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THE LONGITUDINAL EFFECTS OF ADVERSE CHILDHOOD EXPERIENCES ON  
INTERNALIZING AND EXTERNALIZING PROBLEMS: IN SEARCH OF  
DEMOGRAPHIC DISPARITIES

by

Cynthia M. Navarro Flores

A dissertation submitted in partial fulfillment  
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

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2023

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## ABSTRACT

The Longitudinal Effects of Adverse Childhood Experiences on Internalizing and  
Externalizing Problems: In Search of Demographic Disparities

by

Cynthia M. Navarro Flores, Master of Arts

Utah State University, 2023

Major Professor: Melanie M. Domenech Rodríguez, Ph.D.

Department: Psychology

Internalizing and externalizing problems are highly prevalent in childhood and are associated with exposure to adverse childhood experiences (ACEs). Disparities have been found in the levels of ACEs and internalizing/externalizing problems experienced based on demographic factors (i.e., race/ethnicity, sex, income). To date, no study has examined how the trajectories of ACEs and internalizing/externalizing problems develop jointly over time despite the large implications that it can have on identifying sensitive periods in development to support prevention and intervention efforts. Thus, this two-manuscript dissertation sought to assess the individual and co-developing trajectories of ACEs and child mental health problems, as well disparities that may exist in such trajectories due to demographic variables. The first manuscript focused on internalizing problems and the second on externalizing problems. Data from 4,655 at-risk diverse youth from across ages 3, 5, and 9 from the existing Families and Child Wellbeing Study (FFCWS) was used for this dissertation. Trajectories of ACEs demonstrated chronic exposure to ACEs throughout childhood, with youth who experienced from nine to eighteen ACEs across the three years. Differences in individual trajectories of internalizing and externalizing

problems were observed, with trajectories of internalizing problems being stable or increasing, and of externalizing problems mostly decreasing with one increasing trajectory. Findings from these studies provide some evidence for a dose-response effect relationship between ACEs and youth mental health problems, but not for a sensitive period in development. Lastly, the negative long-lasting effects that social determinants of health (i.e., race/ethnicity, income) have on youths' exposure to adversity and their mental wellbeing were noted with low-income and youth of color being the most impacted. We conclude that future research is needed to assess various facets of adversity (e.g., severity, frequency, individual weight) and resilience to get a clearer picture in the relationships between ACEs and youth mental health. Our findings support the need for culturally sensitive and trauma-informed interventions, as well as larger scale efforts (e.g., changes to social policy) to target the root cause of inequities.

(177 pages)

## PUBLIC ABSTRACT

The Longitudinal Effects of Adverse Childhood Experiences on Internalizing and  
Externalizing Problems: In Search of Demographic Disparities

Cynthia M. Navarro Flores

Children experience high rates of emotional problems (e.g., anxiety, depression) and behavioral problems (e.g., defiance, aggression) that can have long-lasting detrimental effects. Emotional/behavioral problems have been found to relate to exposure to adversity during childhood (i.e., adverse childhood experiences [ACEs]). Studies have found that rates of exposure to ACEs and emotional/behavioral problems may vary depending on one's race/ethnicity, sex, and income. Research has not yet looked at how emotional/behavioral problems develop throughout childhood in conjunction to exposure to ACEs. The current two-paper dissertation focused on examining the individual and conjointly developing trajectories of ACEs, and emotional (i.e., internalizing problems) and behavioral problems (i.e., externalizing problems) across the ages of 3, 5, and 9 on 4,655 at-risk diverse youth. ACEs measured included emotional and physical abuse, physical and emotional neglect, parental domestic violence, parental mental health problems, parental substance use, parental incarceration, and parental divorce/separation. We examined if differences existed on the trajectories youth were placed into depending on their race/ethnicity, parent's income, and sex. The first paper focused on ACEs and emotional problems, and the second on ACEs and behavioral problems. Findings from both studies showed that youth experienced the same number of adversities at each age, with youth experiencing from nine to eighteen ACEs across the three years. Findings show that trajectories of emotional problems were mostly stable or increasing, and of

externalizing problem decreasing with one increasing trajectory across childhood. Lower income and Black youth were found to have trajectories with higher ACEs and emotional/behavioral problems. Hispanic youth had trajectories with higher levels of emotional problems and boys with behavioral problems. For most youth, higher exposure to ACEs related to higher emotional/behavioral problems, but some youth with fewer ACEs had the highest levels of emotional/behavioral problems. We did not find that exposure ACEs at a specific age made children more susceptible to experiencing emotional/behavioral problems. We recommend that future research focus on looking at the severity, frequency, and individual impact of ACEs. We suggest that interventions are sensitive to one's culture and exposure to adversity, as well as the need for social policy changes to target inequities.

