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Comparing Three Resilience Frameworks Across Outcomes for Children Who Have Experienced Multiple Adverse Childhood Experiences

Kevin Keane
University Of Alabama At Birmingham

COMPARING THREE RESILIENCE FRAMEWORKS ACROSS OUTCOMES FOR CHILDREN WHO HAVE EXPERIENCED MULTIPLE ADVERSE CHILDHOOD EXPERIENCES

by

KEVIN KEANE

RETTA R. EVANS, COMMITTEE CHAIR
DIONE MOULTRIE KING
LINDSAY LEBAN
DAVID M. MACRINA
LARRELL L. WILKINSON

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COMPARING THREE RESILIENCE FRAMEWORKS ACROSS OUTCOMES FOR CHILDREN WHO HAVE EXPERIENCED MULTIPLE ADVERSE CHILDHOOD EXPERIENCES

KEVIN KEANE

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ABSTRACT

Adverse childhood experiences (ACEs) have a well-established relationship with poorer mental health, health, and school-related outcomes among children. ACEs researchers have identified potential resilience frameworks like the National Scientific Council on the Developing Child (NSCDC), Health Outcomes from Positive Experiences (HOPE), and cumulative positive childhood experiences (PCEs) frameworks that identify protective factors to mitigate ACEs. However, each framework has a limited evidence base with no known studies comparing their effectiveness. The purpose of this dissertation was to compare the relationship between these three resilience frameworks and childhood outcomes in three domains (mental health, weight status, and school-related outcomes) among children who experienced ACEs utilizing a preprint/reprint format in which each study examined a different domain. For all three studies, secondary data analysis was conducted using the 2018-2020 National Survey for Children's Health. The first study found that the NSCDC and HOPE frameworks were associated with childhood mental health, but the NSCDC framework had a stronger relationship. The second study found that the NSCDC and HOPE frameworks were also associated with childhood obesity with the HOPE framework explaining a similar or slightly more variance in childhood obesity than the NSCDC framework. In the final study, the NSCDC and HOPE frameworks were associated with school engagement, excessive

absenteeism, and grade retention, but the NSCDC framework had a stronger relationship with all three outcomes. Across all three studies, the cumulative PCE framework either did not practically or significantly improve any of the regression models. Most outcomes were consistent after controlling for ACEs and across ACEs subgroups. Across analyses, self-regulation, mastery, and a supportive parent/caregiver relationship were the strongest NSCDC framework protective factors for most outcomes. After-school activities and sharing ideas were typically the strongest HOPE framework protective factors across outcomes. Other protective factors from both frameworks were associated with specific outcomes. These findings were consistent after controlling for ACEs and across most ACEs subgroups. While additional research is needed to validate and expand on these findings, the NSCDC and HOPE frameworks are promising resilience frameworks that could be integrated into future interventions to improve outcomes among children who experienced ACEs.

Keywords: adverse childhood experiences, resilience, protective factors, childhood mental health, childhood obesity, school-related outcomes

DEDICATION

This dissertation is dedicated to my wife and two children. To Lisa, I am so grateful for all your love and support along this journey. There is no way that I would have completed this dissertation without you. You have been there loving, supporting, and encouraging me every step along the way even when it was not easy. I am thankful for all the sacrifices that you made to allow me to pursue this dream. You are the most amazing wife, and I love you so much! To Savannah Grace and Caleb, thank you for sacrificing time with your Daddy. I know it wasn't always easy, but I am so grateful for you supporting me and always being so proud of me. To Savannah Grace, you are a special young lady, and I know that you are going to do incredible things. To Caleb, you are such a fun, and caring guy; I'm excited to see the wonderful young man that you will become. To you both, I love you both very much and hope that this pursuit will show you never to give up on your dreams and to trust the plans that God has for you. Thank you all. Without your love, prayers, and support, this dissertation would have never happened.

Above all, this dissertation is dedicated to my Lord and Savior, Jesus Christ. In him, I have been given an unshakable hope that has sustained me on this journey while blessing me with opportunities and incredible people that have invested in my life. He also opened my eyes to see the impact of trauma and ACEs on others. In honor of him, my hope and prayer is that this research can be leveraged to improve the lives of those who have walked through these difficult circumstances while giving them hope and healing (2 Corinthians 1:3-4).

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SUMMARY & DISCUSSION

LIST OF ABBREVIATIONS

ACEs	adverse childhood experiences
ADHD	attention-deficit/hyperactivity disorder
BMI	body mass index
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control & Prevention
COVID	Coronavirus disease
FPL	Federal poverty level
GMVP	Gelberg-Andersen Model for Vulnerable Populations
HOPE	Health Outcomes from Positive Experiences
NS-CSCHN	National Survey of Children with Special Health Care Needs
NSCDC	National Scientific Council on the Developing Child
NSCH	National Survey on Children's Health
PCEs	positive childhood experiences

CHAPTER 1

INTRODUCTION

Background

Adverse Childhood Experiences

Adverse childhood experiences (ACEs) are categories of maltreatment and household dysfunction experienced in childhood that have a dose-wise relationship with risky health behaviors, poorer health outcomes, and early death (Brown et al., 2009; Felitti et al., 1998; Hughes et al., 2017; Petruccelli et al., 2019). In the seminal ACEs study, researchers found that cumulative exposure to multiple categories of ACEs was associated with an increased likelihood of risky health behaviors, risk factors, and poorer health outcomes. Specifically, researchers found that adults who experienced 4 or more categories of ACEs consistently had more negative outcomes. The original ACEs study included seven categories of traumatic events including physical abuse, sexual abuse, psychological abuse, household mental illness, household substance abuse, household domestic violence, and household family incarceration (Felitti et al., 1998). Other ACEs such as parental separation or divorce, emotional neglect, and physical neglect have since been widely adopted with other potential ACEs being investigated (Anda et al., 2006; Finkelhor et al., 2013; Wade et al., 2014).

Based on analyses of the 2011-2014 Behavioral Risk Factor Surveillance System (BRFSS), researchers found that 15.8% of adults surveyed had experienced 4 or more

ACEs. Researchers also found that some racial/ethnic minorities and sexual minorities along with adults that had lower income and less education experienced on average more ACEs (Merrick et al., 2018). Based on analyses of the National Survey of Children's Health (NSCH), 46.3% of children have experienced at least one ACE and 21.7% have experienced 2 or more ACEs. Like adults, children from lower-income households and some racial minorities have a higher prevalence of ACEs. Children between the ages of 12 and 17 years old are also at increased risk (Bethell, Davis, et al., 2017). Thus, ACEs are a public health issue that impacts a large proportion of the population.

Impact of ACEs on Adults and Children

The original ACEs study established a dose-wise relationship between the number of ACEs experienced and risky health behaviors like smoking, alcohol use, drug use, and risky sexual behaviors. Specifically, exposure to each additional ACE increased the likelihood of poorer outcomes with those experiencing 4 or more ACEs being at the greatest risk. ACEs were also associated with mental health issues and chronic diseases like heart disease, cancer, and respiratory disease (Felitti et al., 1998). Multiple studies have replicated and built on these findings by establishing a graded relationship between ACEs and multiple health outcomes, psychosocial issues, and behavioral issues among adults with those experiencing 4 or more ACEs being at the greatest risk (Petruccelli et al., 2019). ACEs have also been associated with early death, unemployment, and lower income (Brown et al., 2009; Campbell et al., 2016; Schurer et al., 2019).

ACEs also have a relationship with poorer childhood outcomes. Children who experienced multiple ACEs have a higher risk of headaches, digestive issues, allergies,

asthma, being obese or overweight, risky sexual behavior, substance abuse, mental health issues, and lower quality of life (Bellis et al., 2018; Burke et al., 2011; Dube et al., 2006; Porche et al., 2016; Song & Qian, 2020). ACEs have also been linked with school issues like poorer academic outcomes, grade retention, low school engagement, absenteeism, behavioral issues, learning problems, and poorer literacy skills (Bellis et al., 2018; Choi et al., 2019; Jimenez et al., 2016; Porche et al., 2016; Stempel et al., 2017).

Furthermore, mental health issues, obesity, and school-related outcomes are all issues impacting children that have an established relationship with multiple ACEs. Based on analyses of the 2016-2019 NSCH of children between 3 and 17 years old, approximately 9.8% of children had ADHD, 9.4% had an anxiety disorder, 8.9% had behavioral issues, and 4.4% had depression (Bitsko et al., 2022). Children who experienced 4 or more ACEs are at increased risk for each of these mental health issues (Bomysoad & Francis, 2020; Choi et al., 2019; Khanijahani & Sualp, 2022; Walker et al., 2021). Childhood obesity has been identified as a significant health issue impacting children with 19% of children between 6 and 11 years old and 21% of children between 12 and 19 years old being obese (Ogden et al., 2020; Sanyaolu et al., 2019). Children who have experienced multiple ACEs are also at increased risk of childhood obesity (Burke et al., 2011; Davis et al., 2019; McKelvey et al., 2019). ACEs have also been linked to poorer school-related outcomes. Children who have experienced multiple ACEs are at increased risk of low school engagement, excessive absenteeism, and grade retention (Crouch, Radcliff, Hung, et al., 2019; Hinojosa et al., 2019; Stempel et al., 2017; Suleiman et al., 2021). Thus, ACEs pose a serious threat to children across multiple types of childhood outcomes.

Resilience and Protective Factors

While ACEs would ideally be prevented, a substantial proportion of children and adults have experienced ACEs. Thus, interventions are needed to mitigate ACEs. One approach is to develop interventions that seek to build resilience to overcome ACEs. While resilience has been defined in multiple ways, this dissertation defined resilience consistent with Zolkoski and Bullock (2012) as the ability to adapt and succeed despite challenges or adversity like ACEs. The definition is consistent with shared factors of other definitions and includes the ability to adapt to avoid negative outcomes associated with ACEs (National Scientific Council on the Developing Child [NSCDC], 2015).

Building on prior resilience research, ACEs researchers and practitioners have begun to recognize the importance of identifying modifiable protective factors that can help children adapt and succeed despite exposure to ACEs (Hornor, 2017; NSCDC, 2015; Ortiz, 2019). While most protective factors that have been identified by ACEs researchers are grounded in historic resilience research (Masten, 2018; Wright et al., 2013), few studies have validated the effectiveness of these protective factors among those who experienced ACEs (Traub & Boynton-Jarrett, 2017). Historic resilience researchers recognized protective factors are dynamic and context-dependent while interacting to build resilience over the lifespan (Masten & Obradovic, 2006; Wright et al., 2013). Thus, ACEs researchers must validate these protective factors among those who experienced ACEs and understand how protective factors interact to build resilience. Fortunately, ACEs researchers have begun to identify resilience frameworks to potentially guide interventions to overcome ACEs (Bethell, Jones, et al., 2019; NSCDC, 2015; Sege & Harper Browne, 2017). However, since most protective factors have simply been adopted

from prior resilience research, research must examine the effectiveness of these protective factors and frameworks among those who have experienced ACEs.

ACEs Resilience Frameworks

The National Scientific Council on the Developing Child (NSCDC) (2015) framework is one ACEs resilience framework in which resilience is the result of four factors: at least one supportive, stable, caring adult relationship; strong self-regulation and executive functioning; mastery in some area; and a supportive faith/cultural tradition. Of these factors, a resilience-building adult relationship is considered the strongest protective factor. While these factors are grounded in historical resilience research (Masten, 2018), only one known study explored whether this framework was associated with better outcomes among individuals who experienced multiple ACEs. Based on secondary data analysis of the 2019 NSCH, Keane and Evans (2022a) found that the NSCDC framework was associated with a lower likelihood of mental health issues among children experiencing four or more ACEs. When considering individual NSCDC protective factors, other studies have found supportive adult relationships were associated with more positive outcomes among individuals experiencing multiple ACEs (Bellis et al., 2017; Yamaoka & Bard, 2019). In studies not including ACEs, the other NSCDC protective factors have also been associated with more positive outcomes (Kasen et al., 2012; Montpetit & Tiberio, 2016; Polizzi & Lynn, 2021; Ramakrishnan & Masten, 2020). However, studies have been limited to exploring certain aspects of individual resilience factors with a limited number of outcomes with only one study exploring the entire framework. Thus, a more extensive evidence base is needed to guide future interventions.

The Health Outcomes from Positive Experiences (HOPE) framework uses an ecological approach that theorizes that a child's ability to overcome ACEs is a byproduct of factors at the societal, community, relationship, and individual levels. The HOPE framework posits children who experience certain positive childhood experiences in the following four categories have a greater likelihood to overcome ACEs: having emotional/social skills; being in an environment that is safe, stable, and equitable; having supportive and nurturing relationships; and being able to engage in constructive social opportunities while developing connectedness (Sege & Harper Browne, 2017). The HOPE framework has a slightly larger evidence base with four known studies exploring the framework (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). However, only three of the studies explored specific outcomes associated with the HOPE framework with only two considering ACEs in the study design. Across all three outcome studies, analyses only examined individual protective factors within the framework and not the overall framework's effectiveness (Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). The significant protective factors differed across studies, and methodological differences created challenges in making any conclusions across outcomes. Thus, additional research is needed to validate that the HOPE framework is associated with better outcomes among children who experienced multiple ACEs.

The cumulative positive childhood experiences (PCEs) framework theorizes that there is a dose-wise relationship between the number of categories of PCEs experienced and more positive outcomes among those who experienced multiple ACEs (Bethell, Jones, et al., 2019). While not theory specific, this approach borrows protective factors

from previous resilience research with researchers utilizing different theories and approaches to identify the PCEs (Bethell, Jones, et al., 2019; Chung et al., 2008; Crandall et al., 2020; Crouch, Radcliff, Merrell, Brown, et al., 2021; Novak & Fagan, 2022; Robles et al., 2019). While terminology differs across studies, this study referred to this as the cumulative PCE approach consistent with Baglivio and Wolff (2020). Unlike the NSCDC and HOPE frameworks, the cumulative PCEs framework seeks to maximize protective factors rather than target the most salient factors. Previous studies have found some evidence of a dose-wise relationship between the number of PCEs experienced and better outcomes among those who experienced multiple ACEs (Baglivio & Wolff, 2020; Bethell, Jones, et al., 2019; Crandall et al., 2019; Novak & Fagan, 2022; Robles et al., 2019). However, there were notable methodological differences with differing protective factors, varying levels of integration of ACEs, and fewer studies with children. This creates challenges in making conclusions regarding the effectiveness of the framework and translating the results to practice.

Thus, while there is a well-established relationship between ACEs and negative health, education, and quality of life outcomes, the relationship between modifiable protective factors and the ability to mitigate ACEs is less established. Drawing on historic resilience research, resilience is context-dependent and best understood within the contact of other protective factors (Wright et al., 2013). The NSCDC, HOPE, and cumulative PCEs frameworks draw extensively from historical resilience research to identify protective factors that may build resilience to overcome ACEs (Bethell, Jones, et al., 2019; Crandall et al., 2019; NSCDC, 2015; Robles et al., 2019; Sege & Harper Browne, 2017). However, few studies have specifically explored the effectiveness of these

frameworks in building resilience to overcome ACEs. Among those studies that have been conducted, methodological differences and varying results make it difficult to draw conclusions regarding the effectiveness of these frameworks across outcomes. Furthermore, no known studies have examined which framework is most effective at understanding factors that build resilience to mitigate ACEs among children. While there are advantages and disadvantages to each approach, research is needed to better understand the effectiveness of each of these frameworks to effectively guide the development of future interventions.

Gelberg-Andersen Model for Vulnerable Populations

While ACEs and protective factors may be associated with this study's outcomes, other factors may also influence mental health, obesity, and school-related outcomes. Furthermore, a model is needed to leverage this study's findings to develop future interventions. Thus, this study used the Gelberg-Andersen Model for Vulnerable Populations (GMVP) to identify other NSCH factors that may be associated with the study outcomes and to serve as a framework to guide future interventions based on the findings of this study. The GMVP was developed as an extension of the Andersen Behavioral Model for vulnerable populations like children, adolescents, homeless populations, minority populations, and individuals with disabilities, mental illness, or chronic illnesses (Gelberg et al., 2000; Stein et al., 2007). The most recent version of the Andersen model theorized that predisposing characteristics, enabling resources, and need determine health behaviors, healthcare utilization, and subsequent health status. Predisposing factors included health beliefs, demographic factors, and factors related to

the individual's social structure that later may influence health and healthcare utilization. Enabling resources included community and social resources along with individual characteristics like having the knowledge and skills to access health-related resources. Need was conceptualized as the individual's perceived need for healthcare services or health behaviors (Andersen, 1995). The Andersen Behavioral Model has considerable evidence and has been widely adopted in multiple studies (Babitsch et al., 2012).

The GMVP expands the Andersen Behavioral Model by categorizing predisposing, enabling, and need factors into traditional and vulnerable domains. Traditional domains align with the original Andersen Behavioral Model while the vulnerable domains consider additional predisposing, enabling, and need factors that are relevant to vulnerable populations (Gelberg et al., 2000). Many of the predisposing factors in the traditional and vulnerable domains align with traditional and proposed ACEs such as child abuse, child neglect, victimization, economic hardship, and household dysfunction (Finkelhor et al., 2013; Gelberg et al., 2000; Wade et al., 2014). Some of the predisposing and enabling factors in the traditional and vulnerable domains align with potential factors that build resilience against ACEs such as mastery, executive functioning, supportive adult relationships, community resources, community safety, and family resources (Gelberg et al., 2000; NSCDC, 2015; Robles et al., 2019; Sege & Harper Browne, 2017). Consequently, two other known ACEs and resilience studies used either the GMVP or Andersen Behavioral Model. Yoonsook et al. (2018) utilized the GMVP to explore factors that may influence homelessness while including ACEs as a potential predisposing factor and supportive adult relationships as a potential enabling protective factor. Crouch et al. (2022) utilized the Andersen Behavioral Model to identify

demographic factors that could influence whether youth were overweight or obese when utilizing the HOPE framework. Thus, the GMVP was used to identify other NSCH factors associated with the study outcome and to serve as a framework for leveraging the study's findings to guide future interventions.

Statement of the Problem

Since the original ACEs study, multiple studies have demonstrated that increased exposure to ACEs has been associated with increased risky health behaviors along with poorer educational, health, and quality of life outcomes in both children and adults (Bellis et al., 2018; Brown et al., 2009; Felitti et al., 1998; Petruccelli et al., 2019; Schurer et al., 2019; Stempel et al., 2017). With over 1 in 5 children experiencing multiple ACEs, interventions are needed to mitigate ACEs (Bethell, Davis, et al., 2017). One potential approach is targeting modifiable protective factors to build resilience to mitigate ACEs. However, few studies have explored whether modifiable protective factors build resilience specifically against ACEs (Traub & Boynton-Jarrett, 2017). Rather, ACEs researchers have adopted protective factors from historic resilience as potential protective factors (Hornor, 2017; Masten, 2018). However, building on historic resilience research, protective factors are context-dependent and best understood within models and theories that understand how protective factors interact to build resilience (Wright et al., 2013). Consequently, researchers must demonstrate the effectiveness of these protective factors specifically within the context of exposure to multiple ACEs and seek to understand how these factors may interrelate to build resilience against ACEs.

ACEs researchers have begun to identify frameworks that identify multiple protective factors that work together to build resilience to overcome ACEs. Three prominent ACEs resilience frameworks are the NSCDC framework, HOPE framework, and cumulative PCEs framework (Bethell, Jones, et al., 2019; NSCDC, 2015; Sege & Harper Browne, 2017). Despite the promise of these frameworks, the evidence of each is limited. While promising, only one known study has explored the effectiveness of the NSCDC framework among children (Keane & Evans, 2022a). Four known studies have explored the HOPE framework among children, but only three of those studies included outcomes and only two involved ACEs (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). The HOPE framework study designs and analyses were inconsistent, making conclusions regarding the effectiveness of the framework challenging while the analysis was focused on identifying specific protective factors rather than validating the framework. Four known studies examined whether increased exposure to cumulative PCEs was associated with better outcomes among children experiencing ACEs. While increased exposure to PCEs was associated with most outcomes across studies, the number and specific PCEs used were inconsistent across studies (Baglivio & Wolff, 2020; Crandall et al., 2019; Novak & Fagan, 2022; Robles et al., 2019). This results in challenges in determining the overall effectiveness of the framework since the methods were different across studies.

Collectively, this results in several gaps in the literature. First, evidence-based frameworks are needed to understand how modifiable protective factors can be targeted to build resilience to mitigate ACEs. While resilience frameworks like the NSCDC, HOPE, and cumulative PCEs frameworks have been identified based on historic

resilience research, the evidence has been limited. Few studies have explored these frameworks or protective factors within each framework. Also, the research has only included a limited number of outcomes, and only a limited number of studies have explored the effectiveness of each framework with limitations that prevent conclusions from being formed on the overall effectiveness of each framework. Thus, evidence is needed to determine the effectiveness of these frameworks and the protective factors within each framework for building resilience to mitigate ACEs.

Second, exposure to multiple ACEs has been associated with multiple childhood outcomes including mental health issues, obesity, and school-related outcomes (Bomysoad & Francis, 2020; Burke et al., 2011; Choi et al., 2019; Khanijahani & Sualp, 2022; McKelvey et al., 2019; Stempel et al., 2017; Walker et al., 2021). As interventions are developed to mitigate ACEs, resilience frameworks that are more effective at building resilience across outcomes have to potential to have a broader impact while being more succinct and cost-effective to increase the likelihood of implementation. Thus, to better inform the development of ACEs interventions to build resilience, researchers must understand the effectiveness of resilience frameworks in building resilience across outcomes. Thus, research must explore and compare the effectiveness of each of these frameworks across multiple outcomes that impact childhood health and well-being.

Finally, to determine the effectiveness of these frameworks and protective factors to build resilience against ACEs, research must explore the effectiveness among children who have experienced multiple ACEs. In previous studies, the inclusion of ACEs has been inconsistent. Some studies controlled for ACEs, others explored the interaction between protective factors and ACEs, and others did not include ACEs in the analysis.

Since resilience is context-specific (Wright et al., 2013), research is needed to explore whether these frameworks and protective factors are associated with improved outcomes among children who experienced ACEs, including those who have experienced 4 or more ACEs, which is the threshold that has widely been recognized in previous studies (Bomysoad & Francis, 2020; Burke et al., 2011; Felitti et al., 1998; Hughes et al., 2017).

Purpose of the Study

This study addressed these gaps in the literature by expanding the evidence base for each of these ACEs resilience frameworks, being the first known study to compare the effectiveness of these resilience frameworks, and examining each framework's effectiveness among children who experienced ACEs using a consistent methodology to allow for comparisons across outcomes. The purpose of this study was to identify which resilience framework and protective factors within each framework were associated with greater resilience among children who experienced ACEs. Specifically, this study explored whether the NSCDC framework or HOPE framework was associated with better outcomes among children who experienced ACEs across three domains. The first domain was childhood mental health. The second domain was childhood obesity. The third domain was school-related outcomes which included absenteeism, school engagement, and grade retention. Since the cumulative PCEs framework conceptually focuses on the cumulative benefit of protective factors and has not been theory-specific across studies, the study examined whether the addition of a cumulative PCE score strengthened the relationship between each framework and outcome to determine the effectiveness of the

framework. Within each framework, the study explored which protective factors have the strongest relationship with improved outcomes in each domain.

Research Questions

1. Does the NSCDC or HOPE framework have a stronger relationship with whether a child has ever been told they had a mental health issue (depression, anxiety, ADHD, or behavioral/conduct problems)?
    a. Of the factors within each framework, which protective factors have the strongest relationship with whether a child has ever been told they had a mental health issue?
    b. Does the addition of a cumulative PCEs score strengthen the relationship between each framework and whether a child has ever been told they had a mental health issue?
    c. Are these relationships the same after controlling for the number of ACEs experienced by children?
    d. Are these relationships consistent across the number of ACEs experienced by children?
2. Does the NSCDC or HOPE framework have a stronger relationship with whether a child is currently obese?
    a. Of the factors within each framework, which protective factors have the strongest relationship with whether a child is currently obese?
    b. Does the addition of a cumulative PCEs score strengthen the relationship between each framework and whether a child is currently obese?

c. Are these relationships the same after controlling for the number of ACEs experienced by children?
d. Are these relationships consistent across the number of ACEs experienced by children?

3. Does the NSCDC or HOPE framework have a stronger relationship with school-related outcomes (school engagement, excessive absenteeism, and grade retention)?
    a. Of the factors within each framework, which protective factors have the strongest relationship with school-related outcomes (absenteeism, school engagement, and grade retention)?
    b. Does the addition of a cumulative PCEs score strengthen the relationship between each framework and school-related outcomes (school absenteeism, school engagement, and grade retention)?
    c. Are these relationships the same after controlling for the number of ACEs experienced by children?
    d. Are these relationships consistent across the number of ACEs experienced by children?

Study Hypotheses

The researcher hypothesized that both the NSCDC and HOPE frameworks would be associated with more positive outcomes among children across outcomes. However, the researcher hypothesized that the addition of a cumulative PCEs score would not significantly strengthen the relationship between either the NSCDC or HOPE framework with any of the study outcomes. One of the criticisms of the original ACEs study was not

all traumatic events are equal with certain types of traumatic events having a differential influence based on the severity, timing, or other factors (Lacey & Minnis, 2020). Similarly, not all PCEs are likely to be equal. Consequently, the researcher hypothesized that frameworks that emphasize the most salient protective factors would have a stronger relationship with better outcomes than a dose-wise score of various protective factors given equal weight. Furthermore, based on historic resilience research, parent/caregiver relationships have one of the largest evidence bases as a protective factor against adversity and cumulative risk (Masten, 2018; Wright et al., 2013). ACEs studies have found similar relationships between supportive adult relationships, which include parent/caregiver relationships, and resilience to overcome ACEs (Bellis et al., 2017; Yamaoka & Bard, 2019). Consequently, Keane and Evans (2022a) found that a supportive parent relationship and self-regulation were the strongest predictors of a child with 4 or more ACEs not having mental health issues. Thus, based on the increased emphasis on resilience-building adult relationships in the NSCDC framework and self-regulation combined with how the protective factors have been measured and conceptualized using the HOPE framework (Crouch, Radcliff, Merrell, Brown, et al., 2021; NSCDC, 2015), the researcher hypothesized that the NSCDC framework would have the strongest relationship with resilience across study outcomes. Since the NSCDC and HOPE frameworks were ACEs resilience frameworks (NSCDC, 2015; Sege & Harper Browne, 2017), the researcher also hypothesized that these relationships would be the same after controlling for ACEs and across ACEs subgroups with the relationships being slightly stronger among those who experienced more ACEs.

Significance of Study

Previous research has established that exposure to multiple ACEs in childhood is associated with risky health behaviors along with poorer educational, health, quality of life, and economic outcomes. With almost 50% of all children in the U.S. experiencing at least one ACE and almost one in four experiencing 2 or more ACEs (Bethell, Davis, et al., 2017), ACEs are a significant public health issue impacting a substantial proportion of the population. While ideally ACEs would be prevented, interventions are needed for the children and adults who have already experienced ACEs to improve outcomes and prevent the intergenerational transmission of ACEs (Woods-Jaeger et al., 2018). To develop these interventions, research is needed to identify protective factors that can be targeted to improve outcomes among individuals who have experienced multiple ACEs.

Recently, research has begun to develop frameworks to explore modifiable protective factors that promote resilience to mitigate ACEs. However, evidence is preliminary with no unified framework for identifying protective factors and no clear evidence that these frameworks are effective at improving outcomes among children experiencing multiple ACEs. Furthermore, not as extensive an evidence base links modifiable resilience framework or protective factors to the myriad of negative outcomes associated with ACEs. Thus, prior to investing considerable resources in developing resilience interventions, research must establish the evidence base for these frameworks. Furthermore, given limited resources, research must determine which factors have the strongest relationship with improved outcomes within these frameworks. The results of this study will be used to inform the development of interventions at multiple levels by integrating the identified resilience framework with the GMVP to increase the utilization

and impact of future interventions. Thus, the study will help researchers, practitioners, and policymakers to focus research, interventions, and policies on those frameworks and factors that are most effective at building resilience. From these results, interventions can be developed to improve outcomes among children who experienced multiple ACEs.

Procedures

This cross-sectional study consisted of secondary data analysis from the combined 2018-2020 National Survey of Children's Health (NSCH). The NSCH is a national survey administered each year by the Health Resources and Services Administration's Maternal and Child Health Bureau that includes data related to the health and well-being of children between 0 and 17 years old. Responses were completed by the child's parent or caregiver (United States Census Bureau, 2020). Due to using subsets of respondents and the number of analyses conducted, three years of data were combined. The sample consisted of children between 6 and 17 years old that had all items of interest completed for a given outcome. For all outcomes except for weight status, the sample ranged from 65,072 to 65,772 children. The sample for the weight status outcome was 46,672 children since BMI status was only provided for children between 10 and 17 years old.

The dissertation used the preprint/reprint dissertation format. Each research question was a separate paper as depicted in Figure 1. The first paper was related to whether the child was ever told they had a mental health issue (depression, anxiety disorder, ADHD, or behavioral/conduct problems). The second paper was related to whether the child was currently obese. The third paper examined three school-related outcomes (school engagement, excessive absenteeism, and grade retention). Model

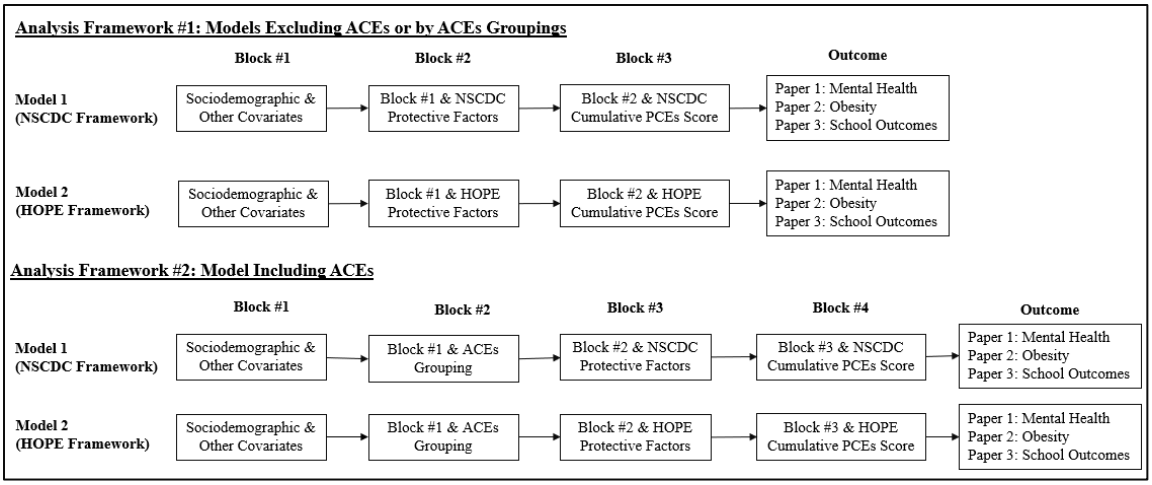

Figure 1. Research study design utilizing preprint/reprint dissertation.

comparisons were conducted using hierarchical logistic regression with validation to test each of the study's research questions.

All statistical analyses were conducted via IBM SPSS Statistics for Windows, Version 27.0. Prior to model comparisons using logistic regression, frequencies were calculated, and bivariate analyses were conducted for the study variables. Then, analyses were conducted in three different ways for each outcome as outlined in Figure 1. First, analysis framework 1 was used to compare the resilience frameworks among children when not considering ACEs. Then, analysis framework 2 was used to compare resilience frameworks after controlling for ACEs. Finally, analysis framework 1 was used again to compare the resilience frameworks across four ACEs subgroups. For each analysis, model one (NSCDC framework) and model two (HOPE framework) were compared.

Analyses framework 1 compared resilience frameworks for all children when not controlling for ACEs and across all four ACEs subgroups. The effectiveness of the NSCDC and HOPE frameworks were based on if the ΔR^2 from block 1 to 2 was

significant. To determine which framework was more effective for each outcome, Nagelkerke's R^2 value was compared in block 2 for model one and model two; the framework with the largest R^2 value had the strongest association with each outcome. Within each framework, the adjusted odds ratios were compared for each protective factor to determine significance and strength. To determine the effectiveness of the cumulative PCEs frameworks, the ΔR^2 from block 2 to 3 was compared for both models. If the ΔR^2 was significant, the cumulative PCE score contributed significantly to the model. The same analyses were repeated among ACEs groupings to determine the stability of the frameworks across ACE groupings.

Analysis framework 2 was used to determine whether the results were consistent after controlling for ACEs. Identical analyses were conducted except block 2 included the covariates and ACEs. Each framework's effectiveness after controlling for ACEs was based on if the ΔR^2 from block 2 to 3 was significant. The effectiveness of the NSCDC and HOPE frameworks were compared based on Nagelkerke's R^2 value in block 3. Each framework's significant protective factors were identified in block 3. The significance of the ΔR^2 from block 3 to 4 determined the effectiveness of the cumulative PCEs scores.

Delimitations

Overall, the study was delimited to children in households that completed the NSCH from 2018 through 2020. Since the NSCH only captured data on ACE items for children between 6 and 17 years old, the study was delimited to children between the ages of 6 and 17 years old for mental health and school-related outcomes. For childhood obesity, the study was delimited to children between 10 and 17 years since body mass

index (BMI) was only calculated for children in that age range. The study was also delimited to surveys where respondents completed all items of interest for each outcome.

Limitations

The study utilized secondary data analysis from the 2018-2020 NSCH, which was a cross-sectional survey completed annually by a parent or guardian regarding one child in the home. Due to the cross-sectional design, the study could not infer a causal or temporal relationship between the resilience frameworks, protective factors, and any of the outcomes. Furthermore, measures utilized in this study were limited to items captured by the NSCH. While previous studies have identified items on the survey that align with the NSCDC, HOPE, and cumulative PCEs frameworks, the items did not correspond exactly with the protective factors described by these frameworks. The NSCH also excluded some of the traditional ACEs while including additional ACEs not as widely identified in the literature. The NSCH also relied on parent and guardian-reported data. Thus, ACEs may have been underreported if parents/guardians were unaware of the child's experiences or were motivated to not disclose the ACE on the survey. Similarly, the items related to resilience may not fully capture the child's perception of those factors since they are reported by the caregiver. Nevertheless, many of these limitations are common limitations of secondary data analysis utilizing cross-sectional data. Finally, while data for the 2018 and 2019 NSCH was collected prior to the COVID-19 pandemic, data for the 2020 NSCH was collected during the pandemic. Thus, the COVID-19 pandemic may have influenced some of the data collected from the 2020 NSCH.

Assumptions

The study assumed that parents and guardians honestly answered all items of interest on the NSCH and that their responses accurately captured their child's experiences and perceptions. The study assumed that increased exposure to ACEs was associated with an increased risk for mental health issues, obesity, and poorer school-related outcomes. The study assumed that resilience is defined as the ability to adapt and succeed despite exposure to adversity with adaptation including the ability to avoid negative adverse outcomes (NSCDC, 2015). Consequently, better outcomes in each domain were associated with higher levels of resilience. The study assumed that the survey items used to measure protective factors from the NSCDC and HOPE frameworks were representative of those frameworks based on previous research with these frameworks and the NSCH (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Keane & Evans, 2022a). Furthermore, based on the lack of consistency in previous studies, this study assumed that a cumulative PCEs score could be calculated by adding the number of protective factors present regardless of the theoretical framework. Finally, the study assumed that BMI is an accurate measure of the child being obese or overweight.

Definitions of Terms

Adverse Childhood Experiences (ACEs): ACEs are categories of trauma that typically include forms of maltreatment and household dysfunction that occur during childhood with a dose-wise relationship to poorer short and long-term health, education, and quality of life outcomes (Felitti et al., 1998).

Childhood Obesity: Children meet this criterion based on a BMI in the 95th percentile or higher when compared to the same age and gender (Centers for Disease Control and Prevention [CDC], 2021b)

Enabling Resources: Community and social resources along with individual characteristics like having the knowledge and skills to access health-related resources that influence healthcare utilization, health behaviors, and health status according to the Andersen Behavioral Model and GMVP (Andersen, 1995; Gelberg et al., 2000).

Historic Resilience Research: The four waves of resilience research that have explored how resilience has helped individuals, families, and systems overcome adversity (Masten, 2018; Masten & Obradovic, 2006; Wright et al., 2013). For this study, this refers to resilience research not specifically related to ACEs.

Mastery: A feeling or sense of control or expertise in some area of one's life. The construct includes elements of self-esteem and hope (Hornor, 2017; NSCDC, 2015).

Modifiable Protective Factors: Protective factors that can potentially change over the course of a lifetime to increase resilience and decrease the likelihood of negative outcomes associated with negative events. These factors are typically the target of interventions (NSCDC, 2015; Traub & Boynton-Jarrett, 2017).

Need Factors: According to the Andersen Behavioral Model and GMVP, need factors are an individual's perceived need for healthcare services or engaging in a health behavior based on their self-perception of the need based on their own experiences or information they have received from others including healthcare providers (Andersen, 1995; Gelberg et al., 2000).

Nonmodifiable Protective Factors: Protective factors that are typically innate characteristics or predispositions less likely to change over the course of a lifetime (Hornor, 2017; Masten, 2018; NSCDC, 2015).

Predisposing characteristics: Factors such as health beliefs, demographic factors, and factors related to the individual's social structure identified in the Andersen Behavioral Model and GMVP that later may influence health, health behaviors, and healthcare utilization (Andersen, 1995; Gelberg et al., 2000).

Protective Factors: Factors identified associated with improved outcomes among individuals who have experienced adversity or trauma (Wright et al., 2013).

Resilience: The ability to adapt and succeed despite difficult circumstances or adversity like ACEs. This includes the ability to adapt to avoid negative adverse outcomes due to adversity (NSCDC, 2015; Zolkoski & Bullock, 2012)

Resilience-Building Adult Relationship: Stable, supportive, and nurturing adult relationships that build resilience by helping children feel safe from fear and the threat of physical or emotional harm, by having stability to ensure consistency and predictability, and that are nurturing to meet the child's developmental, emotional, and physical needs (CDC, 2013; NSCDC, 2015)

Self-Regulation: The capacity to make changes to one's behaviors to meet one's goals or being able to regulate one's natural tendencies to obtain another goal (Vohs & Baumeister, 2016).

CHAPTER 2

LITERATURE REVIEW

Adverse Childhood Experiences

Adverse childhood experiences (ACEs) are traumatic events that occur in childhood that have been linked to poorer short and long-term health, education, and quality of life outcomes. The groundbreaking ACEs study was published in 1998 and utilized a combination of prospective and retrospective data to explore the relationship between childhood adversity and adult health behaviors and health outcomes. The study was a collaboration between Kaiser Permanente and the Centers for Disease Control and Prevention. Participants were patients from Kaiser Permanente between 1995 and 1996 with a previous medical appraisal. A total of 13,494 participants with a completed appraisal were sent an ACEs study questionnaire that asked about household dysfunction and abuse during childhood along with certain health behaviors. A total of 9,508 participants completed the questionnaire to participate in the study (Felitti et al., 1998).

The ACEs questionnaire asked questions to determine childhood exposure to three categories of abuse (sexual abuse, physical abuse, and psychological abuse) and four categories of household dysfunction (household substance abuse, household domestic violence, household substance abuse, and household incarceration). An ACEs score was calculated by the number of categories of ACEs that the participant had experienced. Risky health behaviors and risk factors were assessed based on 10 factors

that were measured on the Health Appraisal Clinic questionnaire. Chronic diseases and disease conditions were assessed by medical histories taken by patients at the clinic. The researchers conducted logistic regression to explore the relationship between ACE scores and each risky health behavior and health condition. Approximately 52% of respondents experienced at least one ACE with 6.2% reporting 4 or more ACEs. Exposure to one ACE increased the likelihood of exposure to other categories of ACEs. The researchers found a significant dose-wise relationship between the number of ACEs experienced and each of the risky health behaviors and risk factors. They also found a significant dose-wise relationship between the number of ACEs experienced and cancer, emphysema, heart disease, hepatitis, poor overall health, and skeletal fractures. This study was significant given the widespread impact of early childhood trauma and adversity on risky health behavior, health, and chronic disease along with the dose-wise relationship to negative health behaviors and outcomes (Felitti et al., 1998).

Since the original ACEs study, multiple studies have replicated the dose-wise relationship between ACEs, risky health behaviors, and negative health outcomes in both adults and children (Bellis et al., 2018; Bomysoad & Francis, 2020; Burke et al., 2011; Hughes et al., 2017; Meeker et al., 2021; Petruccelli et al., 2019). Exposure to traumatic events such as ACEs during childhood is particularly impactful due to childhood being a key developmental stage for brain development. Exposure to severe, repeated, or chronic stressors during childhood can result in changes in the brain and neuroregulatory systems. This has an adverse impact on the overall stress-response system, influencing future health and behaviors (Anda et al., 2006). These changes have been associated with poorer executive functioning, irregular arousal, lower levels of self-regulation, emotional

impairment, decreased social skills, and a poorer immune system response (Bucci et al., 2016). Consequently, Felitti et al. (1998) posited that exposure to ACEs resulted in emotional, cognitive, and social impairment that increased the likelihood of children and adults engaging in risky health behaviors. These behaviors increase the likelihood of later disease and disability along with other potential social problems. Combined, this contributes to an increased risk of earlier death. Researchers have recently extended this paradigm to consider how parental exposure to ACEs results in the intergenerational transmission of ACEs. Parents that are exposed to multiple ACEs were found to be more likely to have poorer mental health, health, and social outcomes that decreased the likelihood of healthy attachment to their children and increased the likelihood of their children being exposed to ACEs (Narayan et al., 2021; Woods-Jaeger et al., 2018). Consequently, the Centers for Disease Control and Prevention (2021a) developed an ACEs pyramid that outlines how ACEs impact long-term health, which has since been extended to consider how the intergenerational transmission of ACEs, historic trauma, and environmental context contribute to negative outcomes associated with ACEs.

The original ACEs study recognized seven categories of ACEs which included child maltreatment and household dysfunction as outlined in Table 1 (Felitti et al., 1998). Currently, the ten ACEs in Table 1 have been widely recognized in the literature with psychological abuse being replaced by emotional abuse, physical neglect, and emotional neglect while divorce or parental separation has been added as an additional ACE (Finkelhor et al., 2013). However, research is being conducted exploring the addition of other potential ACEs that extend beyond categories of childhood maltreatment and household dysfunction. Some other potential ACEs include homelessness, high parental

conflict, community violence, peer victimization, disabilities, legal separation from family, parental unemployment, parental job loss, lack of friends, experiencing a bad accident, economic hardship, discrimination, serious illness or death of a family member, death of peers, school safety, and teenage pregnancy. While there are varying levels of evidence of these potential ACEs, additional research is needed to validate these ACEs prior to being widely adopted (Finkelhor et al., 2013; Wade et al., 2014). The following sections will explore the prevalence and outcomes associated with ACEs in the literature.

Table 1

Categories of Adverse Childhood Experiences (ACEs)

Original Adverse Childhood Experiences[a]	Current Widely Recognized Adverse Childhood Experiences[b]
Child Maltreatment	**Child Maltreatment**
-Physical abuse	-Emotional abuse
-Psychology abuse	-Physical abuse
-Sexual abuse	-Sexual abuse
	-Emotional neglect
	-Physical neglect
Household Dysfunction	**Household Dysfunction**
-Household domestic violence	-Household domestic violence
-Household incarceration	-Household incarceration
-Household mental illness	-Household mental illness
-Household substance abuse	-Household substance abuse
	-Parental divorce/separation

[a]Felitti et al. (1998); [b]Finkelhor et al. (2013)

Prevalence of ACEs

Merrick et al. (2018) conducted secondary data analysis of the 2011-2014 Behavioral Risk Factor Surveillance System (BRFSS) to explore the prevalence of ACEs among U.S. adults. The 2011-2014 BRFSS was a telephone survey that is conducted annually in the United States to explore various health-related outcomes. The 2011-2014 BRFSS included eight ACEs measures: sexual abuse, physical abuse, emotional abuse,

parental divorce or separation, household domestic violence, household mental illness, household substance abuse, and a household family member being incarcerated. Respondents indicated which of these ACEs they experienced prior to 18 years old. A total ACE score was calculated by the sum of these items and ranged from 0 to 8 ACEs.

Approximately 15.8% of adults experienced 4 or more ACEs with 8.8% experiencing 3 ACEs, 13.4% experiencing 2 ACEs, 23.5% experiencing 1 ACE, and 38.5% experiencing 0 ACEs. ACEs were more prevalent in minority populations with multiracial adults averaging 2.5 ACEs compared to 1.8 for Hispanics, 1.7 for African Americans, 1.5 for other race, and 1.5 for Caucasians. Females experienced an average of 1.7 ACEs compared to 1.5 ACEs for males. Individuals with a household income of less than $15,000 averaged 2.2 ACEs compared to 1.4 ACEs for households making $50,000 or more. Lower levels of education were also associated with increased exposure to ACEs. Adults with less than a high school education averaged 2.0 ACEs compared to 1.6 ACEs for high school graduates, 1.7 for adults with some college, and 1.2 for college graduates. Finally, bisexual adults averaged 3.1 ACEs compared to 2.2 ACEs for gay/lesbian adults and 1.6 ACEs for straight adults. Combined, over 1 in 7 adults have experienced ACEs with ACEs disproportionately impacting racial and ethnic minorities, sexual minatory, lower-income, and less educated populations (Merrick et al., 2018).

ACEs also impact a substantial proportion of children. Bethell, Davis, et al. (2017) utilized data from the 2016 NSCH to explore the prevalence of ACEs among children between 0 and 17 years old in the United States. The NSCH collected parent or caregiver-reported data on health-related items. The survey included nine ACE measures: parent/guardian death, parent/guardian incarceration, economic hardship, parental

separation/divorce, household domestic violence, household mental illness, household substance abuse, neighborhood violence, and experiencing racial/ethnic discrimination. A total ACE score ranging from 0 to 9 was calculated based on the number of categories of ACEs experienced. The ACE items excluded childhood abuse and neglect, which may partially account for lower ACE scores. Some additional ACEs items were included that were not included in the ACEs study. However, due to parental or caregiver reports, these numbers were potentially underreported.

Overall, 46.3% of all children experienced at least one ACE with 21.7% experiencing 2 or more ACEs. Among older youth between 12 and 17 years old, 55.7% had experienced at least 1 ACE with 29.9% experiencing 2 or more ACEs. African American children had the highest percentage of children experiencing multiple ACEs (33.8%) followed by other race (28.3%), Hispanics (21.9%), Caucasians (19.2%), and Asians (6.4%). A much higher percentage of children living in households with an income less than 200% of the federal poverty level experienced multiple ACEs with 31.9% experiencing 2 or more ACEs compared to 9.2% of children with a household income of 400% or higher of the federal poverty level. Among households living at less than 200% of the federal poverty level, 44.4% of other race, 39.9% of African American, 34.7% of Caucasian, 25.1% of Hispanic, and 9.0% of Asian children experienced multiple ACEs. Thus, a substantial proportion of children experienced multiple ACEs, placing them at greater risk for negative outcomes with the risk being greater for some minority populations and lower-income populations (Bethell, Davis, et al., 2017).

Impact of ACEs on Adult Outcomes

The original ACEs study established a dose-wise relationship between risky health behaviors and several health outcomes such as heart disease, cancer, emphysema, hepatitis, skeletal fractures, and poor overall health (Felitti et al., 1998). Since the original ACEs study, an extensive evidence base has been established that links exposure to multiple ACEs to increased risky health behaviors and poor health outcomes. Hughes et al. (2017) conducted a systematic review and meta-analysis that identified 37 studies that examined the relationship between exposure to multiple ACEs and health outcomes only utilizing studies that calculated odds ratios, had over 100 participants, and addressed the health categories initially identified. The meta-analysis involved the calculation of pooled odds ratios for those individuals that experienced 4 or more ACEs. Participants that experienced 4 or more ACEs were significantly more likely to engage in the following risky health behaviors than participants that did not experience any ACEs with the pooled odds ratios in parentheses: low physical activity (1.3), being overweight/obese (1.4), heavy use of alcohol (2.2), smoking (2.8), multiple sex partners (3.6), first having sex at an early age (3.7), using illicit drugs (5.6), perpetrating violence (10.2), and previous suicide attempts (30.1). Adults who experienced 4 or more ACEs were also more likely to have the following health conditions than adults experiencing no ACEs with the pooled odds ratios in parenthesis: diabetes (1.5), heart disease (2.1), cancer (2.3), liver disease (2.8), respiratory disease (3.1), anxiety (3.7), depression (4.4), and STIs (5.9).

