect information on reasons for attrition, so the researcher is unable to know why participants dropped out of the study.

**Future Research Ideas**

As previously stated, the resilience factors in this study are all measured when the participants were under the age of 18. Future research is needed to evaluate the influence of the resilience factors on later life. It is possible that the mediators have bigger effects on health in adulthood than they do in childhood and adolescence. Further research would

give greater insight into how these factors interact over the lifespan. Furthermore, additional longitudinal studies are needed. Most individuals receive physical health diagnoses in their 20's and early 30's, meaning that the results from this study may have a larger impact than indicated from results from under the age of 18. Additionally, future research is needed to expand upon the mediating variables to gain greater insight into their impacts on health outcomes, such as measuring nutritional quality of diet in more depth, frequency and duration of physical activity, sleep quality, specific types of relationships and their quality, and other aspects of mental wellness.

**Implications**

Although not all the mediating variables significantly impacted all of the health outcomes in this study, the results from this study highlight the importance of designing and testing intentional interventions that promote the proposed resilience factors by Nadine Burke Harris (2018). Because the mediating variables accounted for some of the variance in the health outcomes (e.g., the indirect effect if mental wellness accounted for 20% of the variance in self-rated health in the total sample), interventions targeting these variables in childhood would likely alleviate the negative health outcome burden in adulthood. Children who experience ACEs may not have as many opportunities to engage in activities to improve upon the identified mediating factors that would increase their overall resilience. Children from minority racial/ethnic groups may have even greater difficulty in doing so, due to lack of access to resources. Extensive amounts of previous research show that mental and physical health disparities exist for marginalized groups (Koh et al., 2011; Natale-Pereira et al., 2011; Zhang et al., 2017), making access to services and engaging in protective activities unfairly harder for marginalized groups.

Developing interventions that focus on the proposed resilience factors could drastically improve the health outcomes for children from marginalized groups, particularly if interventions targeted factors that may uniquely benefit that group (e.g., mental wellness for physical health improvements in Black individuals; physical inactivity for physical health improvements in Latinx individuals).

Interventions need to focus on unique resiliency factors for different racial/ethnic groups and how such tailored interventions impact health outcomes. Children experiencing ACEs may not naturally have access to ways to improve their mental wellness, physical activity, sleep, meal consumption, and healthy relationships, and future research is needed to evaluate the effectiveness of interventions focused on the proposed factors in improving health outcomes. Culturally tailored interventions could help to reduce health disparities and drastically improve overall public health.

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# Appendices

## Appendix A

*Variable Measurements*

Adverse Childhood Experiences

| Wave | Item | Code |
|---|---|---|
| *Emotional Abuse* | | |
| IV | Before your 18th birthday, how often did a parent or other adult caregiver say things that really hurt your feelings or made you feel like you were not wanted or loved? | H4MA1 |
| *Physical Abuse* | | |
| III | How often had your parents or other adult care-givers slapped, hit, or kicked you? | H3MA3 |
| IV | Before your 18th birthday, how often did a parent or adult caregiver hit you with a fist, kick you, or throw you down on the floor, into a wall, or down stairs? | H4MA3 |
| *Physical Neglect* | | |
| III | By the time you started 6th grade, how often had your parents or other adult care-givers left you home alone when an adult should have been with you? | H3MA1 |
| III | How often had your parents or other adult care-givers not taken care of your basic needs, such as keeping you clean or providing food or clothing? | H3MA2 |
| *Sexual Abuse* | | |
| III, IV | How often did a parent or other adult caregiver touch you in a sexual way, force you to touch him or her in a sexual way, or force you to have sexual relations? | H3MA4, H4MA5 |
| *Parent Binge Drinking* | | |
| I *(parent)* | How often in the last month have you had five or more drinks on one occasion? | PA62 |
| *Parent in Jail* | | |
| IV | (Has/did) your biological mother ever (spent/spend) time in jail or prison? | H4WP3 |
| IV | (Has/did) your (mother figure) ever (spent/spend) time in jail or prison? | H4WP16 |
| IV | (Has/did) your biological father ever (spent/spend) time in jail or prison? | H4WP9 |
| IV | (Has/did) your (father figure) ever (spent/spend) time in jail or prison? | H4WP30 |