In another study, Brown et al. (2009) explored the relationship between exposure to multiple ACEs and early death. The researchers utilized the participant records from the original ACEs study and merged their data with death records from the National

Death Index in 2006 to determine which participants were dead and still alive. The researchers then calculated the expected years of life lost, the years of potential life lost, and the relative risk of death prior to 76 years old and 66 years old. On average, those adults with 6 or more ACEs died 20 years earlier than adults that did not experience any ACEs. Adults with 6 or more ACEs were also 1.7 times more likely to die prior to 76 years old and 2.4 times more likely to die before 66 years old than adults that did not experience any ACEs. The estimated years of life lost were almost three times more among adults experiencing 6 or more ACEs than those not experiencing any ACEs. Consistent with the ACEs pyramid (Felitti et al., 1998), Brown et al. (2009) found that experiencing 6 or more ACEs had a large impact on early death.

Another study examined the relationship between ACEs and income. Schurer et al. (2019) utilized longitudinal data from the National Child Development study that began in 1958 in the United Kingdom and followed children from birth to 55 years old. Several measures were collected from participants including measures of ACEs and adult financial outcomes. Based on responses from 7,450 participants with no missing data on economic or ACEs outcomes from birth until 55 years old, the researchers explored subjective poverty, welfare dependence, and net earnings at 55 years old. A statistically significant relationship was found for all three outcomes. For every ACE experienced, there was a 2.7% increase in the likelihood of the adult living in poverty, a 4.3% increase in the likelihood of being welfare dependent at the age of 55, and an 8.9% decrease in net earnings at the age of 55. Thus, ACEs have a strong relationship with quality-of-life outcomes in addition to risky behaviors and poorer health outcomes in adults.

General Impact of ACEs on Children

While the specific childhood outcomes explored in this study will be discussed in subsequent sections, ACEs have been found to have a similar dose-wise relationship with risky health behaviors, educational outcomes, and health outcomes among children. Meeker et al. (2021) analyzed data from the Youth Risk Behavior Surveillance Survey completed in one New York county to explore the relationship between ACEs and risky behaviors. Based on logistic regression analysis of 1,532 responses from high school students, students with 2 or more ACEs were significantly more likely to use alcohol, use marijuana, abuse other substances, come to school intoxicated, engage in self-injurious behaviors, have suicidal ideation, attempt suicide, get into a fight, and carry a gun or weapon than students who had not experienced any ACEs.

Bellis et al. (2018) conducted a retrospective, cross-sectional study in Wales to examine the relationship between ACEs and childhood health. A sample of 2,452 adults between 18 and 69 years old completed questionnaires that assessed their overall ACEs score along with child health and school attendance. Based on logistic regression analysis, children that experienced 4 or more ACEs were significantly more likely to have asthma, regular headaches, digestive issues, and allergies than children not experiencing any ACEs. Children that experienced 4 or more ACEs were also 4.7 times more likely to report poor childhood health than children not experiencing any ACEs. Thus, increased exposure to ACEs has been linked to an increased risk of poor health outcomes in childhood. The following sections will explore the relationship between ACEs and childhood mental health, weight status, and school-related outcomes.

ACEs and Childhood Mental Health

Based on analyses conducted by the Centers for Disease Control and Prevention (CDC) on the NSCH from 2016-2019, 4.4% of children between the ages of 3 and 17 years old in the United States have suffered from depression with 9.4% of children in the same age group experiencing anxiety. Attention deficit/hyperactivity disorder (ADHD) was even more common with 9.8% of children between 3 and 17 years old having been told by a healthcare provider that they had ADHD. Approximately 8.9% of parents surveyed indicated that they were told by a healthcare provider that their child had either behavioral issues or a conduct disorder. Childhood mental health issues have been linked to poorer educational outcomes, risky health behaviors, physical health, and chronic disease (Bitsko et al., 2022). In the original ACEs study, Felitti et al. (1998) identified cognitive, social, and emotional impairment as one of the first areas impacted by ACEs. Consequently, ACEs have a strong relationship with childhood mental health issues, which likely impacts other childhood and adult outcomes.

Research has established that ACEs have a strong relationship with both anxiety and depression. Based on analyses of the 2016-2017 NSCH, Elmore and Crouch (2020) found children from 8 to 17 years old who experienced 4 or more ACEs were 2.2 times more likely to currently be depressed and 1.7 times more likely to currently have anxiety compared to children not experiencing any ACEs. Bomysoad and Francis (2020) utilized data from the 2016-2017 NSCH to explore the relationship between ACEs and mental health outcomes among an older sample of children. Among children between 12 and 17 years old, children with 4 or more ACEs were 10.3 times more likely to have depression and 5.4 times more likely to have anxiety than children who had not experienced any

ACEs. Thus, the impact of ACEs on anxiety and depression appears to be even greater among older children and adolescents.

Kim et al. (2021) explored the relationship between the number of ACEs experienced and various subgroups of anxiety and depression. Increased exposure to ACEs was associated with higher rates of anxiety, depression, and co-occurring anxiety and depression in youth between 12 and 17 years old. This relationship was the strongest for the depression-only and co-occurring depression and anxiety subgroups. While using longitudinal data, Wang et al. (2021) found that household dysfunction experienced by children between birth and 9 years old significantly predicted anxiety and depression at the age of 15 using longitudinal data from the Fragile Family and Child Wellbeing (FFCW) Study. In another longitudinal FFCW study, Zhang and Mersky (2022) found that a child's ACE score at 5 years old predicted anxiety and depression among 9-year-old children. However, this relationship was not significant at other age points. Thus, overall, the literature has established a strong relationship between ACEs and mental health issues like depression and anxiety in both childhood and adolescence.

ACEs also have an established relationship with attention-deficit/hyperactivity disorder (ADHD). In a longitudinal study utilizing data from the FFCW, Jimenez et al. (2017) found that exposure to 3 or more ACEs prior to 5 years old was associated with a 2.6 times increase in the likelihood of a child having ADHD at 9 years old. In a study of older children between the ages of 6 and 17 years old using pooled data from the 2016-2019 NSCH, Khanijahani and Sualp (2022) found that children experiencing 3 or more ACEs were 5.5 times more likely to have ADHD than children who had not experienced any ACEs. After controlling for neighborhood characteristics and other demographics,

children experiencing 3 or more ACEs were still 3.3 times more likely to have ADHD. Among a sample of children between 3 and 17 years old whose parents completed the 2017 and 2018 NSCH, Walker et al. (2021) found that children experiencing 3 or more ACEs were 2.7 times more likely to have ADHD than children not experiencing ACEs. Bomysoad and Francis (2020) also found children between 12 and 17 years old with 4 or more ACEs were 4.1 times more likely to have ADHD than children who had not experienced any ACEs utilizing data from the 2016-2017 NSCH.

ACEs have also been associated with behavioral issues. Bomysoad and Francis (2020) found that youth between 12 and 17 years old with 4 or more ACEs were 7.4 times more likely to have behavioral issues than children with no ACEs based upon analysis of the 2016-2017 NSCH. Similar issues were found in younger children. Secondary data analysis of the FFCW Study found that kindergarteners who experienced 3 or more ACEs were 2.3 times more likely to exhibit aggressive behavior in the classroom and 2.6 times more likely to have social problems with their peers (Jimenez et al., 2016). When examining the relationship between ACEs exposure and various school-based outcomes in 10 U.S. elementary schools, students that experienced 4 or more ACEs were 6.9 times more likely to have school-based behavioral issues than children that had not experienced any ACEs (Blodgett & Lanigan, 2018). Using longitudinal data from a subset of the FFCW Study, Choi et al. (2019) found that increased exposure to ACEs was associated with higher levels of behavioral issues over time. Specifically, children experiencing 3 or more ACEs prior to the age of 3 were 3.6 times more likely at 3 years old, 2.9 times more likely at 5 years old, 3.2 times more likely at 9 years old, and 1.9 times more likely at 15 years old to be in the top 10^{th} percentile for behavioral issues.

Thus, ACEs have a significant relationship with multiple mental health issues including depression, anxiety, ADHD, and behavioral issues among children.

ACEs and Childhood Weight Status

According to analyses of the National Health and Nutrition Examination Survey from 2015 through 2018, approximately 13.7% of children between 2 and 5 years old, 19.3% of children between 6 and 11 years old, and 20.9% of youth between 12 and 19 years old were obese in the United States. Trend data has shown that obesity has increased across age groups from 1999 through 2002 to 2015 through 2018 with a significant increase in obesity among children between 6 and 11 years old and youth between 12 and 19 years old (Ogden et al., 2020). One literature review found that childhood obesity was linked to health issues such as diabetes, asthma, sleep apnea, depression, lower self-esteem, and eating disorders. Childhood obesity has also been linked to cancer and heart disease later in life. Furthermore, children and youth who are obese are at increased risk for obesity in adulthood (Sanyaolu et al., 2019), which has been linked to chronic diseases (CDC, 2022a).

Children who have experienced ACEs are also at increased risk for childhood obesity. Based on analyses conducted of the state-wide 2016 Minnesota Student Survey, Davis et al. (2019) found that youth between 12 and 18 years old that experienced 4 ACEs were 1.6 times more likely to be obese and 1.9 times more likely to be severely obese than youth that did not experience any ACEs. For youth experiencing 6 ACEs, they were 2.0 times more likely to be obese and 4.2 times more likely to be severely obese than youth not experiencing any ACEs. In another study, a retrospective chart review of

children and youth between 0 and 20 years old found that individuals experiencing 4 or more ACEs were 2.0 times more likely to be overweight than those who had not experienced any ACEs (Burke et al., 2011). In a longitudinal study of children participating in the Early Head Start program in Arkansas, McKelvey et al. (2019) found that the number of ACEs experienced by children prior to age 3 was significantly associated with an increased risk of obesity at 11 years old. Children who experienced 4 or more ACEs at or prior to 3 years old were 2.7 times more likely to be obese than children that did not experience any ACEs. Thus, children who experienced ACEs are at higher risk for obesity and poorer health outcomes associated with obesity.

ACEs and School-Related Outcomes

ACEs have been associated with poorer educational outcomes including absenteeism, school engagement, and grade retention. High levels of absenteeism have been linked to poorer academic performance, lower socioemotional skills, and increased psychosocial issues (Ansari & Gottfried, 2021). In one retrospective study in Wales, adults who experienced 4 or more ACEs were 7.2 times more likely to miss more than 20 days per year when enrolled in school (Bellis et al., 2018). Based on analyses of the 2011-2012 NSCH, Stempel et al. (2017) found that students between 6 and 17 years old in the U.S. that experienced 4 or more ACEs were 1.8 times more likely to have missed 15 or more school days in the last year than children not experiencing any ACEs. In a study using data from the 2016 NSCH, Crouch, Radcliff, Hung, et al. (2019) found that children between 6 and 17 years old that experienced 4 or more ACEs were 1.8 times more likely to miss 11 or more days of school than children not experiencing any ACEs.

ACEs have also been associated with lower levels of school engagement among students. In previous studies, school engagement was described as involving tasks like regularly completing homework and caring about how well they do in school (Crouch, Radcliff, Hung, et al., 2019). Based on analyses of students between 6 and 17 years old on the 2016 NSCH, students that experienced 4 or more ACEs were 2.2 times more likely to have low school engagement than students that had not experienced any ACEs (Crouch, Radcliff, Hung, et al., 2019). In a study of students between 12 and 17 years old using the 2016-2018 NSCH, Suleiman et al. (2021) found that students that experienced 4 or more adverse family experiences, which are similar to ACEs, were 1.9 times more likely to have lower school engagement than students experiencing no ACEs after controlling for various covariates. Based on analysis of the 2011-2012 NSCH, Bethell et al. (2014) found that students between 6 and 17 years old that did not experience any ACEs were 2.6 times more likely to be highly engaged in school compared to those students that experienced 2 or more ACEs. Thus, ACEs have been linked to poorer academic performance (Blodgett & Lanigan, 2018; Jimenez et al., 2016).

Furthermore, some evidence has linked exposure to ACEs to academic disengagement and grade retention or failing a grade, which places students at increased risk of dropping out of school (Iachini et al., 2016). Based on analyses of the 2011-2012 NSCH, students between 6 and 17 years old that experienced 3 or more ACEs were 1.7 times more likely to repeat a grade than students that did not experience any ACEs (Hinojosa et al., 2019). Crouch, Radcliff, Hung, et al. (2019) found that students between 6 and 17 years old that experienced 4 or more ACEs were 1.7 times more likely to repeat a grade than students experiencing no ACEs based on analysis of the 2016 NSCH. Based

on longitudinal data collected from the Early Head Start program, students that reported experiencing 3 or more ACEs at age 3 or younger were 2.6 times more likely to repeat a grade by the age of 11 years old (McKelvey et al., 2018). Based on analyses of the Longitudinal Studies on Child Abuse and Neglect (LONGSCAN) that follows individuals from 4 to 6 years old to 18 years old, white youth that experienced 4 or more ACEs were 3.2 times more likely to drop out of school by 18 years old than white youth experiencing fewer than 4 ACEs while African American youth experiencing 4 or more ACEs were 3.1 times more likely to drop out of high school by 18 years old than those who experienced less than 4 ACEs (Leban & Masterson, 2021). Thus, ACEs are linked to school outcomes like absenteeism, school engagement, and grade retention.

Summary

Since the original ACEs study, multiple studies have demonstrated that there is a dose-wise relationship between exposure to multiple ACEs and risky health behaviors along with poorer health, educational, and quality of life outcomes in both children and adults. With almost 16% of all adults experiencing 4 or more ACEs and almost 22% of children experiencing 2 or more ACEs (Bethell, Davis, et al., 2017; Merrick et al., 2018), ACEs are a significant public health issue that impacts a substantial portion of the population. While ACEs would ideally be prevented, a substantial proportion of children have already experienced ACEs and are already experiencing negative outcomes such as mental health issues, obesity, and poorer school-related outcomes. Thus, the next section of the literature review will explore resilience, protective factors, and frameworks that promote resilience to allow children to adapt and succeed despite exposure to ACEs.

Resilience

While various definitions of resilience have been utilized across disciplines and amongst various researchers (Masten, 2018; NSCDC, 2015), the definition of resilience in this study aligns with the definition utilized by Zolkoski and Bullock (2012) and the NSCDC (2015). Resilience is defined as the ability to adapt and succeed despite difficult circumstances or adversity like ACEs. This includes the ability to adapt to avoid negative adverse outcomes due to adversity. When considering other definitions of resilience, the NSCDC (2015) has identified some shared characteristics. Specifically, resilience often refers to the individual ability, process, or systemwide capacity to adapt to challenges, adversity, stress, or threats. Other characteristics include avoiding maladaptive behaviors when facing stressors, being able to return to normal after stressors, and the ability to use available resources to promote general well-being. Furthermore, resilience researchers recognize that resilience is a systemwide concept that can be applied at the individual level (Hornor, 2017; Masten, 2014).

Within the context of ACEs, resilience has been defined as the ability to transform toxic stress into more adaptive or tolerable stress that does not have negative long-term consequences. Toxic stress has been described as chronic, repeated, or intense stressors such as ACEs that have a physiological impact on the brain and other physiological systems involved in stress responses during childhood. This has been identified as the physiological mechanism by which ACEs impact short and long-term negative outcomes (NSCDC, 2015). While there is a genetic component that contributes to the differential development of resilience to overcome ACEs and toxic stress, ACEs researchers have also indicated that resilience can be developed throughout life. Thus, they argue that

interventions must be developed to build resilience to overcome adversity among children who have experienced multiple ACEs (Ortiz, 2019; Sciaraffa et al., 2017; Traub & Boynton-Jarrett, 2017). However, studies have only recently begun to explore which resilience factors are most important to build resilience to overcome ACEs. Most of the protective factors have come from historic resilience research rather than empirical studies exploring which protective factors are most important to build resilience to overcome ACEs. There is also no predominant framework or model for understanding how to best leverage resources to promote protective factors to overcome ACEs.

Due to ACEs research drawing protective factors from historic resilience research, the following sections will provide a brief overview of historic resilience research and the protective factors that have been identified from historic resilience research to potentially build resilience to overcome ACEs. Then, the research on three resilience frameworks that have emerged to explore how resilience can potentially mitigate ACEs will be explored along with the current gaps in the literature.

Historic Resilience Research

Masten and Obradovic (2006) and Wright et al. (2013) described the evolution of resilience research in four waves spanning back to the 1900s. Based on a narrative review, Masten (2014) traced the origins of resilience research back to the end of World War II, which would correspond to the beginning of the first wave of resilience research (Masten & Obradovic, 2006). Following World War II, professionals from around the world provided aid to a humanitarian crisis of children who had been impacted psychologically by trauma from war and disease. While not widely researched at the

time, the ability of some children to not experience as much "shock" due to the conditions in Europe in the presence of caregivers and parents was notable to many clinicians. This aided in the initial identification of the concept of resilience. World War II also gave rise to some of the pioneer resilience researchers as their experiences as children or soldiers during the war would go on to influence their future resilience studies. These pioneers included Emmy Werner, Norman Garmezy, and Michael Rutter. Throughout the 20th century, researchers and practitioners continued to engage in research to explore how some children were able to adapt and succeed despite exposure to adversity as various tragedies and crises occurred around the globe. The events contributed to the evolution of resilience research (Masten, 2014).

Despite the early identification of children who displayed resilience in these traumatic experiences, systematic research and utilization of theory did not begin to fully emerge until the 1970s (Masten, 2018). During this time, researchers began to explore compensatory factors and protective factors that corresponded with more positive outcomes among individuals experiencing adversity. Compensatory factors included factors that improve outcomes for all populations and minimize the risk of negative outcomes regardless of the amount of exposure to adversity. Protective factors were factors that were particularly salient to improve outcomes among those who had experienced trauma. Researchers identified several correlates with more adaptive outcomes among children experiencing adversity that became known as the "short list" of resilience factors. Researchers organized protective and promotive factors into four large categories: characteristics of the child, characteristics of the family, characteristics of the community, and characteristics of the culture or society. Characteristics of the child

included hopefulness, emotional/behavioral regulation, strong executive functioning, social temperament, high self-esteem, and having faith or another way of finding meaning in life. Characteristics of the family included good sibling relationships, strong parental relationships, having a responsive and sensitive caregiver, authoritative parenting, parental engagement in education, and higher socioeconomic status. Characteristics of the community included neighborhood safety, access to recreation, clean water and air, good schools, access to healthcare, parent employment, and availability of community mentors. Characteristics of society and culture included policies toward child protection, resources invested in education, and negative attitudes towards violence (Wright et al., 2013). Many of these characteristics are protective factors found in resilience literature today (Hornor, 2017; Masten, 2018).

While the identification of protective factors was important and continues to shape research today, one major limitation was that many resilience factors were viewed as more stable traits that persisted over time rather than dynamic factors that may evolve or change over the course of a lifetime (Wright et al., 2013). Most resilience research was also variable-focused and descriptive without considering how variables change over time or interact. Also, the primary goal was to identify variables that could be targeted to prevent psychopathology (Masten & Obradovic, 2006). Despite these shortcomings, the first wave of resilience research was pivotal in conceptualizing resilience, developing key terminology, and developing methods to measure and explore resilience (Masten, 2014)

The first wave of resilience research culminated in a paper by Michael Rutter that summarized this wave and introduced a new pathway for the second wave of resilience research (Masten, 2014). In this paper, Rutter (1987) described resilience as differential

responses to stressful situations and that resilience is the byproduct of vulnerabilities and protective factors. However, he discussed how these factors present little value in themselves other than within the context of the process by which they influence resilience and the general context in which these vulnerabilities and protective factors take place. The author then summarized some of these processes and previous research on these processes including the importance of turning points in life. The next wave of resilience research began to explore these processes and the context of resilience to improve the trajectory of those who experienced adversity (Masten, 2014; Rutter, 1987).

The second wave of resilience research began to consider the systems and general processes that are linked to resilience (Masten & Obradovic, 2006). Thus, systems theory began to be heavily integrated into resilience research. Systems theory has been used across disciplines, but many resilience researchers drew from other system theories such as the ecological theory, family systems theory, resilience theory, and developmental systems theory. Thus, resilience began to be viewed from the context of various systems and factors across levels interacting to determine how individuals and systems respond to adversity with these relationships being dynamic over time (Masten, 2018). The second-wave resilience research did not see protective factors as static characteristics and shifted away from viewing resilience as traits individuals processed. Rather, resilience was developed through dynamic processes like the lifelong development of healthy attachment relationships or the development of neurobehavioral systems. The utilization of longitudinal studies allowed researchers to explore the trajectory of resilience and adversity over time to discover how individuals and systems could be influenced by life events or turning points that may cause more positive outcomes. Researchers also saw

how traumatic events could be compounded by future adverse events resulting in more negative outcomes, which aligns with ACEs research. These studies also allowed researchers to see that the impact of trauma may not be immediate (Wright et al., 2013).

Researchers also began to recognize the importance of context to how individuals and systems respond to adversity. Researchers observed that individuals may only exhibit resilience in certain situations or contexts with various protective and risk factors influencing how an individual responds to adversity or challenges. Thus, factors that appeared to be protective were no longer viewed as universal. For example, while healthy parental attachment was generally viewed as protective, avoiding attachment to family members or caregivers that perpetuated dysfunction was now seen as possibly more adaptive. Also, the individual's perception of experiences and situations was influential on whether an individual exhibited resilience. These changing and more dynamic views on resilience helped researchers to recognize that different cultures may respond differently to specific protective factors. Researchers also found that those with a strong sense of connectedness to their cultural identity, ethnic identity, or faith tradition may have more resilience (Wright et al., 2013).

The third wave of resilience research shifted to the development of interventions to build resilience and prevent trauma while also focusing on policies and regulations that prevent negative outcomes among children who have experienced adversity (Masten & Obradovic, 2006). Wright et al. (2013) described how the first two waves created a richer understanding of resilience to guide interventions to prevent psychopathology or to allow individuals to be more adaptive when faced with adversity. The third wave built on the previous waves by developing interventions and evaluating their effectiveness using

experimental studies based on the protective factors, risk factors, theories, models, and processes identified in the first two waves of resilience research. The third wave also began to identify how multiple protective factors and processes interact to develop resilience due to statistical analysis conducted during intervention studies (Masten & Obradovic, 2006). Interventions began to utilize primary prevention to initiate the development of protective processes that build resilience throughout the lifespan. Studies also began to focus on identifying key turning points to deliver interventions during developmental periods that may be more influential. The third wave of resilience research is ongoing and seeks to identify the most effective interventions to increase resilience and reduce the impact of risk and adversity. Wright et al. (2013) emphasized that future successful interventions will incorporate theory and models, target multiple ecological levels, recognize the importance of developmental timing and turning points, maximize the cost-to-benefit ratio, recognize impact may not be immediate, and realize the impact of cumulative risk and the need for developing protective factors in various domains.

The fourth wave of resilience research has begun to explore the neurobiology associated with adversity and resilience (Wright et al., 2013). According to Masten and Obradovic (2006), this wave of research began in 2006 following an interdisciplinary conference on resilience titled *Resilience in Children*. Based on the rapid developments in technology that have allowed researchers to better study the brain, neuroscience, and genetics, researchers have developed a greater understanding of the biology behind adversity and resilience. Research continues to better understand these biological processes and their influence on resilience research (Wright et al., 2013). Consequently, the fourth wave of resilience research has resulted in increased interdisciplinary research

(Masten & Obradovic, 2006). The addition of neurobiology to a field based primarily on psychology and social science research has resulted in an increased level of collaboration among new fields (Wright et al., 2013). By utilizing cross-disciplinary research, interventions will increase in complexity and effectiveness by targeting multiple levels and integrating disciplines such as neuroscience, public health, psychiatry, social work, and other fields. In addition, more efficient and accurate models can be developed to understand resilience and adversity given the increased sophistication of analytical tools and interdisciplinary understanding of resilience. This wave of research has also identified that resilience is modifiable throughout the lifespan despite early adversity that may have had a negative impact on early resilience (Masten & Obradovic, 2006). However, this wave of resilience research has just begun. Nevertheless, this wave has tremendous promise in developing more complex models that offer a greater understanding of the development of resilience and how to effectively develop interventions to build resilience to overcome adversity (Wright et al., 2013).

Potential Protective Factors Against ACEs

Building on historic resilience research that recognizes the potential of protective factors to build resilience to reduce risk among those who have experienced adversity (Wright et al., 2013), ACEs researchers have begun to identify and explore how protective factors can potentially build resilience for children and adults to overcome the negative impact of ACEs (Hornor, 2017; NSCDC, 2015; Ortiz, 2019; Sciaraffa et al., 2017). However, consistent with historic resilience research, researchers must recognize that resilience is context-dependent with protective factors not being universal (Wright et

al., 2013). Thus, researchers and practitioners must seek to identify those protective factors that are effective at building resilience despite the cumulative risk of exposure to multiple ACEs. However, research has been limited in exploring the ability of historic protective factors in building resilience to overcome ACEs. Most protective factors have simply been adapted from prior resilience research (Traub & Boynton-Jarrett, 2017). Thus, the following paragraphs will introduce some of the protective factors that have been identified by resilience researchers to potentially build resilience to overcome ACEs in childhood. The subsequent sections will describe three frameworks that theorize how these factors interrelate to build resilience along with some preliminary evidence of each.

When considering protective factors that build resilience to mitigate ACEs, nonmodifiable and modifiable protective factors have been identified in previous resilience research (Keane & Evans, 2022b). Nonmodifiable protective factors are innate characteristics or predispositions less likely to change over time and less likely to be targeted by interventions. Nonmodifiable protective factors include factors like hardiness, temperament, conscientiousness, internal locus of control, cognitive ability, or other personality characteristics (Hornor, 2017; Masten, 2018; NSCDC, 2015). Conversely, modifiable protective factors can potentially change over the course of a lifetime to increase resilience and decrease the likelihood of negative outcomes associated with ACEs (NSCDC, 2015; Traub & Boynton-Jarrett, 2017). Since the goal of this study is to identify resilience frameworks and protective factors that can be targeted to overcome ACEs, the following paragraphs will focus on modifiable protective factors that can be targeted to increase resilience utilizing the ecological framework (McLeroy et al., 1988).

When considering individual or intrapersonal modifiable protective factors to mitigate ACEs, several have been identified in the literature. First, strong self-regulation and executive functioning have been linked to increased resilience (NSCDC, 2015; Sciaraffa et al., 2017; Traub & Boynton-Jarrett, 2017). The NSCDC (2011) described executive functioning as the byproduct of inhibitory control, cognitive flexibility, and working memory. Self-regulation has been defined broadly as the capacity to make changes to one's behaviors to meet one's goals while others have defined it as being able to regulate one's natural tendencies to obtain another goal (Vohs & Baumeister, 2016). Second, individuals having a feeling of mastery or a sense of control over some circumstances in their life has been associated with resilience to overcome ACEs (NSCDC, 2015). Mastery has also been linked to similar protective factors like higher self-esteem or hope (Hornor, 2017). Third, increased emotional intelligence where children and adults can label and express feelings in a safe environment has been associated with resilience (Sciaraffa et al., 2017). Fourth, hobbies and engaging in creative activities have been considered protective factors. Fifth, engaging in self-care behaviors such as a healthy diet, nutrition, exercise, sleep, and regular routines has been associated with increased resilience (Sege & Harper Browne, 2017; Traub & Boynton-Jarrett, 2017). Finally, increased knowledge about ACEs and resilience has been identified as a possible protective factor against ACEs (Traub & Boynton-Jarrett, 2017).

When considering interpersonal modifiable protective factors, resilience-building adult relationships have been considered one of the most important protective factors (NSCDC, 2015). The CDC (2013) described these relationships as being safe from fear and the threat of physical or emotional harm, having stability to ensure a level of

consistency and predictability within the child's environment, and nurturing to meet the child's developmental, emotional, and physical needs. While other adult relationships can build resilience, the relationship between the parent or caregiver and the child has been considered one of the most important in building resilience with many researchers describing this relationship within the context of healthy attachment (Sege & Harper Browne, 2017; Traub & Boynton-Jarrett, 2017). Furthermore, the availability of parents that are both emotionally and physically healthy has been linked to resilience (Sege & Harper Browne, 2017). Other relationships such as teacher-student relationships or peer relationships are other potential protective factors (Hornor, 2017; Keane & Evans, 2022b; Sege & Harper Browne, 2017). Support groups, educational groups, or services that teach social skills and coping skills may also build resilience factors to overcome ACEs (Ortiz, 2019). Furthermore, the CDC (2013) suggested mental health services for both children and adults along with parent training programs could potentially build resilience in children or empower parents to engage in practices to promote other protective factors.

At the institutional level, students being engaged in school and other institutional environments that are supportive, equitable, and safe has been identified as a potential protective factor (Sege & Harper Browne, 2017). This has been conceptualized to include children living in communities where neighbors are helpful, the community is safe, and additional support can be found in the community (Crouch, Radcliff, Merrell, Brown, et al., 2021). Furthermore, high-quality education has been linked to resilience (Sege & Harper Browne, 2017). Similarly, trauma-informed care has been identified as a mechanism to create safe spaces where children feel supported and avoid traumatization while developing protective factors within the context of schools or organizations (Ortiz,

2019). Higher levels of school connectedness or school support have also been considered a potential protective factor (Crandall et al., 2020). In addition, parent-teacher relationships have been considered a potential protective factor where teachers empower parents to help children who have experienced ACEs (Sciaraffa et al., 2017)

At the community and policy levels, living in stable and safe housing has been linked to increased resilience which applies to the communities that children live in along with policies to ensure quality housing for children. Children receiving high-quality education and medical care while having access to healthy foods are also potential policy and community-level factors. Living in communities where children have access to safe places to play and engage in physical activity has been identified as a potential protective factor (Sege & Harper Browne, 2017). Measures of social cohesion in the community, community norms that promote positive parental relationships, and having a hopeful cultural or faith tradition are also potential protective factors against ACEs (Bethell, Jones, et al., 2019; CDC, 2013; Crandall et al., 2020; NSCDC, 2015). Finally, policies that strengthen households by providing economic support and reducing other family stressors can potentially promote resilience among children and families (CDC, 2013).

While many of these modifiable protective factors provide promising approaches to building resilience to overcome the negative impact of ACEs, the second wave of resilience research revealed the importance of considering how protective factors are interrelated and occur within the context of developmental systems (Masten, 2018). Building on the second and third waves of resilience research, Wright et al. (2013) argued that successful resilience interventions would be built upon models and theories that understood how protective factors interact across ecological levels to develop cost-

effective and impactful interventions for those who experienced adversity. Thus, the following three sections will explore three frameworks that identify modifiable protective factors that can be targeted by interventions to build resilience to overcome ACEs.

National Scientific Council on the Developing Child Framework

The NSCDC framework is grounded in historic resilience research and suggests a pathway by which children can build resilience to overcome exposure to early childhood adversity. According to the NSCDC framework, early childhood adversity or ACEs can negatively impact child and subsequent adult outcomes when children experience toxic stress. Toxic stress is prolonged or ongoing exposure to stressors that result in physiological changes to the brain along with the immune, cardiovascular, and other regulatory systems. However, protective factors can buffer the impact of stress on children by transforming toxic stress into more adaptive, tolerable stress. Protective factors include more innate predispositions and genetic factors along with modifiable protective factors. While predispositions and genetic factors are important in determining the impact of adversity and modifiable protective factors, the NSCDC framework focuses primarily on targeting modifiable protective factors to overcome ACEs (NSCDC, 2015).

The NSCDC framework identifies four modifiable protective factors that promote resilience. First, the child having a supportive, caring, stable relationship with at least one adult is considered the strongest protective factor. The second protective factor is the child having a feeling or sense of mastery that allows them to believe that they can have control over their life and situations that arise. The third protective factor is the child having self-regulation skills and strong executive functioning that allows them to cope

with challenging situations that arise. The final protective factor is coming from a cultural or faith tradition that was affirming and provided a source of strength and hope when faced with adversity. Collectively, this framework believes that resilience can be developed at any time from childhood through adulthood (NSCDC, 2015).

The NSCDC framework is based widely on historic resilience research (NSCDC, 2015). As discussed previously, historic resilience research emerged to better explain how individuals were differentially impacted by traumatic life circumstances. As research expanded to consider individual protective factors in childhood, researchers identified many of the protective factors similar to or identified by the NSCH framework including positive attachment, belonging, being nurtured, parenting, executive functioning skills like problem-solving and planning, self-regulation, hope, agency, faith, belief in self, emotional regulation, and optimism. In historically resilience research, caregiver-child or adult-child relationships were one of the most well-validated resilience factors (Masten, 2018). In addition, several other researchers and practitioners have argued that similar protective factors can be promoted to build resilience to overcome childhood adversity or ACEs (Hornor, 2017; Sciaraffa et al., 2017; Soleimanpour et al., 2017).

Despite the historic resilience research validating this framework, only one known study has specifically explored whether the NSCDC framework was associated with improved outcomes among children who have experienced ACEs. In this study, Keane and Evans (2022a) utilized logistic regression to explore whether the NSCDC framework was associated with whether a child between the ages of 6 and 17 years old with 4 or more ACEs ever had a mental health issue utilizing data from the 2019 NSCH. For this study, children were only included if the parent answered “yes” to four or more of the

ACEs categories on the NSCH. The outcome variable was whether the parent answered "yes" to the child ever being told by a healthcare provider that their child either had ADHD, depression, anxiety, or behavioral issues. A supportive, caring relationship with at least one adult was measured by two measures. The first measure was a supportive parental relationship based on whether the parent and child were able to talk "very well" or "somewhat well" about things that are important. The second was whether the child had another adult that they could go to for advice or help. Self-regulation was measured by whether the child was "usually" or "always" able to stay in control or calm when difficult situations arose. A hopeful family or cultural tradition was based upon whether the family was able to stay hopeful when they faced challenges either most or all the time. Finally, mastery was measured by whether the child was actively involved in some extracurricular activity outside of school including volunteering or work.

Based on the results of logistic regression, Keane and Evans (2022a) found that the model utilizing the NSCDC framework significantly improved the statistical prediction of whether a child ever had mental health issues over the prediction by chance with the model explaining 27.1% of the variance in mental health outcomes among children with 4 or more ACEs. Furthermore, both a supportive, caring parent relationship and self-regulation significantly contributed to the model with children having strong self-regulation being 6.7 times less likely to ever have had a mental health issue. Children with a supportive parent relationship were 1.8 times less likely to have a mental health issue. None of the other protective factors were significant. Despite the relationship between the NSCDC framework and certain protective factors with fewer mental health issues, this was the only study to explore this framework. Thus, the relationship between

the NSCDC framework and other outcomes is unknown. The study will also need to be replicated with other data sets to further validate this model. The study was also limited by the NSCH items not fully capturing the protective factors of mastery and a hopeful family tradition; the utilization of parent or caregiver-reported data also had limitations.

Despite the lack of other studies exploring the NSCDC framework, other researchers have referenced certain aspects of this framework and explored specific protective factors within the NSCDC framework. In a retrospective study conducted with adults over 17 years old in Wales and three counties in England, Bellis et al. (2017) explored the impact of the adult having an "always available adult" (AAA) relationship before the age of 18 on a poor diet, smoking daily, and frequent heavy alcohol usage while also considering the number of ACEs experienced. Across all three outcomes, increased exposure to ACEs resulted in poorer outcomes. Similarly, adults who had AAA relationships had a lower likelihood of all three behaviors. When considering all three outcomes among adults that experienced either 2 to 3 ACEs or 4 or more ACEs, adults no longer had a significant increase in poor diet or frequent heavy alcohol use compared to adults with 0 ACEs when they had a AAA in childhood. The increase was still significant for daily smoking. Thus, supportive adult relationships did make a difference among those experiencing multiple ACEs when it comes to poor diet and alcohol abuse. However, due to this study utilizing retrospective data, there was an increased risk of recall bias. Furthermore, this study involved adults and only focused on one protective factor in the NSCH framework.

In another study, Brown and Shillington (2017) utilized data from the National Survey of Child and Adolescent Well-Being to explore whether supportive relationships

with adults moderated the relationship between ACEs, delinquency, and substance use among adolescents involved with the child welfare system. The total ACE score was based on the sum of the ten ACE items that the child, caregiver, caseworker, or teacher indicated that the child had experienced. A supportive adult relationship was a composite score based on five items that asked about different characteristics of a supportive and protective adult relationship. The child's delinquency was based on the score of the 36-item Denver Youth Survey. The child's substance use was assessed by their response to the 6 items on the Car, Relax, Alone, Friends, Forget, Trouble Survey. Hierarchical multiple regression examined the main effect and interaction for substance use while negative binomial regression explored the main effect and interaction for delinquency.

Overall, while supportive relationships did not have a main effect on substance abuse, Brown and Shillington (2017) found that supportive adult relationships did moderate the relationship between ACEs and substance abuse such that children with more ACEs had an increased risk of substance abuse when they had lower supportive adult relationship scores. However, the relationship was not significant at high levels of supportive adult relationships. Also, the interaction and main effect of supportive adult relationships were not significant for delinquency. Thus, supportive adult relationships only had limited support in this study. However, some caution should be considered when exploring these results. First, by inherently being involved in the child welfare system, these relationships are less likely to be with a parent or caregiver; the quality of the relationships was also less a focus of the study than having a person they could go to for help. The study also only explored limited outcomes and a single protective factor.

Nevertheless, this study demonstrated that supportive relationships could moderate some outcomes among a higher-risk population of adolescents that experienced ACEs.

Yamaoka and Bard (2019) examined the association between caregiver-child relationships and both developmental outcomes and social-emotional outcomes among children between 4 months and 5 years old based on their ACE score using the 2011-2012 NSCH. Developmental outcomes were based on the caregiver's response to the Parents' Evaluation of Developmental Status (PEDS) questionnaire, which evaluates developmental delays. Social and emotional development was based upon the caregiver's response to the "flourishing items" on the NSCH. The total ACEs score was based on the number of ACEs the caregiver answered that the child had experienced. A caregiver relationship score was based on an aggregate score of the number of days the caregiver engaged in shared activities (shared meals, reading to the child, telling stories/singing, family outings, and playing with peers) and the daily hours the child watched television.

Based on hierarchical regression analysis, Yamaoka and Bard (2019) found that children with 4 or more ACEs were significantly more likely to have developmental delays and poorer social-emotional scores. Children with 4 to 6 positive parenting factors were significantly less likely to have developmental delays and poorer social-emotional scores. When combining parenting practices and ACEs in the same model, 4 to 6 positive parenting factors still significantly contributed to a lower likelihood of developmental delays and poorer social-emotional scores after controlling for the number of ACEs. Thus, this study demonstrates that parent and caregiver relationships are an important protective factor for all children, including those experiencing multiple ACES, as early as 4 months to 5 years old. However, this study only explored one of the NSCDC

framework's factors. Furthermore, it was unclear why the researchers did not explore the interaction between ACEs score and protective parenting factors given the study design.

While not specific to ACEs, Polizzi and Lynn (2021) conducted a systematic review to explore how emotional regulation was related to resilience in the general population and among those exposed to adversity. A total of 33 articles were identified that included quantitative studies that examined the relationship between emotional regulation and psychological resilience. The study identified 6 longitudinal studies, 17 cross-sectional studies, and 10 comparison studies that included children, college students, and adults. Overall, emotional regulation was significantly associated with psychological distress across studies with those findings persisting over time. Studies also found that emotional regulation was associated with increased executive functioning. The relationship between emotional regulation and resilience was also bi-directional. While this systematic review did not include ACEs, this does provide evidence of the relationship between self-regulation and resilience. However, the lack of inclusion of ACEs in any of the studies is a major limitation of this study. Furthermore, the analysis was more summative than any type of statistical analysis.

When considering the impact of coming from a cultural or faith tradition that is affirming and generates hope, no known studies have explored the relationship between culture or faith tradition and resilience among children experiencing multiple ACEs. However, Kasen et al. (2012) examined whether religiosity was associated with resilience to prevent major depressive disorder among children of parents with major depressive disorder utilizing a three-wave longitudinal study. Participants included 185 children of parents that received services at the Yale University outpatient clinic with some of the

parents having major depressive disorder (considered high risk) and some not having major depressive disorder (considered low risk). An initial interview was conducted with the family with a 10-year follow-up and a 20-year follow-up interview. Participants were assessed for major depressive disorder and other psychiatric disorders at both follow-up visits. Religiosity based on the strength of association with a denomination, frequency of church attendance, and the importance of religion was assessed at the 10-year follow-up. Participants were categorized as either high-risk or low-risk for depression based on the number of negative life events experienced by participants.

Based on general estimated equation analysis, Kasen et al. (2012) found that increased church attendance was significantly associated with a lower likelihood of any type of psychiatric disorder or mood disorder. When only analyzing the results of the offspring of parents with major depressive disorder, a higher importance score was associated with a lower likelihood of mood disorder among participants experiencing lower negative life events. Thus, both the frequency of church attendance and the importance of church attendance were associated with higher levels of resilience. However, the study was limited by the small sample size which was further subdivided by the various groups. The study design also had a low retention rate with the potential for multiple confounds. Nevertheless, this study provided some evidence that faith may serve as a potential resilience factor among populations experiencing negative life events.

While not specific to a faith or a cultural tradition, some resilience and ACEs research has demonstrated a relationship between hope and resilience. Sparks et al. (2021) conducted surveys with 1,236 sixth and eighth-grade students randomly sampled from metropolitan schools to explore whether hope was a protective factor against

juvenile delinquency and post-traumatic stress symptoms among adolescents experiencing multiple ACEs. In this study, hope was measured by the adolescents' composite score on the Hopelessness Scale for Children while delinquency was measured using a composite score on the Delinquency-National Youth Survey. Post-traumatic symptoms were measured utilizing a composite score on the Child Post-Traumatic Stress Disorder Symptom Scale. Based on multilevel regression analysis, there was a main effect for hope with increased hope being associated with a lower likelihood of delinquency and post-traumatic stress symptoms. There also was an interaction between ACEs and hope related to delinquency with the negative impact of ACEs on delinquency being greater among those with low levels of hope than those with higher levels of hope. The interaction was not significant for post-traumatic stress symptoms. Nevertheless, this study did demonstrate the relationship between hope and resilience to overcome ACEs. However, the study was limited in that it only included the NSCDC protective factor of hope, and hope was not set within the context of a faith or cultural tradition.

No known studies have explored whether mastery builds resilience in childhood to mitigate ACEs. However, recent studies have explored the relationship between mastery and improved outcomes among those experiencing adversity. In one study, Ramakrishnan and Masten (2020) explored whether levels of mastery motivation were associated with increased school readiness among children between 3 and 5 years old living in homeless shelters. Mastery motivation was defined as the child's motivation to engage in activities due to their perceived control and mastery over a situation or a challenge. The researchers also explored whether motivation mastery moderated the relationship between early childhood adversity and prosocial behaviors, math

achievement, executive functioning, and emotional regulation. While mastery motivation was significantly associated with emotional regulation, social functioning, and emotional functioning, there was no relationship with executive functioning or math ability. While there is some evidence mastery was associated with some improved outcomes, the study was limited partially by the sample size. In addition, the definition of mastery motivation differs slightly from the NSCDC framework (NSCDC, 2015). While not related to childhood outcomes, another study of older adults found that self-esteem and mastery of one's environment were significantly associated with lower stress among older adults (Montpetit & Tiberio, 2016). Thus, while mastery has a less established relationship with childhood resilience to overcome ACEs, other studies have shown forms of mastery to be effective at building forms of resilience.

Collectively, these studies demonstrated that the NSCDC framework is grounded in historic resilience research with recent research validating the protective effects of supportive adult relationships and self-regulation (Bellis et al., 2017; Brown & Shillington, 2017; Masten, 2018; NSCDC, 2015; Polizzi & Lynn, 2021; Yamaoka & Bard, 2019). Specifically, studies have demonstrated that parent-caregiver relationships have a relationship with more positive outcomes among both children and adults that have experienced multiple ACEs (Bellis et al., 2017; Brown & Shillington, 2017; Yamaoka & Bard, 2019). While only one study demonstrated the relationship between self-regulation and resilience to overcome ACEs (Keane & Evans, 2022a), self-regulation does have an extensive evidence base as a protective factor against other forms of adversity based on a recent meta-analysis (Polizzi & Lynn, 2021). However, while grounded in historic resilience research, known studies have only explored the

relationship between certain aspects of mastery and a supportive cultural or faith tradition and resilience related to ACEs (Kasen et al., 2012; Ramakrishnan & Masten, 2020; Sparks et al., 2021). No known studies have established the ability for mastery and an affirming and hopeful cultural and faith tradition to mitigate ACEs among children.

Several inconsistencies were also identified across studies. First, not all studies found that resilience-building adult relationships were consistently associated with more positive outcomes. Keane and Evans (2022a) found that parent/caregiver relationships were associated with a lower likelihood of mental health issues among children who experienced multiple ACEs. However, other adult relationships were not significant and parent/caregiver relationships were not the strongest protective factor. Among adults experiencing 2 or more ACEs, Bellis et al. (2017) found resilience-building adult relationships were associated with lower levels of poor diet and heavy alcohol use, but the relationship was not significant for smoking. Yamaoka and Bard (2019) found that resilience-building relationships were associated with better social-emotional and developmental outcomes, but Brown and Shillington (2017) did not find a main effect between supportive adult relationships and either delinquency or substance abuse with only an interaction identified. These inconsistencies can partially be attributed to different methods, different populations, different definitions of resilience-building adult relationships, and different outcome variables across studies. Furthermore, only one study controlled for other resilience factors (Keane & Evans, 2022a).

Also, most of these studies only explored isolated protective factors from the NSCDC framework. Only one study explored the relationship between the entire NSCDC framework and any outcome during adolescence; this study was limited to mental health

outcomes (Keane & Evans, 2022a). Thus, additional research is needed to further validate the NSCDC framework as an effective resilience framework among children who experienced ACEs across multiple outcomes and to validate the initial findings by Keane and Evans (2022a). Studies must also use similar methods, measures, and definitions to better understand the effectiveness of the NSCDC framework across outcomes.

Despite the limitations of previous research and the need to establish an evidence base on the effectiveness of the framework in mitigating ACEs, the NSCDC framework has tremendous promise. The NSCDC framework is a parsimonious model that seeks to identify the most salient protective factors that can be targeted by interventions to build resilience. If research establishes that the framework is associated with improved outcomes among children experiencing ACEs, the model is easily understandable by practitioners and has the promise of easily translating research to practice. The model can also identify the most important protective factors to identify cost-effective approaches to increasing resilience. One disadvantage of the NSCDC framework is the influence of multiple ecological levels is not as clear as in other frameworks. However, if validated, the NSCDC could be integrated with other models or frameworks to address this weakness.

Health Outcomes from Positive Experiences Framework

Another emerging resilience framework that identifies protective factors that mitigate the negative impact of ACEs is the Health Outcomes from Positive Experiences (HOPE) framework. In 2017, Sege and Harper Browne (2017) introduced the HOPE framework which expands on previous resilience models by focusing on the influence of

various ecological levels on child health and resilience to overcome ACEs based on Bronfenbrenner's ecological model of human development and social determinants of health. The HOPE framework is based upon three principles. First, child health is broadly defined to include cognitive, emotional, social, and physical outcomes that influence child health and well-being. Second, health is the byproduct of positive and negative influences at multiple ecological levels. Finally, parent and child health are interdependent with interventions needing to address both to be successful.

The HOPE framework promotes positive childhood experiences to counteract the potential impact of early childhood adversity. The researchers categorize these experiences into four categories. The first category involves developing a supportive and nurturing relationship with parents, adults, and peers. The second category involves children living, engaging, and developing in environments that are equitable, stable, safe, and protective. The third category involves children being in situations and environments where they receive supportive social engagement to ensure they have a sense of connectedness supportive social engagement to ensure they have a sense of connectedness. The final category is children developing the necessary social skills and emotional competencies to navigate challenges. Overall, the HOPE framework promotes maximizing these positive childhood experiences across domains to improve outcomes among children who have experienced adversity (Sege & Harper Browne, 2017).

Since the HOPE framework was introduced by Sege and Harper Browne (2017), studies have begun to explore the protective factors in the HOPE framework and their relationship with childhood outcomes. In a descriptive study, Crouch, Radcliff, Merrell, Brown, et al. (2021) examined the prevalence of protective factors from the HOPE

framework by race and ethnicity utilizing the 2017-2018 NSCH. Utilizing a sample of 6- to 17-year-old children whose parents or caregivers completed the survey, the researchers identified items in each of the four HOPE domains on the survey. For the supportive relationship category, the researchers utilized two measures. The first was whether the child had at least one other adult that they could talk to for advice/guidance. The second was whether they answered most of the time or all the time to all four questions that asked about family resilience. For the safe and equitable environment category, the researchers utilized two measures. The first was how parents answered three questions about the level of support in the environment. The second was the parent's response regarding whether the environment was safe. For the social engagement domain, two measures were used with one related to whether the child was involved in extracurricular activities and the other related to whether the child volunteered in some capacity. Finally, the social skills and emotional competencies category was measured by the parent's indication of the ability of the child to talk to the parent about issues that mattered. In addition to the child's score in each domain, a summary protective factor score was created by adding together the number of protective factors identified.

Crouch, Radcliff, Merrell, Brown, et al. (2021) found that there was a significant difference for all the protective measures based on race/ethnicity except for the child's ability to discuss ideas and issues with a caregiver. Non-Hispanic Caucasian children consistently had the highest percentage having those protective factors with non-Hispanic African American children having the lowest. Excluding the child's ability to discuss ideas and issues with their caregiver, children living in poverty were significantly less likely to have all six protective factors than children at or above 400% of the federal

poverty level. Thus, minority children and children from lower socioeconomic classes had lower levels of exposure to protective factors from the HOPE framework, consistent with ACEs research. While this study did not address ACEs, this study provided a framework for identifying HOPE framework protective factors using the NSCH.

In another study, Crouch, Radcliff, Merrell, Hung, et al. (2021) explored the relationship between protective factors from the HOPE framework and two school-related outcomes (absenteeism and grade retention) utilizing data from the 2017-2018 NSCH. The study only utilized surveys completed by parents of children from the ages of 6 to 17 years old. This study also utilized the same seven measures of protective factors corresponding to the four HOPE protective factor categories as Crouch, Radcliff, Merrell, Brown, et al. (2021). However, Crouch, Radcliff, Merrell, Hung, et al. (2021) did not calculate a summary protective factor score. The outcome of absenteeism was based on whether the caregiver completing the survey indicated the child had missed 11 or more days of school in the last year. Grade retention was based on whether the caregiver indicated the child had repeated a grade since the beginning of kindergarten.

Based on the result of multiple logistic regression, three of the seven protective factor measures were associated with a child missing 11 or more days of school. Specifically, family resilience, participation in extracurricular activities, and whether the child lived in a supportive neighborhood were associated with absenteeism with family resilience and extracurricular activities having the strongest relationships. Extracurricular activities and discussing items with parents or caregivers were the only protective factors associated with grade retention with both having relatively similar adjusted odds ratios. Thus, while protective factors were identified for both outcomes, the only significant

factor across outcomes was extracurricular activities. Furthermore, this study only focused on protective factors for all children and did not include ACEs in the analysis.

In another HOPE framework study, Crouch et al. (2022) explored the relationship between the same seven protective factors across the four HOPE categories on whether children between the ages of 10 and 17 years old were overweight or obese based on parent or caregivers' reported BMI for their child using the 2018-2019 NSCH. Multivariate regression was utilized to explore the relationship between protective factors from the HOPE framework and whether the child was overweight or obese after controlling for multiple demographic variables. This study also completed multiple regression for children who had two or more ACEs and those experiencing zero or one ACE to examine the differential impact based on ACEs exposure.

Based on bivariate analysis, all the protective measures except for being able to communicate with their parent or caregiver were associated with weight status. However, based on multiple regression, none of the protective factors were significantly associated with whether children with 0 or 1 ACE were overweight or obese. For children with 2 or more ACEs, whether the child lived in a supportive neighborhood was the only protective factor significantly associated with a lower likelihood of the child being obese or overweight. Thus, this study added to the literature by exploring the outcome of childhood weight status. The study also looked at this relationship among children with 2 or more ACEs. However, only one of the protective factors was significant (Crouch et al., 2022). Furthermore, the criteria of 2 or more ACEs did not match previous studies with a threshold of 4 or more ACEs being associated with an increased likelihood of child obesity (Burke et al., 2011; Davis et al., 2019; McKelvey et al., 2019).

In another study, Elmore et al. (2020) explored the relationship between the number of ACEs experienced by a child and protective factors experienced from the HOPE framework on depression among children between 8 and 17 years old utilizing data from the 2016-2017 NSCH. In this study, five resilience measures were identified across the four categories in the HOPE framework. The one measure of supportive and nurturing relationships was whether the child had another adult they could get help or advice from. The two measures of a stable and safe environment were whether the family was hopeful when facing difficult circumstances and whether the family solved problems together. Social engagement and connectedness were based upon a single measure of whether the child participated in any extracurricular or volunteer activities. Social and emotional competency was based on whether the child was able to stay in control and calm when challenges arose. The outcome was based on the parent indicating that a doctor had told them that their child had depression and that the child currently had depression. Multivariate regression explored the main effect of each of the resilience measures and ACE count on depression after controlling for demographic variables. Then, multivariate regression was conducted with the interaction between ACEs exposure and each resilience factor.

Based on multiple regression, exposure to 4 or more ACEs was significantly associated with an increased likelihood of childhood depression. In addition, four of the protective measures were associated with a lower likelihood of depression: the child staying calm when facing challenges, the child participating in extracurricular/volunteer activities, the family being hopeful when solving problems, and the family working to solve problems together. When adding the interaction of ACE count and protective

factors, three of the interactions were significant. For children experiencing 4 or more ACEs, the inability to stay in control and calm when facing challenges resulted in an 8.8 times increase in the likelihood of children having depression; the odds ratio was only 3.9 for children experiencing 3 or fewer ACEs. When considering a family that lacks the ability to work together to solve problems, children with 4 or more ACEs were 3.6 times more likely to have depression compared to 2.5 times more likely for those with less than 4 ACEs. The relationship between a family remaining hopeful was the inverse with a child with 4 or more ACEs having a lower likelihood of not having depression than a child with less than 4 ACEs (Elmore et al., 2020).

Elmore et al. (2020) demonstrated that the protective factors from the HOPE framework may differentially improve outcomes among children who experienced 4 or more ACEs while also showing the relationship between three of the protective factors and depression. However, the study did have some limitations. Instead of including all the protective factors in a single logistic regression model, the researchers explored the relationship with each protective factor independently. Thus, the models did not control for the influence of other protective factors on study outcomes. This study also only explored depression and did not explore other mental health issues. Furthermore, the factors from the HOPE framework identified in this study differed from those in previous HOPE framework studies using the NSCH (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021).

Collectively, these studies demonstrated that protective factors from the HOPE framework have been associated with improved school, mental health, and health outcomes among children who have experienced ACEs (Crouch, Radcliff, Hung, et al.,

2019; Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). However, the significant protective factors have not been consistent across outcomes. Family resilience was associated with a lower likelihood of excessive absenteeism and depression (Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020) but not any other outcomes. Extracurricular activities were only associated with lower levels of absenteeism and grade retention (Crouch, Radcliff, Merrell, Hung, et al., 2021). Living in a supportive neighborhood only had a significant relationship with lower levels of absenteeism and a lower risk of being obese or overweight (Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021). Social and emotional competence was only associated with a lower likelihood of repeating a grade while staying calm when experiencing difficult situations was only associated with depression (Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). Thus, while these studies demonstrated the effectiveness of the HOPE framework in identifying protective factors, these factors lacked consistency across studies without an understanding of why different protective factors have a greater association with different outcomes.

Another limitation of HOPE framework research was inconsistencies in study designs. Despite all the studies utilizing the NSCH and many of the studies having the same researchers, the methods were different across studies. Crouch, Radcliff, Merrell, Hung, et al. (2021) utilized a sample of children between the ages of 6 and 17 years old while Crouch et al. (2022) utilized a sample of children between 10 and 17 years old. Elmore et al. (2020) used a sample of children between 8 and 17 years old. Furthermore, Crouch, Radcliff, Merrell, Hung, et al. (2021) did not include ACEs in the analysis. Crouch et al. (2022) compared ACEs across different levels of exposure, and Elmore et

al. (2020) explored interactions between independent protective factors and ACEs on depression. Based on these differences, comparisons across outcomes have limitations. Thus, research is needed to better understand the HOPE framework across outcomes.

Despite these limitations, the HOPE framework does offer considerable promise. Compared to the NSCDC framework, the HOPE framework more explicitly and effectively targets multiple ecological levels to build resilience to overcome ACEs. The HOPE model also has a more extensive evidence base. However, the HOPE framework is less succinct without clear definitions of the specific factors that contribute to each of the four resilience categories. While the researchers in these studies identified protective factors in each domain (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020), the specific protective factors were less clear when identified by the developers of the framework (Sege & Harper Browne, 2017). Thus, the factors identified in these studies may be more of a function of the NSCH than the HOPE framework. Thus, the HOPE framework may lack some of the clarity of the NSCDC framework, increasing the challenge of translating research to practice. Nevertheless, research that can identify the most effective protective factors consistently across categories can potentially address this deficit.

Cumulative Positive Childhood Experiences Framework

Another resiliency approach to mitigate ACEs is the cumulative positive childhood experiences (PCEs) framework (Bethell, Jones, et al., 2019). According to this framework, there is a dose-wise relationship between the number of categories of PCEs experienced and more positive outcomes among individuals who experience multiple

ACEs. This would mirror the ACEs framework for PCEs. While not theory specific, the cumulative PCEs approach borrows protective factors from previous resilience research. These include factors such as parental attachment, overall family health, positive parenting techniques, positive peer relationships, and positive school and community relationships (Bethell, Jones, et al., 2019). While the terminology "positive childhood experiences" has been adopted by the CDC (2020) in their prevention strategy to prevent ACEs, for this study, the cumulative PCEs framework extends to include any cumulative measure of protective factors to mitigate ACEs. Benevolent childhood experiences (BCEs) are another mechanism to calculate a cumulative protective factor score that is grounded in developmental psychopathology and an ecological framework. BCEs are based on the BCE scale which measures ten experiences during childhood that result in both external and internal perceptions of security, safety, and support while creating a sense of predictability and positive life qualities (Narayan et al., 2018). Crandall et al. (2019) utilized a similar composite score of counter-ACEs that were based on resilience theory. This study utilizes the terminology cumulative positive childhood experiences (PCEs) framework to summarize all of these approaches consistent with the terminology from Baglivio and Wolff (2020) and the CDC (2020). The cumulative PCEs approach differs from the previous frameworks in that the focus is maximizing the number of protective factors rather than identifying and targeting the most salient protective factors. The following paragraphs will review studies that have explored the relationship between cumulative protective factors and improved outcomes among those experiencing ACEs.

Utilizing retrospective data from the 2015 Wisconsin Behavioral Risk Factor Survey (BRFS), Bethell, Jones, et al. (2019) examined the relationship between the

number of ACEs experienced, the number of PCEs experienced, and adult mental health issues and social/emotional support. The retrospective study was conducted with adults 18 years old and older. Items were added to the Wisconsin BRFS in 2015 to conduct this study. The study utilized seven PCEs adapted from the Child and Youth Resilience Measure that asked about childhood experiences. The items include being able to talk to family members about their feelings, a sense of peer support, a feeling of belonging in high school, feeling their family was understanding when faced with challenges, a sense of enjoying community activities and tradition, feeling safe/protected when in the home, and having a supportive relationship with at least two adults, not their parents. The ACE score was calculated as the sum of ACEs reported by the participants. Social support was measured by the respondent's answer to a single survey item while depression and/or poor mental health were based upon the participant either reporting that they were ever told they had a depressive disorder or that they had poor mental health in the last 30 days.

Based on multivariable logistic regression, Bethell, Jones, et al. (2019) found a dose-wise relationship between cumulative PCEs and adult depression/mental health; adults who experienced 6 to 7 PCEs (out of 7 PCEs) had lower mental health issues/depression than those with 0 to 2 PCES even after controlling for ACEs. Social support was also significantly higher for adults experiencing 6 or more PCEs than those experiencing 0 to 2 PCEs after controlling for ACEs. Overall, this study demonstrated that 6 to 7 cumulative PCEs were associated with better mental health outcomes and social support among adults. Some of the limitations include this study being a retrospective study that gathered data on childhood experiences; the study also only examined a limited number of PCEs and outcomes. Also, the study only examined adult

outcomes. Nevertheless, this study did begin to establish the evidence base for cumulative PCEs to mitigate ACEs.

In another study, Baglivio and Wolff (2020) explored the relationship between the number of cumulative PCEs and cumulative ACEs experienced and recidivism among youth involved in the juvenile justice system. The sample consisted of 28,048 youth determined to be high risk or moderate-high risk based upon the Positive Achievement Change Tool (PACT) prescreening involved in a community-based juvenile justice program in Florida from 2009 to 2012. The cumulative PCEs were based on the number of categories of PCEs the youth answered "yes" to out of 11 options. The PCEs were based upon historic resilience measures and included factors such as feeling school is a supportive environment, being involved in school activities, engaging in at least one prosocial activity, having mainly prosocial friends, having prosocial ties in the community, having a supportive family, the youth's family engaging in decision-making, having a positive relationship with caregivers, having supportive extended family or friend network, having two or more educators or coaches that are supportive, or having two non-parental, supportive adult relationships. The ACE score was based on the number of ACEs out of 10 traditional ACEs that the child had experienced. The study utilized rearrest and readjudication for the outcome variable of recidivism. Rearrest was when the youth was either referred or arrested again for a new offense within one year of completing their community placement. Readjudication was the youth being convicted for a new offense within one year of completion of their community placement.

Based on logistic regression, Baglivio and Wolff (2020) found that both ACEs and PCEs had a main effect on recidivism. Youth who experienced 4 or more ACEs were

20% more likely to be readjudicated and 15% more likely to be rearrested. However, youth with 6 or more PCEs were 16.6% less likely to be readjudicated and 20% less likely to be rearrested. The researchers conducted additional analysis to compare the relationship between experiencing 4 or more ACEs in a low PCEs group (fewer than 6 PCEs) and a high PCEs group (6 or more PCEs). For youth in the low PCE group, experiencing 4 or ACEs was significantly associated with recidivism. However, in the high PCE group, experiencing 4 or more ACEs was no longer significantly associated with recidivism. Thus, this study demonstrated that cumulative PCES can potentially be a protective factor against recidivism among youth experiencing 4 or more ACEs involved in the juvenile justice system. However, there are some limitations. The PCEs selected did not align with any theoretical framework. Also, some of the PCEs appeared to have a considerable level of overlap with multiple measures of supportive adult relationships and multiple items asking about extracurricular activities. The population was also very narrowly defined with only a single outcome measured. Nevertheless, this does provide evidence of the potential of PCEs among an adolescent population.

In a similar study, Novak and Fagan (2022) examined the link between ACEs and PCEs with youth-reported delinquency and arrests utilizing data from the Longitudinal Studies on Child Abuse and Neglect Research Consortium (LONGSCAN). Depending on the outcome, the sample consisted of 794 or 795 youth who experienced or were at risk for child maltreatment. The youth were tracked from the ages of four or six to eighteen years old with data collected biannually. The study utilized ten ACEs (sexual abuse, physical abuse, emotional abuse, physical neglect, emotional neglect, household domestic violence, caregiver mental health issues, incarceration of a caregiver, family trauma, and

caregiver substance abuse) based upon reports from children, parents/caregivers, and child protective services. ACEs were recoded into ACE groupings (zero, one to two, three to four, and five or more). PCE scores were based on youth responses to items in six indexes (prosocial activity involvement, perceived importance of school, other adult mentors, parent relationships, positive neighborhood, and peers that a prosocial) that were dichotomized based on whether the score was in the top 25th percentile. PCE scores were grouped into high (four to six PCEs) and low (zero to three PCEs) groups. The first outcome variable, delinquency, was based on the number of youth-reported delinquent acts out of 23 that the youth engaged in during the last year at 16 years old. Arrests were based on whether the child reported being arrested during the last year at 16 years old.

Based on multivariable negative binomial models, youth who experienced more ACEs were significantly more likely to have committed more delinquent activities than children who did not experience ACEs. Youth who experienced 4 or more PCEs engaged in fewer delinquent activities. Based on multivariable logistic regression, only youth who experienced three or four ACEs were more likely to be arrested while the relationship between arrest and PCEs was not significant. PCEs also moderated the relationship between ACEs and delinquency among children who experienced between one and four ACEs but did not moderate the relationship for other groups or for arrest. This study expanded the evidence base for cumulative PCEs by demonstrating the relationship between PCEs and delinquency among a population of youth not involved in the juvenile justice system while also finding that PCEs moderated the relationship between ACEs and delinquencies for some children. However, the study does have some limitations. The PCEs used in this study differed from other studies with less emphasis on individual

protective factors. The PCEs were also partially selected based on the availability of items on the LONGSCAN. The study also had a smaller population size with a higher proportion of ACEs due to the sample being those who experienced abuse or maltreatment. The ACEs and PCEs groupings were also different than previous studies. However, the study did demonstrate the effectiveness of the cumulative PCE framework among youth utilizing longitudinal data (Novak & Fagan, 2022).

Based on secondary data analysis of the 10-year, longitudinal Flourishing Families Project, Crandall et al. (2020) explored whether there was a relationship between the number of cumulative PCEs, the number of ACEs reported in adolescence, and five health outcomes in young adulthood. In this study, the researchers referred to protective factors as counter-ACEs. Counter-ACEs were factors identified in Resilience Theory based on the ability of assets at different levels to interact to build resilience to improve outcomes. The ten outcomes included feeling supported by teachers, being happy at school, having affirming beliefs that provided purpose or meaning, having high self-esteem, having a good relationship with someone identified as their best friend, having regular family meals or weekend family activities, parent's being aware of their child's activities, living in a safe neighborhood, having a positive relationship with a best friend, and reporting a positive week in the last seven days. The ACEs score was the number of categories of ACEs experienced using a variation of the original ACEs items. The five outcomes assessed with scales for each outcome were risky sexual behaviors, substance use, negative body image, anxiety, and depression.

Structural equation modeling examined the relationship between the variables of interest utilizing a sample of 489 participants that completed the initial survey between

10 and 13 years old and follow-up surveys in early adulthood. In the model that only included ACEs and covariates, the number of ACEs experienced was associated with all the outcomes except for body image. None of the relationships were significant once the counter-ACE score was added to the model. The cumulative counter-ACE score was associated with better outcomes for all five outcomes in the models with covariates that excluded the ACE score. After controlling for ACEs, the cumulative counter-ACE score was still associated with lower levels of depression, substance abuse, and risky sexual behaviors (Crandall et al., 2020). The study demonstrated a relationship between the number of protective factors experienced in childhood and improved health outcomes in three areas after controlling for ACEs. The study also utilized longitudinal data to better establish a causal relationship. However, there were limitations to the counter-ACEs explored. First, some were more temporal and only measured the characteristic at the time the survey was conducted (i.e., having a positive week). There were no measures of supportive adult relationships with their caregiver or other known resilience factors such as self-regulation. Many factors appeared to be based on the survey items.

While utilizing the HOPE framework to identify protective factors, Crouch, Radcliff, Merrell, Brown, et al. (2021) also explored the number of cumulative PCEs experienced by children between 6 and 17 years old based on race and ethnicity utilizing data from the 2017-2018 NSCH. As mentioned previously, the study identified two measures of supportive relationships, two measures of a safe and equitable environment, two measures of social engagement, and one measure of emotional competency from the HOPE categories. Each of these measures was coded as “yes” or “no” based on the caregiver’s response. Researchers calculated the cumulative PCE score or PCE summary

score by counting the number of measures that were “yes” based on the caregiver’s response. Overall, 20.4% of children had experienced less than 3 PCEs. When considering race and ethnicity, non-Hispanic, Caucasian students had the greatest likelihood of experiencing 3 or more PCEs with 94.5% experiencing 3 or more PCE. All other races and ethnicities were significantly less likely to experience 3 or more PCEs. Females were 1.3 items more likely to experience 3 or more PCEs than males. Children in lower-income homes or with parents with a high school education or less were also significantly less likely to have experienced 3 or more PCEs.

While Crouch, Radcliff, Merrell, Brown, et al. (2021) did not examine the relationship between cumulative PCEs and childhood outcomes, the article provided a framework for utilizing the NSCH to calculate a cumulative PCEs score. The article also integrated the HOPE framework into a cumulative PCEs model to better compare the two frameworks. The study provided epidemiological data to understand the prevalence of PCEs among children while recognizing similarities with how ACEs impact children by race, ethnicity, and socioeconomic status. The clear limitation was that the study did not contribute to a better understanding of the relationship between cumulative PCEs and ACEs related to childhood outcomes. Furthermore, the PCEs selected were somewhat limited by the NSCH items, and the racial/ethnic categories were limited to four groups.

Robles et al. (2019) utilized data from the 2011-2012 NSCH to examine the relationship between ACEs, modifiable protective factors, and school outcomes among children between the ages of 6 and 17 based on caregivers’ responses to the survey items. In this study, a cumulative PCE score was calculated based on the number of community protective factors and familial protective factors that the child possessed based on survey

responses. The four community protective factors included living in a well-kept neighborhood, living in a safe neighborhood, having supportive neighbors, and the neighborhood having parks, pathways, a center for recreation, and a library. The three familial factors were the child always or usually talking with the caregiver about important things, no smoking by others living in the household, and having family dinners 5 or more times per week. The ACEs score was based on the number of categories of ACEs the caregiver reported that the child experienced using historic ACEs measures. The three school-related outcomes were grade retention, whether the child cared about school, and if the student regularly completed homework.

Based on logistic regression, Robles et al. (2019) found the number of ACEs experienced was significantly related to all three school-related outcomes with increased exposure to ACEs increasing the likelihood of repeating a grade, not completing homework assignments, and not caring about school after controlling for covariates. Increased exposure to PCEs was associated with a lower likelihood of grade retention, the child caring more about school, and completing homework after controlling for covariates. When the cumulative PCE and ACEs scores were included in the same model, similar patterns were observed, but the increased likelihood of poorer outcomes in high ACEs groups was not as high, indicating a likely interaction. However, the researchers did not explore this interaction. This study demonstrated that there was a significant relationship between the number of PCEs experienced and better educational outcomes. This study also suggested that there may be some level of interaction in which PCEs may moderate the impact of ACEs on school-related outcomes. However, there are some limitations. First, the rationale for the inclusion of the specific PCEs was not explained

and was not informed by a specific model. Second, the study did not explore the potential interaction between PCEs and ACEs. While the study demonstrated the main effects of both PCEs and ACEs, the study also did not answer whether PCEs were a protective factor against poorer school-related outcomes among children with 4 or more ACEs.

Overall, these studies demonstrated that the cumulative PCEs framework has consistently been associated with improved outcomes across studies. Bethell, Jones, et al. (2019) found that adults experiencing 6 or more PCEs were significantly less likely to have mental health issues and poor social support than those with 2 or fewer PCEs after controlling for ACEs. Baglivio and Wolff (2020) found that youth involved in the juvenile justice system that experienced 4 or more ACEs were no longer more likely to be rearrested or readjudicated if they experienced 6 or more PCEs. Novak and Fagan (2022) found that PCEs were associated with lower levels of delinquency and moderated the relationship between ACEs and delinquency among children experiencing between 1 and 4 ACEs. Crandall et al. (2020) found that increased exposure to PCEs was associated with reduced risky sexual behavior, depression, and substance abuse after controlling for ACEs while Robles et al. (2019) found increased exposure to PCEs was associated with increased school engagement and decreased grade retention. Thus, the cumulative PCEs framework appeared to be consistently associated with better outcomes across studies.

Nevertheless, the cumulative PCEs framework research has several limitations. Across studies, the specific PCEs were not consistent with different studies using different theoretical approaches to identify protective factors. Since the number of PCEs was not consistent across studies, significant thresholds cannot be established to determine the number of PCEs necessary for improved outcomes. The studies also

utilized vastly different populations ranging from children to adults and including subpopulations like youth involved in the juvenile justice system or those at risk for maltreatment.

Conceptually, the cumulative PCEs framework presents some distinct disadvantages compared to the other frameworks. If the goal is to develop parsimonious and cost-effective frameworks to inform future interventions, the cumulative PCEs framework will emphasize the delivery of numerous interventions to maximize the number of protective factors to build resilience. This approach likely increases the cost of interventions and creates barriers to implementation. Furthermore, the state of cumulative PCEs research is in the infancy stages without a guiding framework for identifying the specific protective factors to include in the model. Research is needed to identify which protective factors matter the most and to determine the threshold for interventions.

Despite these limitations, the PCEs framework has promise in building resilience to mitigate ACEs. As these studies found, cumulative PCEs have consistently been linked to resilience across outcomes and populations, unlike other approaches. Furthermore, a key part of the CDC's (2020) strategy to prevent ACEs involves research to identify PCEs and mechanisms through which they build resilience against ACEs. Thus, initiatives have already begun to identify PCEs. These efforts may accelerate research to identify these protective factors to give a more universal definition and measure of cumulative PCEs. Nevertheless, research must ensure this is the most effective approach to building resilience against ACEs to inform future interventions.

Gaps in ACEs Resilience Framework Research

As discussed in the previous sections, researchers have only recently begun to identify and explore how resilience frameworks can be utilized to target protective factors to mitigate ACEs among children. While three promising frameworks have been identified in the literature, the research and evidence have been inconsistent across frameworks. Many of the modifiable protective factors identified by the NSCDC model are grounded in historic resilience research, but only one study has explored the relationship between the NSCDC framework and improved outcomes among children experiencing ACEs (Keane & Evans, 2022a). Several recent studies have explored whether protective factors associated with the HOPE framework are associated with increased resilience using multiple outcomes (Crouch, Radcliff, Hung, et al., 2019; Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). However, the study designs have been inconsistent with only a few studies effectively integrating ACEs into the studies with some completely omitting ACEs. The different age groups and methods used by these HOPE framework studies utilizing the NSCH also create challenges in evaluating the effectiveness of the framework across outcomes. The significant protective factors have also been inconsistent across studies. Studies have also only focused on the individual protective factors and not the overall effectiveness of the entire framework. Cumulative PCEs have consistently been associated with improved outcomes, but the specific protective factors and the number of factors differed widely from study to study. The approach also has distinct economic disadvantages and creates challenges in translating research to practice. Across models, the inclusion of ACEs in the studies has also been inconsistent without a clear focus on how they should be

included to inform future interventions. Also, no known studies have compared these frameworks to determine which resilience framework is most effective at mitigating ACEs among children.

Based on these gaps in the literature, research is needed to validate and compare the effectiveness of each of these three frameworks in reducing the risk of negative outcomes associated with exposure to multiple ACEs across outcomes by utilizing consistent methodology to allow comparisons across outcomes. Research must also identify which factors are most meaningful within these frameworks to guide future interventions in an effective and cost-efficient manner. Finally, since the goal is to identify resilience frameworks that mitigate ACEs, research must be conducted specifically among those populations who have been exposed to multiple ACEs.

Theoretical Framework

Gelberg-Andersen Model for Vulnerable Populations

The Andersen Behavioral Model was originally developed to explain and predict whether families or individuals would utilize healthcare resources. In the second phase, the model was expanded to consider additional factors such as consumer satisfaction. In subsequent phases, the model expanded to predict and explain health outcomes along with healthcare utilization and health behaviors. Overall, the Andersen Behavioral Model posits that healthcare utilization, health behaviors, and health status are the byproduct of predisposing characteristics, enabling resources, and need. Predisposing characteristics include those factors such as health beliefs, demographic factors, and factors related to the individual's social structure that later may influence health and healthcare utilization.

Enabling resources include community and social resources along with individual characteristics such as having the necessary knowledge and skills to access health-related resources that may influence healthcare utilization and health status. The model also posits that healthcare utilization, health behaviors, and health status are the byproduct of the individual's perceived need for healthcare services or health behaviors, which are influenced by any evaluated needs by healthcare providers (Andersen, 1995).

While the Andersen Behavioral Model has been widely utilized and validated (Babitsch et al., 2012), Gelberg et al. (2000) proposed an adaptation to the Andersen Behavioral Model known as the Behavioral Model for Vulnerable Populations. This model was eventually known as the Gelberg-Andersen Model for Vulnerable Populations (GMVP) (Stein et al., 2007). According to this model, vulnerable populations, including children, may have unique predisposing, enabling, and need factors that influence health practices, health service utilization, and health status. Like the Andersen Behavioral Model, predisposing, enabling, and need factors influence health behaviors and health outcomes. However, the GMVP includes traditional and vulnerable domains for predisposing, enabling, and need factors. The traditional predisposing, enabling, and need domains align with those described in the Andersen Behavioral Model. The predisposing vulnerable domain includes factors such as previous victimization, abuse, mental illness, substance abuse, psychological resources like mastery and cognitive abilities, previous abuse and neglect, and out-of-home placements. The enabling vulnerable domain includes factors such as social service resources, family assistance, organizational resources, community violence, and other types of social services. The need vulnerable domain includes unique needs for vulnerable populations like awareness of the need for

mental health services, substance abuse treatment, or other medical issues that are more prevalent among vulnerable populations. Accordingly, these predisposing, enabling, and need factors across both traditional and vulnerable domains influence health practices like substance abuse, self-care, exercise, and diet along with healthcare utilization. These factors combine to influence health status (Gelberg et al., 2000).

Consistent with ACEs research, the GMVP recognizes that ACEs such as childhood victimization, abuse, neglect, household dysfunction, discrimination, and economic hardship can influence future health behaviors and health status through predisposing traditional and vulnerable domains. The GMVP also recognizes that certain factors that have been identified in resilience research like cognitive abilities or executive functioning can also be predisposing factors that could result in more adaptive health behaviors. The GMVP also identifies supportive adult relationships, community resources, family support, community safety, acquired skills, and access to mental health services as factors in both the enabling traditional and vulnerable domains that influence health outcomes consistent with resilience research. The GMVP posits that predisposing and enabling factors interact with perceived needs to influence health behaviors and subsequent health status (Gelberg et al., 2000). This aligns with the pathway through which ACEs influence health behaviors where exposure to ACEs contributes to social, cognitive, and emotional impairment which results in maladaptive health behaviors. This results in eventual disease, poorer social outcomes, disability, and eventual death (Felitti et al., 1998). Consequently, Yoonsook et al. (2018) also identified ACEs as a predisposing factor and supportive adult relationships as an enabling factor within the GMVP model (Yoonsook et al., 2018). Also, Crouch et al. (2022) utilized the Andersen

Behavioral Model to identify demographic factors that could also be confounding variables that influence the relationship between protective factors and obesity among children experiencing ACEs.

For this study, children who have experienced ACEs were a vulnerable population consistent with the GMVP. ACEs were predisposing factors within the vulnerable and traditional domains that contribute to poorer health practices and health status. The study examined whether enabling and predisposing factors identified in the three resilience frameworks were associated with a lower likelihood of poorer outcomes. The study also extended the GMVP to consider educational outcomes due to the relationship between ACEs and educational outcomes. The findings of this study also helped to identify predisposing and enabling factors that can be potentially targeted to increase resilience to overcome ACEs. Future studies can build on the GMVP by exploring the relationship between ACEs, resilience, and utilization of mental health resources while considering how interventions may utilize ACEs and resilience education to increase the perceived and evaluated need to improve outcomes and mental health utilization.

In addition, the GMVP will serve as a framework for identifying covariates from the NSCH that influence child outcomes similar to other studies that utilized the Andersen Behavioral Model to identify potential covariates (Crouch et al., 2022; Crouch, Radcliff, Merrell, & Bennett, 2021). Specifically, age, sex, race/ethnicity, and parents' highest level of education were predisposing factors on the NSCDC that have been associated with the outcomes of interest in this study. Based on analyses of the 2016-2019 NSCH, Bitsko et al. (2022) found ADHD was most prevalent among older children, males, African Americans or Caucasians, and children of parents with only high school

education while behavioral issues were most common among children between 6 and 11 years old, males, African Americans, and children with parents only having a high school education. Bitsko et al. (2022) also found depression and anxiety were more common among older children, females, and Caucasians while depression was more common among parents who never attended college, and anxiety was more common among parents with some college (Bitsko et al., 2022). Based on analyses from the 2011 through 2014 National Health and Nutrition Examination Survey (NHANES), Ogden et al. (2018) found that the prevalence of childhood obesity was similar for males and females, but the prevalence was greater among Hispanic and African American children and in households where parents were not college graduates (Ogden et al., 2018). The prevalence of obesity also increased with age based on the 2017-2020 NHANES (Stierman et al., 2021). School outcomes also differ by age, gender, race/ethnicity, and parental education. During the 2015-2016 school year, older students had the highest rates of chronic absenteeism while American Indian/Alaskan Natives, Pacific Islander, and African American students had the highest rates by race with no differences by sex (U.S. Department of Education, 2019). According to the 2019-2020 NSCH, children of parents with a college degree had the lowest rates of absenteeism (U.S. Department of Health and Human Services, 2020). According to data from the 2019-2020 NSCH, older children, males, and children from households with parents without a college education had the highest rates of low school engagement (U.S. Department of Health and Human Services, 2020). Furthermore, based on analyses of first through tenth-grade students repeating a grade from 1995 through 2010 in the U.S., students were more likely to repeat a grade when younger (1st grade students) or older (10th grade) while males, Hispanics,

African Americans, and children of parents with less education were also more likely to repeat a grade (Warren et al., 2014). Thus, previous research has established the relationship between these predisposing factors from the GMVP and the study outcomes.

In the traditional enabling GMVP domain, family socioeconomic status has been associated with all the study outcomes. Children in households living at or below the federal poverty level have the highest prevalence of ADHD, behavioral issues, and depression. Conversely, children in households with an income of greater than 200% of the federal poverty level had a higher prevalence of anxiety (Bitsko et al., 2022). Ogden et al. (2018) found that children with a household income greater than 350% of the federal poverty level had a much lower prevalence of obesity than children from households with a lower household income. When considering school outcomes, a systematic review identified that lower family socioeconomic status was often associated with higher rates of school absenteeism across most studies (Sosu et al., 2021). Children in households living below the poverty limit also had the highest rates of low school engagement on the 2019 and 2020 NSCH (U.S. Department of Health and Human Services, 2020). When exploring longitudinal data from the Early Childhood Longitudinal Study from 1998 through 2007, Locke and Sparks (2019) found that children living in poverty were at increased risk for repeating a grade. Thus, previous research has demonstrated that all the study outcomes have a relationship with the enabling factor of socioeconomic status. Thus, these predisposing and enabling factors from the GMVP found on the NSCH were included as GMVP covariates in this study.

Ecological Model

The ecological model by McLeroy et al. (1988) was also used to guide this study. Specifically, resilience is the byproduct of factors at multiple ecological levels. At the intrapersonal level, innate characteristics along with executive functioning, self-regulation, and social-emotional functioning are potential resilience factors. At the interpersonal level, parent-child relationships, teacher-student relationships, other adult relationships, and positive peer relationships are potential protective factors. At the institutional or organizational level, schools provide environments, policies, and procedures that can either facilitate or hinder resilience. At the community level, neighborhood safety, the built environment, social norms, and relationships within the neighborhood can be potential resilience factors. Public policy can enhance all ecological levels by providing policies and funding that promote practices to build resilience.

Historic resilience research recognized that resilience is the byproduct of multiple factors across ecological levels interacting across the course of a lifetime to impact outcomes among individuals experiencing adversity (Masten, 2018). All three frameworks in this study utilized protective factors from multiple ecological levels (Bethell, Jones, et al., 2019; NSCDC, 2015; Sege & Harper Browne, 2017). Thus, recognizing the influence of multiple levels on resilience is a strength and key component of all three frameworks. Interventions developed based on the study's findings should target multiple ecological levels to promote the protective factors identified in this study, increase the likelihood that interventions are effective, and integrate historic resilience research (Masten, 2018; McLeroy et al., 1988; Wright et al., 2013).

Summary

Researchers have established the relationship between exposure to multiple ACEs and poorer educational, health, and quality of life outcomes among children and adults (Bellis et al., 2018; Bomysoad & Francis, 2020; Hughes et al., 2017; Meeker et al., 2021; Schurer et al., 2019). Children who experienced multiple ACEs have a higher likelihood of mental health issues, obesity, and poorer school-related outcomes (Bomysoad & Francis, 2020; Crouch, Radcliff, Hung, et al., 2019; Davis et al., 2019; Jimenez et al., 2016; Stempel et al., 2017). In the U.S., over 1 in 5 children have experienced 2 or more ACEs with rates being higher among lower-income and minority populations (Bethell, Davis, et al., 2017). Thus, interventions are needed to reduce negative outcomes among a substantial proportion of children that have experienced ACEs.

Historic resilience research has focused on identifying how children can adapt and succeed despite exposure to early adversity. Resilience researchers have identified modifiable protective factors that can build resilience to overcome adversity (Masten, 2018; Wright et al., 2013). Consequently, ACEs researchers have begun to identify these historic resilience factors as potential protective factors against ACEs (Hornor, 2017; NSCDC, 2015; Ortiz, 2019; Sciaraffa et al., 2017). However, resilience is often context-dependent and is the byproduct of factors at multiple ecological levels through various developmental processes. Also, the third wave of resilience research found that the most effective interventions utilize models and frameworks that target multiple ecological levels while understanding how multiple protective factors and risks interact (Wright et al., 2013). Thus, research must understand which protective factors are effective among children who experienced multiple ACEs and understand how these factors interrelate to

form resilience frameworks to mitigate ACEs. However, few studies have explored whether historic resilience protective factors are associated with improved outcomes among children that have experienced multiple ACEs (Traub & Boynton-Jarrett, 2017). Thus, research must validate historic resilience protective factors among this population.

Despite the limited research on protective factors that build resilience to mitigate ACEs, frameworks have emerged in recent years that seek to identify how modifiable protective factors can be targeted to build resilience to overcome ACEs. Three frameworks that have been identified in the literature include the NSCDC, HOPE, and cumulative PCEs frameworks (Bethell, Jones, et al., 2019; NSCDC, 2015; Sege & Harper Browne, 2017). Each of these frameworks has some distinct advantages and disadvantages. While there is some preliminary evidence for each framework, results and methods have been inconsistent across studies with only a few outcomes explored and only a few studies examining the impact among children who experienced ACEs. Due to the limited number of studies and inconsistency across studies, questions remain about the effectiveness of each framework across outcomes. Furthermore, additional research is needed to identify which of these frameworks is most effective at building resilience to mitigate ACEs so that researchers and practitioners can develop effective ACEs interventions. Research must also identify which protective factors are the most salient to ensure interventions target the most impactful protective factors due to limited resources.

Finally, while each framework identified protective factors that may build resilience to overcome ACEs, none of these frameworks provide a comprehensive theory to guide intervention development. However, the GMVP model recognizes the influence of ACEs and resilience factors through traditional and vulnerable predisposing and

enabling factors on health behaviors, health service utilization, and health outcomes among vulnerable populations. The GMVP also recognizes the influence of multiple other predisposing, enabling, and need factors on health behaviors and health service utilization (Gelberg et al., 2000). Thus, by considering ACEs and resilience frameworks within the context of the GMVP, researchers can identify sociodemographic factors and other environmental factors that may influence health behaviors and health outcomes. The GMVP also provides a model to integrate health education and health promotion interventions through need factors and the utilization of health services. Integrating an ecological perspective also ensures that protective factors identified and interventions developed as a result of this study target multiple ecological levels consistent with historic resilience research (McLeroy et al., 1988; Wright et al., 2013).

Thus, this dissertation contributed to the literature by examining whether the NSCDC, HOPE, and cumulative PCEs frameworks were associated with a lower likelihood of mental health issues, being obese, and school-related outcomes among children who experienced ACEs within the context of the GMVP and ecological model. Furthermore, this study sought to identify which resilience framework has the strongest association with more favorable outcomes in each of these three domains while also seeking to identify which protective factors have the strongest relationship with more favorable outcomes within each of the three resilience frameworks.

CHAPTER 3

METHODS

Purpose Statement

The purpose of this dissertation was to identify which resilience framework and protective factors within each framework were associated with greater resilience among children who experienced ACEs. Specifically, this study explored whether the NSCDC or HOPE framework was associated with better outcomes among children who experienced ACEs across three domains. The first domain was childhood mental health and included whether the child had ever been told by a healthcare provider that they had depression, anxiety, ADHD, or behavioral issues. The second domain was whether the child was obese based on their BMI. The third domain was school-related outcomes which included excessive absenteeism, school engagement, and grade retention. The study also explored whether the addition of a cumulative PCE score strengthened the relationship between each framework and outcome to determine the effectiveness of the cumulative PCEs framework. Within each framework, the dissertation examined which protective factors had the strongest relationship with each outcome. The study then examined whether these outcomes were consistent after controlling for ACEs and across ACE subgroups.

Research Questions

The following research questions guided this dissertation:

1. Does the NSCDC or HOPE framework have a stronger relationship with whether a child has ever been told they had a mental health issue (depression, anxiety, ADHD, or behavioral/conduct problems)?
    a. Of the factors within each framework, which protective factors have the strongest relationship with whether a child has ever been told they had a mental health issue?
    b. Does the addition of a cumulative PCEs score strengthen the relationship between each framework and whether a child has ever been told they had a mental health issue?
    c. Are these relationships the same after controlling for the number of ACEs experienced by children?
    d. Are these relationships consistent across the number of ACEs experienced by children?
2. Does the NSCDC or HOPE framework have a stronger relationship with whether a child is currently obese?
    a. Of the factors within each framework, which protective factors have the strongest relationship with whether a child is currently obese?
    b. Does the addition of a cumulative PCEs score strengthen the relationship between each framework and whether a child is currently obese?
    c. Are these relationships the same after controlling for the number of ACEs experienced by children?

    d. Are these relationships consistent across the number of ACEs experienced by children?

3. Does the NSCDC or HOPE framework have a stronger relationship with school-related outcomes (school engagement, excessive absenteeism, and grade retention)?
    a. Of the factors within each framework, which protective factors have the strongest relationship with school-related outcomes (school engagement, excessive absenteeism, and grade retention)?
    b. Does the addition of a cumulative PCEs score strengthen the relationship between each framework and school-related outcomes (school engagement, excessive absenteeism, and grade retention)?
    c. Are these relationships the same after controlling for the number of ACEs experienced by children?
    d. Are these relationships consistent across the number of ACEs experienced by children?

Study Design

The study utilized retrospective, secondary data analyses of publicly available data from the 2018-2020 National Survey of Children's Health (NSCH). The NSCH is a nationwide survey administered by the Health Resources and Services Administration's Maternal and Child Health Bureau that gathers information on the health, mental health, and overall well-being of children between 0 and 17 years old (United States Census Bureau, 2020). The NSCH has been used in other ACEs and resilience studies and includes an ACEs scale and multiple resilience items (Balistreri & Alvira-Hammond,

2016; Bomysoad & Francis, 2020; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore & Crouch, 2020; Foster & Weinstein, 2019; Kwong & Hayes, 2017; Robles et al., 2019; Stempel et al., 2017; Uddin et al., 2020). NSCDC, HOPE, and cumulative PCEs framework studies have also utilized the NSCH (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020; Keane & Evans, 2022a; Robles et al., 2019). Beginning with the 2016 NSCH, the NSCDC allowed surveys from multiple years to be combined to increase the sample size of potentially underrepresented samples as long as the items are unchanged (United States Census Bureau, 2021b). Due to this study using smaller ACE subgroups, validation/training samples, and conducting multiple analyses with several independent variables, the 2018 NSCH, 2019 NSCH, and 2020 NSCH were combined since the items of interest were essentially identical across years.

The dissertation utilized a preprint/reprint format comprised of three different manuscripts as previously outlined in Figure 1 based on the three research questions. The first study examined the relationship between the three resilience frameworks and whether children who experienced ACEs ever had been told by a healthcare provider that they had a mental health issue (anxiety, depression, ADHD, or behavioral/conduct problems). The second study examined whether the three resilience frameworks were associated with whether children who experienced ACEs were currently obese. The final study examined whether the resilience frameworks were associated with three school-related outcomes (school engagement, absenteeism, and grade retention) among children who experienced ACEs. Model comparisons using hierarchical logistic regression were used to answer the research question as outlined in the data analysis section.

Despite previous studies utilizing the NSCH to explore ACEs, resilience frameworks, protective factors, and each of the outcomes identified in the study, there were several limitations due to the study design. Since the study utilized cross-sectional data, causal or temporal relationships could not be drawn between the resilience frameworks, protective factors, and any of the outcomes. Due to the items utilized by the NSCH, there were also some limitations. First, not all the ACEs captured by the NSCH were representative of the ACEs widely accepted in literature with some ACEs excluded and some additional ACEs. Second, while previous studies exploring the NSCDC, HOPE, and cumulative PCEs framework utilized the NSCH, the items captured by the NSCH do not correspond exactly to the definitions of the protective factors identified within these frameworks. Some were proxy measures that give estimates of the protective factors. Another limitation was that the responses were by the parent or caregiver. Thus, the response may not always have captured the child's experience or perception of each of the factors or outcomes. ACEs may also be underreported if the caregiver was unaware of ACEs or unmotivated to disclose a particular ACE. Finally, the exclusion of some survey responses from the study due to missing data was also a limitation. Nevertheless, many of these limitations were common for secondary data analysis.

Another limitation of the study was that some of the data captured by the NSCH were collected during the COVID-19 pandemic. While data collection for the 2018 NSCH and 2019 NSCH ended prior to the U.S. declaring a public health emergency on January 31, 2020 and the subsequent shutdown due to COVID-19 (CDC, 2022b; United States Census Bureau, 2018, 2020), data collection for the 2020 NSCH occurred during the COVID-19 pandemic with data collected from July 27, 2020 through January 22,

2021 (United States Census Bureau, 2021a). Consequently, a higher percentage of NSCH surveys were completed online in 2020 compared to previous years. Nevertheless, analyses found that response rates were similar to previous years and that there were no significant changes in the composition of respondents from 2019 to 2020 despite this change (United States Census Bureau, 2021a). However, based on analyses of health and protective factors on the NSCH from 2016 through 2020, Lebrun-Harris et al. (2022) found that there was a significant increase in behavioral issues, disruptions in caregiver employment due to childcare issues, and lack of preventive healthcare visits when comparing data immediately before the pandemic (2019 NSCH) to data during the pandemic (2020 NSCH). While the specific impact was not known for all variables in this study, the COVID-19 pandemic likely influenced data from the 2020 NSCH and was a potential threat to study validity. While a variable was added to control for the timing of the NSCH related to the COVID-19 pandemic, this was a clear limitation of this study.

Study Population

For this study, the population consisted of children between 6 and 17 years old. The population was limited to children this age range since the population of interest was school-aged children, and the NSCH only collected data on most variables of interest for this age group. The population also only consisted of households that completed the NSCH topical questionnaire from 2018 to 2020.

Study Sample

This study utilized data from the 2018, 2019, and 2020 NSCH to conduct

secondary data analysis. Publicly available deidentified data was provided by the U.S. Census Bureau (Maternal and Child Health Bureau, 2018, 2019, 2020). The NSCH is administered by the Health Resources and Services Administration's Maternal and Child Health Bureau annually. The national survey gathers information related to the mental health, health, and well-being of children between 0 and 17 years old. Each year, a sample of addresses was identified by the NSCH with varying levels of certainty that a child resided in the home. The initial sample was 176,000 households in 2018, 184,000 households in 2019, and 240,000 households in 2020. The sample was drawn from all states and the District of Columbia. The initial sample was sent a screener questionnaire to gather general information regarding children in the home. The percentage of households completing the screener questionnaire varied by year (40.3% in 2018, 37.2% in 2019, and 39.0% in 2020). Based on the screener questionnaires, a topical survey was administered to eligible households asking for parents or caregivers to complete all items of interest for a specific child in the home with an intentional oversampling of children between 0 and 5 years old along with children that have special healthcare needs. There were three NSCH versions based on the child's age (0 to 5 years old, 6 to 11 years old, and 12 to 17 years old). The topical survey response rates were 36.9% in 2018, 35.3% in 2019, and 36.4% in 2020. Select respondents received up to a $5 incentive for the screener and topical surveys (United States Census Bureau, 2019, 2020, 2021a).

Consistent with the study design discussed previously, the final sample included all children between the ages of 6 and 17 years old with all the variables of interest completed for a given outcome. For all outcomes, responses were excluded from the analysis if any of the predictor variables from any of the resilience frameworks or

covariates were missing data. For the mental health outcomes, the sample also excluded respondents that were missing a response to any of the depression, anxiety, ADHD, or behavioral/conduct issue items. For the school-related outcomes, the sample excluded respondents that were missing responses for that specific outcome (absenteeism, school engagement, and grade retention). For weight status, the sample was only children between 10 and 17 years old since weight status was not reported for children under 10 years old; the sample also excluded those missing weight status based on BMI.