| | | |
|---|---|---|
| *Family Suicide* | | |
| I, II | Have any of your family members tried to kill themselves during the past 12 months? | H1SU6, H2SU6 |
| *Loss of Parent* | | |
| II | Is non-resident biological mother still living? | H2NM4 |
| II | Have you lived with her since {MOLI}? **referring to biological mother* | H2NM2 |
| II | How old were you when she died? **referring to biological mother* | H2NM5 |
| II | Is he still living? **referring to biological father* | H2NF4 |
| II | Have you lived with him since {MOLI}? **referring to biological father* | H2NF2 |
| I | Is she still living? **referring to biological mother* | H1NM2 |
| I | Did you ever live with her? **referring to biological mother* | H1NM7 |
| I | Is he still living? **referring to biological father* | H1NF2 |
| I | Did you ever live with him? **referring to biological father* | H1NF7 |

| Mental Wellness | | |
|---|---|---|
| Wave | Item | Code |
| I, II | You have a lot of energy | H1PF26, H2PF17 |
| I, II | You have a lot of good qualities. | H1PF30, H2PF21 |
| I, II | You have a lot to be proud of. | H1PF32, H2PF23 |
| I, II | You like yourself just the way you are. | H1PF33, H2PF24 |
| I, II | You feel like you are doing everything just about right | H1PF34, H2PF25 |
| I, II | You feel socially accepted. | H1PF35, H2PF26 |
| I, II | You feel loved and wanted. | H1PF36, H2PF27 |
| I, II | You felt hopeful about the future | H1FS8, H2FS8 |
| I | During the past 12 months, did you ever seriously think about committing suicide? | H1SU1 |
| I, II | You will live to age 35. | H1EE12, H2EE12 |

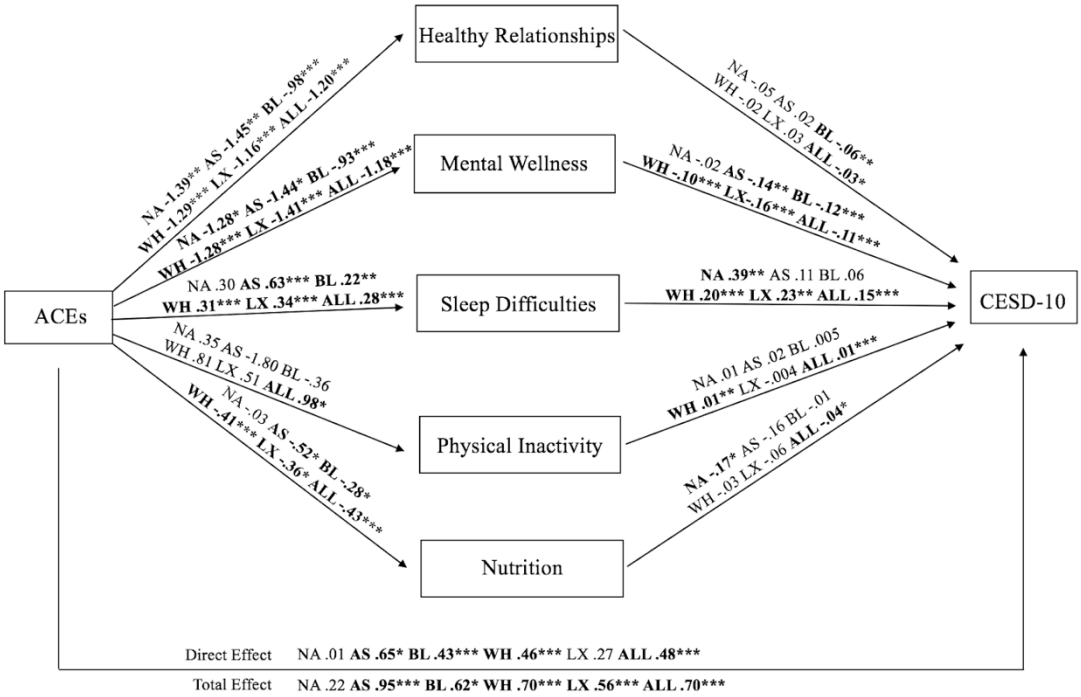
| Healthy Relationships *(14 items total)* | | |
|---|---|---|
| Wave | Item | Code |
| I, II | ‘‘How much do you feel that adults care about you?” | H1PR1, H2PR1 |
| I, II | ‘‘How much do you feel that your teachers care about you?’’ | H1PR2, H2PR2 |
| I, II | ‘How much do you feel that your parents care about you?,’’ | H1PR3, H2PR3 |
| I, II | “How much do you feel that your friends care about you?” | H1PR4, H2PR4 |