As shown in Figure 2, 102,740 NSCH surveys were completed from 2018 to 2020 including all ages. Only versions of the survey completed by caregivers of children between 6 and 17 years old included all the variables of interest. Of the 73,849 responses for children between 6 and 17 years old, 69,433 (94.0%) were missing no ACEs items. Of students with all ACEs items completed, 65,931 (95.0%) were missing none of the covariates or protective factors in this study. The final sample for each outcome was further determined by the number of responses not missing any of the variables of interest for a specific outcome. For mental health issues, the final sample was 65,072 after excluding 859 responses missing either the anxiety, depression, ADHD, or behavioral issues item. For the school-related outcome of absenteeism, the final sample was 65,548 after excluding 383 responses missing data on absenteeism. For the school-related outcome of school engagement, the final sample was 65,595 after excluding 336 responses missing data on either of the two school engagement items. For the school-related outcome of grade retention, the final sample was 65,772 after excluding 159 responses missing data on whether the child ever repeated a grade. For the weight status, the sample was further limited based on BMI status only being available for children

between the ages of 10 and 17 years old. Of the 65,931 responses with data on all the independent variables and covariates, 47,917 responses (72.7%) were for children between 10 and 17 years old. Of those 47,917 responses, 46,672 (97.4%) included data on weight status to be included in the final weight status sample. For all the outcomes, the sample size exceeded the minimum recommended sample size for logistic regression of either 500 cases or 100 + (50 x the number of independent variables) since the maximum number of predictor variables was 14 (100 + 50 x 14 = 800) (Bujang et al., 2018).

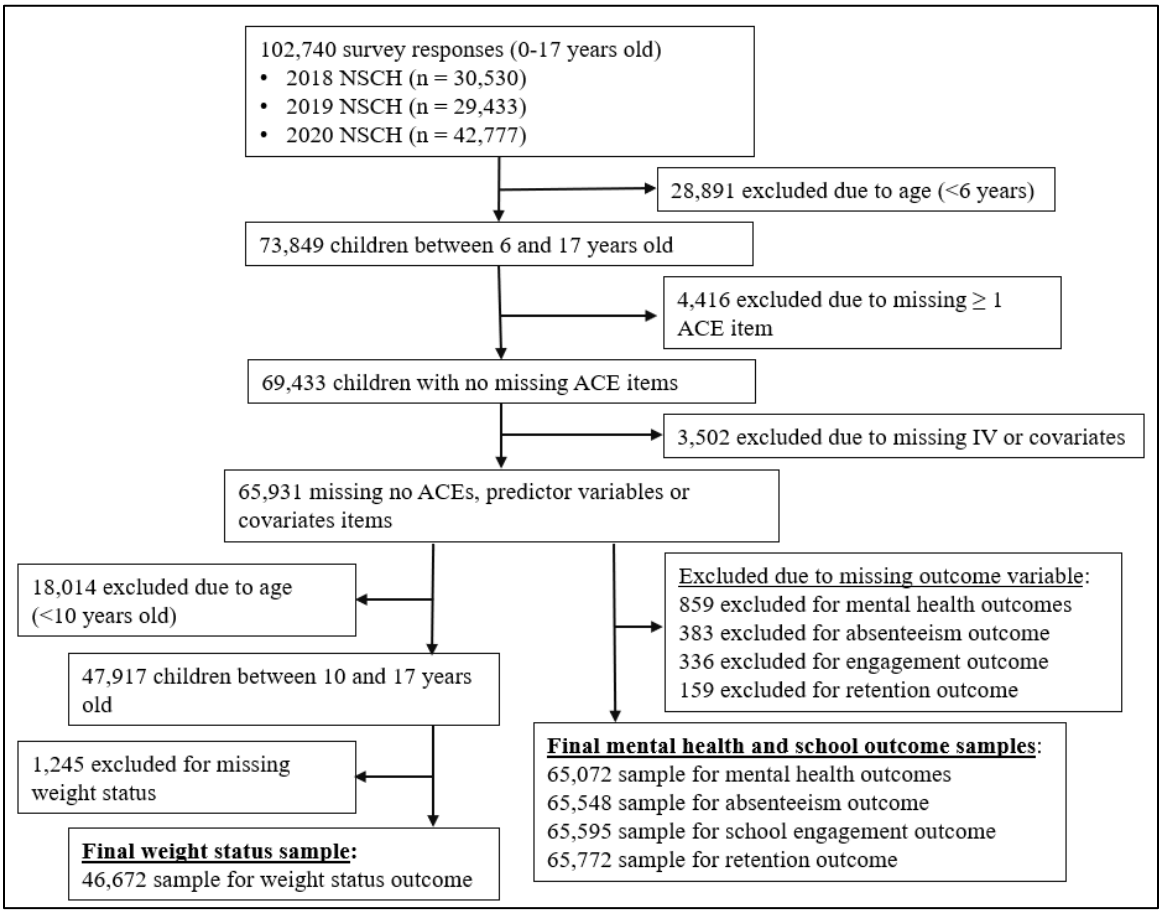

Figure 2. Sample selection method.

Instrumentation

The study used secondary data from the 2018-2020 NSCH. The United States Census Bureau for the Health Resources and Services Administration's Maternal and Child Health Bureau conducts the NSCH annually. The first NSCH was conducted in 2003 and was implemented in conjunction with the National Survey of Children with Special Health Care Needs (NS-CSCHN). Both surveys were conducted at state and national levels to identify data related to children's health along with other factors related to health such as access, utilization, and quality of healthcare resources, community and family factors related to health, and the impact and prevalence of special healthcare needs. Initially, both surveys were periodic telephone surveys. The telephone-based NSCH was conducted in 2003, 2007, and 2011-2012; the NS-CSCHN was conducted by telephone in 2001, 2005-2006, and 2009-2010 (United States Census Bureau, 2021a).

Beginning in 2016, the NSCH and NS-CSCHN surveys were combined into a single survey maintaining the NSCH name. While the national and state samples along with the content were still recognized as a strength of the survey, the transition was necessitated by declining response rates due to households transitioning to cell phones. The redesigned NSCH shifted to an annual survey that utilized address-based sampling using both mail and web-based surveys. The survey also began to utilize two-phase data collection with an initial screener questionnaire to identify children in the home and a follow-up topical survey with detailed questions related to children's health and well-being. The screener would identify the ages of children in the home and allow an oversampling of younger children and children with special healthcare needs. Before launching the revised 2016 NSCH, a pre-test was conducted in 2015 to evaluate and

make changes based on feedback on the overall survey methodology, data collection instruments, and the NSCH processes and policies (United States Census Bureau, 2018).

Sampling frames for the revised NSCH were randomly selected from the Census Master Address File with households stratified into one of two strata based on the likelihood of a child being in the home. States were sampled to produce an equal number of responses from each state. All households randomly selected to participate in the study were mailed a letter with the URL to complete the screener questionnaire online. If the survey was not completed in four weeks, a second letter with a URL was sent to complete the screener questionnaire online (except for those with a low probability of web completion, which received the screener questionnaire with the second follow-up). If no response, a paper-based screener questionnaire was mailed to the household with up to six mailings to each house including the URL and screener questionnaire. Incentives of $0 to $5 were randomly assigned in the mailings (United States Census Bureau, 2018).

For the web-based screener questionnaire, respondents were immediately assigned to complete the topical questionnaire for one of their children after completing the online screener questionnaire. The screener utilized study methodology to intentionally oversample children who were younger (between 0 and 5 years old) and with special healthcare needs. For households completing paper-based screening questionnaires, households were mailed back a paper-based topical questionnaire using the same subsampling methodology. Completion time was unavailable for the paper-based surveys. For households with children, the average time to complete the web-based screening questionnaire was 5.4 minutes, and the average time to complete the web-based topical questionnaire was 30.7 minutes (United States Census Bureau, 2018).

The redesigned NSCH had three different versions: one for children between 0 and 5 years old (T1), one for children between 6 and 11 years old (T2), and one for children between 12 and 17 years old (T3). Each topical survey had up to 11 sections with some only being completed by certain age groups. These sections included the child's health, experiences as an infant, healthcare services, experiences with healthcare providers, health insurance coverage, provision of healthcare, and school and learning activities along with sections related to the caregiver/child relationship, the family/household, parent/caregiver information, and general household information (United States Census Bureau, 2018). In redesigning the 2016 NSCH, efforts were made to keep previous items. However, a topical expert panel was formed that met between 2012 and 2016 to review and refine all the NSCH items (Ghandour et al., 2018).

Beginning in 2011-2012, ACEs items were added to the NSCH. These items were modifications of the original ACEs scale to consider appropriateness for parent or caregiver responses and to minimize underreporting by parents by considering potential biases. These items were maintained in the revised 2016 NSCH following the review by the topical expert panels. Analysis has found the measures to be acceptable to respondents with a cumulative ACE score having high internal and predictive validity (Bethell, Carle, et al., 2017). Based on previous studies, items related to each of the previous resilience frameworks have also been measured by the NSCH (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020; Keane & Evans, 2022a; Robles et al., 2019). The ACEs items, resilience measures, and outcome variables have also been used in multiple other studies (Balistreri & Alvira-Hammond, 2016; Bomysoad & Francis, 2020; Crouch,

Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore & Crouch, 2020; Foster & Weinstein, 2019; Kwong & Hayes, 2017; Robles et al., 2019; Stempel et al., 2017; Uddin et al., 2020). The study variables utilized from the 2018-2020 NSCH will be discussed in the subsequent sections. However, the 2018 to 2020 NSCH survey years were selected due to using the same scales and item wording for all of the items of interest other than changing gender-specific pronouns of "his or her" to "their" for some items (Maternal and Child Health Bureau, 2018, 2019, 2020).

Study Variables

Adverse Childhood Experiences

The 2018-2020 NSCH shared nine identical ACEs items as outlined in Table 2 with the 2020 NSCH having one additional ACE item not included in this study. The additional ACE item excluded asked whether the child was ever "treated or judged unfairly because of their sexual orientation or gender identity". This item was excluded from the study to avoid inflating 2020 ACE scores with an additional item not collected in previous years. All the ACE items in Table 2 except for economic hardship were dichotomous ("yes" or "no"). Economic hardship was reported as "never", "rarely", "somewhat often", or "very often". Consistent with previous studies (Balistreri & Alvira-Hammond, 2016; Crouch, Radcliff, Hung, et al., 2019; Keane & Evans, 2022a), children experienced economic hardship ("yes") if the respondent answered "somewhat often" or "very often". Otherwise, the children had not experienced economic hardship ("no"). The total ACE score was calculated by adding the number of ACE items in answered "yes".

Table 2

Adverse Childhood Experience (ACE) Items on the 2018-2020 National Survey of Children's Health

1. **Economic Hardship:** Since the child was born, how often has it been very hard to cover the basics, like food or housing, on your family's income?
   a) Never b) Rarely c) Somewhat often d) Very often

To the best of your knowledge, has this child ever experienced any of the following:
   a) Yes b) No
2. **Racial/Ethnic Discrimination:** Treated or judged unfairly because of their race or ethnic group?
3. **Parent/Guardian Divorce or Separation:** Parent or guardian divorced or separated?
4. **Death of Parent/Guardian:** Parent or guardian died?
5. **Parent/Guardian Incarceration:** Parent or guardian served time in jail?
6. **Household Domestic Violence:** Saw or heard parents or adults slap, hit, kick, punch one another in the home?
7. **Community Violence:** Was a victim of violence or witnessed violence in their neighborhood?
8. **Household Mental Illness:** Lived with anyone who was mentally ill, suicidal, or severely depressed?
9. **Household Drug/Alcohol Abuse:** Lived with anyone who had a problem with alcohol or drugs?

ACE scores were incorporated into this study in two ways. To compare the resilience frameworks among children who experienced ACEs, the effectiveness of each framework was compared after controlling for ACEs as previously described in Figure 1. To determine whether the study outcomes were consistent across children with varying levels of exposure to ACEs, hierarchical logistic regression was conducted across the ACE groupings as depicted in Figure 1. To facilitate these comparisons, ACE scores were converted to ACE groupings that were differentiated by lowest risk (0 ACEs), low risk (1 ACE), moderate risk (2-3 ACEs), and highest risk (4 or more ACEs) consistent with another study (Bethell, Jones, et al., 2019). This is consistent with previous research that has established 4 or more ACEs as the threshold in which individuals are consistently at increased risk for negative outcomes (Bomysoad & Francis, 2020; Burke et al., 2011; Elmore & Crouch, 2020; Felitti et al., 1998; Hughes et al., 2017). Previous ACEs studies utilizing the NSCH also used 4 or more ACEs as the criteria (Crouch, Radcliff,

Strompolis, et al., 2019; Elmore & Crouch, 2020; Keane & Evans, 2022a). ACE groupings also simplified reporting and study interpretations (Bethell, Jones, et al., 2019).

Dependent Variables

Mental health outcomes. The first outcome explored by this study was whether the child ever had been told by a healthcare provider that they had a mental health issue such as ADHD, anxiety, depression, or behavioral/conduct issues. The NSCH has four dichotomous items ("yes" or "no) that ask whether "a doctor or other healthcare provider EVER told them that this child has" either "depression", "anxiety problems", "behavior or conduct problems", or "attention deficit disorder or attention-deficit/hyperactivity disorder, that is, ADD or ADHD". Consistent with other studies using a combined measure of childhood mental health issues using the NSCH (Bennett et al., 2012; Bomysoad & Francis, 2020; Keane & Evans, 2022a; Turcotte Benedict et al., 2015), children were coded as ever having a mental health issue if the caregiver answered "yes" to any of the four items. Otherwise, they were coded as not ever having a mental health issue. A combined measure of childhood mental health was used since the purpose of the study was to compare the effectiveness of the framework across three domains. This allowed for clearer conclusions in the mental health domain while simplifying reporting and comparisons due to the complexity of the overall analysis.

Childhood obesity. One widely recognized method of determining weight status is body mass index (BMI). BMI should be compared to others of the same age and sex to determine the weight status of children due to fluctuations across age and sex. The CDC

considers children that are at or above the 95th percentile as obese. While BMI does have limitations, BMI has been correlated with measures of body fat (CDC, 2021b). Childhood obesity has also been associated with adult obesity and poorer adult health outcomes (Greenberg, 2013; Keramat et al., 2021; Sanyaolu et al., 2019; Steele et al., 2017). Parents or caregivers reported the height and weight of the child on the NSCH. While that data was unavailable in public data sets, the public NSCH dataset provided the BMI percentile group for children between 10 and 17 years old. The four groups were "less than 5th percentile", "5th percentile to less than 85th percentile", "85th percentile to less than 95th percentile", and "equal to or greater than the 95th percentile". Consistent with previous studies using the NSCH (Crouch et al., 2022; Li et al., 2020), children were obese if the calculated BMI was "equal to or greater than the 95th percentile".

School-related outcomes. This study examined three school-related outcomes captured by the NSCH (excessive absenteeism, school engagement, and grade retention). To allow for consistent methodology to facilitate resilience framework and protective factor comparisons across all dissertation outcomes, all outcome variables were dichotomized consistent with previous NSCH studies. Absenteeism was based on the caregiver's response to the item "during the past 12 months, about how many days did this child miss school because of illness or injury?". Possible responses included "no missed school days", "1-3 days", "4-6 days", "7-10 days", "11 or more days", and "this child was not enrolled in school". Like other NSCH studies that explored high or problematic absenteeism (Crouch, Radcliff, Merrell, Hung, et al., 2021; Roy et al., 2022; Stromberg et al., 2022; Suleiman et al., 2021), responses of "11 or more days" were

coded as “yes” for excessive absenteeism since that was the highest level of absenteeism and closest to the recognized definition of chronic absenteeism (U.S. Department of Education, 2019). All other responses were coded as “no” for excessive absenteeism. Children “not enrolled in school” were excluded from the sample for this outcome.

Consistent with previous NSCH school engagement studies (Crouch, Radcliff, Hung, et al., 2019; Porche et al., 2016; Uddin et al., 2021), school engagement was based on two items on the NSCH: “how often does this child care about doing well in school?” and “how often does this child do all of the required homework?”. Beginning in 2018, the possible responses to each item were revised to “never”, “sometimes”, “usually”, and “always”. Since other study outcomes were dichotomous, school engagement was dichotomized to better facilitate framework comparisons utilizing the same methodology across outcomes. Thus, consistent with a previous study using the 2018 NSCH (Uddin et al., 2021), children were engaged in school if the caregiver responded “usually” or “always” to both items. Otherwise, the child was considered not engaged in school.

Similar to other studies that explored grade retention or repeating a grade using the NSCH (Crouch, Radcliff, Merrell, Hung, et al., 2021; Ghanem, 2021; Hinojosa et al., 2019), grade retention was based on the item “Since starting kindergarten, has this child repeated any grades?”. Responses of “yes” indicated that the child has repeated a grade. Responses of “no” indicated that the child has not repeated a grade.

Independent Variables

NSCDC framework. According to the NSCDC framework, resilience protective factors include a resilience-building adult relationship, strong self-regulation/executive

functioning, mastery in some area of their life, and an affirming faith or cultural tradition that builds hope (NSCDC, 2015). Building on the previous study that explored the relationship between the NSCDC and mental health issues among children experiencing ACEs using the 2019 NSCH, this study utilized the same five items to measure the four NSCDC protective factors (Keane & Evans, 2022a). Furthermore, consistent with previous studies that used the NSCH (Foster & Weinstein, 2019; Heard-Garris et al., 2018; Keane & Evans, 2022a), ordinal responses were recoded into dichotomous responses that indicate whether the child possessed that protective factor against ACEs. Using the same NSCDC items as a previous NSCDC study (Keane & Evans, 2022a), the four NSCDC protective factors were measured using five items as outlined in Table 3. All items were dichotomized ("yes" or "no") to indicate whether the child had that protective factor and to calculate a cumulative NSCDC PCE score. A resilience-building adult relationship was measured by two items: parent/caregiver relationship and other adult relationship. The child had a supportive parent/caregiver relationship ("yes") based on a response of "somewhat well" or "very well". The child had another adult relationship if the respondent answered "yes" to the item. For the self-regulation item, a response of "most of the time" or "all of the time" indicated strong self-regulation ("yes"); otherwise, the child did not have strong self-regulation ("no"). Participation in at least one of the mastery activities indicated the child had mastery in an area ("yes"). If none were selected, they did not have mastery in some area. For a hopeful/affirming cultural tradition, a response of "most of the time" or "all of the time" was coded "yes" with all other responses being coded "no".

Table 3

NSCDC Framework Items on the 2018-2020 National Survey of Children's Health

1. **Parent/Caregiver Relationship**[a]: How well can you and this child share ideas or talk about things that really matter?
2. **Other Adult Relationship**[b]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
3. **Self-Regulation**[c]: Does this child stay calm and in control when faced with a challenge?
4. **Mastery**[b]: During the past 12 months, did this child participate in:
a. Any clubs or organizations after school or on weekends?
b. A sports team or did they take sports lessons after school or on weekends?
c. Any other organized activities or lessons, such as music, dance, language, or other arts?
d. Any type of community service or volunteer work at school, place of worship, or in the community?
5. **Hopeful/Affirming Cultural Tradition**[d]: When your family faces problems, how often are you likely to stay hopeful even in difficult times?

[a]Responses of "very well", "somewhat well", "not very well", "not at all"; [b]responses of "yes" or "no"; [c]responses of "always", "usually", "sometimes", "never"; [d]responses of "all of the time", "most of the time", "some of the time", "none of the time"

HOPE framework. The HOPE framework posits that factors in the four categories are associated with resilience to overcome ACEs: having supportive and nurturing relationships; living, playing, learning, and being in stable, safe, equitable, and protective environments; being provided opportunities for social engagement and to develop connections; and learning emotional and social competencies (Sege & Harper Browne, 2017). Multiple studies have used the NSCH to explore the relationship between HOPE framework protective factors and various outcomes (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). Thus, this study used items initially identified by Crouch, Radcliff, Merrell and Bennett (2021) and utilized in subsequent research to organize NSCH items within each of the HOPE categories and associated protective factors (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021). Consistent with the NSCDC protective factors, all items were recoded into having the protective factor ("yes") or not ("no") to facilitate cumulative PCE scores.

The four HOPE framework categories were captured using seven items as outlined in Table 4. In the supportive and nurturing relationships category, a mentoring relationship was based on the respondent's response ("yes" or "no"); family resilience ("yes") was based on responses of either "most of the time" or "all of the time" to all four items. For the two stable, safe, equitable, and protective environment measures, a supportive neighborhood ("yes") was based on one or more responses of "definitely agree" and responses of "somewhat agree" to the remaining items. A safe neighborhood ("yes") was based on a response of either "somewhat agree" or "definitely agree". In the opportunities for social engagement and developing connections category, participating in any of the activities indicated the child participated in after-school activities ("yes") with none selected being coded "no". A response of "yes" to the volunteerism item

Table 4

HOPE Framework Items on the 2018-2020 National Survey of Children's Health

Category 1: Supportive and nurturing relationships

1. **Mentor Relationship**[a]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
2. **Family Resilience**[b]: When your family faces problems, how often are you to do each of the following?
    a. Work together to solve problems.
    b. Talk together about what to do.
    c. Know we have strengths to draw on.
    d. Stay hopeful even in difficult times.

Category 2: Being in stable, safe, equitable, and protective environments

3. **Supportive Neighborhood**[c]:
    a. We watch out for each other's children in this neighborhood
    b. People in this neighborhood help each other out
    c. When we encounter difficulties, we know where to go for help in our community
4. **Safe Neighborhood**[c]: This child is safe in our neighborhood.

Category 3: Opportunities for social engagement and developing connections

5. **After-School Activities**[a]: During the past 12 months, did this child participate in:
    a. Any clubs or organizations after school or on weekends?
    b. A sports team or did they take sports lessons after school or on weekends?
    c. Any other organized activities or lessons, such as music, dance, language, or other arts?
6. **Volunteerism**[a]: During the past 12 months, did this child participate in any type of community service or volunteer work at school, place of worship, or in the community?

Category 4: Learning emotional and social competencies

7. **Sharing Ideas**[d]: How well can you and this child share ideas or talk about things that really matter?

[a]Responses of "yes" or "no"; [b]responses of "all of the time", "most of the time", "some of the time", "none of the time"; [c]responses of "definitely agree", "somewhat agree", "somewhat disagree", "definitely disagree"; [d]responses of "very well", "somewhat well", "not very well", "not at all"

indicated the child participated in volunteerism. Emotional and social competencies ("yes") were based on a response of "very well" or "somewhat well".

Cumulative PCEs framework. Only two known studies have utilized the cumulative PCEs framework to explore protective factors among children using the NSCH (Crouch, Radcliff, Merrell, Brown, et al., 2021; Robles et al., 2019). Consistent with the literature on cumulative PCEs, these protective factors differed across studies. Thus, the unique theoretical contribution of the cumulative PCEs framework was that there is a dose-wise relationship between exposure to protective factors or PCEs and improved outcomes (Bethell, Jones, et al., 2019; Crandall et al., 2020; Crouch, Radcliff, Merrell, Brown, et al., 2021; Robles et al., 2019). Thus, this study explored whether the addition of a cumulative PCE score based on that specific framework significantly contributes to improving the effectiveness of the NSCDC and HOPE frameworks.

For the HOPE framework, Crouch, Radcliff, Merrell, Brown, et al. (2021) created a cumulative PCE score using HOPE framework factors. Thus, the cumulative HOPE PCEs score was calculated by first determining whether the child had each of the seven factors identified within the HOPE framework as described previously. Consistent with Crouch, Radcliff, Merrell, Brown, et al. (2021), the cumulative PCEs score was the sum of the factors that were "yes". Groupings were used to simplify reporting and interpretations like a previous cumulative PCE study (Bethell, Jones, et al., 2019). This also allowed for better comparison between cumulative PCE scores using the HOPE and NSCDC frameworks since they had different numbers of protective factors. The

cumulative HOPE PCEs groupings were separated into low (0-2), moderate (3-5), and high (6-7) groups consistent with a previous study (Bethell, Jones, et al., 2019).

While no known studies have created a cumulative PCEs score based on the NSCDC framework, a similar score was calculated using the same approach as the HOPE framework with the protective factors identified in the NSCDC framework. The researchers utilized the NSCDC protective factors to ensure that the only unique additional contribution to the model was the number of protective factors within the framework and not the introduction of new protective factors from other frameworks. Thus, the cumulative PCEs score for the NSCDC framework was calculated by first determining whether the child had each of the five items identified within the NSCDC framework. The cumulative PCEs for the NSCDC framework was the sum of the number of factors that are a "yes". The NSCDC groupings were separated into low (0-2), moderate (3-4), and high groups (5) to align with the HOPE framework and due to similar distributions of PCEs across the three levels with the HOPE framework.

Covariates

When considering the GMPV (Gelberg et al., 2000), ACEs align with predisposing factors and protective factors align with enabling factors while there are several other potential covariates from the NSCH that align with the GMVP that could have influenced the outcomes in this study as depicted in Figure 3. Consequently, other researchers have utilized the Andersen Behavioral Model as a framework for identifying sociodemographic variables and covariates (Crouch et al., 2022; Crouch, Radcliff, Merrell, & Bennett, 2021). Thus, this study utilized other covariates identified by the

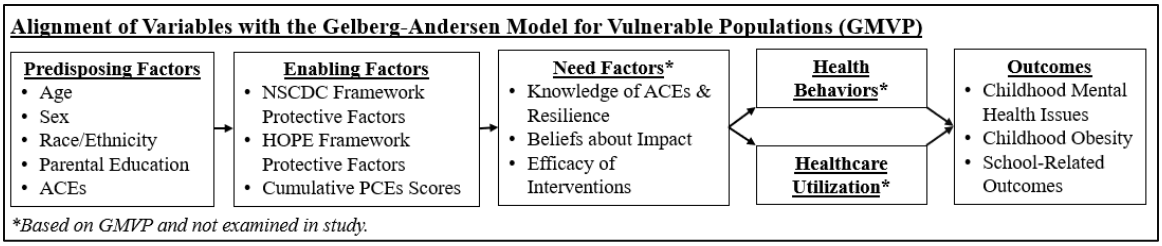

Figure 3. Study variables using the Gelberg-Andersen Model for Vulnerable Populations.

GMVP that were not identified in the resilience frameworks or ACEs and have been associated with the study outcomes. Demographic characteristics included from the GMVP in the traditional and vulnerable predisposing domains included age, sex, race/ethnicity, and parental education. Since age was not reported as a continuous variable, age was recoded as "6 to 12 years old" and "13 to 17 years old" to differentiate younger children and adolescents. Consistent with a previous study (Keane & Evans, 2022a), race was reported as either "White alone", "Black or African American alone", or "Other" based on the recoded race/ethnicity reported in the NSCH public dataset. For logistic regression, "White" was the referent group. Sex was based on the caregiver's response to the item "what is your child's sex?" with the options of "male" and "female". The highest level of caregiver's educational attainment was based on the recoded variable in the NSCH publicly available dataset that indicates the "highest level of education among reported adults" with the options of "less than high school", "high school (including vocational, trade, or business school)", "some college or Associate degree", and "college degree or higher".

One measure was included from the GMVP traditional and vulnerable enabling domains that was identified on the 2018-2020 NSCH (family income) (Gelberg et al., 2000). For total family income, the NSCH used sequential regression to impute missing

values of family income to provide an estimate of the family poverty ratio (FPL) since 15% of respondents do not report at least one aspect necessary to estimate FPL. Thus, the NSCH provided six estimates of FPL for each child that were then averaged, consistent with NSCH guidance to calculate an estimated FPL (United States Census Bureau, 2021c). These ratios were recategorized as 0% to 199%, 200%-399%, and 400% or higher consistent with previous studies (Keane & Evans, 2022a; Stempel et al., 2017).

As discussed previously, data collection for the 2018 and 2019 NSCH occurred prior to the COVID-19 pandemic while data collection for the 2020 NSCH occurred during the COVID-19 pandemic. Since COVID-19 could potentially influence some of the outcome variables, a COVID-19 variable was added to the study to control for differences in outcome variables that could potentially be attributed to the timing of the survey during the COVID-19 pandemic. Thus, surveys completed during the pandemic (2020 NSCH) were coded as "Yes" for the COVID-19 variable while surveys completed prior to the pandemic (2018 NSCH and 2019 NSCH) were coded as "No".

Data Analysis

While the final samples differed across outcomes due to missing data, the same methodology was used across studies. Thus, the following section will describe the same data analyses that were replicated across all three studies to answer the research questions. First, the frequencies of the protective factors, ACEs groupings, PCE groupings, and covariates were calculated for the final samples for each outcome. Then, X^2 tests of independence were conducted between each predictor variable and outcome variable. Outcomes of the X^2 tests were interpreted using Cramer's V effect sizes due to

large sample sizes and some variables having more than two comparison levels (Akoglu, 2018). The assumptions of logistic regression were also tested for each outcome.

To answer the research questions, model comparisons were performed using hierarchical logistic regression with validation for the outcomes of each study. For all the logistic regression models, logistic regression was completed on the entire sample to develop the initial model. Then, logistic regression was rerun with a training sample of 75% and again with a validation sample of 25% to verify that the model has the same level of validity. Due to page limitations for journal submission, these were not described in each manuscript. However, findings were consistent across the full sample, training, and validation samples, but findings were sometimes no longer significant in some training and validation samples, partially due to smaller samples. For each outcome, model comparisons using hierarchical logistic regression were conducted three ways. First, the analyses were completed on the entire sample excluding ACEs groupings to compare the frameworks when not considering ACEs. Then, the analyses were conducted with ACE score groupings introduced to the regression models in block 2 to compare the effectiveness of each framework after controlling for ACEs to demonstrate effectiveness among children who experienced ACEs. Finally, the analyses were conducted for each of the four ACEs subgroups to compare the effectiveness of each framework across different levels of ACEs exposure. Across all analyses, model one included NSCDC protective factors and model two included HOPE protective factors. Cumulative PCE scores were included in each model based on either the NSCDC or HOPE framework.

For each manuscript, hierarchical logistic regression was first conducted with the entire sample as outlined in Figure 4 to compare the relationship between the resilience

frameworks and each outcome when not considering ACEs. The effectiveness of the NSCDC and HOPE frameworks were based on if the ΔR^2 from block 1 to 2 was significant. Since the analyses from both models used the same sample and outcome variables, adjusted R^2 values could be compared to determine which model was most effective in this sample in block #2 (Lewis-Beck & Skalaban, 1990). Nagelkerke's R^2 was used since it is a pseudo-R^2 value that more closely mirrors an adjusted R^2 value for logistic regression to facilitate this comparison (Field, 2013; Smith & McKenna, 2013). Thus, to determine whether the NSCDC or HOPE framework had a stronger relationship with each outcome, Nagelkerke's R^2 values were compared in block 2 for model 1 and model 2. The framework with the largest R^2 value had the strongest association with each outcome. Within each framework, the adjusted odds ratios were compared for each protective factor to answer the research question examining which protective factors within each framework had the strongest relationship with that study outcome. The strength was based on the magnitude of the adjusted odds ratio and whether it was significant. To determine whether a cumulative PCE strengthened the relationship between each framework and the study's outcomes, the ΔR^2 from block 2 to 3 was compared for both models. If the ΔR^2 was significant, the cumulative PCE score contributed significantly to the model. To determine the stability of these findings across the number of ACEs experienced, the same analyses were repeated among subsamples of responses separated by ACEs groupings (0 ACEs, 1 ACE, 2 or 3 ACEs, ≥ 4 ACEs).

To examine whether the relationship between the resilience frameworks were the same after controlling for ACEs, model comparisons were conducted using hierarchical logistic regression as outlined in Figure 5. The analyses were identical to the previous

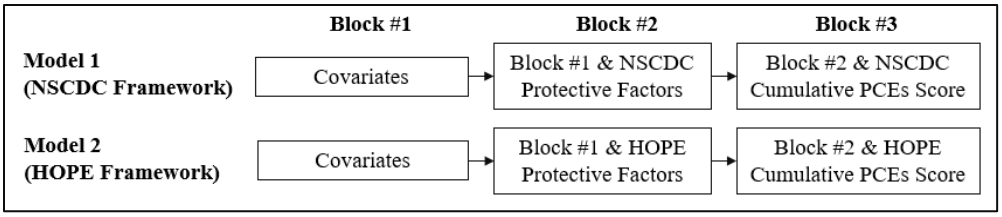

Figure 4. Hierarchical logistic regression for analyses excluding ACEs.

analyses except block 2 included the covariates and ACEs. The effectiveness of each framework after controlling for ACEs was based on if the ΔR^2 from block 2 to 3 was significant. The strength of the relationship between the NSCDC and HOPE framework and each study's outcomes were compared based on Nagelkerke's R^2 value in block 3. Within each framework, the adjusted odds ratios were compared for each outcome in block 3 to determine which protective factors significantly contributed to the regression model and had the strongest relationship with that particular outcome. If the ΔR^2 from block 3 to 4 was significant, that framework's cumulative PCE score improved the regression model, demonstrating the effectiveness of that framework's cumulative PCEs score. A p-value of 0.05 was used for all analyses, but additional interpretations were made based on the strength of Nagelkerke's R^2 to examine practical significance when comparing regression models.

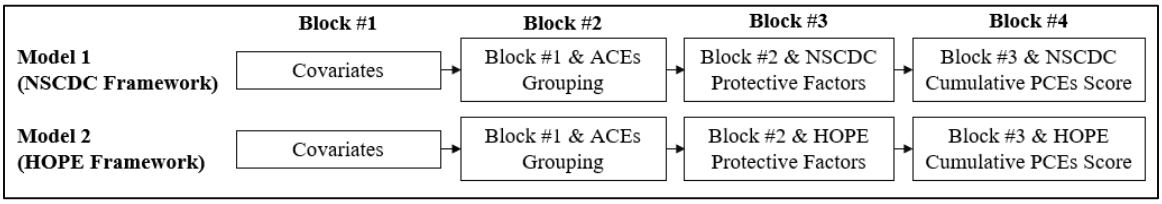

Figure 5. Hierarchical logistic regression for analyses including ACEs.

CHAPTER FOUR

RESULTS

MANUSCRIPT 1: COMPARING THE RELATIONSHIP BETWEEN THREE RESILIENCE FRAMEWORKS AND MENTAL HEALTH OUTCOMES AMONG CHILDREN WHO EXPERIENCED MULTIPLE ADVERSE CHILDHOOD EXPERIENCES

by

KEVIN KEANE, RETTA R. EVANS, LARRELL WILKINSON, DIONE MOULTRIE KING, LINDSAY LEBAN, DAVID MACRINA

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Abstract

Adverse childhood experiences (ACEs) have a well-established relationship with childhood mental health. Researchers have begun to explore resilience frameworks like the National Scientific Center for the Developing Child (NSCDC), Health Outcomes from Positive Experiences (HOPE), and cumulative positive childhood experiences (PCEs) frameworks that identify protective factors to build resilience to overcome ACEs. However, each of these frameworks has a limited evidence base. This study explored which of these three frameworks had the strongest relationship with childhood mental health outcomes utilizing data from the 2018-2020 National Survey for Children's Health. Model comparisons using hierarchical logistic regression were conducted on a sample of 65,072 children between 6 and 17 years old. Both the NSCDC and HOPE frameworks were significantly associated with childhood mental health. However, the NSCDC framework had a stronger relationship in the full sample excluding ACEs, after controlling for ACEs, and across ACEs subsamples. The addition of a cumulative PCEs score did not practically improve any of the regression models. Significant protective factors were identified in both frameworks. The results demonstrated the potential for the NSCDC framework to build resilience to overcome ACEs. Future ACEs interventions should potentially seek to integrate the NSCDC framework to potentially mitigate the impact of ACEs.

Keywords: resilience, adverse childhood experiences, childhood mental health, protective factors

Introduction

Adverse childhood experiences (ACEs) are categories of maltreatment and household dysfunction experienced in childhood that have a dose-wise relationship with risky health behaviors, poorer health outcomes, and early death with adults experiencing 4 or more ACEs being at the greatest risk (Brown et al., 2009; Felitti et al., 1998; Hughes et al., 2017; Petruccelli et al., 2019). Children who experienced multiple ACEs are also at increased risk for poorer school outcomes, risky behaviors, and poorer health (Bellis et al., 2018; Burke et al., 2011; Crouch et al., 2019; Meeker et al., 2021; Stempel et al., 2017). Approximately 61.5% of adults in the U.S. have experienced at least 1 ACE and 15.8% have experienced 4 or more (Merrick et al., 2019). Similarly, 46.3% of U.S. children under 18 years old have experienced at least 1 ACE while 21.7% have experienced 2 or more ACEs (Bethell et al., 2017). ACEs are more prevalent among lower-income households, less educated adults, and certain racial and ethnic minority populations (Bethell et al., 2017; Merrick et al., 2019). Thus, ACEs pose a public health risk to a substantial proportion of children and adults with some populations disproportionately impacted.

One way ACEs may impact long-term health is through emotional, social, and cognitive impairment that contributes to mental health issues, subsequent risky health behaviors, and poorer health (Felitti, 2009; Felitti et al., 1998). ACEs have a well-established relationship with childhood mental health. Children and adolescents who experienced 4 or more ACEs have a higher risk of anxiety, depression, behavioral issues, and ADHD (Bomysoad & Francis, 2020; Elmore & Crouch, 2020). Childhood mental health issues have also been associated with poorer health outcomes in young adulthood

(Otto et al., 2021; Schlack et al., 2021). Thus, identifying protective factors that prevent mental health issues among children who experienced ACEs is important to mitigating ACEs and preventing future negative health outcomes.

Resilience and Protective Factors

Resilience has been identified as the ability to adapt and succeed despite challenges or adversity (Zolkoski & Bullock, 2012). Resilience research emerged in the early 1900s seeking to understand factors that help individuals successfully adapt following traumatic events (Masten, 2018; Wright et al., 2013). ACEs researchers have begun to draw on historical resilience research to identify potential protective factors to mitigate ACEs (Hornor, 2017; Masten, 2018; National Scientific Council on the Developing Child [NSCDC], 2015). While these protective factors are promising, many factors have been borrowed from historic research without prior research validating the effectiveness among individuals experiencing ACEs (Traub & Boynton-Jarrett, 2017). Two findings of historical resilience research were that resilience is context-dependent and protective factors interact to build resilience (Masten, 2018; Wright et al., 2013). Thus, research must validate that these protective factors are effective among those who have experienced ACEs and establish how protective factors interact to build resilience. Fortunately, ACEs researchers have recently begun to develop frameworks that describe how potential modifiable protective factors work together to build resilience (Bethell, Jones, et al., 2019; NSCDC, 2015; Sege & Harper Browne, 2017). Three prominent ACEs resilience frameworks are the National Scientific Council on the Developing Child (NSCDC) (NSCDC, 2015), Health Outcomes from Positive Experiences (HOPE) (Sege

& Harper Browne, 2017), and cumulative positive childhood experiences (PCEs) frameworks (Bethell, Jones, et al., 2019).

National Scientific Council on the Developing Child (NSCDC) Framework

According to the NSCDC framework, resilience against ACEs is the result of four factors: at least one supportive, stable, caring adult relationship; strong self-regulation and executive functioning; mastery; and a supportive faith/cultural tradition. A resilience-building adult relationship is considered the most important factor (NSCDC, 2015). While these factors are grounded in historic resilience research (Masten, 2018), only one known study has explored the effectiveness of this framework among those who experienced ACEs. This study found that the NSCDC framework was associated with a lower likelihood of mental health issues among children experiencing 4 or more ACEs; strong self-regulation and a supportive parent/caregiver relationship were the strongest protective factors (Keane & Evans, 2022). Other studies have found individual protective factors from the NSCDC framework were associated with more positive outcomes among those experiencing ACEs (Bellis et al., 2017; Sparks et al., 2021; Yamaoka & Bard, 2019). Nevertheless, a more extensive evidence base is needed to validate the effectiveness of the framework before widespread adoption to guide interventions.

Health Outcomes from Positive Experiences (HOPE) Framework

The Health Outcomes from Positive Experiences (HOPE) framework uses an ecological approach where children who experience protective factors in the following four categories are more likely to overcome ACEs: having emotional/social skills; being

in an environment that is safe, stable, and equitable; having supportive and nurturing relationships; and engaging in constructive social opportunities that develop connectedness (Sege & Harper Browne, 2017). The HOPE framework has a slightly larger evidence base with four known studies (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020), but only three studies explored specific outcomes with two considering ACEs (Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). The only study examining mental health found that three protective factors were associated with lower levels of childhood depression with those factors having a stronger relationship among children with 4 or more ACEs (Elmore et al., 2020). The other studies examined the relationship between HOPE protective factors and childhood obesity, absenteeism, and grade retention (Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021). These studies only explored individual protective factors and not the overall framework's effectiveness. Thus, research is further needed to validate the framework.

Cumulative Positive Childhood Experiences (PCEs) Framework

The cumulative positive childhood experiences (PCEs) framework theorizes a dose-wise relationship between the number of categories of PCEs experienced and more positive outcomes among individuals who experience multiple ACEs (Baglivio & Wolff, 2020; Bethell, Jones, et al., 2019). This framework borrows protective factors from previous resilience research with researchers utilizing different theories and approaches to identify PCEs (Bethell, Jones, et al., 2019; Crandall et al., 2020; Crouch, Radcliff, Merrell, Brown, et al., 2021; Novak & Fegan, 2022; Robles et al., 2019). The cumulative

PCE framework seeks to maximize protective factors rather than target the most salient factors. Researchers have found some evidence of the cumulative PCE framework mitigating ACEs (Baglivio & Wolff, 2020; Bethell, Jones, et al., 2019; Crandall et al., 2019; Novak & Fegan, 2022; Robles et al., 2019). The only known cumulative PCEs study examining mental health outcomes found adults who experienced 6 or 7 PCEs in childhood were less likely to have mental health issues than those experiencing 0 to 2 PCEs after controlling for ACEs (Bethell, Jones, et al., 2019). The only known child studies examined the relationship between cumulative PCEs and school-based outcomes, delinquent behavior, and involvement with the juvenile justice system (Baglivio & Wolff, 2020; Novak & Fegan, 2022; Robles et al., 2019). Despite a stronger evidence base, few studies focused on children and the number/type of protective factors differed across studies. Interventions using this approach are also likely less parsimonious and cost-effective since the framework seeks to maximize protective factors. Thus, research is needed to refine and further validate this framework.

Gelberg-Andersen Model for Vulnerable Populations (GMVP)

While ACEs and protective factors are associated with childhood mental health outcomes (Bomysoad & Francis, 2020; Elmore & Crouch, 2020; Elmore et al., 2020; Keane & Evans, 2022), other factors influence childhood mental health. The Gelberg-Andersen Model for Vulnerable Populations (GMVP) posits that health behaviors, health outcomes, and healthcare utilization are the byproduct of predisposing, enabling, and need factors in traditional and vulnerable domains (Gelberg et al., 2000). The model is an adaptation of the Andersen Behavioral Model for vulnerable populations, which includes

children and those experiencing mental health issues (Gelberg et al., 2000; Stein et al., 2007). While predisposing and enabling factors include ACEs and protective factors (Finkelhor et al., 2013; Gelberg et al., 2000; Wade et al., 2014), the GMVP provides a model for identifying other sociodemographic factors that could influence childhood mental health consistent with previous studies (Crouch et al., 2022; Yoonsook et al., 2018). The GMVP also provides a model for understanding how factors interrelate to influence mental health and the adoption of interventions by parents, caregivers, and children to build resilience. Thus, this study utilized the GMVP to identify covariates and to interpret how the results can inform future interventions.

Aims and Purpose

The NSCDC, HOPE, and cumulative PCEs frameworks draw extensively from historical resilience research to identify potential protective factors to overcome ACEs (Bethell, Jones, et al., 2019; Crandall et al., 2019; NSCDC, 2015; Robles et al., 2019; Sege & Harper Browne, 2017). However, few studies have explored the effectiveness of these frameworks in building resilience to overcome ACEs. Methodological differences and varying outcomes among those few studies also make it difficult to draw conclusions regarding which framework is most effective. Also, only two known studies have used these frameworks to explore childhood mental health outcomes among children experiencing ACEs (Elmore et al., 2020; Keane & Evans, 2022) with no known studies examining which framework is most effective. Due to the relationship between ACEs, childhood mental health, and poorer health outcomes (Felitti, 2009; Felitti et al., 1998), understanding the relationship between these frameworks and childhood mental health is

critical to guide future interventions. While each framework has advantages and disadvantages, research is needed to understand the relative effectiveness of each to inform future interventions.

Thus, the purpose of this study was to identify which resilience framework and protective factors within each framework were associated with a lower likelihood of childhood mental health issues among children who experienced ACEs. The specific aims were: (1) to determine whether the NSCDC or HOPE framework has a stronger relationship with childhood mental health issues; (2) to identify which protective factors within each framework have the strongest association with childhood mental health issues; (3) to determine whether the addition of a cumulative PCEs score strengthened the relationship between each framework and childhood mental health issues; (4) to determine whether the previous relationships were the same after controlling for the number of ACEs experienced by children; and (5) to determine whether these relationships were the same across the number of ACEs experienced by children.

Materials and Methods

Data and Sample

The study utilized retrospective, secondary data from the 2018-2020 National Survey of Children's Health (NSCH). The NSCH is a nationwide survey administered in the U.S. by the Maternal and Child Health Bureau and gathers information on the health, mental health, and overall well-being of children between 0 and 17 years old (United States Census Bureau, 2020). The NSCH has been used in previous ACEs and resilience studies including those using the identified frameworks (Balistreri & Alvira-Hammond,

2016; Bomysoad & Francis, 2020; Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore & Crouch, 2020; Elmore et al., 2020; Keane & Evans, 2022; Robles et al., 2019; Stempel et al., 2017). The surveys were web-based or paper-based. Parents or caregivers completed an initial screener questionnaire and a follow-up topical survey for one child in their home. Due to smaller subsamples used in this study, multiple years were combined using NSCH guidance (U.S. Census Bureau, 2021c). The topical survey response rates were 36.9% in 2018, 35.3% in 2019, and 36.4% in 2020 (U.S. Census Bureau, 2019, 2020, 2021a). The final sample consisted of children with no missing variables of interest. The sample excluded children under 6 years old since some variables of interest were not included in their version of the survey. There were 102,740 total responses. Of the 73,849 (71.9%) responses from children between 6 and 17 years old, 65,072 (88.1%) were in the final sample meeting the criteria.

Measures

Adverse childhood experiences (ACEs). The 2018-2020 NSCH shared nine ACEs items; the 2020 NSCH had one additional item that was excluded for consistency. For eight items, respondents answered "yes" or "no" whether their child experienced parent/guardian divorce or separation, deceased parent/guardian, parent/guardian incarceration, adult/caregiver domestic violence, neighborhood violence, household mental illness, household drug/alcohol abuse, and discrimination. The ninth ACE, economic hardship, was coded "yes" if the respondent reported "somewhat often" or "very often" to "how often has it been hard to cover the basics" since the child was born

like other studies (Balistreri & Alvira-Hammond, 2016; Crouch et al., 2019; Keane & Evans, 2022). The ACE score was calculated by adding the number of ACE items coded as "yes". ACE groupings were used to simplify reporting and interpretations. Analyses were conducted with and without groupings to verify findings were consistent. ACE groupings were differentiated by lowest risk (0 ACEs), low risk (1 ACE), moderate risk (2-3 ACEs), and highest risk (≥ 4 ACEs) like another study (Bethell, Jones, et al., 2019).

Mental health outcomes. The NSCH has four items that ask whether "a doctor or other healthcare provider ever told them that their child had either "depression", "anxiety problems", "behavior or conduct problems", or "attention deficit disorder or attention-deficit/hyperactivity disorder". A combined measure of childhood mental health was used since the purpose of the study was to compare the effectiveness of three resilience frameworks and associated protective factors. This simplified reporting and allowed for clearer conclusions. Thus, consistent with other NSCH studies using a combined measure of childhood mental health (Bennett et al., 2012; Bomysoad & Francis, 2020; Keane & Evans, 2022; Turcotte Benedict et al., 2015), children were coded as ever having childhood mental health issues if the caregiver answered "yes" to any of the four items.

NSCDC framework protective factors. The four NSCDC protective factors were measured by five items in Table 1 consistent with the previous NSCH study (NSCDC, 2015). To facilitate cumulative PCE counts, ordinal responses were coded into dichotomous responses ("yes" or "no") indicating whether the child possessed that protective factor. The criteria for having each of the protective factors ("yes") is listed

below. Otherwise, they did not have the protective factor ("no"). A resilience-building adult relationship included parent/caregiver relationships and other adult relationships. A supportive parent or caregiver relationship ("yes") was based on a response of "somewhat well" or "very well". A supportive other adult relationship ("yes") was based on a response of "yes" to the item. The child had strong self-regulation ("yes") based on a response of "most of the time" and "all of the time". Mastery was coded "yes" if the child participated in any of the extracurricular items. Hopeful/affirming cultural tradition was coded "yes" for "most of the time" or "all of the time".

Table 1

NSCDC Framework Items on the 2018-2020 National Survey of Children's Health

1. **Parent/Caregiver Relationship**[a]: How well can you and this child share ideas or talk about things that really matter?
2. **Other Adult Relationship**[b]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
3. **Self-Regulation**[c]: Stay calm and in control when faced with a challenge?
4. **After-School Activities**[b]: During the past 12 months, did this child participate in:
   a. Any clubs or organizations after school or on weekends?
   b. A sports team or did they take sports lessons after school or on weekends?
   c. Any other organized activities or lessons, such as music, dance, language, or other arts?
   d. Any type of community service or volunteer work at school, place of worship, or in the community?
5. **Hopeful/Affirming Cultural Tradition**[d]: When your family faces problems, how often are you likely to stay hopeful even in difficult times?

[a]Responses of "very well", "somewhat well", "not very well", "not at all"; [b]responses of "yes" or "no"; [c]responses of "always", "usually", "sometimes", "never"; [d]responses of "all of the time", "most of the time", "some of the time", "none of the time"

HOPE framework protective factors. Consistent with previous NSCH HOPE framework studies (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021), this study used the same measures and recoded items as having the protective factor ("yes" or "no") to allow for the calculation of a cumulative PCEs score. The HOPE categories and corresponding NSCH items are in

Table 2. Mentor relationship was based on a response of "yes". Family resilience was coded "yes" if the respondent answered "most of the time" or "all of the time" to all four items. A supportive neighborhood was coded "yes" for a response of "definitely agree" to at least one item and "somewhat agree" to the other items. A safe neighborhood was coded "yes" for "somewhat agree" and "definitely agree". After-school activities were coded "yes" if they answered "yes" to any of the items. Volunteerism ("yes") was based on a response of "yes" to the item. The child shared ideas ("yes") based on a response of "very well" or "somewhat well".

Cumulative PCEs scores. Only two known studies used the cumulative PCEs framework utilizing the NSCH with the protective factors differing across studies

Table 2

HOPE Framework Items on the 2018-2020 National Survey of Children's Health

Category 1: Supportive and nurturing relationships

1. **Mentor Relationship**[a]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
2. **Family Resilience**[b]: When your family faces problems, how often are you to do each of the following?
    a. Work together to solve problems.
    b. Talk together about what to do.
    c. Know we have strengths to draw on.
    d. Stay hopeful even in difficult times.

Category 2: Being in stable, safe, equitable, and protective environments

3. **Supportive Neighborhood**[c]:
    a. We watch out for each other's children in this neighborhood
    b. People in this neighborhood help each other out
    c. When we encounter difficulties, we know where to go for help in our community
4. **Safe Neighborhood**[c]: This child is safe in our neighborhood

Category 3: Opportunities for social engagement and developing connections

5. **After-School Activities**[a]: During the past 12 months, did this child participate in:
    a. Any clubs or organizations after school or on weekends?
    b. A sports team or did they take sports lessons after school or on weekends?
    c. Any other organized activities or lessons, such as music, dance, language, or other arts?
6. **Volunteerism**[a]: During the past 12 months, did this child participate in any type of community service or volunteer work at school, place of worship, or in the community?

Category 4: Learning emotional and social competencies

7. **Sharing Ideas**[d]: How well can you and this child share ideas or talk about things that really matter?

[a]Responses of "Yes" or "No"; [b]responses of "all of the time", "most of the time", "some of the time", "none of the time"; [c]responses of "definitely agree", "somewhat agree", "somewhat disagree", "definitely disagree"; [d]responses of "very well", "somewhat well", "not very well", "not at all"

(Crouch, Radcliff, Merrell, Brown, et al., 2021; Robles et al., 2019). Since the unique theoretical contribution of the cumulative PCEs framework is a dose-wise relationship between protective factors and improved outcomes (Bethell, Jones, et al., 2019; Crandall et al., 2020; Crouch, Radcliff, Merrell, Brown, et al., 2021; Robles et al., 2019), this study explored whether the addition of a cumulative PCE score based on that specific framework strengthened the relationship between the framework and mental health issues. Consistent with a previous HOPE framework study (Crouch, Radcliff, Merrell, Brown, et al., 2021), the cumulative HOPE PCEs score was calculated by adding the number of HOPE protective factors that were previously coded as "yes". While no known studies created a cumulative NSCDC PCEs score, the cumulative NSCDC PCEs score was also calculated by adding the number of NSCDC items that were previously coded as "yes". For both, groupings were used to simplify reporting and interpretations. Analyses were conducted with and without groupings to verify consistency. The cumulative HOPE PCEs groupings were separated into low (0-2), moderate (3-5), and high (6-7) groups consistent with a previous study (Bethell, Jones, et al., 2019). The NSCDC groupings were separated into low (0-2), moderate (3-4), and high (5) groups due to similar prevalence as the cumulative HOPE PCEs and a high percentage of children having 5 PCEs (61.8%).

Covariates. Building on the GMVP (Gelberg et al., 2000), several additional predisposing and enabling factors captured by the NSCH were identified. Demographic characteristics included from the predisposing GMVP domains were age, sex, race/ethnicity, and parental education. Since age was not reported as a continuous

variable, age was recoded as “6 to 12 years old” and “13 to 17 years old” to differentiate younger children and adolescents. Race was reported as either “White alone”, “Black or African American alone”, or “Other” based on race/ethnicity recoded by the NSCH. Sex was “male” or “female” based on the parents/caregiver’s report. The highest level of caregiver’s educational attainment was either “less than high school”, “high school (including vocational, trade, or business school)”, “some college or Associate degree”, or “college degree or higher”. One measure was included from the GMVP enabling domains, family income (Gelberg et al., 2000). The NSCH utilized sequential regression to impute values for missing income that were averaged to estimate the family poverty ratio (FPL) (United States Census Bureau, 2021b). These were recategorized as 0% to 199%, 200%-399%, and 400% or higher.

Data collection for the 2018 and 2019 NSCH occurred before the COVID-19 pandemic while the 2020 NSCH occurred during the pandemic. A COVID-19 variable was added to control for differences due to the timing of the survey during the pandemic. Responses were “yes” if collected during the pandemic; “no” if prior to the pandemic.

Data Analysis

All statistical analyses were conducted with IBM SPSS Statistics for Windows, Version 27.0. First, the prevalence of the protective factors, ACEs groupings, PCE groupings, and covariates was calculated. Then, X^2 tests were conducted between each predictor variable and the outcome variable of childhood mental health. Model comparisons using hierarchical logistic regression were then conducted to answer the study’s research questions. The analyses were conducted in three ways. First, the

analyses were completed on the entire sample excluding ACEs groupings to compare the effectiveness of each model unrelated to ACEs. Then, the analyses were conducted with ACE score groupings introduced to the regression models in block 2 to compare the effectiveness of each model after controlling for ACEs. Finally, the analyses were conducted for each of the four ACEs subgroups to compare the effectiveness of each framework across different levels of ACEs exposure.

Model comparisons using hierarchical logistic regression were conducted as outlined in Figure 1. For each analysis, model one (NSCDC framework) and model two (HOPE framework) were compared. Analyses framework 1 compared resilience frameworks for all children when not controlling for ACEs and across all four ACEs subgroups. The effectiveness of the NSCDC and HOPE frameworks was based on if the ΔR^2 from block 1 to 2 was significant. To determine which framework was more effective, Nagelkerke's R^2 values were compared in block 2 for both models; the framework with the largest R^2 value had the strongest association with childhood mental health. In each framework, the adjusted odds ratios were compared for each protective factor to determine the significance and strength in block 2. To determine the effectiveness of the cumulative PCEs frameworks, the ΔR^2 from block 2 to 3 was compared. If the ΔR^2 was significant, the cumulative PCE score contributed significantly to the model. The same analyses were repeated among ACEs groupings to determine the stability of the findings across ACE groupings.

Analysis framework 2 was used to determine if the results were consistent after controlling for ACEs. Identical analyses were conducted except block 2 included the covariates and ACEs. Each framework's effectiveness after controlling for ACEs was

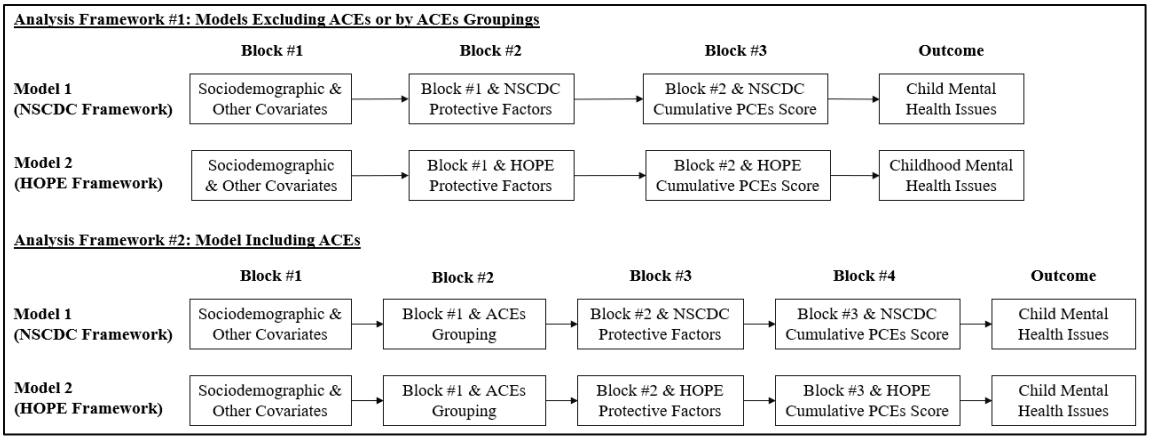

Figure 1. Research study design.

based on if the ΔR^2 from block 2 to 3 was significant. The effectiveness of the NSCDC and HOPE frameworks were compared based on Nagelkerke's R^2 value in block 3. Each framework's significant protective factors were identified in block 3. The significance of the ΔR^2 from block 3 to 4 determined the effectiveness of the cumulative PCEs scores.

The sample met all the assumptions of logistic regression. All samples and subsamples had a sufficiently large sample size (Bujang et al., 2018). Each observation was independent while the dependent variable was dichotomous. All VIF values were between 1 and 10, indicating that the assumption of no multicollinearity was met (Marquardt, 1970). All results were tested at a p-value of 0.05. However, due to the large sample size, all results were interpreted within the context of effect size.

Results

Descriptive Statistics and Bivariate Analysis

Demographic characteristics and X^2 tests are summarized in Table 3. The final sample included 65,072 children (M_{age}=12.1; 48% female; 78.2% Caucasian, 15.0% other

race, 6.8% Black/African American). Approximately 26.3% had a mental health issue with 43.8% experiencing at least 1 ACE, 21.2% experiencing 2 or more ACEs, and 6.3% experiencing 4 or more ACEs. While most X^2 tests were significant, most factors had a weak relationship with mental health due to a Cramer's V of less than 0.10, but ACEs had a strong to very strong relationship with a Cramer's V of 0.25 (Akoglu, 2018).

Table 4 summarizes the prevalence of protective factors and cumulative PCE scores and compares the prevalence by mental health status utilizing X^2 tests. Most

Table 3

Sample Demographic and Other Characteristics by Childhood Mental Health Status

Sample Characteristics	Overall, n (%) (n = 65,072)	MH[a] Issue(s), n (%) (n = 17,129, 26.3%)	No MH[a] Issues, n (%) (n = 47,943, 73.7%)	P-Value[b]/ Cramer's V
Race/Ethnicity				
Caucasian	50,890 (78.2%)	14,007 (27.5%)	36,883 (72.5%)	<0.001
Black/African American	4,429 (6.8%)	1,073 (24.2%)	3,356 (75.8%)	0.054
Other	9,753 (15.0%)	2,049 (21.0%)	7,704 (79.0%)	
Sex				
Male	33,827 (52.0%)	9,693 (28.7%)	24,134 (71.3%)	<0.001
Female	31,245 (48.0%)	7,436 (23.8%)	23,809 (76.2%)	0.055
Age				
6-12 Years Old	33,131 (50.9%)	7,397 (22.3%)	25,734 (77.7%)	<0.001
13-17 Years Old	31,941 (49.1%)	9,732 (30.5%)	22,209 (69.5%)	0.092
Household Income[c]				
<200% FPL	16,925 (26.0%)	5,072 (30.0%)	11,853 (70.0%)	<0.001
200%-399% FPL	23,380 (35.9%)	5,976 (25.6%)	17,404 (74.4%)	0.050
≥400% FPL	24,767 (38.1%)	6,081 (24.6%)	18,686 (75.4%)	
Parents Highest Education				
Less than High School	1,639 (2.5%)	366 (22.3%)	1,273 (77.7%)	<0.001
High School	8,478 (13.0%)	2,427 (28.6%)	6,051 (71.4%)	0.054
Some Coll/Assoc Degree	15,338 (23.6%)	4,446 (29.0%)	10,892 (71.0%)	
≥ College Degree	39,617 (60.9%)	9,890 (25.0%)	29,727 (75.0%)	
COVID[d]				
Prior to COVID-19	37,836 (58.1%)	9,890 (26.1%)	27,946 (73.9%)	0.209
During COVID-19	27,236 (41.9%)	7,239 (26.6%)	19,997 (73.4%)	0.005
ACEs[e]				
0 ACEs	36,562 (56.2%)	6,825 (18.7%)	29,737 (81.3%)	<0.001
1 ACE	14,739 (22.7%)	4,107 (27.9%)	10,632 (72.1%)	0.249
2-3 ACEs	9,688 (14.9%)	3,869 (39.9%)	5,819 (60.1%)	
4 or More ACEs	4,083 (6.3%)	2,328 (57.0%)	1,755 (43.0%)	

[a]MH based on whether a healthcare provider ever told the family that the child had ADHD, anxiety issues, behavioral/conduct issues, or depression; [b]p-value based on X^2 test of independence; [c]family income as percentage of the federal poverty level; [d]COVID based on whether the survey was administered prior to or during the COVID-19 pandemic; [e]ACEs are adverse childhood experiences

Table 4

NSCDC and HOPE Framework Protective Factors by Childhood Mental Health Status

Sample Characteristics	Overall, n (%) (n = 65,072)	MH[a] Issue(s), n (%) (n = 17,129, 26.3%)	No MH[a] Issues, n (%) (n = 47,943, 73.7%)	P-Value[b]/ Cramer's V
NSCDC[c] Protective Factors				
Parent Relationship				
Yes	61,914 (95.1%)	15,169 (24.5%)	46,745 (75.5%)	<0.001
No	3,158 (4.9%)	1,960 (62.1%)	1,198 (37.9%)	0.183
Other Adult Relationship				
Yes	59,775 (91.9%)	15,526 (26.0%)	44,249 (74.0%)	<0.001
No	5,297 (8.1%)	1,603 (30.3%)	3,694 (69.7%)	0.027
Strong Self-Regulation				
Yes	48,929 (75.2%)	8,359 (17.1%)	40,570 (82.9%)	<0.001
No	16,143 (24.8%)	8,770 (54.3%)	7,373 (45.7%)	0.365
Mastery in Some Area				
Yes	58,002 (89.1%)	14,533 (25.1%)	43,469 (74.9%)	<0.001
No	7,070 (10.9%)	2,596 (36.7%)	4,474 (63.3%)	0.082
Hopeful/Affirming Cultural Tradition				
Yes	61,263 (94.1%)	15,344 (25.0%)	45,919 (75.0%)	<0.001
No	3,809 (5.9%)	1,785 (46.9%)	2,024 (53.1%)	0.116
Cumulative NSCDC[c] PCE[d] Score				
0 to 2 PCEs	2,214 (3.4%)	1,415 (63.9%)	799 (36.1%)	<0.001
3 to 4 PCEs	22,633 (34.8%)	9,167 (40.5%)	13,466 (59.5%)	0.305
5 PCEs	40,225 (61.8%)	6,547 (16.3%)	33,678 (83.7%)	
HOPE[e] Framework Protective Factors				
Mentor Relationship				
Yes	59,775 (91.9%)	15,526 (26.0%)	44,249 (74.0%)	<0.001
No	5,297 (8.1%)	1,603 (30.3%)	3,694 (69.7%)	0.027
Family Resilience				
Yes	54,423 (83.6%)	12,986 (23.9%)	41,437 (76.1%)	<0.001
No	10,649 (16.4%)	4,143 (38.9%)	6,506 (61.1%)	0.126
Supportive Neighborhood				
Yes	40,457 (62.2%)	9,539 (23.6%)	30,918 (76.4%)	<0.001
No	24,615 (37.8%)	7,590 (30.8%)	17,025 (69.2%)	0.080
Safe Neighborhood				
Yes	45,920 (70.6%)	11,251 (24.5%)	34,669 (75.5%)	<0.001
No	19,152 (29.4%)	5,878 (30.7%)	13,274 (69.3%)	0.064
After-School Activities				
Yes	54,567 (83.9%)	13,208 (24.2%)	41,359 (75.8%)	<0.001
No	10,505 (16.1%)	3,921 (37.3%)	6,584 (62.7%)	0.110
Volunteerism				
Yes	30,760 (47.3%)	7,301 (23.7%)	23,459 (76.3%)	<0.001
No	34,312 (52.7%)	9,828 (28.6%)	24,484 (71.4%)	0.056
Sharing Ideas				
Yes	61,914 (95.1%)	15,169 (24.5%)	46,745 (75.5%)	<0.001
No	3,158 (4.9%)	1,960 (62.1%)	1,198 (37.9%)	0.183
Cumulative HOPE[e] PCE[d] Score				
0 to 2 PCEs	2,405 (3.7%)	1,250 (52.0%)	1,155 (48.0%)	<0.001
3 to 5 PCEs	28,665 (44.1%)	8,753 (30.5%)	19,912 (69.5%)	0.156
6 to 7 PCEs	34,002 (52.3%)	7,126 (21.0%)	26,876 (79.0%)	

[a]MH based on a mental health care provider ever told the child had ADHD, anxiety issues, behavioral/conduct issues, or depression; [b]p-value based on X^2 test of independence; [c]National Scientific Council on the Developing Child; [d]positive childhood experiences; [e]Health Outcomes from Positive Experiences

children had each protective factor except for volunteerism. While all the protective factors and cumulative PCE scores were significant, other adult/mentor relationships, volunteerism, a safe neighborhood, a supportive neighborhood, and mastery had a very weak to weak relationship with mental health issues based on a Cramer's V of less than 0.10 (Akoglu, 2018). The cumulative NSCDC PCEs score and self-regulation had a very strong relationship; parent relationships/sharing ideas and the cumulative HOPE PCEs score had a strong relationship based on Cramer's V (Akoglu, 2018).

Comparison of Resilience Frameworks and Models

Table 5 summarizes the variance in childhood mental health outcomes (Nagelkerke's R^2) explained by each model by block across each sample and analyses framework. The ΔR^2 identifies whether the addition of the factors in that block significantly improved the model; the percent of cases classified correctly demonstrates the practical significance of the model. In the full sample, covariates were significantly associated with mental health issues (X^2 (10) = 1,233.24, p<0.001) and explained 2.7% of the variance in childhood mental health. In the analyses that excluded ACEs, the models in block two with the protective factors from the NSCDC framework (X^2 (15) = 10,373.29, p<0.001) and HOPE framework (X^2 (17) = 4,156.74, p<0.001) added were significant with the ΔR^2 also being significant, demonstrating the effectiveness of each framework. The NSCDC framework explained 21.5% of the variance in mental health issues while the HOPE framework only explained 9.0% of the variance. The overall model was significant with the addition of the cumulative PCE score for the NSCDC framework (X^2 (17) = 10,388.36, p<0.001) and HOPE framework (X^2 (19) = 4,160.43,

Table 5

Comparison of the NSCDC[a] and HOPE[b] Frameworks Relationship with Childhood Mental Health[c] Based on Nagelkerke's R^2

Analysis Type/ Framework	Overall Sample Size	% Classified Correct[d] by Chance	Block #1 (Covariates Only)		Block #2 (Block #1 & ACE Count) (If Applies)			Block #3 (Block #2 & Protective Factors)			Block #4 (Block #3 & Cumulative PCE Count)		
			R^2	% Classified Correct[d]	R^2	ΔR^2	% Classified Correct[d]	R^2	ΔR^2	% Classified Correct[d]	R^2	ΔR^2	% Classified Correct[d]
Full Sample (PCEs[e] Only)													
NSCDC[a] Framework	65,072	61.21%	0.027***	73.70%				0.215***	0.188***	77.40%	0.216***	0.001***	77.40%
HOPE[b] Framework	65,072	61.21%	0.027***	73.70%				0.090***	0.063***	75.00%	0.091***	0.001	75.00%
Full Sample (PCEs[e] & ACEs[f])													
NSCDC[a] Framework	65,072	61.21%	0.027***	73.70%	0.103***	0.076***	74.50%	0.254***	0.151***	78.40%	0.254***	0.000*	78.40%
HOPE[b] Framework	65,072	61.21%	0.027***	73.70%	0.103***	0.076***	74.50%	0.145***	0.042***	75.60%	0.145***	0.000	75.60%
Children Experiencing 0 ACEs[f]													
NSCDC[a] Framework	36,562	69.64%	0.024***	81.30%				0.180***	0.156***	82.60%	0.180***	0.000	82.60%
HOPE[b] Framework	36,562	69.64%	0.024***	81.30%				0.072***	0.048***	81.70%	0.073***	0.001	81.70%
Children Experiencing 1 ACE[f]													
NSCDC[a] Framework	14,739	59.80%	0.025***	72.10%				0.188***	0.163***	75.80%	0.188***	0.000	75.90%
HOPE[b] Framework	14,739	59.80%	0.025***	72.10%				0.072***	0.047***	73.10%	0.072***	0.000	73.00%
Children Experiencing 2 to 3 ACEs[f]													
NSCDC[a] Framework	9,688	52.03%	0.031***	59.90%				0.207***	0.176***	70.10%	0.208***	0.001	70.10%
HOPE[b] Framework	9,688	52.03%	0.031***	59.90%				0.070***	0.039***	63.40%	0.071***	0.001	63.40%
Children Experiencing 4 or More ACEs[f]													
NSCDC[a] Framework	4,083	50.98%	0.016***	57.80%				0.238***	0.222***	69.90%	0.240***	0.002*	69.90%
HOPE[b] Framework	4,083	50.98%	0.016***	57.80%				0.082***	0.066***	60.60%	0.082***	0.000	60.50%

[a]National Scientific Council on the Developing Child; [b]Health Outcomes from Positive Experiences; [c]ever told by healthcare provider their child had ADHD, anxiety issue, depression, or behavioral/conduct issue; [d]percentage of cases accurately classified by model; [e]positive childhood experiences; [f]adverse childhood experiences; *p<0.05; **p<0.01; ***p<0.001

p<0.001), but the ΔR^2 was only significant for the NSCDC framework. However, the NSCDC model still only explained 21.6% of the variance in mental health issues and did not improve the percentage of cases classified correctly. Thus, the addition of a cumulative PCE did not practically improve either of the models.

When including ACEs in the full sample, the second block with ACEs and covariates was significant (X^2 (13) = 4,761.86, p<0.001) and explained 10.3% of the variance. ACEs groupings significantly improved the model over just covariates based on a ΔR^2 of 0.076 (p < 0.001), demonstrating the relationship between ACEs and mental health issues. The addition of NSCDC and HOPE framework protective factors significantly improved each model based on the ΔR^2, demonstrating the effectiveness of each framework after controlling for ACEs. The NSCDC framework explained 25.4% of the variance in mental health issues compared to 14.5% for the HOPE framework. The ΔR^2 in block 4 was only significant for the NSCDC framework but lacked practical significance since the R^2 value and percent classified correctly didn't change.

Similar outcomes were found across ACEs subgroups. In each ACE subgroup, the addition of the resilience frameworks significantly improved each model with the NSCDC framework having a stronger relationship with childhood mental health than the HOPE framework based on Nagelkerke's R^2. Across ACEs subgroups, the addition of a cumulative PCEs score was only significant for the NSCDC framework among children experiencing 4 or more ACEs. However, the model still lacked practical significance. When comparing ACE groupings in models in block 3, the most variance in mental health issues was explained by the NSCDC framework among children experiencing 4 or more ACEs (Nagelkerke's R^2 = 0.238). While the amount of variance explained by the

HOPE framework and covariates was highest in the same group (Nagelkerke's R^2 = 0.082), a similar graded relationship was not seen across ACEs subgroups.

Comparison of Protective Factors within Frameworks

The adjusted odds ratios using the NSCDC framework protective factors after controlling for covariates and ACEs (if applicable) are presented in Table 6. Of the

Table 6

Adjusted Odds Ratios of Child Mental Health Issues[a] Using the NSCDC[b] Framework Across Analyses[c]

Covariates/Protective Factors	Full Sample (PCEs[d] Only) (n=65,027)	Full Sample (PCEs[d] & ACEs[e]) (n=65,027)	Children with 0 ACEs[e] (n=36,562)	Children with 1 ACE[e] (n=14,739	Children with 2 3 ACEs[e] (n=9,688)	Children with ≥ 4 ACEs[e] (n=4,083)
Covariates						
Race/Ethnicity						
Caucasian (Referent)						
Black/African American	0.73***	0.67***	0.77***	0.64***	0.59***	0.73**
Other	0.67***	0.63***	0.54***	0.66***	0.66***	0.85
Female (Male as Referent)	0.85***	0.84***	0.84***	0.82***	0.86**	0.80**
13-17 Years (6-12 as Referent)	1.98***	1.85***	1.90***	1.87***	1.91***	1.38***
Household Income						
≥400% FPL (Referent)						
200%-399% FPL	0.97	0.88***	0.85***	0.86**	1.01	0.91
<200% FPL	1.14***	0.88***	0.79***	0.83**	1.08	1.07
Parents' Highest Education						
≥ College Degree (Referent)						
Some College/Assoc Degree	1.01	0.88***	0.95	0.88*	0.77***	0.79**
High School Degree or Other	0.92**	0.80***	0.88*	0.81**	0.69***	0.72**
Less than High School	0.58***	0.55***	0.51***	0.58***	0.57***	0.53***
During COVID-19	0.91***	0.93	0.89***	0.95	0.95	1.02
Number of ACEs[e] Experienced						
0 ACEs (Referent)						
1 ACE		1.57***				
2 to 3 ACEs		2.49***				
4 or More ACEs		4.57***				
NSCDC[b] Framework Protective Factors						
Parent/Caregiver Relationship	0.43***	0.45***	0.36***	0.51***	0.54***	0.47***
Other Adult Relationship	1.08*	1.09*	1.14*	0.97	1.17*	1.07
Strong Self/Regulation	0.18***	0.19***	0.18***	0.20***	0.21***	0.19***
Mastery	0.74***	0.76***	0.72***	0.71***	0.84**	0.82*
Hopeful/Affirming Tradition	0.68***	0.79***	0.70***	0.90	0.83*	0.71**

[a]Ever told by healthcare provider their child had ADHD, anxiety issue, depression, or behavioral/conduct issue; [b]National Scientific Council on the Developing Child; [c]all analyses based on block 3; [d]positive childhood experiences; [e]adverse childhood experiences; *p<0.05; **p<0.01; ***p<0.001

covariates, age, race, and education had the strongest relationship with childhood mental health. In the full sample that included ACEs, age had the strongest relationship (AOR = 1.85) followed by less than a high school education compared to at least a college degree (AOR = 0.55) and other race compared to white (AOR = 0.63). Children experiencing 4 or more ACEs were 4.57 times more likely to have a mental health issue than children experiencing 0 ACEs. Self-regulation and parent/caregiver relationship had the strongest relationship with mental health across analyses. After controlling for the other variables, children with strong-self regulation were 5.26 times (1.00/0.19) less likely to have mental health issues; children with supportive parent/caregiver relationships were 2.22 times (1.00/0.45) less likely to have mental health issues. Mastery and a hopeful/affirming cultural tradition were the third and fourth strongest protective factors. Other adult relationships were only significant in some analyses.

The adjusted odds ratios using the HOPE framework protective factors after controlling for covariates and ACEs (if applicable) are presented in Table 7. After controlling for other variables, parents' highest level of education, race, and age were the covariates with the strongest relationship with mental health issues. In the full sample that included ACEs, children of parents that did not complete high school compared to those that completed college (AOR = 0.54) was the strongest covariate followed by other race compared to Caucasian (AOR = 0.61), black/African American compared to Caucasian AOR = 0.65), and adolescent compared to younger children (AOR = 1.44). Similar relationships were found across analyses with some variations in age and race. Children experiencing 4 or more ACEs were 5.26 times more likely to have mental health issues. Sharing ideas was the strongest protective factor followed by after-school activities and

Table 7

Adjusted Odds Ratios of Child Mental Health Issues[a] Using the HOPE[b] Framework Across Analyses[c]

Covariates/Protective Factors	Full Sample (PCEs[d] Only) (n=65,027)	Full Sample (PCEs[d] & ACEs[e]) (n=65,027)	Children with 0 ACEs[e] (n=36,562)	Children with 1 ACE[e] (n=14,739)	Children with 2 3 ACEs[e] (n=9,688)	Children with ≥ 4 ACEs[e] (n=4,083)
Covariates						
Race/Ethnicity						
Caucasian (Referent)						
Black/African American	0.70***	0.65***	0.71***	0.65***	0.59***	0.71**
Other	0.63***	0.61***	0.51***	0.64***	0.67***	0.76**
Female (Male as Referent)	0.82***	0.80***	0.81***	0.79***	0.82***	0.81**
13-17 Years (6-12 as Referent)	1.55***	1.44***	1.48***	1.48***	1.48***	1.09
Household Income						
≥400% FPL (Referent)						
200%-399% FPL	0.98	0.88***	0.85***	0.88**	1.02	0.94
<200% FPL	1.17***	0.90***	0.79***	0.86**	1.13	1.08
Parents' Highest Education						
≥ College Degree (Referent)						
Some College/Assoc Degree	1.02	0.89***	0.96	0.87**	0.82***	0.81**
High School Degree or Other	0.89***	0.79***	0.84**	0.78***	0.74***	0.72***
Less than High School	0.54***	0.54***	0.47***	0.54***	0.63***	0.51***
During COVID-19	1.02	1.03	1.01	1.03	1.07	1.08
Number of ACEs[e] Experienced						
0 ACEs (Referent)						
1 ACE		1.61***				
2 to 3 ACEs		2.67***				
4 or More ACEs		5.26***				
HOPE[b] Framework Protective Factors						
Mentor Relationship	1.09**	1.06	1.11	0.97	1.09	1.06
Family Resilience	0.63***	0.71***	0.64***	0.76***	0.75***	0.71***
Supportive Neighborhood	0.86***	0.93**	0.92*	0.89**	0.98	0.97
Safe Neighborhood	0.84***	0.90***	0.85***	0.94	0.95	0.86*
After-School Activities	0.63***	0.65***	0.61***	0.62***	0.75***	0.64***
Volunteerism	0.85***	0.89***	0.86***	0.86***	0.97	0.98
Sharing Ideas	0.27***	0.28***	0.22***	0.31***	0.35***	0.32***

[a]Ever told by healthcare provider their child had ADHD, anxiety issue, depression, or behavioral/conduct issue; [b]Health Outcomes from Positive Experiences; [c]all analyses based on block 3; [d]positive childhood experiences; [e]adverse childhood experiences; *p<0.05; **p<0.01; ***p<0.001

family resilience in most analyses and subsamples. In the full sample that included ACEs, children that shared ideas with a parent were 3.57 times (1.00/0.28) more likely not to have mental health issues than children that did not share ideas. Children that participated in at least one after-school activity were 1.54 (1.00/0.65) less likely to have mental health issues; children with family resilience were 1.41 (1.00/0.71) times less likely to have

mental health issues. There was a similar relationship with children experiencing 4 or more ACEs.

Discussion

The purpose of this study was to compare the relationship between three resilience frameworks and their protective factors with childhood mental health issues among children experiencing ACEs. When comparing R^2 values, this study found that the NSCDC framework had a stronger relationship with childhood mental health than the HOPE framework across all analyses and ACEs subgroups. The addition of a cumulative HOPE PCE score was not statistically significant; the addition of a cumulative NSCDC PCE score was statistically significant in the full sample. However, the addition of a cumulative PCE score in both models lacked practical significance. Similar findings were found after controlling for ACEs and across ACE groupings. Self-regulation and supportive parent/caregiver relationships were the strongest NSCDC framework protective factors across all analyses. Sharing ideas with parents, family resilience, and extracurricular activities were the strongest HOPE framework protective factors.

Comparison of the NSCDC and HOPE Frameworks

For the first specific aim, this study found that the NSCDC framework and covariates explained more variance in childhood mental health issues (21.5%) than the HOPE framework (9.0%). Thus, the NSCDC framework had a stronger relationship with childhood mental health. The effectiveness of the NSCDC framework aligns with historic resilience research that has demonstrated the effectiveness of the NSCDC protective

factors (Masten, 2018; Wright et al., 2013). Previous studies have also established a relationship between the NSCDC protective factors and mental health (Brumariu & Kerns, 2010; Kasen et al., 2012; Sawyer et al., 2015; Sparks et al., 2021; Tambelli et al., 2012). The NSCDC framework also included the two strongest protective factors in the study across analyses: self-regulation and parent/caregiver relationships. Strong self-regulation is a well-established protective factor (Polizzi & Lynn, 2021) and has been suggested as a mediator between other protective factors and resilience (Heard-Garris et al., 2018; Watters & Wojciak, 2020). Thus, self-regulation may capture the indirect effect of other protective factors not in this study. The NSCDC framework also captured the strongest HOPE framework protective factor, sharing ideas, due to the item being identical to parent/caregiver relationships with different terminology across frameworks. Thus, the NSCDC framework captured the two most salient factors. Research is still needed to determine if the NSCDC framework has a similar relationship to other outcomes impacted by ACEs.

While the addition of the HOPE framework protective factors improved the model, the amount of variance explained was modest compared to the NSCDC framework. While no known studies have explored the relationship between the entire HOPE framework and childhood mental health, the relative strength was surprising since the framework identifies factors across multiple ecological levels (Sege & Harper Browne, 2017). Researchers have argued that interventions that target factors across ecological levels are more effective (McLeroy et al., 1988; Richard et al., 2011) and have found a relationship between ecological factors and mental health (Figge et al., 2018; Mian et al., 2011; Taylor & Distelberg, 2016). However, some studies have found that

individual-level factors have a stronger relationship with mental health with other ecological factors having an indirect effect on mental health through individual factors (Mian et al., 2011; Taylor & Distelberg, 2016). Thus, the relationship between some HOPE framework protective factors and childhood mental health could have been mediated by an individual-level factor not included or self-regulation. The HOPE framework protective factors in this study were also based on factors identified by other researchers using the NSCH (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021). The original HOPE framework identified four categories of protective factors (Sege & Harper Browne, 2017) with subsequent studies by other researchers conceptualizing factors used in this study (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021). The selection of different protective factors could strengthen the model. Future studies should consider how HOPE protective factors could be reconceptualized to integrate more salient protective factors and explore indirect relationships.

For the fourth specific aim, the NSCDC framework still had a stronger relationship with childhood mental health than the HOPE framework after controlling for ACEs. For the fifth specific aim, the NSCDC framework had a stronger relationship across all ACEs subgroups. The only other known study exploring the NSCDC framework also found the NSCDC protective factors explained 27.1% of the variance in childhood mental health issues among children experiencing 4 or more ACEs (Keane & Evans, 2022). Other studies also found that individual NSCDC protective factors were associated with a lower likelihood of mental health issues and other negative outcomes

among those experiencing multiple ACEs (Bellis et al., 2017; Brown & Shillington, 2017; Sparks et al., 2021; Yamaoka & Bard, 2019). However, the HOPE framework was not as effective as the NSCDC framework after controlling for ACEs or across ACE subgroups. While the HOPE framework and covariates explained 8.2% of the variance among children experiencing 4 or more ACEs, the framework explained more variance in the entire sample with inconsistent patterns across other ACE groupings. Thus, the NSCDC framework has a stronger relationship with childhood mental health after controlling for ACEs and across ACE groupings with the strongest relationship found among children exposed to 4 or more ACEs.

Impact of Cumulative PCEs

The third specific aim determined whether the addition of a cumulative PCE score strengthened each model. While the cumulative NSCDC framework PCE score did statistically strengthen the model when using the entire sample excluding ACEs, the model lacked practical significance since it only explained an additional 0.1% of the variance. The addition of a cumulative HOPE framework PCE score was not statistically significant. The addition of a cumulative PCE score also did not practically improve the models after controlling for ACEs or across ACE groupings for the fourth and fifth specific aims. These findings are inconsistent with previous studies where a cumulative PCEs score was associated with better outcomes, including mental health outcomes (Baglivio & Wolff, 2020; Bethell, Jones, et al., 2019; Crandall et al., 2019; Novak & Fagan, 2022; Robles et al., 2019). Unlike those studies, this study explored whether the addition of a cumulative PCE score strengthened the model over the individual protective

factors. This study demonstrated that a cumulative PCE score had no additional impact above the individual protective factors. While no known studies have used a similar approach, others have found similar limitations with ACEs, which is a measure of cumulative risk (Lacey & Minnis, 2020; Negriff, 2020). Researchers found not all ACEs are equal with maltreatment ACEs typically being linked to more negative outcomes (Lacey & Minnis, 2020; Negriff, 2020; Sayyah et al., 2022). Certain ACEs also may interact synergistically (Briggs et al., 2021). Thus, authors have suggested that theoretical groupings of individual ACEs may be more meaningful (Lacey & Minnis, 2020). While less research has explored cumulative PCEs, this study suggests the most salient PCEs may have a stronger relationship with childhood mental health than a cumulative PCE score. Alternatively, the NSCDC and HOPE PCEs used in this study differed from previous studies (Baglivio & Wolff, 2020; Bethell, Jones, et al., 2019; Crandall et al., 2020; Novak & Fagan, 2022; Robles et al., 2019). The inclusion of different PCEs may strengthen the relationship between the cumulative PCEs framework and childhood mental health. Also, while a cumulative PCEs score did not practically improve the models, X^2 tests did find a strong to very strong relationship between cumulative PCEs scores and childhood mental health. Thus, while a cumulative PCEs score did not strengthen the models in this study, cumulative PCEs do have some relationship with childhood mental health. Future research should identify the most important PCEs to better compare the cumulative PCE framework with other frameworks.

Strongest Protective Factors

When using the NSCDC framework, self-regulation and supportive parent/caregiver relationships were the strongest protective factors. A hopefully affirming family tradition and mastery also significantly contributed to the model but had a weaker relationship. The previous NSCDC framework study also found that self-regulation and parent/caregiver relationships had the strongest relationship with childhood mental health (Keane & Evans, 2022). Other researchers have also recognized self-regulation (Foster & Weinstein, 2019; Song & Qian, 2020) and parent/caregiver relationships (Centers for Disease Control and Prevention [CDC], 2013; NSCDC, 2015; Robles et al., 2019) as important protective factors against ACEs. Thus, interventions utilizing the NSCDC framework should likely prioritize these two protective factors. A hopeful, affirming family tradition and mastery also significantly contributed to the model across most analyses and subgroups. Previous studies have also found hope (Munoz, 2022; Sparks et al., 2021) and mastery (Montpetit & Tiberio, 2016; Ramakrishnan & Masten, 2020) were associated with more favorable outcomes among those experiencing ACEs. However, while the results were significant in this study, the items on the NSCH for these two factors did not align as closely with the NSCDC framework's definitions as the other factors (NSCDC, 2015). This may have limited the effectiveness of these factors. Other adult relationships had an insignificant or weak relationship with childhood mental health. Since the NSCDC framework posits that the presence of at least one resilience-building adult relationship builds resilience to overcome ACEs (NSCDC, 2015), the addition of another adult relationship may not have added any additional benefit since 95% of children already had a strong parent/caregiver relationship. Thus, a better

measure of a resilience-building adult relationship may be the presence of either a parent/caregiver relationship or another adult relationship.

With the HOPE framework, sharing ideas had the strongest relationship with childhood mental health; family resilience and after-school activities were the next strongest factors. These were the only other significant protective across analyses and ACEs subgroups. The NSCH item that measured sharing ideas was identical to the NSCDC supportive parent/caregiver relationship item. Thus, this factor was significant in both frameworks and consistent with previous studies (CDC, 2013; Keane & Evans, 2022; NSCDC, 2015; Robles et al., 2019); sharing ideas has also been identified as a protective factor against grade retention (Crouch, Radcliff, Merrell, Hung, et al., 2021). Studies have also found after-school activities (Crouch, Radcliff, Merrell, Hung, et al., 2021) and family resilience were protective factors against negative outcomes (Bethell, Gombojav, et al., 2019; Song et al., 2021). While a supportive neighborhood, safe neighborhood, and volunteerism were statistically significant in both analyses including the entire sample, the relative strength was weaker with these relationships not being significant in most ACEs subsamples. These findings are inconsistent with previous non-ACE studies where neighborhood characteristics were associated with a decreased likelihood of childhood mental health issues (Butler et al., 2012; Dahal et al., 2018). However, these studies involved mostly demographic and community-level factors. One explanation is that the relationship between neighborhood characteristics and mental health may be mediated by other individual or family-level factors already included in this study (Sharp et al., 2021). When considering volunteerism and mentor relationships, no known studies have validated volunteerism as a protective factor against ACEs, and

none of the HOPE framework studies identified volunteerism as a significant protective factor (Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). Therefore, while volunteerism was significant in some analyses, the study lacked practical significance due to the inconsistent results across subsamples and relatively weak odds ratios. Like the NSCDC framework, mentor relationships, which used the same item as other adult relationship, was only significant among the entire sample when excluding ACEs, likely due to the same reasons discussed previously. Thus, interventions utilizing the HOPE framework should likely prioritize sharing ideas with a secondary emphasis on extracurricular activities and family resilience.

Limitations

While the findings were promising, this study has several limitations. Due to the cross-sectional design, the study cannot infer a causal or temporal relationship between any factors and childhood mental health. The measures were also limited by the NSCH items. While previous studies identified NSCH items for each framework, the items do not correspond exactly with the protective factors described by these frameworks. Future studies that utilize instruments that fully capture the protective factors as identified by these frameworks are needed to further validate this study's findings. The NSCH also excluded some traditional ACEs while including additional ACEs not as widely accepted. The study also relied on parent/caregiver-reported data, potentially underreporting some ACEs or misrepresenting their child's perception of protective factors. Nevertheless, these limitations are common in cross-sectional, secondary data analysis.

While the protective factors identified in this study aligned with previous studies using the HOPE (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021) and cumulative PCEs frameworks (Crouch, Radcliff, Merrell, Brown, et al., 2021), the original theorist did not conceptualize how they were captured in this study. The HOPE framework identified four categories of protective factors (Sege & Harper Browne, 2017), but subsequent studies by different researchers identified the specific protective factors utilizing the NSCH (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021). Other items on the NSCH may have fit the HOPE framework. This study also assumed the unique contribution of the cumulative PCEs framework was the number of PCEs experienced since previous studies did not utilize consistent protective factors. However, the inclusion of different PCE factors may have strengthened the model. Due to the purpose of the study, a combined measure of childhood mental health issues was used. However, some of the resilience frameworks or protective factors may have had a stronger relationship with some of the specific mental health issues. Finally, some data were also collected prior to the COVID-19 pandemic, and some were collected during the pandemic. While a COVID-19 covariate was added to control for this factor, the pandemic could have impacted other aspects of the study. The study also only explored three frameworks based on previous literature. Models that include different factors or a combination of factors across models may be more effective. Finally, this study only compared the strength of these frameworks using the outcome of childhood mental health. Future research should examine other childhood outcomes.

Conclusions and Future Research

Despite the promise of the NSCDC framework, additional research is still needed to further validate the effectiveness of the NSCDC framework compared to other frameworks. Future studies should explore whether similar findings are found across other childhood outcomes, including specific mental health issues. Researchers should also consider the development of instruments designed to measure the protective factors from these frameworks and implement longitudinal studies to better understand the causal relationship between ACEs, resilience frameworks, and childhood outcomes. Studies are also needed to examine whether other protective factors should be included or excluded from these frameworks and whether more effective frameworks can be developed through the integration of protective factors from multiple frameworks.

Nevertheless, this was the first known study to compare the effectiveness of the NSCDC, HOPE, and cumulative PCE frameworks in building resilience to overcome the impact of ACEs on childhood mental health. This study found that the NSCDC framework had the strongest relationship with childhood mental health; the HOPE framework had a weaker significant relationship. The cumulative PCEs framework did not practically contribute to either model. These findings were consistent across ACEs subgroups and after controlling for ACEs. This demonstrated the ability of the NSCDC framework to build resilience among children experiencing ACEs to reduce the risk of childhood mental health issues. Self-regulation and parent/caregiver relationships also had the strongest relationship followed by a hopeful family tradition and mastery.

Based on these findings, researchers and practitioners should explore the development of interventions using the NSCDC framework among children who

experienced ACEs to improve childhood mental health. These interventions should prioritize self-regulation and parent/caregiver relationships. Building on the GMVP (Gelberg et al., 2000) and this study, future interventions should recognize the impact of predisposing factors like ACEs, race/ethnicity, age, sex, and parental education along with the enabling factor of household income on childhood mental health. To mitigate ACEs, interventions should focus on enabling factors identified by the NSCDC framework that build resilience such as parent/caregiver relationships and self-regulation skills while creating opportunities for children to build mastery and working with families and communities to promote predisposing factors that develop a hopeful and affirming cultural tradition. While not explored in this study, the GMVP also recognizes the importance of identifying a health need prior to engaging in health practices or using healthcare services (Babitsch et al., 2012). Thus, interventions should promote the need and benefit of NSCDC interventions to adults and children to ensure the utilization of interventions. Collectively, this study demonstrated that the NSCDC framework was associated with a lower likelihood of childhood mental health issues among children who experienced ACEs and should potentially be used to inform future interventions.

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MANUSCRIPT 2: ADVERSE CHILDHOOD EXPERIENCES, PROTECTIVE FACTORS, AND CHILDHOOD OBESITY: EXPLORING THE EFFECTIVENESS OF THREE RESILIENCE FRAMEWORKS

by

KEVIN KEANE, RETTA R. EVANS, LARRELL WILKINSON, DIONE MOULTRIE KING, LINDSAY LEBAN, DAVID MACRINA

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Abstract

While rates of childhood obesity continue to rise in the United States, multiple studies have linked childhood obesity to adverse childhood experiences (ACEs). ACEs researchers have begun to develop frameworks that identify protective factors that build resilience against ACEs. However, these frameworks have a limited evidence base. This study compared the effectiveness of the National Scientific Council on the Developing Child (NSCDC), Health Outcomes from Positive Experiences (HOPE), and cumulative positive childhood experiences (PCEs) frameworks in mitigating the impact of ACEs on childhood obesity. Based on hierarchical logistic regression using data from the 2018-2020 National Survey of Children's Health, this study found that both the NSCDC and HOPE frameworks were associated with childhood obesity with each framework explaining a similar amount of variance in childhood obesity across analyses and ACEs subgroups. The cumulative PCEs framework did not strengthen the relationship between either framework and childhood obesity. Across analyses and ACEs groupings, strong self-regulation, mastery/after-school activities, and living in a supportive neighborhood had the strongest relationship with childhood obesity. The findings suggest that the most salient protective factors may be those most closely associated with the direct causes of childhood obesity with the need to identify factors across ecological levels. Future research is needed to further validate these frameworks and explore these frameworks with other outcomes. The implications include approaches to leveraging these findings for future interventions using the Gelberg-Andersen Model for Vulnerable Populations.
Keywords: resilience, adverse childhood experiences, protective factors, childhood obesity

Introduction

From 2017 through 2020, approximately 41.9% of adults in the United States (U.S.) were considered obese (Stierman et al., 2021). Adults who are obese are at increased risk of chronic disease and earlier death (Greenberg, 2013; Keramat et al., 2021; Steele et al., 2017). Childhood obesity has also been linked to adult obesity (Sanyaolu et al., 2019). From 2107 to 2018, approximately 19.5% of children between 2 and 19 years old in the U.S. were obese (Stierman et al., 2021). Childhood obesity rates have been rising in the U.S. with significant increases in recent years (Ogden et al., 2020) and have been linked to childhood diabetes, asthma, sleep apnea, depression, lower self-esteem, eating disorders, and other negative outcomes (Sahoo et al., 2015; Sanyaolu et al., 2019). Rates of childhood obesity tend to increase in prevalence with age (Ogden et al., 2020). Also, while males and females had similar rates of childhood obesity, childhood obesity is highest among Hispanic and Black/African American populations along with children from lower-income households (Stierman et al., 2021). Thus, childhood obesity presents a serious public health issue that is linked to childhood health issues, adult obesity, and chronic disease with certain populations being at increased risk.