| | | |
|---|---|---|
| I, II | "How much do you feel that people in your family understand you?" | H1PR5, H2PR5 |
| I, II | "How much do you feel that you and your family have fun together?" | H1PR7, H2PR7 |
| I, II | "How much do you feel that your family pays attention to you?" | H1PR8, H2PR8 |
| Physical Inactivity *(6 items total)* | | |
| Wave | Item | Code |
| I, II | How many hours a week do you watch television? | H1DA8, H2DA8 |
| I, II | How many hours a week do you watch videos? | HIDA9, H2DA9 |
| I, II | How many hours a week do you play video or computer games? | H1DA10, H2DA10 |
| Sleep Difficulties *(4 items total)* | | |
| Wave | Item | Code |
| I, II | Please tell me how often you have had each of the following conditions in the past 12 months.<br><br>woken up feeling tired? | H1GH11, H2GH17 |
| I, II | trouble falling asleep or staying asleep | H1GH18, H2GH23 |
| Meal consumption | | |
| Wave | Item | Code |
| II | In the last seven days, on how many days did you eat...<br>breakfast? | H2NU78 |
| II | lunch? | H2NU79 |
| II | dinner/supper? | H2NU80 |
| Depressive Symptoms – CESD-10 *(10 items total)* | | |
| Wave | Item | Code |
| IV | (During the past seven days:) You were bothered by things that usually don't bother you. | H4MH18 |
| IV | (During the past seven days:) You could not shake off the blues, even with help from your family and your friends. | H4MH19 |
| IV | (During the past seven days:) You felt you were just as good as other people. | H4MH20 |
| IV | (During the past seven days:) You had trouble keeping your mind on what you were doing. | H4MH21 |
| IV | (During the past seven days:) You felt depressed. | H4MH22 |
| IV | (During the past seven days:) You felt that you were too tired to do things. | H4MH23 |
| IV | (During the past seven days:) You felt happy. | H4MH24 |
| IV | (During the past seven days:) You enjoyed life. | H4MH25 |
| IV | (During the past seven days:) You felt sad. | H4MH26 |
| IV | You felt that people disliked you, during the past seven days | H4MH27 |
| Mental Health Diagnosis | | |

| Wave | Item | Code |
|---|---|---|
| IV | Has a doctor, nurse or other health care provider ever told you that you have or had: depression | H4ID5H |
| IV | post-traumatic stress disorder or PTSD | H4ID5I |
| IV | anxiety or panic disorder | H4ID5J |
| IV | attention problems or ADD or ADHD | H4ID5L |
| Self-rated Health | | |
| Wave | Item | Code |
| IV | In general, how is your health? | H4GH1 |
| Physical Health Diagnosis | | |
| Wave | Item | Code |
| IV | Has a doctor, nurse or other health care provider ever told you that you have or had: cancer or lymphoma or leukemia | H4ID5A |
| IV | high blood cholesterol or triglycerides or lipids | H4ID5B |
| IV | high blood pressure or hypertension | H4ID5C |
| IV | high blood sugar or diabetes | H4ID5D |
| IV | heart disease | H4ID5E |
| IV | asthma, chronic bronchitis or emphysema | H4ID5F |
| IV | migraine headaches | H4ID5G |
| IV | epilepsy or another seizure disorder | H4ID5K |
| IV | Hepatitis C | H4ID5N |
| IV | Have you ever been told by a doctor, nurse, or other health professional that you had any of the following sexually transmitted diseases? Select all of the diseases you have had. chlamydia; gonorrhea; trichomoniasis; syphilis; genital herpes; genital warts; hepatitis B (HBV); Human papilloma virus (HPV); pelvic inflammatory disease (PID); cervicitis or mucopurulent cervicitis (MPC); urethritis; vaginitis; any other sexually transmitted disease | H4SE36A;H4SE36B; H4SE36C;H4SE36D; H4SE36E; H4SE36F; H4SE36G;H4SE36H; H4SE36I; H4SE36J; H4SE36K; H4SE36L; H4SE36N |