Adverse Childhood Experiences

While multiple factors contribute to childhood obesity (Sahoo et al., 2015), one factor that has been linked to childhood obesity is adverse childhood experiences (ACEs) (Burke et al., 2011; Davis et al., 2019; McKelvey et al., 2018; Schroeder et al., 2021). In the seminal ACEs study, ACEs were identified as categories of childhood maltreatment and household dysfunction that had a dose-wise relationship with risky health behaviors

and poorer short and long-term health outcomes among adults with those experiencing 4 or more categories of ACEs being at the highest risk (Felitti et al., 1998). Subsequent studies have considered expanding ACEs to include other types of traumatic events (Finkelhor et al., 2013; Wade et al., 2014). Multiple studies have replicated and built on the findings of the original ACEs study by establishing a dose-wise relationship between ACEs and multiple behavioral issues, psychosocial issues, and negative health outcomes (Brown et al., 2009; Campbell et al., 2016; Petruccelli et al., 2019). Children who experienced ACEs are also at increased risk for poorer school, mental health, and health outcomes (Bellis et al., 2018; Bitsko et al., 2022; Crouch, Radcliff, Hung, et al., 2019; Meeker et al., 2021).

Children who have experienced ACEs are also at increased risk for obesity. Compared to youth who did not experience ACEs, youth who experienced 4 ACEs were 1.6 times more likely to be obese and 1.9 times more likely to be severely obese; youth who experienced 6 ACEs were 2.0 times more likely to be obese and 4.2 times more likely to be severely obese (Davis et al., 2019). Children who experienced 4 or more ACEs before the age of three were also found to be 2.7 times more likely to be obese at 11 years old than those who did not experience ACEs (McKelvey et al., 2019). With 46.3% of children in the U.S. experiencing at least one ACE and 21.7% of children experiencing multiple ACEs (Bethell et al., 2017), ACEs have the potential to significantly contribute to childhood obesity in the U.S. Thus, identifying protective factors that can build resilience to mitigate the impact of ACEs on childhood obesity is one promising approach to reducing childhood obesity.

Resilience and Protective Factors

Beginning in the early 1900s, researchers began to identify protective factors that allowed individuals to exhibit resilience – the ability to adapt and succeed – despite exposure to trauma and adversity (Masten, 2018; Wright et al., 2013; Zolkoski & Bullock, 2012). Researchers were able to identify multiple protective factors that were associated with an increased likelihood of resilience (Masten, 2018; Wright et al., 2013). Subsequent resilience research recognized that resilience is often context-dependent and that protective factors are best understood when considering how they relate to one another (Wright et al., 2013). ACEs researchers and practitioners have recently begun to adopt protective factors from previous resilience research (Hornor, 2017; Ortiz, 2019; Sciaraffa et al., 2017). However, research has not yet established many of these protective factors as promoting resilience specifically against ACEs (Traub & Boynton-Jarrett, 2017). While some studies have begun to explore the effectiveness of some of these protective factors in isolation (Areba et al., 2021; Crouch, Radcliff, Strompolis, et al., 2019), frameworks and models that describe how protective factors work together to build resilience are needed to drive future interventions consistent with previous resilience research. While having a limited evidence base, three prominent ACEs resilience frameworks have recently emerged in the literature.

National Scientific Council on the Developing Child Framework

The National Scientific Council on the Developing Child (NSCDC) framework identifies four childhood protective factors that build resilience against ACEs with at least one supportive, caring, and stable adult relationship, or resilience-building

relationship, being the most important protective factor. The four protective factors are strong self-regulation/executive functioning, mastery in some area, a resilience-building adult relationship, and a supportive, affirming, hopeful cultural or faith tradition (National Scientific Council on the Developing Child [NSCDC], 2015). The individual protective factors from the NSCDC framework are based on previous resilience research (Masten, 2018) with some evidence of the effectiveness of individual protective factors in building resilience against ACEs (Bellis et al., 2017; Sparks et al., 2021; Yamaoka & Bard, 2019). The only known study exploring the effectiveness of this framework among children who experienced ACEs found that the NSCDC framework was associated with a lower likelihood of childhood mental health issues among children experiencing 4 or more ACEs (Keane & Evans, 2022). Despite the promise of this study, a more extensive evidence base is needed to validate the effectiveness of this framework and to determine whether the NSCDC framework is associated with a lower risk of other negative outcomes, including childhood obesity, prior to being used to guide interventions.

Health Outcomes from Positive Experiences Framework

The Health Outcomes from Positive Experiences (HOPE) framework recognizes that health encompasses several domains with resilience being the byproduct of factors at multiple ecological levels. Resilience against ACEs is developed through factors in four categories during childhood: having relationships that are nurturing and supportive; being in environments that are protective, equitable, and stable; having opportunities to engage in social activities that are constructive and promote connectedness; and developing emotional and social competencies (Sege & Harper Browne, 2017). Compared to the

NSCDC framework, the HOPE framework has a slightly larger evidence base with four known studies exploring the framework (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). One study including ACEs explored whether HOPE framework protective factors were associated with a lower likelihood of children being overweight or obese. The study found that one HOPE framework protective factor, living in a supportive neighborhood, was associated with a lower likelihood of children experiencing 2 or more ACEs being overweight or obese (Crouch et al., 2022). Other studies identified specific HOPE framework protective factors associated with better school outcomes (Crouch, Radcliff, Merrell, Hung, et al., 2021) and childhood depression (Elmore et al., 2020). None of these studies examined the overall effectiveness of the framework. Also, different protective factors were significant across studies with ACEs included inconsistently. Research is needed to validate the effectiveness of the HOPE framework and compare the effectiveness to other resilience frameworks among children who experienced ACEs.

Cumulative Positive Childhood Experiences Framework

According to the cumulative positive childhood experiences (PCEs) framework, categories of positive experiences in childhood have a graded, dose-wise relationship with fewer adverse outcomes among individuals who have experienced ACEs (Baglivio & Wolff, 2020; Bethell et al., 2019). Unlike the previous frameworks, this framework seeks to maximize the number of protective factors rather than target the most important factors. Researchers have borrowed PCEs from historic resilience research with inconsistencies in the specific protective factors and terminology used across studies

(Bethell et al., 2019; Crandall et al., 2020; Crouch, Radcliff, Merrell, Brown, et al., 2021; Robles et al., 2019). Nevertheless, studies have found cumulative PCEs were associated with lower levels of mental health issues, risky sexual behaviors, and substance abuse in adulthood after controlling for ACEs (Bethell et al., 2019; Crandall et al., 2020). Exposure to more PCEs has also been found to be a protective factor against recidivism and delinquency among youth who experienced multiple ACEs (Baglivio & Wolff, 2020; Novak & Fagan, 2022). However, no known studies have examined the relationship between the cumulative PCEs and childhood obesity; the one adult study exploring this framework found that an above-median PCE score was associated with a lower likelihood of obesity, but the relationship was no longer significant after controlling for ACEs (Kuhar & Zager Kocjan, 2021). Thus, while preliminary evidence has linked the cumulative PCEs framework with better outcomes among those who experienced ACEs, additional research is needed to explore the relationship with childhood obesity and to compare the framework to approaches using the most salient factors.

Gelberg-Andersen Model for Vulnerable Populations

In addition to ACEs and protective factors, multiple other factors have been associated with childhood obesity (Olson et al., 2016; Singh et al., 2008; Williams et al., 2018). For this study, the Gelberg-Andersen Model for Vulnerable Populations (GMVP) was utilized to identify other potential factors influencing obesity from the National Survey of Children's Health (NSCH) and to conceptualize future interventions based on the study's findings. The GMPV theorizes that predisposing characteristics, enabling resources, and perceived need from the traditional and vulnerable domains influence

health behaviors, healthcare utilization, and the health status of vulnerable populations, including children and those experiencing trauma (Gelberg et al., 2000). The previously identified ACEs and protective factors would be considered predisposing and enabling factors. Other sociodemographic factors identified by the GMPV include socioeconomic status, parental education, gender, and race/ethnicity (Gelberg et al., 2000; Singh et al., 2008; Williams et al., 2018). Thus, these factors were used in this study and considered in the implications of this study.

The Current Study

Building on previous research, the current study addresses four gaps in the literature. First, while historic resilience research has identified several protective factors (Masten, 2018; Wright et al., 2013), few studies have explored the effectiveness of these protective factors specifically among those who have experienced multiple ACEs (Traub & Boynton-Jarrett, 2017). Since protective factors are context-specific (Wright et al., 2013), this study filled this gap by exploring the effectiveness of these protective factors among children who experienced ACEs. Second, resilience is best understood within the context of how protective factors interrelate to build resilience (Wright et al., 2013). While three ACEs resilience frameworks were identified (Bethell et al., 2019; NSCDC, 2015; Sege & Harper Browne, 2017), each has a limited evidence base with few studies exploring the effectiveness of these frameworks. This study explored the effectiveness of all three frameworks related to childhood obesity. Third, no known studies have compared the effectiveness of the NSCDC, HOPE, and cumulative PCE frameworks to guide future interventions. This study compared the strength of the relationship between

each of these frameworks and childhood obesity. Finally, while ACEs have an established relationship with childhood obesity (Davis et al., 2019; McKelvey et al., 2019; Schroeder et al., 2021), few studies have examined the relationship between protective factors and childhood obesity among children experiencing ACEs (Crouch et al., 2022). Thus, this study identified which protective factors and frameworks had the strongest relationship with childhood obesity among children who experienced ACEs. Combined, these findings provided a fuller understanding of how resilience frameworks and protective factors are associated with childhood obesity to guide future interventions to mitigate the impact of ACEs on childhood obesity and subsequent health outcomes.

The first aim of this study was to determine whether the NSCDC or HOPE framework was associated with a lower likelihood of childhood obesity. The second aim was to determine whether a cumulative PCE score strengthened the relationship between each framework and childhood obesity. The third aim was to identify which protective factors within each framework had the strongest relationship with childhood obesity. The fourth aim was to identify whether the previously identified relationships were the same after controlling for the number of ACEs. The final aim was to determine whether the previously identified relationships were the same across ACEs subgroups. The researchers hypothesized that the NSCDC and HOPE frameworks would be associated with a lower likelihood of childhood obesity, but the addition of a cumulative PCEs score would not strengthen either framework. One criticism of the original ACEs study was that not all ACEs are equal with certain ACEs having a differential impact based on the severity, timing, or other factors (Lacey & Minnis, 2020). Similarly, all PCEs are not likely to be equal to one another. Thus, frameworks that emphasize the most salient

protective factors would have a stronger relationship than a dose-wise score of various protective factors given equal weight. The researchers hypothesized that the NSCDC framework would have a stronger relationship with childhood obesity than the HOPE framework since parent/caregiver relationships have one of the largest evidence bases as a protective factor against adversity and cumulative risk (Bellis et al., 2017; Masten, 2018; Wright et al., 2013; Yamaoka & Bard, 2019) and another study established a strong relationship between the NSCDC framework and childhood mental health among children experiencing multiple ACEs (Keane & Evans, 2022). Of the protective factors in this study, a supportive parent/caregiver relationship, self-regulation, and a supportive neighborhood were theorized to be the strongest predictors based on previous studies using the NSCDC framework with mental health outcomes (Keane & Evans, 2022) and the HOPE frameworks using childhood obesity (Crouch et al., 2022). Finally, these outcomes were expected to be the same after controlling for ACEs and across ACEs subgroups with the frameworks and protective factors having a slightly stronger relationship with childhood obesity among children experiencing more ACEs.

Methods

Data and Sample

Data came from the 2018-2020 NSCH, a national survey of childhood health and well-being conducted by the U.S. Maternal and Child Health Bureau (United States Census Bureau, 2020). Parents or caregivers of children between 0 and 17 years old completed a web or paper-based screening survey and follow-up topical survey on one child selected in their home. The response rates ranged from 35.3% to 36.9% on the 2018

to 2020 NSCHs (United States Census Bureau, 2019, 2020, 2021a). Respondents were given one of three versions depending on their child's age. Only the versions of the survey for children between 6 and 17 years old included all the applicable ACEs and protective factor items. The NSCH only provided BMI categories for children 10 to 17 years old. Thus, the final sample consisted of all children between 10 and 17 years old missing none of the variables of interest. Multiple years were combined to ensure adequate sample sizes for all subgroups. Of the 102,740 responses to the surveys, 53,787 (52.4%) were children between 10 and 17 years old with 46,672 (86.8%) in the final sample having no variables of interest missing.

Measures

Adverse childhood experiences. The 2018-2020 NSCH shared eight ACE items (household mental illness, household substance abuse, household domestic violence, parent/guardian divorce or separation, parent/guardian death, parent/guardian incarceration, neighborhood violence, and discrimination) that were dichotomized ("yes" or "no") indicating the child had experienced that ACE. Consistent with previous studies (Crouch, Radcliff, Hung, et al., 2019; Keane & Evans, 2022), a ninth ACE, economic hardship, was coded "yes" if the respondent reported they "very often" or "somewhat often" had problems paying for necessities since the child's birth. Consistent with another study (Bethell et al., 2019), ACEs were grouped by risk level (0 ACEs, 1 ACE, 2-3 ACEs, ≥ 4 ACEs) to simplify reporting and differentiate the high (2 or 3 ACEs) and highest risk groups (≥ 4 ACEs).

Childhood weight status. The data collected on the child's height and weight were not available in the public dataset. However, the public NSCH dataset provided four BMI percentile groups ("less than 5th percentile", "5th percentile to less than 85th percentile", "85th percentile to less than 95th percentile", and "equal to or greater than the 95th percentile") for children from 10 to 17 years old based on their age, height, and weight. Consistent with previous studies using the NSCH (Crouch et al., 2022; Li et al., 2020) and the criteria for childhood obesity (Centers for Disease Control and Prevention [CDC], 2021), children were obese if their calculated BMI was "equal to or greater than the 95th percentile".

NSCDC framework protective factors. In Table 1, five items capture the four protective factors from the NSCDC framework consistent with the previous NSCDC study (Keane & Evans, 2022). To facilitate analysis and a cumulative PCE score, all responses were dichotomized ("yes" or "no") based on whether the child had that protective factor. A supportive adult relationship was based on two items: parent/caregiver relationship and other adult relationship. The child had a supportive parent/caregiver relationship ("yes") if the respondent answered "very well" or "somewhat well". A response of "yes" indicated a supportive other adult relationship. If the respondent answered "all of the time" or "most of the time" to the self-regulation item, the child had strong self-regulation ("yes"). If the child participated in any of the mastery activities, the child had mastery in some area ("yes"). If the respondent answered "all of the time" or "most of the time" to the hopeful/affirming cultural tradition, they possessed this protective factor.

Table 1

NSCDC Framework Items on the 2018-2020 National Survey of Children's Health

1. **Parent/Caregiver Relationship**[a]: How well can you and this child share ideas or talk about things that really matter?
2. **Other Adult Relationship**[b]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
3. **Self-Regulation**[c]: Stay calm and in control when faced with a challenge?
4. **Mastery**[b]: During the past 12 months, did this child participate in:
a. Any clubs or organizations after school or on weekends?
b. A sports team or did they take sports lessons after school or on weekends?
c. Any other organized activities or lessons, such as music, dance, language, or other arts?
d. Any type of community service or volunteer work at school, place of worship, or in the community?
5. **Hopeful/Affirming Cultural Tradition**[d]: When your family faces problems, how often are you likely to stay hopeful even in difficult times?

[a]Responses of "very well", "somewhat well", "not very well", "not at all"; [b]responses of "yes" or "no"; [c]responses of "always", "usually", "sometimes", "never"; [d]responses of "all of the time", "most of the time", "some of the time", "none of the time"

HOPE framework protective factors. In Table 2, seven items captured the four HOPE framework protective factor categories consistent with previous NSCH HOPE framework studies (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021). To allow for analysis and cumulative PCE scores, each item was coded based on whether the child had that protective factor ("yes" or "no"). For supportive and nurturing relationships, the child had a mentoring relationship based on a response of "yes" and had family resilience based on responses of "all of the time" or "most of the time" to all four items. For stable, safe, equitable, and protective environments, the child had a supportive neighborhood based on at least one "definitely agree" response with responses of at least "somewhat agree" for the other items; the child had a safe neighborhood based on a response of "definitely agree" or "somewhat agree". For opportunities for social engagement and developing connections, the child was determined to have participated in after-school activities based on a response of "yes" to any of the three items and exhibited volunteerism based on a

response of "yes" to the one item. For learning emotional and social competencies, children shared items based on a response of "somewhat well" or "very well".

Table 2

HOPE Framework Items on the 2018-2020 National Survey of Children's Health

Category 1: Supportive and nurturing relationships
1. **Mentor Relationship**[a]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
2. **Family Resilience**[b]: When your family faces problems, how often are you to do each of the following?
a. Work together to solve problems. c. Know we have strengths to draw on.
b. Talk together about what to do. d. Stay hopeful even in difficult times.
Category 2: Being in stable, safe, equitable, and protective environments
3. **Supportive Neighborhood**[c]:
a. We watch out for each other's children in this neighborhood
b. People in this neighborhood help each other out
c. When we encounter difficulties, we know where to go for help in our community
4. **Safe Neighborhood**[c]: This child is safe in our neighborhood
Category 3: Opportunities for social engagement and developing connections
5. **After-School Activities**[a]: During the past 12 months, did this child participate in:
a. Any clubs or organizations after school or on weekends?
b. A sports team or did they take sports lessons after school or on weekends?
c. Any other organized activities or lessons, such as music, dance, language, or other arts?
6. **Volunteerism**[a]: During the past 12 months, did this child participate in any type of community service or volunteer work at school, place of worship, or in the community?
Category 4: Learning emotional and social competencies
7. **Sharing Ideas**[d]: How well can you and this child share ideas or talk about things that really matter?

[a]Responses of "yes" or "no"; [b]responses of "all of the time", "most of the time", "some of the time", "none of the time"; [c]responses of "definitely agree", "somewhat agree", "somewhat disagree", "definitely disagree"; [d]responses of "very well", "somewhat well", "not very well", "not at all"

Cumulative PCE scores. To determine whether a cumulative PCE score strengthened each framework, a cumulative PCE score was calculated using the HOPE or NSCDC framework. For the cumulative HOPE PCE score, the score was calculated by adding the number of previously identified HOPE framework protective factors that the child possessed consistent with a previous study (Crouch, Radcliff, Merrell, Brown, et al., 2021). Similar to the ACE groupings, the cumulative HOPE PCE scores were separated into low (0 to 2 PCEs), moderate (3 to 5 PCEs), and high (6 to 7 PCEs) to simplify comparisons and conclusions consistent with a previous study (Bethell et al., 2019). An

identical approach was used to create a cumulative NSCDC PCE score by summing the NSCDC protective factors coded as "yes". The scores were separated into low (0 to 2 PCEs), moderate (3 to 4 PCEs), and high (5 PCEs) PCE groups.

Covariates. Several covariates were included from the predisposing and enabling domains from the GMVP (Gelberg et al., 2000). One predisposing characteristic of the parent was the highest level of educational attainment by the caregiver ("less than high school", "high school (including vocational, trade, or business school)", "some college or associate degree", or "college degree or higher"). Predisposing characteristics of the child included the child's sex ("male" or "female") and the child's race ("Black or African American alone", "White alone", or "Other) as coded by the NSCH. Age was recoded as 13 to 17 years old compared to 10 to 12 years old to differentiate between adolescents and pre-adolescents since age was not provided by the NSCH as a continuous variable. One enabling family characteristic was family income, which was based on the average of estimated values of the family poverty level (FPL) provided by the NSCH (United States Census Bureau, 2021b) that were recategorized into three groups (0% to 199%, 200%-399%, and 400% or higher) for comparison purposes. Finally, due to 2020 NSCH data collection occurring during the COVID-19 pandemic, a variable (COVID-19) was added to control for possible differences due to the timing of the surveys during ("yes") or before the pandemic ("no").

Statistical Analysis

IBM SPSS Statistics for Windows, Version 27.0 was used for all statistical

analyses. The prevalence of covariates, protective factors, childhood obesity, ACE groupings, and cumulative PCE groupings were first identified. Then, bivariate analyses were conducted using X^2 tests to compare differences in childhood weight status by covariates, protective factors, ACE groupings, and PCE groupings. To explore the study's aims, model comparisons using hierarchical logistic regression were conducted using three approaches. First, model comparisons using hierarchical logistic regression were completed using the entire sample excluding ACEs. The same analysis was completed again while controlling for ACE groupings. Finally, model comparisons using hierarchical logistic regression were completed with the four different ACE groupings (0 ACEs, 1 ACE, 2-3 ACEs, and 4 or more ACEs) to determine the effectiveness for each subsample. The sample met the assumptions of logistic regression. All observations were independent. The assumption of no multicollinearity was met due to the VIF values being between 1 and 10 (Marquardt, 1970). The sample and subsamples had a large enough sample size (Bujang et al., 2018); the outcome variable was dichotomous.

Figure 1 depicts the analyses conducted using the entire sample excluding ACEs and the analyses using the ACEs subgroups. For all analyses, the NSCDC framework (model 1) and HOPE framework (model 2) were compared to determine which framework has the strongest relationship with childhood obesity. The effectiveness of the NSCDC and HOPE frameworks was based on whether the ΔR^2 from block 1 to 2 was significant. To determine which framework had a stronger relationship with childhood weight status, Nagelkerke's R^2 values using the NSCDC and HOPE frameworks in block 2 were compared with the greatest R^2 value having the strongest relationship with childhood obesity. The adjusted odds ratios in block 2 were compared within each

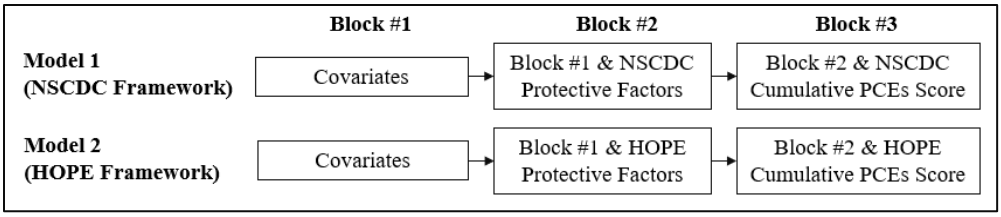

Figure 1. Hierarchical logistic regression for analyses excluding ACEs.

framework to determine which protective factors had the strongest relationship with childhood weight status. Finally, if the ΔR^2 from block 2 to 3 was significant, that framework's cumulative PCE score improved the model.

Figure 2 depicts the analysis conducted for the logistic regression models that included the entire sample and controlled for ACEs. The analyses were identical except an additional block (block 2) was added with ACEs groupings. The effectiveness of each framework was based on if the ΔR^2 from block 2 to 3 was significant. To determine which framework had a stronger relationship with childhood obesity, Nagelkerke's R^2 values were compared in block 3. The strength of protective factors after controlling for ACEs was compared in block 3. If the ΔR^2 from block 3 to 4 was significant, that framework's cumulative PCEs score significantly contribute to the model after controlling for ACEs. A p-value of 0.05 was used to determine significance, but results were also interpreted with measures of effect size due to the larger sample sizes.

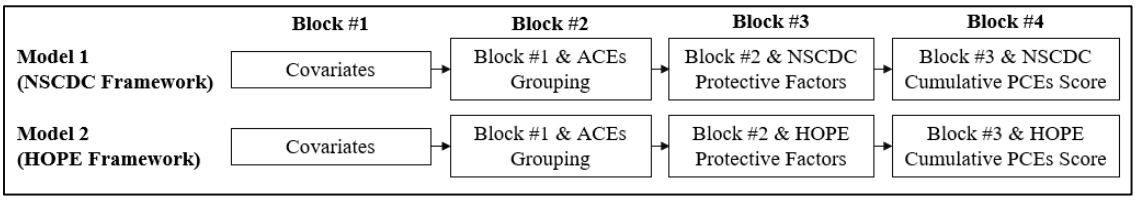

Figure 2. Hierarchical logistic regression for analyses including ACEs.

Results

Descriptive Statistics and Bivariate Analyses

Table 3 summarizes the demographic characteristics of the entire sample and X^2 tests comparing characteristics by childhood weight status. The full sample included 46,672 children between 10 and 17 years old (M_{age}=13.8; 48% female; 78.8% Caucasian, 14.5% other race, 6.7% Black/African American). Approximately 13.6% of children met the criteria to be considered obese; 46.4% of children experienced at least 1 ACE with

Table 3

Study Sample Demographic and Other Characteristics by Childhood Weight Status

Sample Characteristics	Overall, n (%) (n=46,672)	BMI ≥ 95th Percentile[a], n (%) (n=6,348, 13.6%)	BMI < 95th Percentile[a], n (%) (n=40,324, 86.4%)	P-Value[b]/ Cramer's V
Race/Ethnicity				
Caucasian	36,797 (78.8%)	4,725 (12.8%)	32,072 (87.2%)	<0.001
Black/African American	3,111 (6.7%)	699 (22.5%)	2,412 (77.5%)	0.070
Other	6,764 (14.5%)	924 (13.7%)	5,840 (86.3%)	
Sex				
Male	24,254 (52.0%)	3,909 (16.1%)	20,345 (83.9%)	<0.001
Female	22,418 (48.0%)	2,439 (10.9%)	19,979 (89.1%)	0.076
Age				
6-12 Years Old	15,022 (32.2%)	2,326 (15.5%)	12,696 (84.5%)	<0.001
13-17 Years Old	31,650 (67.8%)	4,022 (12.7%)	27,628 (87.3%)	0.038
Household Income[c]				
<200% FPL	11,759 (25.2%)	2,437 (20.7%)	9,322 (79.3%)	<0.001
200%-399% FPL	16,867 (36.1%)	2,315 (13.7%)	14,552 (86.3%)	0.135
≥400% FPL	18,046 (38.7%)	1,596 (8.8%)	16,450 (91.2%)	
Parents Highest Education				
Less than High School	1,216 (2.6%)	264 (21.7%)	952 (78.3%)	<0.001
High School	6,136 (13.1%)	1,413 (23.0%)	4,723 (77.0%)	0.158
Some College/Assoc Degree	11,075 (23.7%)	2,023 (18.3%)	9,052 (81.7%)	
≥ College Degree	28,245 (60.5%)	2,648 (9.4%)	25,597 (90.6%)	
COVID[d]				
Prior to COVID-19	27,169 (58.2%)	3,605 (13.3%)	23,564 (86.7%)	0.013
During COVID-19	19,503 (41.8%)	2,743 (14.1%)	16,760 (85.9%)	0.011
ACEs[e]				
0 ACEs	25,031 (53.6%)	2,621 (10.5%)	22,410 (89.5%)	<0.001
1 ACE	10,942 (23.4%)	1,641 (15.0%)	9,301 (85.0%)	0.109
2-3 ACEs	7,491 (16.1%)	1,398 (18.7%)	6,093 (81.3%)	
4 or More ACEs	3,208 (6.9%)	688 (21.4%)	2,520 (78.6%)	

[a]Children with a BMI ≥ 95th percentile were classified as having childhood obesity; [b]p-value based on Chi-squared test of independence; [c]family income as percentage of the federal poverty level; [d]COVID based on whether the survey was administered prior to or during the COVID-19 pandemic; [e]adverse childhood experiences

6.9% experiencing 4 or more ACEs. All the covariates had a significant relationship with childhood obesity. Based on a Cramer's V value of more than 0.15 (Akoglu, 2018), parental education had a strong relationship with childhood obesity with obesity being less common among children when a parent completed college. Household income and the number of ACEs experienced had a moderate to strong relationship with childhood obesity. Childhood weight status had a weak to moderate relationship between sex and race/ethnicity with obesity being most common among males (16.1%) and Black/African American youth (22.5%).

The prevalence of childhood obesity is summarized and compared by NSCDC and HOPE framework protective factors and cumulative PCE scores utilizing X^2 tests in Table 4. Most children had each of the protective factors. While all the protective factors were significant, parent relationship/sharing ideas, other adult relationship/mentor relationship, family resilience, and a hopeful/affirming cultural tradition had a very weak to weak effect size due to a Cramer's V value of less than 0.05 (Akoglu, 2018). While only having a weak to moderate relationship (Akoglu, 2018), after-school activities, the cumulative HOPE PCE scores, the cumulative NSCDC PCE scores, and mastery in some area had the strongest relationships with childhood obesity. The other protective factors also had a weak to moderate relationship with childhood weight status.

Comparison of Resilience Frameworks and Models

Table 5 summarizes the amount of variance in childhood obesity explained by each analysis, model, and block based on Nagelkerke's R^2. The ΔR^2 describes the additional amount of variance explained by the factors added in that block; the

Table 4

NSCDC and HOPE Framework Protective Factors by Childhood Weight Status

Sample Characteristics	Overall, n (%) (n = 46,672)	BMI ≥ 95th Percentile[a] , n (%) (n = 6,348, 13.6%)	BMI < 95th Percentile[a], n (%) (n = 40,324, 86.4%)	P-Value[b]/ Cramer's V
NSCDC[c] Protective Factors				
Parent Relationship				
Yes	44,203 (94.7%)	5,912 (13.4%)	38,291 (86.6%)	<0.001
No	2,469 (5.3%)	436 (17.7%)	2,033 (82.3%)	0.028
Other Adult Relationship				
Yes	43,002 (92.1%)	5,745 (13.4%)	37,257 (86.6%)	<0.001
No	3,670 (7.9%)	603 (16.4%)	3,067 (83.6%)	0.024
Strong Self-Regulation				
Yes	36,198 (77.6%)	4,429 (12.2%)	31,769 (87.8%)	<0.001
No	10,474 (22.4%)	1,919 (18.3%)	8,555 (81.7%)	0.074
Mastery in Some Area				
Yes	42,688 (91.5%)	5,423 (12.7%)	37,265 (87.3%)	<0.001
No	3,984 (8.5%)	925 (23.2%)	3,059 (76.8%)	0.086
Hopeful/Affirming Cultural Tradition				
Yes	43,862 (94.0%)	5,877 (13.4%)	37,985 (86.6%)	<0.001
No	2,810 (6.0%)	471 (16.8%)	2,339 (83.2%)	0.023
Cumulative NSCDC[c] PCE[d] Score				
0 to 2 PCEs	1,464 (3.1%)	311 (21.2%)	1,153 (78.8%)	<0.001
3 to 4 PCEs	14,894 (31.9%)	2,587 (17.4%)	12,307 (82.6%)	0.090
5 PCEs	30,314 (65.0%)	3,450 (11.4%)	26,864 (88.6%)	
HOPE[e] Framework Protective Factors				
Mentor Relationship				
Yes	43,002 (92.1%)	5,745 (13.4%)	37,257 (86.6%)	<0.001
No	3,670 (7.9%)	603 (16.4%)	3,067 (83.6%)	0.024
Family Resilience				
Yes	38,578 (82.7%)	5,085 (13.2%)	33,493 (86.8%)	<0.001
No	8,094 (17.3%)	1,263 (15.6%)	6,831 (84.4%)	0.027
Supportive Neighborhood				
Yes	29,075 (62.3%)	3,438 (11.8%)	25,637 (88.2%)	<0.001
No	17,597 (37.7%)	2,910 (16.5%)	14,687 (83.5%)	0.067
Safe Neighborhood				
Yes	33,503 (71.8%)	4,155 (12.4%)	29,348 (87.6%)	<0.001
No	13,169 (28.2%)	2,193 (16.7%)	10,976 (83.3%)	0.056
After-School Activities				
Yes	39,857 (85.4%)	4,878 (12.2%)	34,979 (87.8%)	<0.001
No	6,815 (14.6%)	1,470 (21.6%)	5,345 (78.4%)	0.096
Volunteerism				
Yes	24,639 (52.8%)	2,823 (11.5%)	21,816 (88.5%)	<0.001
No	22,033 (47.2%)	3,525 (16.0%)	18,508 (84.0%)	0.066
Sharing Ideas				
Yes	44,203 (94.7%)	5,912 (13.4%)	38,291 (86.6%)	<0.001
No	2,469 (5.3%)	436 (17.7%)	2,033 (82.3%)	0.028
Cumulative HOPE[e] PCE[d] Score				
0 to 2 PCEs	1,623 (3.5%)	376 (23.2%)	1,247 (76.8%)	<0.001
3 to 5 PCEs	19,737 (42.3%)	3,225 (16.3%)	16,512 (83.7%)	0.094
6 to 7 PCEs	25,312 (54.2%)	2,747 (10.9%)	22,565 (89.1%)	

[a]Children with a BMI ≥ 95th percentile were classified as having childhood obesity; [b]p-value based on Chi-squared test of independence; [c]National Scientific Council on the Developing Child; [d]positive childhood experiences; [e]Health Outcomes from Positive Experiences

significance determines whether the new factors significantly improved the model while the percentage of cases classified correctly demonstrates practical significance. In the full sample excluding ACEs, block 1 which only included covariates was significant (X^2 (10) = 1,7822.77, p<0.001) and explained 6.8% of the variance in childhood obesity. When using the full sample excluding ACEs in block 3, the NSCDC (X^2 (15) = 1,926.81, p<0.001) and HOPE framework (X^2 (17) = 1,939.01, p<0.001) models were significant with the ΔR^2 also being significant for both models. Despite significantly improving both models, both frameworks explained the same amount of variance in childhood obesity (7.4%), a modest increase of 0.6% compared to block 1. They also did not improve the percentage of cases correctly identified. When adding a cumulative PCE score in block 4, the overall NSCDC and HOPE framework models were both significant. However, the ΔR^2 from block 3 to 4 was not significant, demonstrating that the addition of a cumulative PCE score did not significantly improve either model.

For the analysis that included ACEs groupings with the full sample, the model in block 2 including ACEs and covariates was significant (X^2 (13) = 1,952.71, p<0.001) and the addition of ACEs significantly improved the model (ΔR^2 = 0.007, p<0.001). After adding protective factors in block 3, the NSCDC (X^2 (18) = 2,050.13, p<0.001) and HOPE (X^2 (20) = 2,060.45, p<0.001) frameworks' models were significant with the ΔR^2 being significant for both models after controlling for ACEs. In block 3, the HOPE framework explained slightly more variance in childhood obesity (7.9%) than the NSCDC framework (7.8%) with both models correctly classifying the same percentage of cases. Thus, both models had a similar relationship with childhood obesity. In block 4, the ΔR^2 was not significant after the addition of a cumulative PCE score for either model.

Table 5

Comparison of the NSCDC[a] and HOPE[b] Frameworks Relationship with Childhood Weight Status[c] Based on Nagelkerke's R^2

Analysis Type/ Framework	Overall Sample Size	% Classified Correctly[d] by Chance	Block #1 (Covariates Only)		Block #2 (Block #1 & ACE Count) (If Applicable)			Block #3 (Block #2 & Protective Factors)			Block #4 (Block #3 & Cumulative PCE Count)		
			R^2	% Classified Correctly[d]	R^2	ΔR^2	% Classified Correctly[d]	R^2	ΔR^2	% Classified Correctly[d]	R^2	ΔR^2	% Classified Correctly[d]
Full Sample (PCEs[e] Only)													
NSCDC[a] Framework	46,672	76.50%	0.068***	86.40%				0.074***	0.006***	86.40%	0.074***	0.000	86.40%
HOPE[b] Framework	46,672	76.50%	0.068***	86.40%				0.074***	0.006***	86.40%	0.074***	0.000	86.40%
Full Sample (PCEs[e] & ACEs[f])													
NSCDC[a] Framework	46,672	76.50%	0.068***	86.40%	0.075***	0.007***	86.40%	0.078***	0.003***	86.40%	0.078***	0.000	86.40%
HOPE[b] Framework	46,672	76.50%	0.068***	86.40%	0.075***	0.007***	86.40%	0.079***	0.004***	86.40%	0.079***	0.000	86.40%
Children Experiencing 0 ACEs[f]													
NSCDC[a] Framework	25,031	81.25%	0.063***	89.50%				0.070***	0.007***	89.50%	0.070***	0.000	89.50%
HOPE[b] Framework	25,031	81.25%	0.063***	89.50%				0.071***	0.008***	89.50%	0.071***	0.000	89.50%
Children Experiencing 1 ACE[f]													
NSCDC[a] Framework	10,942	74.50%	0.062***	85.00%				0.065***	0.003***	85.00%	0.065***	0.000	85.00%
HOPE[b] Framework	10,942	74.50%	0.062***	85.00%				0.065***	0.003**	85.00%	0.065***	0.000	85.00%
Children Experiencing 2 to 3 ACEs[f]													
NSCDC[a] Framework	7,491	69.64%	0.055***	81.30%				0.058***	0.003*	81.30%	0.058***	0.000	81.30%
HOPE[b] Framework	7,491	69.64%	0.055***	81.30%				0.059***	0.004*	81.40%	0.060***	0.001	81.40%
Children Experiencing 4 or More ACEs[f]													
NSCDC[a] Framework	3,208	66.31%	0.023***	78.60%				0.025***	0.002	78.60%	0.025***	0.000	78.60%
HOPE[b] Framework	3,208	66.31%	0.023***	78.60%				0.028***	0.005	78.60%	0.029***	0.001	78.60%

[a]National Scientific Council on the Developing Child; [b]Health Outcomes from Positive experiences; [c]based on whether the child had a BMI ≥ 95th percentile, meeting the criteria for childhood obesity; [d]percentage of cases accurately classified by model; [e]positive childhood experiences; [f]adverse childhood experiences; *p<0.05; **p<0.01; ***p<0.001

Across ACEs subgroups, similar outcomes were found with the addition of the NSCDC and HOPE framework protective factors strengthening each model based on a significant ΔR^2 except for among children experiencing 4 or more ACEs. Among all ACE groupings except children experiencing 1 ACE, the HOPE framework had a slightly larger Nagelkerke's R^2 value, indicating it was associated with slightly more variance than the NSCDC framework. However, there was no improvement in the cases classified correctly, demonstrating both frameworks were very similar. When comparing R^2 values across analyses, the models for both frameworks had a stronger relationship with childhood obesity in subgroups that experienced fewer ACEs. Across all subgroups, the addition of cumulative PCE scores did not significantly strengthen any of the models.

Comparison of Protective Factors within Frameworks

In Table 6, the adjusted odds ratios from block 3 after controlling for covariates and ACEs (if applicable) are presented from the NSCDC framework analyses. All covariates except for COVID-19 and other race compared to Caucasian were associated with childhood obesity across analyses and subgroups except for children experiencing 4 or more ACEs, in which only three covariates were significant. Parents' highest education, female compared to male, Black/African American compared to Caucasian, and household income were the covariates with the strongest relationship to childhood obesity. The only NSCDC protective factors that were significant in any of the analyses were strong self-regulation and mastery with the relative strength varying across analyses. Self-regulation was the strongest protective factor among children that experienced 1 ACE or 2 to 3 ACEs with mastery being stronger in the full sample

excluding ACEs and children with 0 ACEs. Only self-regulation was significant among children experiencing 2 to 3 ACEs and none of the protective factors were significant among children experiencing 4 or more ACEs. In the full sample after controlling for ACEs, children with strong self-regulation and mastery in some area had the same

Table 6

Adjusted Odds Ratios of Childhood Obesity[a] Using the NSCDC[b] Framework[c]

Covariates/Protective Factors	Entire Sample (PCEs[d]) (n=46,672)	Entire Sample (PCEs[d] & ACEs[e]) (n=46,672)	Children with 0 ACEs[e] (n=25,031)	Children with 1 ACE[e] (n=10,942)	Children with 2 to 3 ACEs[e] (n=7,491)	Children with ≥4 ACEs[e] (n=3,208)
Covariates						
Race/Ethnicity						
Caucasian (Referent)						
Black/African American	1.59***	1.55***	1.75***	1.57***	1.46***	1.10
Other	1.03	1.02	0.97	1.02	1.13	0.97
Female (Male as Referent)	0.64***	0.64***	0.57***	0.69***	0.64***	0.88
13-17 Years (10-12 as Referent)	0.81***	0.80***	0.81***	0.77***	0.75***	0.93
Household Income						
≥400% FPL (Referent)						
200%-399% FPL	1.31***	1.26***	1.21***	1.24**	1.43***	1.11
<200% FPL	1.61***	1.49***	1.40***	1.48***	1.71***	1.33*
Parents' Highest Education						
≥ College Degree (Referent)						
Some College/Assoc Degree	1.77***	1.70***	1.82***	1.78***	1.43***	1.47***
High School Degree/Other	2.20***	2.12***	2.37***	2.14***	1.79***	1.75***
Less than High School	1.84***	1.85***	1.97***	2.02***	1.57**	1.37
During COVID-19	1.04	1.05	1.02	1.15*	1.00	1.02
Number of ACEs[e] Experienced						
0 ACEs (Referent)						
1 ACE		1.25***				
2 to 3 ACEs		1.45***				
4 or More ACEs		1.51***				
NSCDC[b] Framework Protective Factors						
Parent/Caregiver Relationship	0.96	0.98	0.83	1.00	1.05	1.09
Other Adult Relationship	1.02	1.02	1.09	0.98	0.97	1.05
Strong Self/Regulation	0.75***	0.79***	0.74***	0.81***	0.81**	0.88
Mastery	0.78***	0.79***	0.63***	0.82*	0.95	0.86
Hopeful/Affirming Tradition	0.94	0.99	1.04	0.93	0.94	1.08

[a]Based on whether the child had a BMI ≥ 95th percentile, meeting the criteria for childhood obesity; [b]National Scientific Council on the Developing Child; [c]all analyses based on block 3; [d]positive childhood experiences; [e]adverse childhood experiences; *p<0.05; **p<0.01; ***p<0.001

strength with children possessing these protective factors being 1.27 (1.00/0.79) times less likely to be obese compared to those lacking strong self-regulation.

The adjusted odds ratios after controlling for covariates and ACEs (if applicable) in the HOPE framework analyses are presented in Table 7. The same covariates identified in the NSCDC analyses were also significant in the HOPE framework analyses among the same subgroups. Lower levels of parental education, males, Black/African American compared to Caucasian, children from lower-income households, and children between 10 and 12 years older were more likely to be obese except for among children who experienced 4 or more ACEs. Only parental education was associated with childhood obesity among children who experienced 4 or more ACEs. In the full sample including ACEs, children experiencing 4 or more ACEs were 1.51 times more likely to be obese. Participating in after-school activities was the strongest protective factor except for among children who experienced 4 or more ACEs. After controlling for ACEs in the full sample, children who participated in at least one after-school activity were 1.32 (1.00/0.76) times less likely to be obese than those who did not. Living in a supportive neighborhood was the second strongest protective factor across all models except for children who experienced 4 or more ACEs, where it was the strongest protective factor. In the full sample including ACEs, children in supportive neighborhoods were 1.16 (1.00/0.86) times less likely to be obese. However, a supportive neighborhood was not significant among children experiencing 2 to 3 ACEs. Sharing ideas with a parent or caregiver, living in a safe neighborhood, and volunteerism were only significant in a limited number of analyses or ACEs subgroups.

Table 7

Adjusted Odds Ratios of Childhood Obesity[a] Using the HOPE[b] Framework[c]

Covariates/Protective Factors	Entire Sample (PCEs[d]) n=46,672)	Entire Sample (PCEs[d] & ACEs[e]) (n=46,672)	Children with 0 ACEs[e] (n=25,031)	Children with 1 ACE[e] (n=10,942)	Children with 2 to 3 ACEs[e] (n=7,491)	Children with ≥4 ACEs[e] (n=3,208)
Covariates						
Race/Ethnicity						
Caucasian (Referent)						
Black/African American	1.54***	1.52***	1.70***	1.55***	1.41***	1.09
Other	1.01	1.00	0.95	0.99	1.11	0.94
Female (Male as Referent)	0.64***	0.64***	0.57***	0.68***	0.63***	0.88
13-17 Years (10-12 as Referent)	0.79***	0.78***	0.79***	0.76***	0.71***	0.89
Household Income						
≥400% FPL (Referent)						
200%-399% FPL	1.29***	1.25***	1.19***	1.23**	1.41***	1.11
<200% FPL	1.58***	1.46***	1.37***	1.46***	1.69***	1.30
Parents' Highest Education						
≥ College Degree (Referent)						
Some College/Assoc Degree	1.74***	1.68***	1.76***	1.75***	1.44***	1.50***
High School Degree or Other	2.14***	2.07***	2.25***	2.11***	1.80***	1.77***
Less than High School	1.76***	1.78***	1.82***	1.97***	1.58**	1.38
During COVID-19	1.05	1.06	1.03	1.15*	1.02	1.03
Number of ACEs[e] Experienced						
0 ACEs (Referent)						
1 ACE		1.25***				
2 to 3 ACEs		1.44***				
4 or More ACEs		1.51***				
HOPE[b] Framework Protective Factors						
Mentor Relationship	1.07	1.06	1.16	1.02	0.97	1.08
Family Resilience	0.95	0.99	0.98	0.98	0.99	1.01
Supportive Neighborhood	0.84***	0.86***	0.86**	0.88*	0.93	0.74**
Safe Neighborhood	0.93*	0.96	0.91	0.93	0.96	1.16
After-School Activities	0.75***	0.76***	0.63***	0.85*	0.80*	0.89
Volunteerism	0.96	0.99	0.93	0.92	1.22*	1.02
Sharing Ideas	0.89*	0.92	0.77*	0.93	0.97	1.08

[a]Based on whether the child had a BMI ≥ 95th percentile, meeting the criteria for childhood obesity; [b]Health Outcomes from Positive Experiences; [c]all analyses based on block 3; [d]positive childhood experiences; [e]adverse childhood experiences; *p<0.05; **p<0.01; ***p<0.001

Discussion

The purpose of this study was to compare the strength of the relationship between three resilience frameworks and childhood obesity among children who experienced ACEs. The study also sought to identify which protective factors within each framework had the strongest relationship with childhood obesity and determine if these results were

consistent after controlling for ACEs and across ACE groupings. Overall, the addition of protective factors from both the NSCDC and HOPE frameworks significantly improved the regression models in all analyses and ACEs subsamples except for children experiencing 4 or more ACEs, demonstrating the effectiveness of both frameworks in most analyses. While the HOPE framework explained slightly more variance in childhood obesity after controlling for ACEs and in three ACEs subsamples, the difference was modest (0.001 to 0.003) with no difference in the percentage of cases classified correctly. Thus, the two frameworks had similar effectiveness. However, the addition of a cumulative PCE score did not significantly strengthen any of the logistic regression models. Across analyses, mastery and self-regulation were the strongest NSCDC protective factors, and after-school activities and a supportive neighborhood were the strongest HOPE framework protective factors against childhood obesity.

Comparison of Resilience Frameworks

When considering the first, fourth, and fifth aims, the researchers hypothesized that the NSCDC framework would have a stronger relationship with childhood obesity than the HOPE framework across analyses. While the NSCDC framework was significantly associated with childhood obesity, this hypothesis was not supported since the HOPE framework explained similar variance in childhood obesity across all analyses. Nevertheless, the NSCDC framework was associated with childhood obesity in all analyses except among children experiencing 4 or more ACEs. In support of this finding, a previous study found the NSCDC framework was associated with childhood mental health issues (Keane & Evans, 2022). The effectiveness of the NSCDC framework may

be attributed to the emphasis placed on resilience-building adult relationships and self-regulation (NSCDC, 2015). Both factors have an extensive evidence base as protective factors (Bellis et al., 2017; Masten, 2018; Polizzi & Lynn, 2021; Wright et al., 2013; Yamaoka & Bard, 2019) and have been associated with childhood obesity (Anderson & Keim, 2016). The previous NSCDC framework study also identified these as the strongest two protective factors (Keane & Evans, 2022).

The HOPE framework had a stronger relationship with childhood obesity than hypothesized by the researchers. One explanation is that childhood obesity is a complex health issue that is influenced by a myriad of factors across ecological levels (Boonpleng et al., 2013; Sahoo et al., 2015; Williams et al., 2018). The HOPE framework identified protective factors from multiple ecological levels including the family and community levels that were not as prevalent in the NSCDC framework and have been associated with childhood obesity (Boonpleng et al., 2013). Thus, while self-regulation was a key factor excluded from the HOPE framework, the inclusion of community-level factors such as a supportive neighborhood and safe neighborhood may explain the effectiveness of the HOPE framework in this study. These findings highlight the importance of identifying protective factors at multiple ecological levels and suggest that frameworks may be developed by integrating key protective factors from the NSCDC with additional HOPE protective factors from various ecological levels.