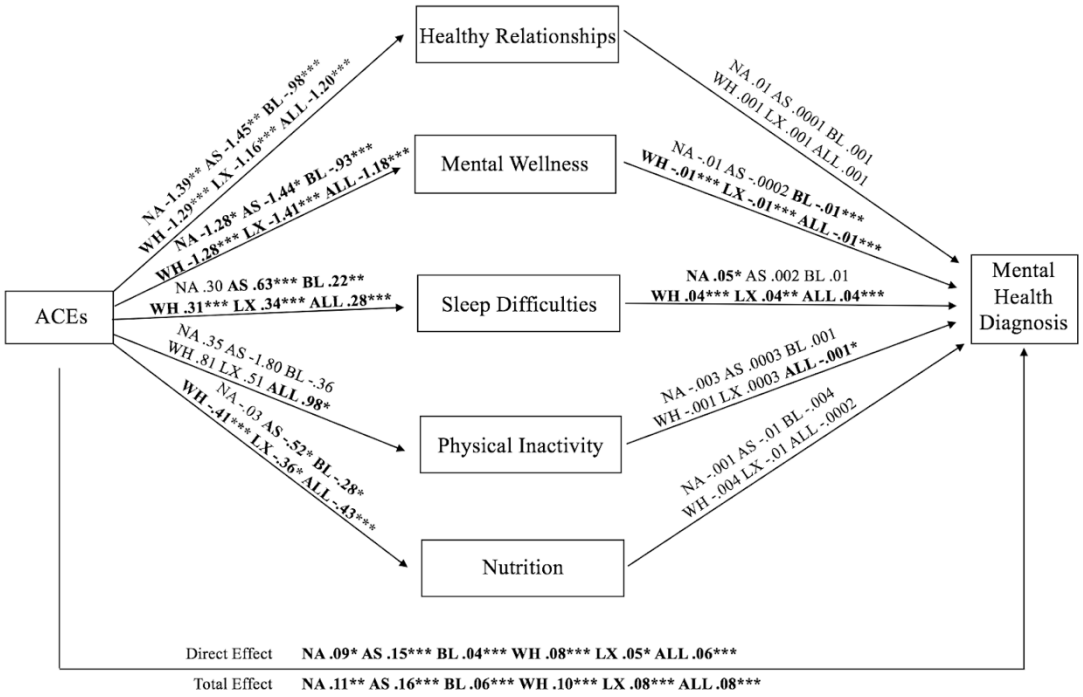
Appendix B

*B1 Results of mediation model on CESD*



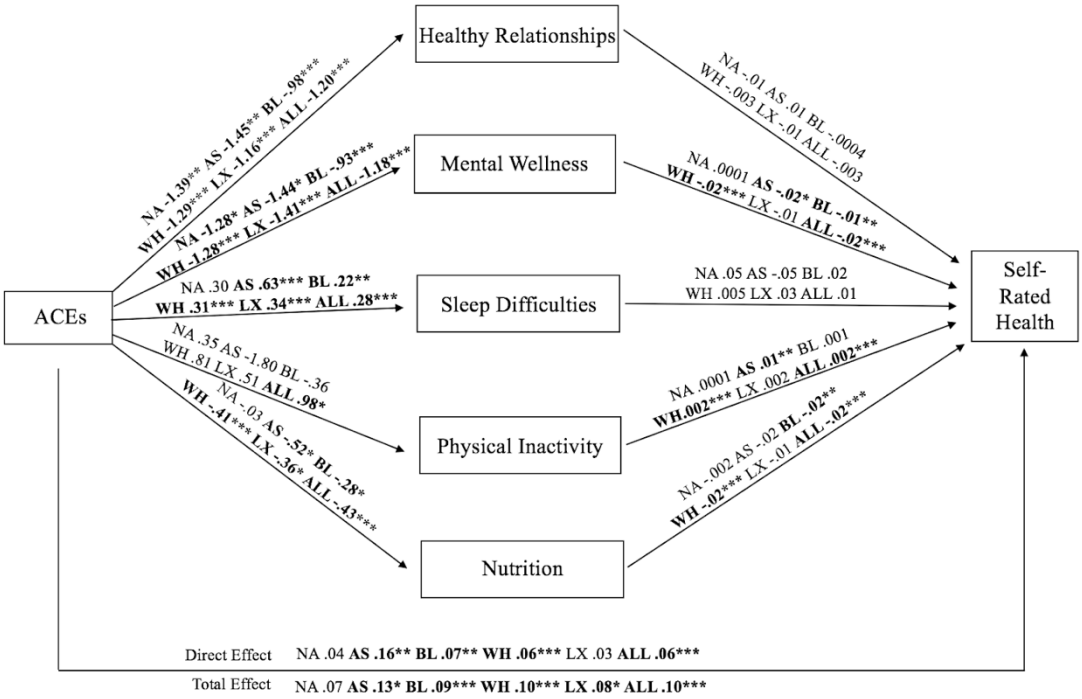

*Note.* * p < .05. ** p < .01. *** p < .001. ACEs = adverse childhood experiences; CESD = Center for Epidemiologic Studies Depression Scale-10). NA = Native Americans. AS = Asian Americans. BL = Blacks. WH = Whites. LX = Latinx. ALL = Total. Sample sizes: Native American (n = 141), Asian American (n = 127), Black (n = 843), White (n = 2549), Latinx (n = 386), All (n = 3677).