Even though the NSCDC and HOPE frameworks significantly improved the regression models in most analyses, the amount of variance in childhood obesity explained by the models including covariates was modest (ranging from 2.5% to 7.9%). Thus, other factors not included in the model accounted for most of the variance in

childhood obesity. Previous research has identified that genetics, poor nutritional patterns, sleep, family meal habits, parents' behaviors, activity levels, screen time, household rules, mental health, emotional regulation, government policies, and other factors are associated with childhood obesity (Boonpleng et al., 2013; Sahoo et al., 2015; Williams et al., 2018). Given the numerous factors influencing childhood obesity, the relationship between ACEs, protective factors, and obesity may be more complex than other outcomes. Thus, protective factors may have a more indirect influence on childhood obesity by influencing other factors linked to childhood obesity not included in this study like exercise or nutrition. In support of this explanation, the protective factors identified in this study that had the strongest relationship with childhood obesity were those associated with physical activity and food consumption like mastery, after-school activities, and self-regulation. Future studies should include other factors associated with obesity and explore whether they mediate the relationship between protective factors and childhood obesity. Also, the items on the NSCH did not fully capture the protective factors as described by the original theorists. The HOPE framework measures used were also adopted by future researchers and not identified by the original developers of the framework (Sege & Harper Browne, 2017). The HOPE framework could potentially be strengthened by the addition of other protective factors within the four protective categories. Thus, studies using instruments that fully capture the protective factors as described by the original developers of the NSCDC and HOPE frameworks are needed to further validate these models and could account for more variance in childhood obesity.

When comparing the NSCDC and HOPE frameworks across analyses, the researchers hypothesized the frameworks would have similar outcomes with a slightly

stronger relationship among children experiencing more ACEs. This hypothesis was not supported since the ΔR^2 values were not significant among children experiencing 4 or more ACEs. This was surprising since the NSCDC and HOPE frameworks were established as frameworks that build resilience against ACEs (NSCDC, 2015; Sege & Harper Browne, 2017) and previous studies established the effectiveness of the entire framework or specific protective factors among children experiencing higher levels of ACEs (Crouch et al., 2022; Keane & Evans, 2022). One factor contributing to this difference was that the group experiencing 4 or more ACEs had less statistical power than other subgroups due to a smaller sample size. This is supported by both frameworks significantly improving the models in the full sample after controlling for ACEs. When comparing odds ratios across previous studies, childhood obesity also does not have as strong a relationship with ACEs as some other child health outcomes (Bellis et al., 2018; Burke et al., 2011). Also, while the overall R^2 values were lower in subgroups experiencing more ACEs, this was largely attributed to the covariates explaining less variance in the first block only including covariates. Collectively, this demonstrates that other factors not included in this study have an increasing influence on whether children experiencing 4 or more ACEs are obese. As discussed previously, the relationship between protective factors and childhood obesity could be mediated by another factor influenced by both ACEs and protective factors. Future studies should seek to identify other factors that influence childhood obesity among children experiencing ACEs and determine whether they mediate the relationship between the NSCDC and HOPE frameworks and childhood obesity.

The second aim explored whether the addition of a cumulative PCE score from each framework strengthened the relationship between each framework and childhood obesity. Consistent with the researchers' hypothesis, the cumulative PCE score did not strengthen the relationship between either framework and childhood obesity. These findings contrast with previous studies that found higher cumulative PCE scores were associated with more positive outcomes among those experiencing ACEs (Baglivio & Wolff, 2020; Bethell et al., 2019; Crandall et al., 2019; Novak & Fagan, 2022; Robles et al., 2019). However, unlike those studies, this study explored whether the addition of a cumulative PCE score added any protective value above the individual factors. Previous ACEs researchers have found that not all ACEs are equal with certain ACEs having a greater impact on negative outcomes (Lacey & Minnis, 2020; Negriff, 2020; Sayyah et al., 2022). Thus, this study suggests that the most salient protective may have a stronger relationship with childhood obesity. Future studies should explore if a similar relationship exists with other outcomes. Another explanation is that the PCEs in this study differed from previous studies. Cumulative PCE scores with different protective factors may have a stronger relationship with childhood obesity. Research is needed to identify the most relevant PCEs to better understand the effectiveness of this framework.

Protective Factors

In accordance with the third aim of this study, the researchers hypothesized that a supportive parent/caregiver relationship, self-regulation, and a supportive neighborhood would have the strongest relationship with childhood obesity. This hypothesis was partially supported. Consistent with a previous NSCDC study (Keane & Evans, 2022),

self-regulation was one of the strongest protective factors. In the full sample after controlling for ACEs, children with strong self-regulation were 1.27 (1/0.79) times less likely to be obese. Unlike the previous NSCDC study and in contrast to the NSCDC framework (Keane & Evans, 2022; NSCDC, 2015), a strong parent/caregiver relationship was not associated with a lower likelihood of childhood obesity. While not hypothesized, mastery was one of the strongest protective factors across analyses and subgroups. In the full sample after controlling for ACEs, children who exhibited mastery were 1.27 (1/0.79) times less likely to be obese. One explanation for the strength of self-regulation and mastery may be their more direct relationship with obesity. Previous research has established that a lack of balance between energy use and consumption was one of the strongest factors associated with childhood obesity (Wyszyńska et al., 2020). In this study, mastery included participation in extracurricular activities, which has a direct relationship with energy use and is one of the most important modifiable factors to reduce childhood obesity (Wyszyńska et al., 2020). Self-regulation has also been associated with higher levels of physical activity and energy consumption (Dohle et al., 2018; Wills et al., 2007). Thus, protective factors more closely associated with the causes of obesity may be more effective. In contrast, while previous research has linked parent relationships and attachment to childhood obesity (Anderson & Keim, 2016), researchers have theorized that self-regulation may mediate the relationship between parent/child relationships and childhood obesity (Anderson & Keim, 2016). Also, the parent/caregiver relationship measure on the NSCH does not fully capture all characteristics of resilience-building relationships (CDC, 2013) or early parent-child attachment that may protect against childhood obesity (Santos et al., 2021). Thus, studies should consider whether

parent/caregiver relationships and other protective factors may have an indirect impact on childhood obesity through self-regulation and other factors more closely related to childhood obesity using measures more consistent with the NSCDC framework.

As hypothesized when using the HOPE framework, living in a supportive neighborhood was one of the strongest protective factors across analyses and most subgroups consistent with a previous HOPE framework study of childhood obesity (Crouch et al., 2022). Among the full sample including ACEs, children in a supportive neighborhood were 1.16 (1/0.86) times less likely to be obese; children who experienced 4 or more ACEs living in a supportive neighborhood were 1.35 (1/0.74) times less likely to be obese. Previous research has linked supportive neighborhoods with increased levels of physical activity and lower levels of obesity (Franzini et al., 2009). Consequently, children who live in neighborhoods where they feel supported and connected likely have higher levels of social engagement and activity outside the home. This study demonstrates this is particularly important among children experiencing ACEs. In most analyses and ACEs subsamples except among children experiencing 4 or more ACEs, after-school activities were the strongest protective factor. In the full sample that included ACEs, children who participated in after-school activities were 1.32 (1/0.76) times less likely to be obese. Due to the direct relationship between participating in extracurricular activities and physical activity, this further demonstrates that the most salient protective factors in this study were the ones with a more direct relationship with factors that contribute to childhood obesity (Wyszyńska et al., 2020). This also suggests that the strongest protective factors may differ by outcome. Alternatively, moderation analyses

may help better understand how protective factors from ACEs resilience frameworks influence various outcomes.

While protective factors from the NSCDC and HOPE frameworks were associated with childhood obesity, covariates identified using the GMVP had a stronger relationship with childhood obesity than the previously identified protective factors. In the full sample that included ACEs, parental education, sex, race/ethnicity, and socioeconomic status had a stronger relationship with childhood obesity than the identified protective factors. Parents' highest education had the strongest relationship across all analyses. Children in households where the parent's highest level of education was high school were 2.07 to 2.12 times more likely to be obese after controlling for ACEs than those with a college degree. These findings demonstrate the complexity of factors contributing to childhood obesity among children, including those who have experienced ACEs. Ecological approaches like the HOPE framework could potentially be strengthened by considering other protective from various ecological levels while recognizing the influence of other social determinants of health from the GMVP. Future research should consider how to integrate upstream protective factors that may be addressed at a policy, organizational, or community level to gain a fuller picture of protectives factors that build resilience against the negative impact of ACEs on childhood obesity (CDC, 2019; Nobles et al., 2021).

Strengths, Limitations, and Implications

This study made several contributions to the literature on protective factors and resilience among children who experienced ACEs. This was the first known study to

compare the effectiveness of three ACEs resilience frameworks among children who experienced ACEs. The study also took the unique approach of determining whether the addition of a cumulative PCE score strengthened the relationship between each framework and childhood obesity. The findings demonstrated that the most salient protective factors have a stronger relationship with childhood obesity than a cumulative score with some preliminary evidence that ecological frameworks may be more effective. This study also expanded the evidence base for the NSCDC and HOPE frameworks. While a previous study explored the relationship between the NSCDC framework and mental health (Keane & Evans, 2022), this was the first known study to explore the relationship between the NSCDC framework and childhood obesity. Similarly, a previous study explored the relationship between individual HOPE framework protective factors and childhood obesity (Crouch et al., 2022), but this was the first study to examine the overall effectiveness of the HOPE framework with childhood obesity. This study also examined these relationships across ACE groupings and after controlling for ACEs to validate and better understand the relationship between these frameworks and childhood obesity among children who experienced ACEs. Previous studies utilizing these frameworks had inconsistently included ACEs in the study. Finally, this study combined multiple years of the NSCH to ensure enough statistical power to explore the relationship between factors and to allow for analysis with multiple subsamples.

Nevertheless, this study had several limitations. Even though previous NSCDC and HOPE studies utilized the NSCH, the survey items did not fully capture the protective factors as described by the original developers (NSCDC, 2015; Sege & Harper Browne, 2017). The cumulative PCE score utilized each framework's protective factors

and not the factors used in previous studies since there was no consensus. Future studies are needed using instruments designed to capture each framework's protective factors as described by the developers with future studies better establishing the factors to include using the cumulative PCEs framework. Causal or temporal relationships also could not be determined in this study due to the cross-sectional nature of the study. The NSCH also utilized parent or caregiver-reported data, which may not fully represent the experiences and perspectives of the children in this study. The ACEs on the NSCH also did not align with the ACEs in the original ACEs study (Felitti et al., 1998). While the NSCDC and HOPE frameworks significantly improved each model, the amount of variance in childhood obesity explained by each model was relatively low based on R^2 values ranging from 0.023 to 0.079. Thus, other factors not included in the study contributed to much of the variance. Finally, while protective factors from the NSCDC and HOPE frameworks were associated with childhood obesity, some of the covariates had a stronger relationship with childhood obesity, and the relationships were not as strong among children who experienced more ACEs.

Despite these limitations, this study had several important implications. First, the study established that the NSCDC and HOPE frameworks were associated with childhood obesity after controlling for ACEs and across ACE groupings. Also, the addition of a cumulative PCE score did not strengthen the relationship between either framework and childhood obesity. This suggests that interventions that focus on the most salient protective factors may be more effective at building resilience against ACEs. Strong self-regulation, mastery/after-school activities, and supportive neighborhoods were also associated with a lower likelihood of childhood obesity. However, some of the

strongest protective factors associated with childhood obesity differed from those associated with mental health based on a previous study (Keane & Evans, 2022) and another manuscript in preparation by the authors. Thus, future research should examine how protective factors may differ across outcomes among children who experienced ACEs. Future research is also needed to identify other potential protective factors consistent with these frameworks, explore moderating factors, establish instruments that better measure each framework, explore these frameworks with other outcomes, and determine if a combination of these frameworks may be more effective. Nevertheless, the findings still have implications for future interventions. Within the context of the GMVP (Gelberg et al., 2000), the study identified predisposing characteristics in the traditional and vulnerable domains such as parental education, race/ethnicity, age, sex, and exposure to ACEs that were associated with childhood obesity. Interventions should target social determinants of health associated with these characteristics across multiple ecological levels along with interventions that prevent ACEs to reduce the risk of childhood obesity. Within the traditional and vulnerable GMVP domains of enabling characteristics, the study identified that strong self-regulation, mastery/after-school activities, supportive neighborhoods, and household income were associated with childhood obesity. To reduce the likelihood of childhood obesity, interventions are needed to empower communities, schools, and families to utilize strategies to improve child self-regulation while encouraging and increasing child participation in after-school activities. Ecological approaches that strengthen community cohesion while reducing economic disparities may also be promising. Interventions should also educate others about ACEs and resilience to

increase the perceived need for these interventions to increase the likelihood of adoption of these interventions consistent with the GMVP.

Conclusions

When comparing the NSCDC, HOPE, and cumulative PCEs frameworks, this study found that the NSCDC and HOPE frameworks were associated with a lower likelihood of childhood obesity among children experiencing ACEs. Three protective factors were associated with a lower likelihood of childhood obesity among children experiencing ACEs across most analyses. This study demonstrated the promise of both frameworks, but future research is needed to further validate these frameworks with this and other outcomes. These findings are important in guiding future ACEs interventions to build resilience against the negative impact of ACEs on childhood obesity.

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MANUSCRIPT 3: COMPARING THREE RESILIENCE FRAMEWORKS ACROSS SCHOOL-RELATED OUTCOMES AMONG CHILDREN WHO EXPERIENCED ADVERSE CHILDHOOD EXPERIENCES

by

KEVIN KEANE, RETTA R. EVANS, LARRELL WILKINSON, DIONE MOULTRIE KING, LINDSAY LEBAN, DAVID MACRINA

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Format adapted for dissertation

Abstract

Adverse childhood experiences (ACEs) have an established relationship with poorer school-related outcomes which has long-term implications for the health and well-being of children. Resilience research has identified protective factors to overcome adversity, but researchers have only begun to explore how these factors work together to build resilience against ACEs. While the National Scientific Council on the Developing Child (NSCDC), Health Outcomes from Positive Experiences (HOPE), and cumulative positive childhood experiences (PCEs) frameworks are promising ACEs resilience frameworks, each has a limited evidence base. This study compared the relationship between these three resilience frameworks and three school-related outcomes (school engagement, absenteeism, and grade retention) among children who experienced ACEs. Based on hierarchical logistic regression using the 2018-2020 National Survey of Children's Health, the study found the NSCDC and HOPE frameworks were associated with all three outcomes, but the NSCDC framework had a stronger relationship across outcomes. The cumulative PCEs framework was associated with all study outcomes when using the full samples but lacked practical significance. Self-regulation, parent/caregiver relationships, sharing ideas, mastery, and after-school activities were the strongest protective factors across analyses. These findings demonstrate the effectiveness of the NSCH and HOPE frameworks and have implications for guiding future interventions while providing direction for future resilience research using these and similar frameworks to mitigate the negative impact of ACEs.

Keywords: resilience, protective factors, adverse childhood experiences, school engagement, absenteeism, grade retention

Introduction

Adverse childhood experiences (ACEs) are traumatic childhood events that have a dose-wise relationship with risky health behaviors, poorer health outcomes, and decreased quality of life (Brown et al., 2009; Felitti et al., 1998; Petruccelli et al., 2019; Schurer et al., 2019). While ACEs originally included categories of maltreatment and household dysfunction (Felitti et al., 1998), subsequent studies have considered other forms of childhood trauma that may have a dose-wise relationship with negative outcomes (Finkelhor et al., 2013; Wade et al., 2014). In the U.S., 46.3% of children experienced at least one ACE with 29.9% experiencing 2 or more ACEs (Bethell et al., 2017). ACEs are more prevalent among those with lower income, households with lower parental educational attainment, and some racial/ethnic minorities (Merrick et al., 2018). ACEs pose a public health threat that disproportionately impacts some populations.

ACEs have also been associated with poorer school-related outcomes (Bellis et al., 2018; Jimenez et al., 2016; Porche et al., 2016; Stempel et al., 2017). Children who experienced 4 or more ACEs had lower school engagement (Crouch et al., 2019; Suleiman et al., 2021) and were more likely to miss more days of school (Bellis et al., 2018; Stempel et al., 2017). ACEs have also been associated with a higher likelihood of repeating a grade and subsequently dropping out of high school (Hinojosa et al., 2019; Iachini et al., 2016; Leban & Masterson, 2021; McKelvey et al., 2018). Consequently, adults who experienced multiple ACEs in childhood were more likely to be welfare dependent, live in poverty, and have lower earnings (Schurer et al., 2019). Since ACEs disproportionately impact low-income and less-educated households (Merrick et al., 2018), ACEs can perpetuate health disparities and economic inequalities through the

intergenerational transmission of ACEs resulting in lower educational attainment, poorer economic outcomes, and poorer health (Braveman et al., 2010; Narayan et al., 2021).

To mitigate ACEs, researchers have begun to identify protective factors from historic resilience research, which identified factors that allowed individuals to succeed despite exposure to adversity (Ortiz, 2019; Sciaraffa et al., 2017; Wright et al., 2013; Zolkoski & Bullock, 2012). Despite the promise of these protective factors, most protective factors have not been explored specifically among children who experienced ACEs (Traub & Boynton-Jarrett, 2017). Most studies that examined these protective factors have not considered how protective factors work together to build resilience. Building on historic resilience research, resilience is best understood within the context of how protective factors interact to build resilience (Wright et al., 2013). Researchers have begun to identify frameworks to explain how protective factors work together to build resilience against ACEs. Despite a limited evidence base, three ACEs frameworks that have emerged are the National Scientific Council on the Developing Child (NSCDC), Health Outcomes from Positive Experiences (HOPE), and cumulative positive childhood experiences (PCEs) frameworks (Bethell et al., 2019; National Scientific Council on the Developing Child [NSCDC], 2015; Sege & Harper Browne, 2017).

The NSCDC framework posits that children build resilience to overcome ACEs through four protective factors: a supportive, stable relationship with at least one adult; strong self-regulation/executive functioning; mastery; and having an affirming, supportive, hopeful faith or cultural tradition. A resilience-building adult relationship is considered the most important of these factors (NSCDC, 2015). While these protective factors are grounded in historic resilience research (Masten, 2018; Wright et al., 2013)

and some individual factors have been associated with better outcomes among those who experienced ACEs (Bellis et al., 2017; Yamaoka & Bard, 2019), only one known study has explored the effectiveness of the entire framework among children who experienced ACEs (Keane & Evans, 2022). While this study found the NSCDC framework along with self-regulation and a supportive parent/caregiver relationship were associated with a lower likelihood of childhood mental health issues (Keane & Evans, 2022), no known studies have explored the effectiveness of this framework with school-related outcomes or compared the effectiveness to other frameworks. Thus, research is needed to determine its effectiveness on school outcomes and compare its effectiveness relative to other frameworks.

The HOPE framework recognizes that resilience to overcome ACEs and promote health across domains is the byproduct of four categories of protective factors across ecological levels. The categories include supportive and nurturing relationships; being in environments that are safe, protective, stable, and equitable; opportunities for developing connections and social engagement; and learning social and emotional competencies (Sege & Harper Browne, 2017). While no known studies have explored the overall effectiveness of this framework, it has a slightly larger evidence base with three known studies examining the relationship between protective factors from the framework and childhood outcomes (Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). While not including ACEs, one study identified three protective factors associated with school absenteeism and two associated with grade retention (Crouch, Radcliff, Merrell, Hung, et al., 2021). Other HOPE framework studies that included ACEs identified protective factors linked to childhood weight status and

depression (Crouch et al., 2022; Elmore et al., 2020), but research is still needed to establish the effectiveness of the entire framework and compare it to other frameworks.

Rather than targeting the strongest protective factors, the cumulative PCEs framework theorizes that there is a dose-wise relationship between childhood protective factors and more positive outcomes among those who have experienced ACEs (Baglivio & Wolff, 2020; Bethell et al., 2019). One study found that increased exposure to PCEs was associated with a lower likelihood of not caring about school, not completing homework, and grade retention among children who experienced 4 or more ACEs (Robles et al., 2019). Increased exposure to PCEs was also associated with a lower likelihood of readjudication and recidivism among youth involved in the juvenile justice system (Baglivio & Wolff, 2020). Experiencing 4 or more PCEs has also been associated with lower levels of delinquent behavior and moderated the relationship between ACEs and delinquency among youth experiencing 1 to 4 ACEs (Novak & Fagan, 2022). While these are the only known child studies, adult studies associated more PCEs with a lower likelihood of mental health issues, substance abuse, risky sexual behaviors, and obesity in studies that included ACEs (Bethell et al., 2019; Crandall et al., 2020; Kuhar & Zager Kocjan, 2021). Despite the effectiveness of this framework, few studies involved children, the protective factors differed across studies, and research has not compared the framework to other frameworks.

Multiple other factors have also been associated with poorer school outcomes (Lim et al., 2019; Piscitello et al., 2022). Thus, this study utilized the Gelberg-Andersen Model for Vulnerable Population (GMVP) to identify other covariates associated with school-related outcomes consistent with previous studies and to consider how the

findings could be used to inform future interventions (Crouch et al., 2022; Gelberg et al., 2000; Yoonsook et al., 2018). The model was selected due to the way that predisposing and enabling categories in the traditional and vulnerable domains aligned with ACEs, protective factors, and covariates along with the model being extended to consider the impact of health and mental health on school-related outcomes (Vernet & Sberna, 2022).

Thus, while previous research has established ACEs are associated with poorer school outcomes (Crouch et al., 2019; Iachini et al., 2016; Stempel et al., 2017), researchers have only begun to examine protective factors that can mitigate ACEs (Traub & Boynton-Jarrett, 2017). The NSCDC, HOPE, and cumulative PCE frameworks are three promising ACEs resilience frameworks, but each has a limited evidence base with only two known studies examining any of these frameworks for school outcomes (Crouch, Radcliff, Merrell, Hung, et al., 2021; Robles et al., 2019). Previous studies have also inconsistently included ACEs with no known studies comparing their relative effectiveness. This study addressed these gaps by comparing the relationship between these three frameworks and three school-related outcomes (school engagement, excessive absenteeism, and grade retention) among children who experienced ACEs. This expanded the evidence base for each framework while determining which framework and factors are most effective to inform future interventions utilizing the GMVP. The specific aims of this study were: 1) to determine whether the NSCDC or HOPE framework has a stronger relationship with school-related outcomes; 2) to determine whether a cumulative PCE score strengthens the relationship between each framework and school-related outcomes; 3) to determine which protective factors have the strongest relationship with school-related outcomes; and 4) to determine whether these relationships are the same

after controlling for ACEs and across ACE subgroups. Due to the only previous study exploring the effectiveness of the entire framework (Keane & Evans, 2022), the specific protective factors included (NSCDC, 2015), and another publication in preparation by the authors, the authors hypothesized the NSCDC and HOPE frameworks would be associated with all three outcomes. They also anticipated that the NSCDC would have the strongest relationship across outcomes and that self-regulation would be the strongest protective factor followed by a strong parent/caregiver relationship. Other HOPE factors would be associated with the study outcomes, but they would differ by outcome like a previous study (Crouch, Radcliff, Merrell, Hung, et al., 2021). Also, the authors hypothesized a cumulative PCE score would not significantly strengthen either model with the outcomes being persistent across ACE subgroups and after controlling for ACEs.

Methods

Participants

The study utilized secondary data from the 2018 to 2020 National Survey of Children's Health (NSCH). The NSCH is a national survey conducted by the U.S. Maternal and Child Health Bureau on child health and wellbeing (U.S. Census Bureau, 2020). Parents or caregivers completed a web-based or paper-based survey on children between 0 and 17 years old in their homes. After completing a screening survey, respondents completed one of three topical surveys on a single child selected from their home that differed based on the child's age. Due to analyses using various subgroups, data from the 2018, 2019, and 2020 NSCH were combined to ensure sufficient sample sizes. The response rates were 36.9% in 2018, 35.3% in 2019, and 36.4% in 2020 (U.S.

Census Bureau, 2019, 2020, 2021a). This study only used responses based on 6- to 17-year-old children since only these NSCH versions included all the applicable ACEs and protective factor items. The final samples for each outcome consisted of all children in that age group missing none of the variables of interest. Of the 102,740 responses, 73,849 (71.9%) were children between 6 and 17 years old. Of those 73,849 responses, the final sample with no variables of interest missing was 65,595 (88.8%) for school engagement, 65,548 (88.8%) for absenteeism, and 65,772 (89.1%) for grade retention.

Measures

Adverse childhood experiences. The parent/caregiver answered eight dichotomized ("yes" or "no") ACE items (household substance abuse, household mental illness, household domestic violence, parent/guardian incarceration, parent/guardian divorce or separation, parent/guardian death, neighborhood violence, and discrimination) indicating whether the child ever experienced that ACE. A ninth ACE, economic hardship, was coded as "yes" if the respondent reported they "very often" or "somewhat often" had problems paying for the child's necessities since birth (Crouch et al., 2019; Keane & Evans, 2022). An ACEs score was based on the sum of ACEs experienced ("yes"). ACEs were grouped as 0 ACEs, 1 ACE, 2-3 ACEs, and ≥ 4 ACEs to simplify reporting and separate by risk level consistent with a previous study (Bethell et al., 2019).

School-related outcomes. This study explored three school-related outcomes (low school engagement, excessive absenteeism, and grade retention). Building on the limitations of previous studies, all outcomes were dichotomized to better facilitate

resilience framework and protective factor comparisons across study outcomes and other studies using similar methodology. Low school engagement was based on two items: "how often does this child care about doing well in school?" and "how often does this child do all of the required homework?". Like previous studies (Crouch et al., 2019; Uddin et al., 2021), children were engaged in school based on responses of "usually" or "always" to both items; otherwise, the child had low school engagement. For absenteeism, parents/caregivers were asked "during the past 12 months, about how many days did this child miss school because of illness or injury?" with the options of "1-3 days", "4-6 days", "7-10 days", "11 or more days", and "this child was not enrolled in school". Children that missed 11 or more days of school were excessively absent like other studies (Crouch, Radcliff, Merrell, Hung, et al., 2021; Roy et al., 2022). Children that missed less than 11 days were not excessively absent; responses of "this child was not enrolled in school" were excluded from the sample. Grade retention was based on a response of "yes" to "since starting kindergarten, has this child repeated any grades?".

NSCDC framework protective factors. The four NSCDC protective factors were measured using five items as outlined in Table 1 like the previous NSCDC study (Keane & Evans, 2022). All items were dichotomized ("yes" or "no") to indicate whether the child had that protective factor and to calculate a cumulative NSCDC PCE score. Two items – parent/caregiver relationship and other adult relationship – measured at least one supportive adult relationship. The child had a supportive parent/caregiver relationship ("yes") based on a response of "somewhat well" or "very well". If the respondent answered "yes" to other adult relationship, they had this protective factor. For self-

regulation, a response of “most of the time” or “all of the time” indicated strong self-regulation (“yes”). Participation in at least one mastery activity listed in the past 12 months indicated mastery in an area (“yes”). Responses of “most of the time” or “all of the time” to the hopeful/affirming cultural tradition item indicated that they had this protective factor (“yes”).

Table 1

NSCDC Framework Items on the 2018-2020 National Survey of Children's Health

1. **Parent/Caregiver Relationship**[a]: How well can you and this child share ideas or talk about things that really matter?
2. **Other Adult Relationship**[b]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
3. **Self-Regulation**[c]: Does this child stay calm and in control when faced with a challenge?
4. **Mastery**[b]: During the past 12 months, did this child participate in:
   a. Any clubs or organizations after school or on weekends?
   b. A sports team or did they take sports lessons after school or on weekends?
   c. Any other organized activities or lessons, such as music, dance, language, or other arts?
   d. Any type of community service or volunteer work at school, place of worship, or in the community?
5. **Hopeful/Affirming Cultural Tradition**[d]: When your family faces problems, how often are you likely to stay hopeful even in difficult times?

[a]Responses of "very well", "somewhat well", "not very well", "not at all"; [b]responses of "yes" or "no"; [c]responses of "always", "usually", "sometimes", "never"; [d]responses of "all of the time", "most of the time", "some of the time", "none of the time"

HOPE framework protective factors. Building on previous NSCH HOPE framework studies (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021), the four HOPE framework categories were captured using seven items as outlined in Table 2. Each protective factor was dichotomized (“yes” or “no”) to facilitate a cumulative HOPE PCEs score. Within the supportive and nurturing relationships category, a mentoring relationship was based on the respondent’s response (“yes” or “no”), and the child had family resilience (“yes”) based on answers of either “most of the time” or “all of the time” to all items. For the two

Table 2

HOPE Framework Items on the 2018-2020 National Survey of Children's Health

Category 1: Supportive and nurturing relationships
1. **Mentor Relationship**[a]: Other than you or other adults in your home, is there at least one other adult … who knows this child well and who they can rely on for advice or guidance?
2. **Family Resilience**[b]: When your family faces problems, how often are you to do each of the following?
a. Work together to solve problems. c. Know we have strengths to draw on.
b. Talk together about what to do. d. Stay hopeful even in difficult times.
Category 2: Being in stable, safe, equitable, and protective environments
3. **Supportive Neighborhood**[c]:
a. We watch out for each other's children in this neighborhood
b. People in this neighborhood help each other out
c. When we encounter difficulties, we know where to go for help in our community
4. **Safe Neighborhood**[c]: This child is safe in our neighborhood.
Category 3: Opportunities for social engagement and developing connections
5. **After-School Activities**[a]: During the past 12 months, did this child participate in:
a. Any clubs or organizations after school or on weekends?
b. A sports team or did they take sports lessons after school or on weekends?
c. Any other organized activities or lessons, such as music, dance, language, or other arts?
6. **Volunteerism**[a]: During the past 12 months, did this child participate in any type of community service or volunteer work at school, place of worship, or in the community?
Category 4: Learning emotional and social competencies
7. **Sharing Ideas**[d]: How well can you and this child share ideas or talk about things that really matter?

[a]Responses of "yes" or "no"; [b]responses of "all of the time", "most of the time", "some of the time", "none of the time"; [c]responses of "definitely agree", "somewhat agree", "somewhat disagree", "definitely disagree"; [d]responses of "very well", "somewhat well", "not very well", "not at all"

stable, safe, equitable, and protective environment measures, a supportive neighborhood ("yes") was based on one or more responses of "definitely agree" and responses of "somewhat agree" to the remaining items. A safe neighborhood ("yes") was based on a response of either "somewhat agree" or "definitely agree". In the opportunities for social engagement and developing connections category, participating in any after-school activities was coded "yes"; a response of "yes" indicated the child engaged in volunteerism. Possessing emotional and social competencies ("yes") was based on a response of "very well" or "somewhat well".

Cumulative PCEs scores. Cumulative PCE scores were calculated for each framework to examine whether the addition of a cumulative PCE score improved the model. Like a previous HOPE framework study (Crouch, Radcliff, Merrell, Brown, et al., 2021), the cumulative HOPE PCE score was determined by adding the number of protective factors coded as "yes". Cumulative HOPE PCE scores were separated into groupings (0 to 2 PCEs, 3 to 5 PCEs, and 6 to 7 PCEs) consistent with a previous study to facilitate comparisons with the NSCDC PCE scores and to simplify reporting (Bethell et al., 2019). The cumulative NSCDC PCE score was calculated the same way. Scores were separated into groups (0 to 2 PCEs, 3 to 4 PCEs, and 5 PCEs) due to similar prevalence and to simplify comparisons.

Covariates. Several NSCH variables were included that are predisposing and enabling factors from the GMPV (Gelberg et al., 2000). Predisposing factors included parental education, the child's sex, and the child's race/ethnicity. Parents' highest education was based on the highest level of parental/caregiver educational attainment ("less than high school", "high school", "some college or associate degree", or "college degree or higher"). Sex was the child's biological sex ("male" or "female) reported by the parent/caregiver; the child's race ("Black or African American alone", "White alone", or "Other") was based on race as coded by the NSCH. Since age was not reported as a continuous variable, age was recoded as "6 to 12 years old" and "13 to 17 years old" to differentiate younger children and adolescents. The enabling factor of household income was based on the mean of imputed values provided by the NSCH (U.S. Census Bureau, 2021b). Household income was reported based on the estimated family poverty level with

recoded categories of 0% to 199%, 200%-399%, and 400% or higher to allow for comparisons. Since data was collected for the 2020 NSCH during the COVID-19 pandemic, a COVID-19 variable ("yes" or "no") indicated whether data collection was during COVID-19. This controlled for potential differences due to the timing of the survey during the pandemic.

Data Analysis

First, the frequencies for the protective factors, cumulative PCE scores, ACEs groupings, and covariates were identified for samples using each outcome (school engagement, absenteeism, and grade retention). Differences were explored using X^2 tests. Model comparisons using hierarchical logistic regression were conducted to examine the specific aims of this study utilizing three approaches for each outcome. Hierarchical logistic regression was first used with the entire sample while excluding ACEs; the regression models were then repeated after controlling for ACEs. The final analyses utilized hierarchical logistic regression with the four ACEs subgroups (0 ACEs, 1 ACE, 2-3 ACEs, ≥ 4 ACEs) to examine whether the findings were consistent across ACEs subgroups. For all three outcomes, the samples met the assumptions of logistic regression. Since all VIF values were between 1 and 10, none of the samples had multicollinearity (Marquardt, 1970). All observations were independent with dichotomous outcome variables. Each sample and subsample had a sufficiently large sample size (Bujang et al., 2018). Analyses were conducted with IBM SPSS Statistics for Windows, Version 27.0. A p-value of 0.05 was used with interpretations of effect size included due to some large sample sizes.

For the analyses excluding ACEs and utilizing ACEs subgroups, Figure 1 summarizes the hierarchical logistic regression steps used to compare the NSCDC framework (model 1) and the HOPE framework (model 2) for each outcome. First, if the ΔR^2 from block 1 to 2 was significant for each framework, that framework significantly improved the regression model, demonstrating that framework's effectiveness. Then, Nagelkerke's R^2 values were compared in block 2 to determine whether the NSCDC or HOPE framework had a stronger relationship with each outcome. In block 2, the adjusted odds ratios were compared to determine which protective factors were significant and had the strongest association with each outcome using that framework. The cumulative PCEs framework's effectiveness was based on if the ΔR^2 from block 2 to 3 was significant.

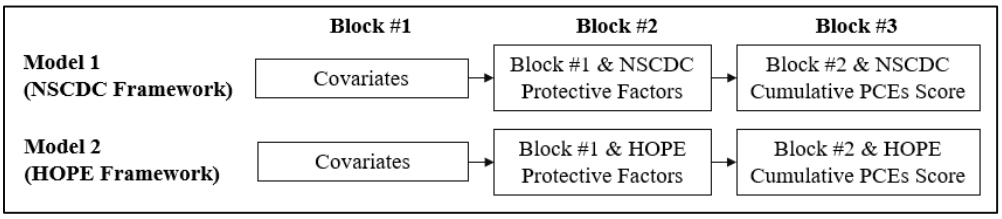

Figure 1. Hierarchical logistic regression for analyses excluding ACEs.

For the analyses that controlled for ACEs, Figure 2 summarizes the logistic regression steps. The only difference was ACEs groupings were introduced in block 2. Each framework's effectiveness was based on if the ΔR^2 from block 2 to 3 was significant. Nagelkerke's R^2 values were compared in block 3 to determine the most effective framework. The adjusted odds ratios in block 3 were used to identify each framework's strongest protective factors. Each framework's cumulative PCE score was determined to contribute to the model if the ΔR^2 from block 3 to 4 was significant.

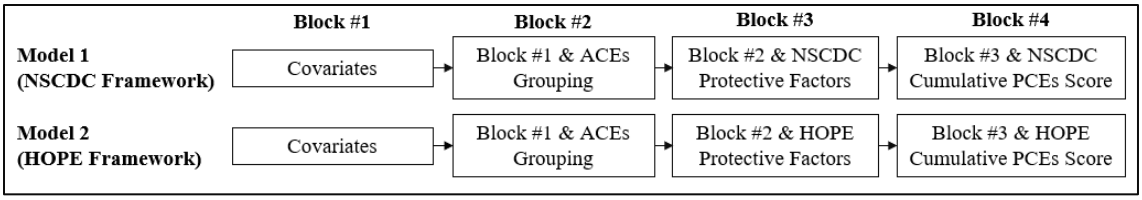

Figure 2. Hierarchical logistic regression for analyses including ACEs.

Results

Descriptive Statistics and Bivariate Analysis

The descriptive statistics and X^2 tests for the full samples of each school-related outcome are summarized in Table 3. The demographic composition for each sample was very similar (M_{age}=12.1; 48.0%-48.1% female; 78.2% Caucasian, 15.0% other race, 6.8% Black/African American). Across samples, 43.8%-43.9% of children experienced at least 1 ACE with 6.2%-6.3% experiencing 4 or more ACEs. A total of 11,057 (16.9%) children had low school engagement, 2,829 (4.3%) missed 11 or more days of school, and 3,453 (5.2%) repeated a grade since kindergarten. Based on bivariate analyses, the number of ACEs experienced was associated with all three outcomes and had the strongest effect size. All the other covariates were significant other than sex for excessive absenteeism across outcomes. Based on Cramer's V (Akoglu, 2018), most associations were weak to very weak. Parents' highest level of education and household income had a moderate to strong effect size for school engagement and grade retention; sex had a moderate to strong effect size for school engagement. Other than ACEs, all covariates had a weak to very weak effect size for absenteeism.

Table 4 summarizes the prevalence of protective factors and cumulative PCE scores with the results of bivariate analyses. The majority of children had all the

Table 3

Study Sample Demographic and Other Characteristics by School Outcomes

Sample Characteristics	School Engagement			Absenteeism			Grade Retention		
	Total Sample (%) (n=65,595)	Low School Engage.[a] (%)	P-Value[d]/ Cramer's V	Total Sample (%) (n=65,548)	Excessive Absent.[b] (%)	P-Value[d]/ Cramer's V	Total Sample (%) (n=65,772)	Repeat a Grade[c] (%)	P-Value[d]/ Cramer's V
Overall	100%	16.9%		100%	4.3%		100%	5.2%	
Race/Ethnicity									
Caucasian	78.2%	16.9%	<0.001	78.2%	4.5%	0.001	78.2%	4.9%	<0.001
Black/Afr. American	6.8%	19.6%	0.023	6.8%	3.8%	0.015	6.8%	9.5%	0.052
Other	15.0%	15.6%		15.0%	3.7%		15.0%	5.0%	
Sex									
Male	52.0%	22.1%	<0.001	51.9%	4.2%	0.065	52.0%	6.6%	<0.001
Female	48.0%	11.1%	0.147	48.1%	4.5%	0.007	48.0%	3.8%	0.061
Age									
6-12 Years Old	50.8%	15.1%	<0.001	50.9%	3.2%	<0.001	50.9%	4.3%	<0.001
13-17 Years Old	49.2%	18.6%	0.046	49.1%	5.5%	0.056	49.1%	6.3%	0.045
Household Income[e]									
<200% FPL	26.1%	22.7%	<0.001	26.0%	6.5%	<0.001	26.1%	8.9%	<0.001
200%-399% FPL	35.9%	17.1%	0.106	35.9%	4.1%	0.066	35.9%	4.8%	0.103
≥400% FPL	37.9%	12.6%		38.0%	3.1%		37.9%	3.1%	
Parents Highest Education									
Less than High School	2.5%	21.4%	<0.001	2.5%	6.0%	<0.001	2.5%	12.4%	<0.001
High School	13.1%	22.7%	0.104	13.1%	5.7%	0.048	13.1%	9.4%	0.112
Some College/ Assoc Degr	23.6%	21.2%		23.6%	5.4%		23.6%	6.9%	
≥College Degree	60.7%	13.7%		60.8%	3.5%		60.7%	3.4%	
COVID[f]									
Prior to COVID	58.2%	15.5%	<0.001	58.3%	4.7%	<0.001	58.3%	5.6%	<0.001
During COVID	41.8%	18.7%	0.041	41.7%	3.8%	0.022	41.7%	4.8%	0.016
ACEs[g]									
0 ACEs	56.1%	11.2%	<0.001	56.2%	2.5%	<0.001	56.1%	3.4%	<0.001
1 ACE	22.7%	18.4%	0.213	22.6%	4.8%	0.125	22.6%	5.8%	0.119
2-3 ACEs	14.9%	26.6%		14.9%	7.5%		14.9%	8.0%	
4 or More ACEs	6.3%	38.9%		6.2%	11.3%		6.3%	13.2%	

[a]Low level of caring about doing well in school or doing required homework; [b]missed 11 or more days of school in the last year; [c]ever repeated a grade since kindergarten; [d]p-value based on Chi-squared test of independence; [e]family income as percentage of the federal poverty level; [f]COVID based on whether the survey was administered prior to or during the COVID-19 pandemic; [g]adverse childhood experiences

protective factors except for volunteerism. Across outcomes, over 90% of children had a supportive parent relationship, sharing ideas, a hopeful/affirming cultural tradition, and another adult/mentor relationship. All NSCDC and HOPE protective factors and cumulative PCE scores were associated with all three study outcomes. Based on Cramer's V values (Akoglu, 2018), most protective factors had a weak to very weak

Table 4

Protective Factors and Cumulative PCE Scores by School Outcomes

Sample Characteristics	School Engagement			Absenteeism			Grade Retention		
	Total Sample (%) (n=65,595)	Low School Engage.[a] (%)	P-Value[d]/ Cramer's V	Total Sample (%) (n=65,548)	Excessive Absent.[b] (%)	P-Value[d]/ Cramer's V	Total Sample (%) (n=65,772)	Repeat a Grade[c] (%)	P-Value[d]/ Cramer's V
NSCDC[e] Protective Factors									
Parent Relationship									
Yes	95.2%	14.7%	<0.001	95.2%	3.9%	<0.001	95.2%	4.9%	<0.001
No	4.8%	58.5%	0.251	4.8%	11.8%	0.083	4.8%	12.4%	0.073
Other Adult Relationship									
Yes	91.9%	16.0%	<0.001	91.9%	4.2%	<0.001	91.9%	5.1%	<0.001
No	8.1%	26.4%	0.076	8.1%	6.1%	0.026	8.1%	7.2%	0.025
Strong Self-Regulation									
Yes	75.2%	8.6%	<0.001	75.3%	2.9%	<0.001	75.2%	3.9%	<0.001
No	24.8%	41.8%	0.382	24.7%	8.5%	0.118	24.8%	9.3%	0.105
Mastery in Some Area									
Yes	89.1%	14.9%	<0.001	89.2%	3.8%	<0.001	89.1%	4.6%	<0.001
No	10.9%	32.5%	0.146	10.8%	8.4%	0.069	10.9%	10.7%	0.085
Hopeful/Affirming Cultural Tradition									
Yes	94.1%	15.5%	<0.001	94.2%	4.0%	<0.001	94.1%	5.1%	<0.001
No	5.9%	38.5%	0.144	5.8%	10.0%	0.069	5.9%	8.2%	0.033
Cumulative NSCDC[e] PCE[f] Score									
0 to 2 PCEs	3.4%	64.3%	<0.001	3.3%	15.1%	<0.001	3.4%	13.6%	<0.001
3 to 4 PCEs	34.8%	29.3%	0.366	34.7%	6.4%	0.133	34.8%	7.8%	0.117
5 PCEs	61.8%	7.2%		61.9%	2.6%		61.8%	3.4%	
HOPE[g] Framework Protective Factors									
Mentor Relationship									
Yes	91.9%	16.0%	<0.001	91.9%	4.2%	<0.001	91.9%	5.1%	<0.001
No	8.1%	26.4%	0.076	8.1%	6.1%	0.026	8.1%	7.2%	0.025
Family Resilience									
Yes	83.6%	14.0%	<0.001	83.6%	3.7%	<0.001	83.6%	4.8%	<0.001
No	16.4%	31.4%	0.172	16.4%	7.7%	0.073	16.4%	7.4%	0.044
Supportive Neighborhood									
Yes	62.1%	13.2%	<0.001	62.2%	3.5%	<0.001	62.1%	4.5%	<0.001
No	37.9%	22.9%	0.126	37.8%	5.7%	0.053	37.9%	6.4%	0.042
Safe Neighborhood									
Yes	70.5%	14.6%	<0.001	70.5%	3.7%	<0.001	70.5%	4.9%	<0.001
No	29.5%	22.2%	0.092	29.5%	5.8%	0.047	29.5%	6.1%	0.025
After-School Activities									
Yes	83.9%	13.9%	<0.001	84.0%	3.6%	<0.001	83.8%	4.3%	<0.001
No	16.1%	32.2%	0.180	16.0%	8.3%	0.086	16.2%	10.3%	0.099
Volunteerism									
Yes	47.3%	11.5%	<0.001	47.4%	3.5%	<0.001	47.3%	4.1%	<0.001
No	52.7%	21.6%	0.134	52.6%	5.1%	0.039	52.7%	6.3%	0.049
Sharing Ideas									
Yes	95.2%	14.7%	<0.001	95.2%	3.9%	<0.001	95.2%	4.9%	<0.001
No	4.8%	58.5%	0.251	4.8%	11.8%	0.083	4.8%	12.4%	0.073
Cumulative HOPE[g] PCE[f] Score									
0 to 2 PCEs	3.7%	52.1%	<0.001	3.7%	12.2%	<0.001	3.7%	11.5%	<0.001
3 to 5 PCEs	44.1%	22.4%	0.248	44.0%	5.5%	0.100	44.1%	6.6%	0.085
6 to 7 PCEs	52.2%	9.7%		52.3%	2.8%		52.2%	3.7%	

[a]Low level of caring about doing well in school or doing required homework; [b]missed 11 or more days of school in the last year; [c]ever repeated a grade since kindergarten; [d]p-value based on Chi-squared test of independence; [e]National Scientific Council on the Developing Child; [f]positive childhood experiences; [g]Health Outcomes from Positive Experiences

association with each outcome. Both cumulative PCE scores, the NSCDC factors of strong self-regulation and parent/caregiver relationship, and the HOPE protective factors of sharing ideas, after-school activities, and family resilience had a strong to very strong effect on school engagement. While no protective factors had a strong effect on absenteeism or grade retention, both cumulative PCE scores and strong self-regulation from the NSCDC framework had a moderate effect on absenteeism. Only the cumulative NSCDC PCE scores and self-regulation had a moderate effect on grade retention with all others being weak or very weak.

Comparison of Resilience Frameworks and Models

Based on Nagelkerke's R^2, Table 5 summarizes the variance in each outcome explained by block for each analysis and model. If the ΔR^2 was significant, this demonstrates the addition of those protective factors significantly improved the logistic regression model. While analyses were conducted across ACEs subgroups, only the subgroup of children who experienced 4 or more ACEs is captured for conciseness since those are the highest risk group for more negative school outcomes due to ACEs (Bellis et al., 2018; Crouch et al., 2019; Stempel et al., 2017). For school engagement, the covariates in the full sample explained 6.8% of the variance in low school engagement with the covariates and ACEs explaining 11.5%. Since the ΔR^2 was significant for the NSCDC and HOPE models in block 3, the inclusion of protective factors from both frameworks improved the model. The NSCDC framework had a stronger relationship with school engagement in the full sample excluding (NSCDC $R^2 = 0.286$; HOPE $R^2 = 0.187$) and including ACEs (NSCDC $R^2 = 0.302$; HOPE $R^2 = 0.211$). For both

Table 5

Comparison of the NSCDC[a] and HOPE[b] Frameworks Relationship with School Outcomes Based on Nagelkerke's R^2

Analysis Type/ Framework	Overall Sample Size	Block #1 (Covariates)	Block #2 (Block #1 & ACE Count) (If Applies)		Block #3 (Block #2 & Protective Factors)		Block #4 (Block #3 & Cumulative PCE Count)	
		R^2	R^2	ΔR^2	R^2	ΔR^2	R^2	ΔR^2
Low School Engagement[c]								
Full Sample (PCEs[f] Only)								
NSCDC[a] Framework	65,595	0.068***			0.286***	0.218***	0.287***	0.001***
HOPE[b] Framework	65,595	0.068***			0.187***	0.119***	0.188***	0.001*
Full Sample (PCEs[f] & ACEs[g])								
NSCDC[a] Framework	65,595	0.068***	0.115***	0.047***	0.302***	0.187***	0.302***	0.000**
HOPE[b] Framework	65,595	0.068***	0.115***	0.047***	0.211***	0.096***	0.211***	0.000*
Children Experiencing 4 or More ACEs[g]								
NSCDC[a] Framework	4,127	0.047***			0.277***	0.230***	0.277***	0.000
HOPE[b] Framework	4,127	0.047***			0.172***	0.125***	0.172***	0.000
Excessive Absenteeism[d]								
Full Sample (PCEs[f] Only)								
NSCDC[a] Framework	65,548	0.031***			0.084***	0.053***	0.084***	0.000*
HOPE[b] Framework	65,548	0.031***			0.067***	0.036***	0.067***	0.000
Full Sample (PCEs[f] & ACEs[g])								
NSCDC[a] Framework	65,548	0.031***	0.061***	0.030***	0.100***	0.039***	0.101***	0.001*
HOPE[b] Framework	65,548	0.031***	0.061***	0.030***	0.086***	0.025***	0.086***	0.000
Children Experiencing ≥ 4 ACEs[g]								
NSCDC[a] Framework	4,092	0.040***			0.094***	0.054***	0.094***	0.000
HOPE[b] Framework	4,092	0.040***			0.077***	0.037***	0.078***	0.001
Repeated a Grade[e]								
Full Sample (PCEs[f] Only)								
NSCDC[a] Framework	65,772	0.063***			0.092***	0.029***	0.093***	0.001***
HOPE[b] Framework	65,772	0.063***			0.079***	0.016***	0.080***	0.001*
Full Sample (PCEs[f] & ACEs[g])								
NSCDC[a] Framework	65,772	0.063***	0.079***	0.016***	0.101***	0.022***	0.102***	0.001***
HOPE[b] Framework	65,772	0.063***	0.079***	0.016***	0.091***	0.012***	0.091***	0.000*
Children Experiencing ≥ 4 ACEs[g]								
NSCDC[a] Framework	4,131	0.024***			0.059***	0.035***	0.059***	0.000
HOPE[b] Framework	4,131	0.024***			0.043***	0.019***	0.043***	0.000

[a]National Scientific Council on the Developing Child; [b]Health Outcomes from Positive Experiences; [c]low level of caring about doing well in school or doing required homework; [d]missed 11 or more days of school in the last year; [e]ever repeated a grade since kindergarten; [f]positive childhood experiences; [g]adverse childhood experiences; *p<0.05; **p<0.01; ***p<0.001

frameworks, the addition of a cumulative PCE score was significant but lacked practical significance since the model only improved by 0.1% compared to the model excluding a cumulative PCE score. Across ACEs subgroups, the findings were similar. However, the

NSCDC framework improved more from block 1 to block 3 among children experiencing 4 or more ACEs than the HOPE framework. Also, the addition of a cumulative PCE score was no longer significant across most subgroups.

When considering excessive absenteeism, the covariates in the full sample explained 3.1% of the variance with the addition of ACEs groupings in the full sample explaining 6.1% of the variance. While the NSCDC and HOPE frameworks were both associated with absenteeism based on the ΔR^2 being significant in the full sample excluding and including ACEs, the NSCDC framework had a slightly stronger relationship with excessive absenteeism than the HOPE framework in the full sample excluding ACEs (NSCDC $R^2 = 0.084$; HOPE $R^2 = 0.067$) and after controlling for ACEs (NSCDC $R^2 = 0.100$; HOPE $R^2 = 0.086$). While the ΔR^2 from block 3 to block 4 was significant in the full sample including and excluding ACEs, the addition of a cumulative PCE score lacked practical significance since the ΔR^2 was 0.001 or less. Findings were consistent across ACEs subgroups with the NSCDC framework explaining slightly more variance than the HOPE framework across all ACE subgroupings with the most variance among subgroups being explained among children experiencing 4 or more ACEs. While the addition of the NSCDC and HOPE frameworks was significant across all ACEs subgroups, the only significant cumulative PCE score was the NSCDC PCE score for children experiencing 1 ACE. However, the cumulative NSCDC PCE score still only explained an additional 0.4% of the variance in excessive absenteeism.

For grade retention, the covariates in the full sample explained 6.3% of the variance in repeating a grade while covariates and ACEs explained 7.9% of the variance. In the full sample, the addition of protective factors from the NSCDC and HOPE

frameworks significantly improved the models. The NSCDC framework explained slightly more variance in children ever repeating a grade compared to the HOPE framework in the full sample excluding ACEs (NSCDC R^2 = 0.092; HOPE R^2 = 0.079) and including ACEs (NSCDC R^2 = 0.101; HOPE R^2 = 0.091). The addition of a cumulative PCE score using the NSCDC and HOPE frameworks significantly improved each model based upon a significant ΔR^2 but lacked practical significance since the additional amount of variance explained was 0.1% or less. Across ACEs subgroups, the findings were consistent with the NSCDC framework explaining slightly more variance and the addition of a cumulative PCE score lacking statistical or practical significance.

Comparison of Protective Factors within Frameworks

Tables 6 and 7 summarize the adjusted odds ratios for each of the outcomes from the third block of logistic regression analyses for the NSCDC and HOPE frameworks after controlling for the covariates and ACEs (if applicable). When considering covariates in both analyses, Caucasian compared to other race, males, adolescents, children from lower-income households, and children of parents with only some college education or a high school degree had lower levels of school engagement in the full sample including and excluding ACEs. In the full sample including and excluding ACEs, Caucasians compared to Black/African American and other race, females. adolescents, and children from lower-income households had a higher likelihood of excessive absenteeism. In the full sample including and excluding ACEs, children who were Black/African American compared to Caucasian, males, adolescents, children from lower-income households, and children of parents with lower levels of education were more likely to have repeated a

Table 6

Adjusted Odds Ratios of School Outcomes Using the NSCDC[a] Framework[b]

Covariates/Protective Factors	Low School Engagement[e]			Excessive Absenteeism[f]			Repeated a Grade[g]		
	Full Sample (No ACEs)[h]	Full Sample (ACEs)[h]	Children with ≥4 ACEs[i]	Full Sample (No ACEs)[j]	Full Sample (ACEs)[j]	Children with ≥ 4 ACEs[k]	Full Sample (No ACEs)[l]	Full Sample (ACEs)[l]	Children with ≥ 4 ACEs[m]
Covariates									
Race/Ethnicity									
Caucasian (Ref.)									
Black/African American	0.96	0.92	1.03	0.64***	0.61***	0.97	1.55***	1.52***	1.37*
Other	0.86***	0.84***	0.91	0.79***	0.77***	0.85	0.98	0.97	0.91
Female	0.44***	0.43***	0.49***	1.20***	1.18***	1.16	0.61***	0.60***	0.72***
13-17 Years	1.70***	1.59***	1.54***	2.02***	1.88***	1.94***	1.69***	1.61***	1.63***
Household Income									
≥400% FPL (Ref.)									
200%-399% FPL	1.22***	1.12***	0.98	1.24***	1.12*	2.05**	1.27***	1.20***	0.96
<200% FPL	1.34***	1.11**	1.01	1.79***	1.45***	2.55***	1.74***	1.51***	1.02
Parents' Highest Education									
≥ College Degree (Ref.)									
Some Coll/Assoc Degree	1.31***	1.19***	1.04	1.12*	1.00	1.01	1.54***	1.43***	1.19
H.S. Degree or Other	1.31***	1.20***	0.87	1.02	0.92	0.70*	1.89***	1.78***	1.32*
Less than H.S.	1.06	1.04	1.04	0.93	0.92	1.15	2.29***	2.28***	1.58*
During COVID-19	1.14***	1.16***	1.22**	0.73***	0.74***	0.73**	0.80***	0.81***	0.82*
Number of ACEs[d] Experienced									
0 ACEs (Ref.)									
1 ACE		1.45***			1.61***			1.34***	
2 to 3 ACEs		1.95***			2.22***			1.56***	
4 or More ACEs		2.81***			2.85***			2.31***	
NSCDC[a] Framework Protective Factors									
Parent/Caregiver Relationship	0.28***	0.29***	0.35***	0.62***	0.65***	0.77	0.66***	0.68***	1.06
Other Adult Relationship	0.81***	0.81***	0.74**	0.92	0.93	0.72*	1.01	1.01	1.15
Strong Self-Regulation	0.16***	0.17***	0.20***	0.37***	0.42***	0.49***	0.47***	0.51***	0.49***
Mastery	0.61***	0.62***	0.73***	0.59***	0.60***	0.66**	0.66***	0.66***	0.64***
Hopeful/Affirming Tradition	0.58***	0.65***	0.71**	0.64***	0.72***	0.62***	0.97	1.06	0.98

[a]National Scientific Council on the Developing Child; [b]all analyses based on block 3; [c]positive childhood experiences; [d]adverse childhood experiences; [e]based on a low level of caring about doing well in school or doing required homework; [f]missed 11 or more days of school in the last year; [g]ever repeated a grade since kindergarten; [h]n = 65,595; [i]n = 4,127; [j]n = 65,548; [k]n = 4,092; [l]n = 65,772; [m]n=4,131; *p<0.05; **p<0.01; ***p<0.001

grade. Among children experiencing 4 or more ACEs, similar trends were found, but many of those relationships were no longer significant. Respondents completing the survey during COVID-19 had significantly lower school engagement with a lower likelihood of excessive absenteeism and ever repeating a grade. Compared to children who experienced 0 ACEs, children who experienced 4 or more ACEs were 2.81 to 3.33

times more likely to have low school engagement, 2.85 to 3.12 times more likely to miss 11 or more days of school, and 2.31 to 2.60 times more likely to repeat a grade of school after controlling for other variables.

In Table 6, all five NSCDC protective factors were associated with a lower likelihood of low school engagement across all analyses and ACEs subgroups. In the full sample with and without ACEs and across most subgroups, parent/caregiver relationship, strong self-regulation, mastery, and a hopeful/affirming tradition were significantly associated with excessive absenteeism. Among children experiencing 4 or more ACEs, a supportive parent/caregiver relationship was no longer associated with excessive absenteeism while other adult relationship was. Across most subsamples and the full sample including and excluding ACEs, a parent/caregiver relationship, strong self-regulation, and mastery were associated with a lower likelihood of repeating a grade. A strong parent/caregiver relationship was not significantly associated with grade retention among children experiencing 4 or more ACEs. Across analyses, strong self-regulation was the strongest NSCDC protective factor. In the full sample after controlling for ACEs, covariates, and other NSCDC protective factors, children with strong self-regulation were 5.88 times (1.00/0.17) less likely to have low school engagement, 2.38 times (1.00/0.42) less likely to have missed 11 or more days of school, and 1.96 times (1.00/0.51) less likely to have ever repeated a grade. The next strongest protective factor varied, but mastery was the only other protective factor significant across all analyses and outcomes.

In Table 7, the HOPE protective factors of sharing ideas, after-school activities, family resilience, volunteerism, and a supportive neighborhood were associated with school engagement across all analyses. A mentor relationship was only significant in the

Table 7

Adjusted Odds Ratios of School Outcomes Using the HOPE[a] Framework[b]

Covariates/Protective Factors	Low School Engagement[e]			Excessive Absenteeism[f]			Repeated a Grade[g]		
	Full Sample (No ACEs)[h]	Full Sample (ACEs)[h]	Children with ≥4 ACEs[i]	Full Sample (No ACEs)[j]	Full Sample (ACEs)[j]	Children with ≥ 4 ACEs[k]	Full Sample (No ACEs)[l]	Full Sample (ACEs)[l]	Children with ≥ 4 ACEs[m]
Covariates									
Race/Ethnicity									
Caucasian (Ref.)									
Black/African American	0.89*	0.86**	1.02	0.61***	0.59***	0.92	1.53***	1.52***	1.41*
Other	0.77***	0.76***	0.80*	0.73***	0.73***	0.78	0.94	0.94	0.88
Female (Male as Referent)	0.45***	0.44***	0.53***	1.17***	1.16***	1.17	0.60***	0.60***	0.74**
13-17 Years	1.34***	1.26***	1.22**	1.83***	1.70***	1.73***	1.55***	1.47***	1.44***
Household Income									
≥400% FPL (Ref.)									
200%-399% FPL	1.19***	1.10**	0.98	1.21***	1.10	2.03**	1.28***	1.20***	1.00
<200% FPL	1.32***	1.08*	0.98	1.74***	1.41***	2.50***	1.77***	1.53***	1.10
Parents' Highest Education									
≥ College Degree (Ref.)									
Some Coll/Assoc Degree	1.24***	1.13***	0.99	1.09	0.98	1.01	1.52***	1.41***	1.22
H.S. Degree or Other	1.14***	1.05	0.78*	0.95	0.87*	0.68*	1.81***	1.71***	1.29
Less than H.S.	0.83**	0.85*	0.85	0.81	0.84	1.06	2.10***	2.15***	1.56
During COVID-19	1.24***	1.27***	1.26**	0.77***	0.78***	0.75**	0.82***	0.83***	0.84
Number of ACEs[d] Experienced									
0 ACEs (Ref.)									
1 ACE		1.47***			1.63***			1.38***	
2 to 3 ACEs		2.09***			2.32***			1.68***	
4 or More ACEs		3.33***			3.12***			2.60***	
HOPE[a] Framework Protective Factors									
Mentor Relationship	0.93	0.90**	0.84	0.99	0.97	0.74*	1.03	1.00	1.06
Family Resilience	0.50***	0.55***	0.67***	0.64***	0.72***	0.68**	0.85***	0.93	0.93
Supportive Neighborhood	0.74***	0.79***	0.78**	0.85***	0.91*	0.77*	0.90*	0.95	0.93
Safe Neighborhood	0.83***	0.88***	0.92	0.80***	0.85**	1.03	1.04	1.10*	1.39**
After-School Activities	0.52***	0.54***	0.61***	0.53***	0.56***	0.70**	0.62***	0.64***	0.61***
Volunteerism	0.64***	0.66***	0.64***	0.79***	0.83***	0.77*	0.84***	0.87***	0.89
Sharing Ideas	0.19***	0.20***	0.27***	0.48***	0.52***	0.66**	0.52***	0.55***	0.86

[a]Health Outcomes from Positive Experiences; [b]all analyses based on block 3; [c]positive childhood experiences; [d]adverse childhood experiences; [e]based on a low level of caring about doing well in school or doing required homework; [f]missed 11 or more days of school in the last year; [g]ever repeated a grade since kindergarten; [h]n = 65,595; [i]n = 4,127; [j]n = 65,548; [k]n = 4,092; [l]n = 65,772; [m]n=4,131; *p<0.05; **p<0.01; ***p<0.001

full sample after controlling for ACEs; a safe neighborhood was significant across all samples except children experiencing 2 or 3 ACEs and 4 or more ACEs. For excessive absenteeism, all the HOPE protective factors except a mentor relationship were associated with excessive absenteeism in the full sample before and after controlling for ACEs. Across ACEs subgroups, only sharing ideas, after-school activities, and family

resilience were consistently associated with excessive absenteeism. Among children who experienced 4 or more ACEs, a mentor relationship, a supportive neighborhood, and volunteerism were also associated with excessive absenteeism. For grade retention, sharing ideas, after-school activities, and volunteerism were associated with repeating a grade in both the full sample including and excluding ACEs; only after-school activities were associated with grade retention across all analyses and ACEs subsamples. Across all outcomes, analyses, and ACEs subgroups except for grade retention among children experiencing 4 or more ACEs, sharing ideas was the strongest HOPE protective factor. In the full sample after controlling for ACEs, covariates, and other HOPE protective factors, children who shared ideas with their parent/caregiver were 5.00 times (1.00/0.20) less likely to have low school engagement, 1.92 times (1.00/0.52) less likely to miss 11 or more days of school, and 1.82 times (1.00/0.55) less likely to have repeated a grade. The next strongest protective factors differed across outcomes and analyses; the only other protective factor that was significantly associated with all the outcomes across analyses and ACEs subgroups was after-school activities.

Discussion

The purpose of this study was to examine the relationship between three resilience frameworks (the NSCDC, HOPE, and cumulative PCE frameworks) and three school-related outcomes (school engagement, absenteeism, and grade retention). The study also sought to identify the strongest protective factors within each resilience framework and to determine whether the findings were consistent after controlling for ACEs and across ACEs subgroups. In this study, both the NSCDC and HOPE frameworks were associated

with all three school-related outcomes, but the cumulative PCEs frameworks using the NSCDC and HOPE frameworks did not practically improve any of the regression models. The study also identified protective factors from the NSCDC and HOPE frameworks that were associated with improved outcomes across analyses.

Comparison of Resilience Frameworks

Few studies have explored the effectiveness of these frameworks with most focusing on protective factors with varying levels of inclusion of ACEs (Bethell et al., 2019; Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020; Keane & Evans, 2022; Robles et al., 2019). This is the first known study to compare the relative effectiveness of these frameworks for any outcome. The effectiveness of these frameworks at mitigating the impact of ACEs on school-related outcomes is particularly important given how ACEs and poorer school-related outcomes perpetuate lower educational attainment, economic disparities, and poorer health outcomes (Braveman et al., 2010; Narayan et al., 2021). These findings expand the evidence base for these frameworks while identifying the most effective resilience framework and associated protective factors to inform future interventions to improve school-related outcomes among children experiencing ACEs.

As hypothesized, the NSCDC and HOPE frameworks were both associated with all three school-related outcomes across all analyses. Since these frameworks were effective after controlling for ACEs and across ACEs subgroups, this demonstrates the effectiveness of both frameworks at building resilience to overcome the negative impact of ACEs on school-related outcomes. This also demonstrates the effectiveness of

frameworks that focus on the most salient protective factors and that utilize protective factors from historic resilience research (Masten, 2018; Wright et al., 2013). For each study outcome, the addition of a cumulative PCE score did significantly improve the models in all full samples and across some ACEs subgroups, but the framework lacked practical significance since the additional variance explained ranged from less than 0.1% to 0.4%. Nevertheless, the cumulative PCE scores did have a relationship with each outcome since it was one of the strongest protective factors based on X^2 tests and Cramer's V. This demonstrated that while the number of PCEs experienced is related to better school-related outcomes, cumulative PCE scores in this study provided minimal to no additional benefit over measuring the most important protective factors. Thus, interventions that target the most salient protective factors may be more promising than those that seek to maximize protective factors.

Across all three outcomes, the NSCDC framework had a stronger relationship than the HOPE framework after controlling for ACEs and across ACE subgroupings, demonstrating the effectiveness in building resilience against ACEs. The effectiveness of the NSCDC framework may be attributed to having the strongest protective factor across outcomes, strong self-regulation. Parent/caregiver relationship and mastery were also two of the strongest protective factors and were similar to the two factors that emerged as the strongest HOPE factor protective factors. Thus, the NSCDC framework captured the three strongest protective factors across analyses. However, the NSCH items used to identify protective factors from the HOPE framework were not identified by the original theorist (Sege & Harper Browne, 2017). Rather, they were identified in NSCH studies by other researchers (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021;

Crouch, Radcliff, Merrell, Hung, et al., 2021). The strongest NSCDC protective factor in this study, self-regulation, could potentially be consistent with the HOPE framework protective category of learning social and emotional competencies (Sege & Harper Browne, 2017). However, this may highlight a limitation of the HOPE framework. Despite the added strength of using an ecological framework, the broad categories of protective factors leave the specific protective factors up to interpretation. More prescriptive frameworks like the NSCDC framework be more pragmatic in guiding future research and interventions. Based on these findings, the NSCDC framework appears to be more promising at guiding interventions to reduce negative school outcomes associated with ACEs. However, some additional caution should be made in interpreting these findings. The NSCDC framework explained an additional 9.1% of school engagement variance after controlling for ACEs, but the NSCDC only explained an additional 1.4% and 1.0% of the variance in excessive absenteeism and grade retention. This indicates the effectiveness of these frameworks may vary by outcome and that the difference is much more modest for these two outcomes. Thus, future research should explore whether these findings are consistent across other outcomes while considering the integration of these two frameworks with the goal of identifying the strongest protective factors across ecological levels to improve outcomes among children who experienced ACEs.

Finally, while results were consistent across outcomes, the resilience frameworks, ACEs, and covariates had a stronger relationship with some school-related outcomes. While the NSCDC framework along with ACEs and covariates explained 30.2% of the variance in low school engagement, they only explained 10.0% of the variance in excessive absenteeism and 10.1% of the variance in grade retention. This discrepancy can

potentially be attributed to more extraneous factors not included in the regression models having a stronger relationship with absenteeism and grade retention. Other factors linked to higher levels of absenteeism include poorer physical health, psychosocial functioning, parental relationships, family situations, school dynamics, neighborhood conditions, and socioeconomic disparities (Childs & Lofton, 2021). Grade retention has been associated with students being younger/less mature than classmates, missing too many days of school, frequently moving, having a learning disability, being non-English learners, or voluntary decisions by the parent/guardian (National Association of School Psychologists, 2022; Picklo & Christenson, 2005). If these factors contributed to excessive absenteeism and grade retention in this sample rather than ACEs, these protective factors identified by ACEs resilience frameworks may be less effective at mitigating these outcomes. In support of this explanation, bivariate analyses in this study found that ACEs had a stronger relationship with school engagement than the other outcomes. Another study also found ACEs had a stronger relationship with school engagement (Crouch et al., 2019). Alternatively, other protective factors not included in this study may have a stronger relationship with these two outcomes. This is partially supported by some variations in the strongest protective factors across outcomes in this study. Future studies should examine the relative influence of ACEs on these outcomes and whether other protective factors can be integrated into these frameworks to strengthen the relationship between these frameworks, absenteeism, and grade retention.

Protective Factors

This study also identified the strongest protective factors within each framework across outcomes to better inform future interventions. When utilizing the NSCDC framework, self-regulation was the strongest protective factor across all three study outcomes. A previous study also found this was the strongest NSCDC protective factor against childhood mental health issues (Keane & Evans, 2022). Thus, ACEs interventions using the NSCDC framework to improve school outcomes should identify strategies that strengthen self-regulation through strategies like co-regulation with adults and skill-based learning such as social-emotional learning (Murray et al., 2016; Murray et al., 2019; Zins & Elias, 2007). A supportive parent/caregiver relationship had the second strongest relationship with school engagement across all analyses and was associated with absenteeism and grade retention in the full sample after controlling for ACEs. This demonstrates the importance of supportive, caring adult relationships (NSCDC, 2015). Interventions should promote parent-child relationships to build resilience against ACEs. However, in this study, parent/caregiver relationships were not associated with absenteeism or grade retention among children experiencing 4 or more ACEs. As discussed previously, this may be due to a weaker relationship between ACEs and these outcomes. Alternatively, children that have experienced ACEs are more likely to have parents that experienced ACEs which may adversely impact parent-child relationships (Randell et al., 2015; Woods-Jaeger et al., 2018). Thus, parent-child relationships may only be protective if they are safe, stable, and nurturing, which was not measured in this study. Mastery was also associated with all three study outcomes and had the second-strongest relationship with absenteeism and grade retention. In this study, mastery

involved children participating in extracurricular activities or volunteer/service activities. This emphasizes the importance of promoting extracurricular activities due to the previously established relationship with academic outcomes (Guèvremont et al., 2014) and the potential to mitigate ACEs. While other NSCDC framework protective factors were associated with certain outcomes in this study and should be integrated into NSCDC framework interventions when applicable, these three protective factors would be prioritized given their association across outcomes and relative strength.

For the HOPE framework, sharing ideas was the strongest protective factor across all three study outcomes for all analyses except for grade retention among children who experienced 4 or more ACEs. The NSCH item of sharing ideas is identical to the item for parent/caregiver relationships using the NSCDC framework. Thus, this also demonstrates the importance of promoting parent-child relationships that are safe, secure, stable, and protective to build resilience against ACEs (NSCDC, 2015). Likewise, after-school activities, which are similar to mastery except for excluding volunteerism, were the second strongest protective factor across most analyses for the three study outcomes consistent with a previous study of grade retention and absenteeism (Crouch, Radcliff, Merrell, Hung, et al., 2021). It also had a particularly strong association with excessive absenteeism and grade retention among children who experienced 4 or more ACEs. While not as strong as after-school activities, volunteerism also was associated with better school-related outcomes across most analyses. Thus, ACEs interventions seeking to improve school-related outcomes should seek to maximize the engagement of children who have experienced ACEs in after-school and volunteer activities. Family resilience and supportive neighborhoods were also associated with school engagement and

absenteeism. Thus, HOPE framework interventions that promote supportive communities and strengthen family resilience have the potential to increase engagement and reduce absenteeism. This also emphasizes the importance of utilizing interventions that target multiple ecological levels. HOPE framework interventions should seek to integrate these protective factors while identifying other factors that may align with the HOPE framework not included in this study to improve school outcomes among children who have experienced ACEs.

Limitations

Despite the contributions of this study, the study has limitations with most being due to using secondary analysis with cross-sectional data. Overall, the study was limited by the NSCH items. While previous NSCH and HOPE framework studies utilized items from the NSCH (Crouch, Radcliff, Merrell, Brown, et al., 2021; Keane & Evans, 2022), the survey items do not fully capture the protective factors as described by the developers of each framework. Studies that utilize instruments developed to fully capture these protective factors may be more representative of the original frameworks. The NSCH also did not include all ACEs that are widely accepted in the literature including childhood maltreatment which may have resulted in ACEs being underreported. Since the survey was completed by the parent or caregiver, the responses may not fully represent the child's experiences or perceptions. Also, temporal and causal relationships cannot be determined due to the cross-sectional nature of the study.

Another limitation was that the HOPE framework protective factors included in this study were identified by other researchers using the NSCH and not the original

theorist (Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021). Other items on the NSCH could have been included that would have been consistent with the HOPE framework. Their inclusion could potentially strengthen the relationship between the HOPE framework and school-related outcomes. Likewise, since studies utilizing the cumulative PCEs framework lack consistency in the protective factors utilized, the protective factors used were identified using the NSCDC and HOPE frameworks. The use of other protective factors could strengthen this framework. Future studies should consider expanding and refining the protective factors associated with these frameworks. Another limitation was that the amount of variance explained in excessive absenteeism and grade retention was lower than that of school engagement. Future studies should consider additional protective factors and other factors not included in this study that may be related to these outcomes. Other limitations include some data collection that occurred during the COVID-19 pandemic, the study only considered three resilience frameworks, and the study only explored school-related outcomes. Additional evidence is needed to validate these frameworks with other outcomes and consider other resilience frameworks or a potential composite of the frameworks used in this study.

Conclusions

While the NSCDC and HOPE frameworks and associated protective factors were both associated with better school-related outcomes, this study found that the NSCDC framework had a stronger relationship with school engagement, absenteeism, and grade retention. While all five NSCDC protective factors were associated with at least one school-related outcome, strong self-regulation along with parent/caregiver relationships

and mastery were the strongest protective factors across outcomes including among children experiencing ACEs. Furthermore, multiple covariates included in this study were also associated with school-related outcomes. This has important implications for future research and interventions to mitigate ACEs.

Building on the GMVP (Gelberg et al., 2000), several predisposing factors were associated with school outcomes like ACEs, race/ethnicity, gender, age, and parental education. Interventions can leverage an ecological approach (McLeroy et al., 1988) with the GMVP that targets social determinants that are associated with poorer school-related outcomes while preventing exposure to ACEs. Several enabling factors were also associated with better school-related outcomes among children experiencing ACEs like household income, self-regulation, supportive parent/caregiver relationships, and mastery/after-school activities. Interventions should use developmentally appropriate interventions to target these protective factors while recognizing the influence of other enabling factors that can influence school outcomes not examined in this study. Based on the GMVP, interventions must recognize the importance of perceived need. Without strategies that increase the perceived need for interventions to build resilience to overcome ACEs among children and adults, interventions will likely be ineffective.

Researchers and practitioners must continue to engage in research and practice that identifies and targets the most salient protective factors to improve school outcomes among children who have experienced ACEs. This study provided preliminary evidence of the effectiveness of the NSCDC and HOPE frameworks at mitigating ACEs with the NSCDC being more effective across outcomes. Future research should further validate and expand on these findings to develop a more extensive evidence base for resilience

frameworks that can be utilized to improve various outcomes among children who experienced ACEs. These findings can also be leveraged by practitioners to improve educational outcomes among those who have experienced ACEs; this is critical given the short and long-term impact ACEs have on children and adults.

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CHAPTER 5

SUMMARY & DISCUSSION

Introduction

The primary purpose of this dissertation was to compare the relationship between three resilience frameworks (NSCDC framework, HOPE framework, and cumulative PCEs framework) and childhood outcomes across three domains (mental health, weight status, and school-related outcomes) among children who experienced ACEs. This dissertation utilized a preprint-reprint format in which each manuscript examined a different domain. Collectively, these three manuscripts contribute to the literature by expanding the limited evidence base for each framework, being the first known study to compare the effectiveness of these frameworks, and utilizing a consistent methodology that integrated ACEs to examine the effectiveness specifically among children who experienced ACEs and allow for comparison across outcomes. These findings are important for guiding future ACEs resilience research and interventions.

Summary and Conclusions

The first manuscript examined the relationship between the three resilience frameworks and whether the child was ever told by a healthcare provider that they had a mental health issue. The study also identified the strongest protective factors within each framework and examined whether these findings were consistent after controlling for

ACEs and across ACE subgroups. While the NSCDC and HOPE frameworks were both associated with childhood mental health in all analyses, the NSCDC framework had a stronger relationship than the HOPE framework across all analyses including and excluding ACEs. The cumulative PCEs framework only significantly improved some of the models, but the framework lacked practical significance. While all NSCDC protective factors were significantly associated with childhood mental health across most analyses, self-regulation was the strongest protective factor followed by a parent/caregiver relationship and either mastery or a hopeful/affirming tradition. Several HOPE protective factors were associated with childhood mental health, but sharing ideas was the strongest factor followed by either family resilience or after-school activities across analyses.

The second manuscript explored the same research questions utilizing the same methodology except the study examined the outcome of childhood obesity. The NSCDC and HOPE frameworks were both significantly associated with childhood obesity excluding ACEs, after controlling for ACEs, and across all ACEs subgroups except for children experiencing 4 or more ACEs. However, the cumulative PCE framework was not associated with childhood obesity in any of the regression models. When comparing the NSCDC and HOPE frameworks, the frameworks explained a similar amount of variance in childhood obesity. Across analyses, the frameworks explained either the same amount of variance or the HOPE framework explained slightly more. Self-regulation and mastery were the strongest NSCDC protective factors across most analyses, but no NSCDC protective factors were significant among children who experienced 4 or more ACEs. After-school activities and living in a supportive neighborhood were the strongest

HOPE protective factors across most analyses with some other factors emerging in some ACEs subgroups.

The third manuscript used the same research questions and methodology as the first two manuscripts except they examined three school-related outcomes (school engagement, absenteeism, and grade retention). The NSCDC and HOPE frameworks were both associated with all three school-related outcomes when excluding ACEs, including ACEs, and across all ACEs subgroups. Across all analyses, the NSCDC framework had a stronger relationship with school engagement, absenteeism, and grade retention than the HOPE framework. The addition of a cumulative PCE score was only statistically significant when using the full samples with some models, but it lacked practical significance in all models. Across all three outcomes and most analyses, self-regulation was the strongest NSCDC protective factor with parent/caregiver relationship and mastery emerging as significant protective factors across most outcomes and analyses. A hopeful/affirming tradition was associated with school engagement and absenteeism across analyses while another adult relationship was associated with school engagement across most analyses. When using the HOPE framework, sharing ideas emerged as the strongest protective factor across most analyses followed by after-school activities and family resilience. Other protective factors emerged across analyses for different outcomes with volunteerism and a supportive neighborhood being associated with school engagement and absenteeism for most analyses.

Across manuscripts, the NSCDC and HOPE frameworks were associated with all of the study outcomes across domains when not including ACEs, after controlling for ACEs, and across ACEs subgroups with the exception of childhood obesity among

children who experienced 4 or more ACEs. This demonstrates the effectiveness of these two frameworks in mitigating the impact of ACEs on these outcomes. While the addition of a cumulative PCE score statistically improved some models, it did not practically improve any of the models. This demonstrates that frameworks that emphasize the most salient protective factors like the NSCDC and HOPE frameworks may be more effective than approaches that maximize the number of protective factors. When comparing the NSCDC and HOPE frameworks, the NSCDC framework had a stronger relationship with all the outcomes except for childhood obesity across analyses. This suggests interventions utilizing the NSCDC framework may be effective at improving mental health and school-related outcomes among children who experienced ACEs. However, the NSCDC and HOPE frameworks had a very similar relationship with childhood obesity. Thus, the effectiveness of the NSCDC and HOPE frameworks may differ across some outcomes. Alternatively, other protective factors or extraneous variables not included in the regression models may have a stronger relationship with childhood obesity given the low amount of variance explained by both models. Finally, while there were some differences in the strongest protective factors across outcomes, self-regulation was the strongest NSCDC protective factor across most outcomes and analyses with mastery and a supportive parent/caregiver relationship being strong protective factors for most outcomes. When using the HOPE framework, after-school activities were consistently one of the strongest protective factors across study outcomes, but sharing ideas emerged as the strongest protective factor for mental health issues, school engagement, and absenteeism. Other protective factors differed across outcomes.

While one known study examined and found a relationship between the NSCDC framework and childhood mental health issues among children who experienced ACEs (Keane & Evans, 2022a), no other known studies have examined the effectiveness of the entire NSCDC and HOPE frameworks among children who have experienced ACEs. Thus, these findings extend the evidence base for both frameworks. However, these findings are unsurprising given that the protective factors from both frameworks are grounded in historic resilience research (Masten, 2018; Wright et al., 2013) and the resilience frameworks were developed to combat childhood adversity or ACEs (NSCDC, 2015; Sege & Harper Browne, 2017). The inclusion of ACEs subgroups and controlling for ACEs further demonstrated the effectiveness of these frameworks specifically among children who experienced ACEs. Unlike previous studies that found that increased exposure to PCEs was associated with more positive outcomes (Baglivio & Wolff, 2020; Bethell, Jones, et al., 2019; Crandall et al., 2019; Novak & Fagan, 2022; Robles et al., 2019), this study found that a cumulative PCE score either did not practically or statistically improve any of the models. However, unlike previous studies, this study examined whether a cumulative PCE score improved the model over the individual protective factors. Thus, while bivariate analysis found a relationship between cumulative PCEs and all the study outcomes, the scores were not as meaningful after the individual factors were considered. Like previous ACEs studies have found (Lacey & Minnis, 2020; Negriff, 2020; Sayyah et al., 2022), this suggests that not all PCEs are equal. Thus, targeting the most important protective factors may be more meaningful than maximizing protective factors to improve outcomes among those who have experienced ACEs.

While no previous studies have compared the effectiveness of the NSCDC and HOPE frameworks, the effectiveness of the NSCDC framework compared to the HOPE framework across most outcomes except for childhood obesity may largely be attributed to the inclusion of three of the strongest protective factors across outcomes. Strong self-regulation was the strongest protective factor for mental health, excessive absenteeism, and grade retention while also being associated with school engagement and childhood obesity. In historic resilience research, self-regulation has been well-established as a protective factor and has also been considered a possible mediator between other protective factors and resilience (Heard-Garris et al., 2018; Polizzi & Lynn, 2021; Watters & Wojciak, 2020). Two of the strongest protective factors across analyses in the HOPE framework were sharing ideas and after-school activities; these were similar to the NSCDC protective factors of parent/caregiver relationships and mastery. Thus, the inclusion of self-regulation in the NSCDC framework was likely one factor that strengthened the NSCDC framework. However, this highlights a deficit in the HOPE framework. While the HOPE framework has the strength of utilizing an ecological approach, the use of broad categories within an ecological framework makes the specific protective factors more ambiguous (Sege & Harper Browne, 2017). Since this study utilized the protective factors identified by previous researchers using the NSCH (Crouch et al., 2022; Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021), self-regulation was excluded from the HOPE framework. However, future studies should consider how self-regulation may align with the HOPE framework based on the model proposed by the original theorists (Sege & Harper Browne, 2017).

As previously discussed, self-regulation, mastery/after-school activities, and parent/caregiver relationships or sharing ideas emerged as the strongest protective factors most consistently across studies. Previous research has also identified these as potential protective factors against negative outcomes and ACEs (Bethell, Gombojav, et al., 2019; Crouch, Radcliff, Merrell, Hung, et al., 2021; Keane & Evans, 2022a; Montpetit & Tiberio, 2016; Ramakrishnan & Masten, 2020; Robles et al., 2019). This suggests that interventions that target these protective factors using the NSCDC or HOPE framework can build resilience against ACEs. However, while these factors emerged across most outcomes, this study found that certain protective factors had a stronger relationship with certain outcomes. For example, family resilience had one of the strongest relationships with school engagement when using the HOPE framework but was not associated with childhood obesity or grade retention in most analyses. This is consistent with previous HOPE framework studies in which the significant protective factors differed across outcomes (Crouch et al., 2022; Crouch, Radcliff, Merrell, Hung, et al., 2021; Elmore et al., 2020). This further demonstrates that resilience is context-dependent and factors that promote resilience may differ based upon the outcome consistent with historic resilience research (Wright et al., 2013). Thus, future research should consider the strongest protective factors by outcome while refining frameworks to identify the most salient protective factors across outcomes and the pathways by which ACEs influence poorer outcomes to increase the likelihood of targeting the most impactful protective factors.

Study Limitations

Despite these promising findings, this dissertation did have some limitations. The

methodology involved secondary data analysis of cross-sectional data from the 2018-2020 NSCH. Due to the cross-sectional design, causal or temporal relationships could not be made between any of the variables used in this study. The study was also limited by the items on the NSCH. Some of the protective factor items on the NSCH did not fully capture the definitions by the original developers. Some widely recognized ACEs such as categories of child maltreatment were also excluded from the NSCH with other ACEs added. Since the NSCH used caregiver responses, the data may not have fully captured the child's exposure to ACEs or their perceptions regarding protective factors.

To compare the NSCDC, HOPE, and cumulative PCE frameworks utilizing the NSCH, protective factors were identified based on previous studies. However, there were limitations. For example, some of the NSCH NSCDC framework measures like mastery were proxy measures that did not fully capture the protective factor as described by the theorists. Similarly, the HOPE protective factors were based on factors identified by other researchers using the NSCH to examine the HOPE framework (Crouch, Radcliff, Merrell, Brown, et al., 2021; Crouch, Radcliff, Merrell, Hung, et al., 2021) and not the original theorists (Sege & Harper Browne, 2017). Thus, other NSCH measures could have possibly been included in the HOPE framework. Also, the cumulative PCEs score was calculated using the NSCDC and HOPE framework protective factors since there is not a consistent approach to identifying PCEs. A cumulative PCE score using different factors may have a stronger relationship with these outcomes. The study also utilized an overall measure of childhood mental health issues to simplify comparisons across domains. However, there may be some differences across specific mental health outcomes that should be examined by future studies. Finally, data for the 2020 NSCH was collected

during the COVID-19 pandemic; data for the 2018 and 2019 NSCH was collected before the COVID-19 pandemic. Even though a variable was added to control for COVID-19, the pandemic may have influenced some of the data used in this dissertation.

Recommendations for Future Studies

While this study has important implications for practice, future research is needed to further validate and expand on the findings of this dissertation. Building on some of the limitations, future studies should develop, validate, and utilize instruments that fully capture the protective factors as identified by the developers of the NSCDC and HOPE frameworks to fully capture each framework's effectiveness. Future studies should also utilize longitudinal designs that can establish causal and temporal relationships between the frameworks, protective factors, and more positive outcomes among children who have experienced ACEs. Researchers should also seek to utilize the ten ACEs most widely adopted in the literature (Finkelhor et al., 2013) and child-reported data to ensure the study more accurately captures the experience and perceptions of the children. Future studies should also examine other childhood outcomes and begin to explore the impact of these frameworks on adult outcomes. This could provide a richer understanding of how different protective factors and frameworks may be more effective for certain outcomes.

While this study did find that the NSCDC and HOPE frameworks were associated with better outcomes among children who experienced ACEs, the findings of this study suggest that these frameworks can potentially be improved by incorporating additional protective factors. For the HOPE framework, future research should consider and refine the protective factors in each ecological level that are associated with resilience and

consider how other factors like self-regulation could fit within the framework. While the cumulative PCE did not practically improve any of the models, this may be attributed to a lack of clarity on the specific PCEs. Future research that examines the specific protective factors that have a cumulative benefit could potentially improve this framework. While the NSCDC framework had the strongest relationship with most study outcomes, future research should consider whether an ecological lens could improve this framework along with more refined measures. While this study examined the protective factors as presented by the original developers, future studies should consider whether some of these frameworks could be integrated or other protective factors added to strengthen the frameworks. Finally, while some protective factors and frameworks were more effective with certain outcomes, future research should consider whether certain outcomes like mental health may moderate the relationship between ACEs, protective factors, and other outcomes. If so, interventions could target moderating outcomes to improve outcomes among those who experienced ACEs. Researchers must also begin to explore how the NSCDC and HOPE frameworks can be integrated into future ACEs interventions.

Implications for Health Promotion Practice

The findings of this dissertation have important implications for future health promotion practice. While this study found that both the NSCDC and HOPE frameworks were associated with better childhood outcomes across domains, the NSCDC framework had a stronger relationship with all of the outcomes except for childhood obesity. While the strongest protective factors differed somewhat across outcomes, self-regulation, mastery, and a supportive parent/caregiver relationship emerged as the strongest

protective factors across most outcomes. While interventions that target specific outcomes should potentially be tailored to target the framework, factors, and covariates that have the strongest relationship with that outcome, these findings suggest that general ACEs interventions should potentially utilize the NSCDC framework to target protective factors such as self-regulation, mastery, and supportive parent/caregiver relationships to improve outcomes among children who experienced ACEs. Behavioral theories like the GMVP can potentially be used to inform future interventions using these findings.

Figure 6 depicts how the GMVP could be integrated with the findings of this dissertation by targeting contributing factors identified in this study or through the GMVP with potential strategies to overcome the negative impact of ACEs on children. Consistent with the GMVP (Gelberg et al., 2000), this dissertation found that predisposing demographic and social factors such as parental education, age, gender, and race/ethnicity were associated with most of the childhood outcomes examined in this dissertation. ACEs are also more prevalent among many of those groups at increased risk (Bethell, Davis, et al., 2017). This further demonstrates the impact of social determinants of health on childhood health and well-being (Francis et al., 2018). Thus, while the focus of this dissertation was primarily individual protective factors, this suggests that ACEs intervention should integrate community and policy-level approaches that address inequities that contribute to poorer childhood outcomes. This study also validated that ACEs, another predisposing GMVP factor, were associated with all the study outcomes. Thus, interventions are also needed to prevent ACEs utilizing approaches like those identified by the CDC (2019). However, a substantial number of children have already

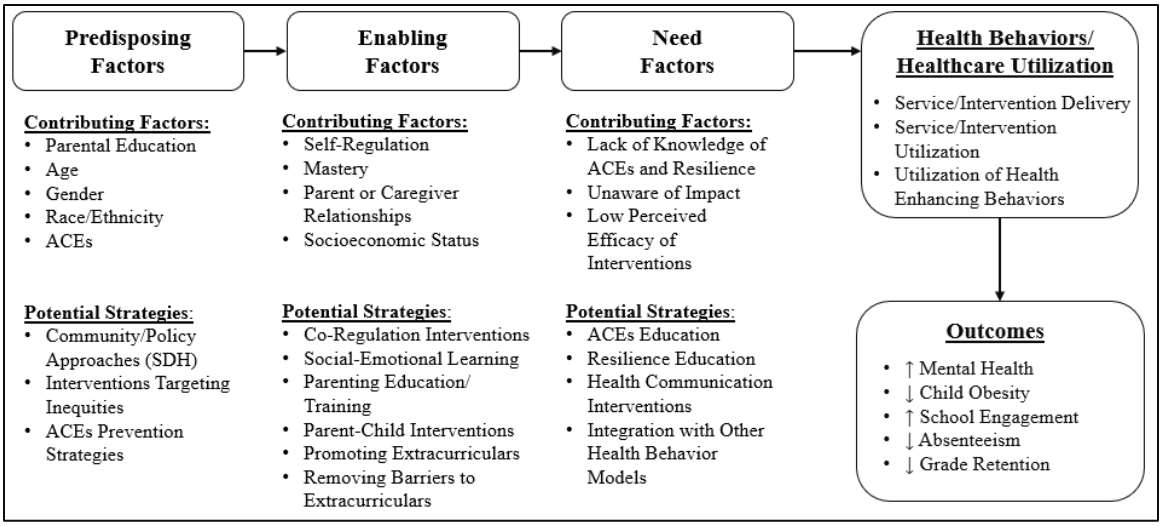

Figure 6. Implications using the Gelberg-Andersen Model for Vulnerable Populations.

experienced ACEs. Fortunately, this study identified enabling protective factors that could potentially mitigate the impact of ACEs on children.

While self-regulation, mastery, and supportive parent/caregiver relationships could potentially be predisposing factors within the GMVP depending upon whether it preceded exposure to ACEs, this discussion assumes that interventions will be developedafter ACEs exposure to improve outcomes, making it an enabling factor. Thus, ACEs interventions should target these enabling protective factors to improve outcomes among children who experienced ACEs. Future ACEs interventions can potentially utilize developmentally appropriate strategies that educate parents, teachers, and other adults on co-regulation strategies that model self-regulation while teaching children self-regulation skills (Murray et al., 2016; Murray et al., 2019). Schools and other organizations can also teach self-regulation and improved executive functioning through curricula that promote social-emotional learning (Murray et al., 2016; Zins & Elias, 2007). ACEs interventions should also work closely with parents and caregivers to

promote positive parent/child relationships to teach them strategies to develop resilience-building relationships with their children from early childhood throughout adolescence (CDC, 2013). In the absence of resilience-building parent/caregiver relationships, interventions and research should consider other potential adult relationships that can potentially build resilience to overcome ACEs (NSCDC, 2015). Finally, this study found that mastery, which was identified as mostly extracurricular activities, was an enabling factor associated with better childhood outcomes. Thus, schools, teachers, parents, caregivers, and other adults should actively utilize strategies to provide opportunities and encouragement for all children to engage in extracurricular activities to help develop competence and engagement in areas to help them to build resilience against ACEs. This would also involve removing systemic barriers that may prevent children from engaging in these opportunities. While not examined in this study, interventions should also consider other opportunities for children to develop mastery in other areas consistent with the NSCDC framework to build resilience to overcome ACEs (NSCDC, 2015).

According to the GMVP (Gelberg et al., 2000), healthcare utilization, health behaviors, and health outcomes are also a function of perceived need. Thus, beyond developing interventions that target predisposing and enabling factors, interventions must also educate parents, children, and other adults on ACEs and resilience while utilizing other strategies to increase the need factors or perceived need for these interventions. This will help ensure the adoption of these strategies by practitioners and the utilization of these services by parents, caregivers, and children. Collectively, practitioners should seek to integrate strategies to develop comprehensive ACEs interventions that target the most important protective factors to build resilience among children who experienced

ACEs. By utilizing these strategies, parents and children may adopt health-enhancing behaviors that develop self-regulation, supportive parent/caregiver relationships, and mastery that promote improve outcomes across outcomes examined in this dissertation. Thus, these findings have important implications for health promotion and improving the health and well-being of children who experienced ACEs.

Conclusions

While ACEs pose a significant threat to the short and long-term health and well-being of a substantial number of children and adults, this dissertation validated the effectiveness of the NSCDC and HOPE frameworks at potentially building resilience to overcome negative outcomes associated with ACEs in children. This study found that across most outcomes the NSCDC framework had the strongest relationship with more favorable outcomes among children who experienced ACEs. Protective factors from both frameworks were also associated with an increased likelihood of better outcomes among children who experienced ACEs. These results have important implications for future research and practice. Future studies should seek to further validate these findings across other childhood and adult outcomes while building upon these findings by further refining and strengthening these resilience frameworks. Future interventions can combine these findings with health behavior theories like the GVMP to develop comprehensive, community- and population-based strategies to mitigate the impact of ACEs on children. Given the impact of ACEs on children and adults, these population and community-based strategies have tremendous promise at improving outcomes for those who experienced early childhood maltreatment and household dysfunction.

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APPENDIX A

IRB APPROVAL LETTER

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 |
irb@uab.edu

NHSR DETERMINATION

TO: Keane, Kevin D

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)
IORG Registration # IRB00012550 (IRB 03)

DATE: 04-Aug-2022

RE: IRB-300009731
Exploring the Effectiveness of Three Resilience Frameworks Across Multiple Outcomes for Children Who Have Experienced Multiple Adverse Childhood Experiences

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The Office of the IRB has reviewed your Application for Not Human Subjects Research Designation for the above referenced project.

The reviewer has determined this project is not subject to FDA regulations and is not Human Subjects Research. Note that any changes to the project should be resubmitted to the Office of the IRB for determination.

if you have questions or concerns, please contact the Office of the IRB at 205-934-3789.

Additional Comments:

De-identified, publicly available data from Census Bureau - NSCH