*B2 Results of mediation model on mental health diagnosis*



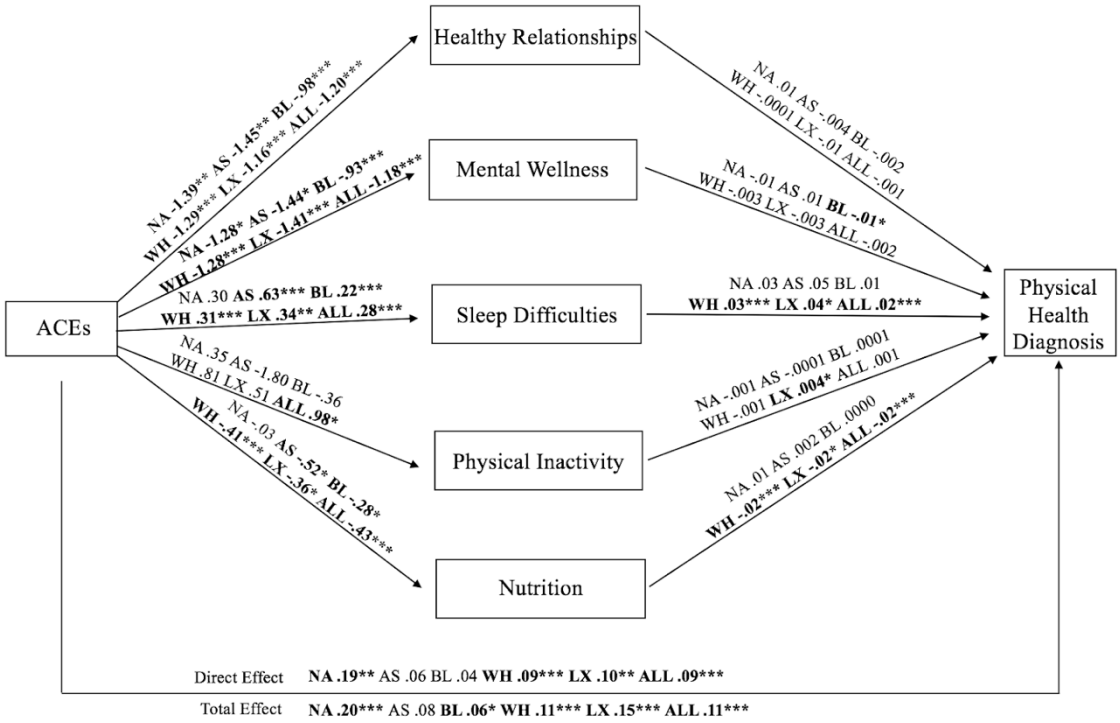

*Note.* * p < .05. ** p < .01. *** p < .001. ACEs = adverse childhood experiences. NA = Native Americans. AS = Asian Americans. BL = Blacks. WH = Whites. LX = Latinx. ALL = Total. Sample sizes: Native American (n = 142), Asian American (n = 127), Black (n = 843), White (n = 2548), Latinx (n = 386), All (n = 3677).

*B3 Results of mediation model on self-rated health*




*Note.* * p < .05. ** p < .01. *** p < .001. ACEs = adverse childhood experiences. NA = Native Americans. AS = Asian Americans. BL = Blacks. WH = Whites. LX = Latinx. ALL = Total. Sample sizes: Native American (n = 142), Asian American (n = 127), Black (n = 843), White (n = 2549), Latinx (n = 386), All (n = 3678).

*B4 Results of mediation model on physical health diagnosis*




*Note.* * p < .05. ** p < .01. *** p < .001. ACEs = adverse childhood experiences. NA = Native Americans. AS = Asian Americans. BL = Blacks. WH = Whites. LX = Latinx. ALL = Total. Sample sizes: Native American (n = 138), Asian American (n = 124), Black (n = 805), White (n = 2492), Latinx (n = 374), All (n = 3573).