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Cynthia M. Navarro Flores

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## CHAPTER I

### GENERAL INTRODUCTION

Internalizing and externalizing problems are highly prevalent in childhood. Over seven percent (7.1%) of children between the ages of 3 and 17 meet diagnostic criteria for an internalizing (e.g., anxiety, depression) or an externalizing disorder (e.g., behavioral or conduct problems; Ghandour et al., 2019). Children with internalizing and externalizing disorders can experience detrimental outcomes later in life such as health problems, school drop-out, substance use, suicidality, criminal involvement, sexual risk-taking behavior, work incapacity, and future mental health problems (e.g., anxiety, depression, externalizing problems; Fergusson et al., 2013; Jamnik & DiLalla, 2019; Liu et al., 2011; Narusyte et al., 2017). Research has shown that internalizing and externalizing problems have a strong positive association; however, internalizing and externalizing problems are separate symptoms clusters that may not always co-occur (Achenbach et al., 2016). Moreover, longitudinal research has illustrated that internalizing and externalizing problems do not develop similarly over time. Trajectories of internalizing problems have been found to be stable trajectories at various levels (i.e., low, moderate, high) and fluctuating trajectories over time (i.e., decreasing then increasing, rising starting at low or moderate levels; Davis et al., 2015; Klein et al., 2019; Sterba et al., 2007). While some similar trajectories of externalizing problems have been found to those of internalizing problems (i.e., trajectories that are increasing and start at moderate-low to moderate levels) most of the trajectories observed in the literature for externalizing problems are decreasing, limited to childhood, or onset during adolescence (Figge et al., 2018; Kjeldsen et al., 2014; Thompson et al., 2011). Therefore, examining the longitudinal

trajectories of internalizing and externalizing problems separately, especially when examining factors that may explain their development, is crucial as these two constructs are not mutually exclusive (Achenbach et al., 2016).

Research has suggested that adverse childhood experiences (ACEs) are highly correlated with internalizing and externalizing problems (Evans et al., 2013; McLaughlin et al., 2012). Longitudinal research has also established the sequence where experiencing ACEs increase risk for developing internalizing and/or externalizing disorders. A higher amount of ACEs are related to high-stable levels of internalizing or externalizing problems across childhood (Kjeldsen et al., 2021; Lansford et al., 2006). The literature clearly points to ACEs as an important risk factor for children's development of internalizing and externalizing problems, yet there is limited longitudinal research to identify when in development ACEs have the most detrimental effects. The majority of research focusing on the effects of ACEs on internalizing and externalizing problems is cross-sectional and focuses on retrospective reports of ACEs, which limits specific information about timing of exposure. A large portion of longitudinal research focuses on measuring cumulative ACEs (i.e., summing the presence or absence of ACEs) which clusters all ACEs into one variable without accounting for age of exposure. Research focused on timing of exposure to adversity has discovered that longitudinal trajectories of internalizing and externalizing problems differ at the initial levels and rate of change over time (i.e., higher levels of problems) depending on the age of exposure (i.e., early vs. late exposure) to child maltreatment (Keiley et al., 2001). Worse health outcomes are experienced at age 18 when individuals experience ACEs chronically through childhood (Thompson et al., 2015).

The present studies build and extend on studies discussing the importance of examining the interplay between adversity and child behavior outcomes over time (Keiley et al., 2001; Schroeder et al., 2020) by examining the individual trajectories and co-development of ACEs in internalizing (chapter 2) and externalizing (chapter 3) problems across time. Further, existing research documents that ACEs, internalizing, and externalizing problems are experienced at greater rates based on race/ethnicity (Anderson & Mayes, 2010; Lansford et al., 2006; Maguire-Jack et al., 2019; McLaughlin et al., 2007; Slopen et al., 2016), sex (Baglivio et al., 2014; Gutman & Codioli McMaster, 2020; Shanahan et al., 2014; Tiet et al., 2001), and income (Lacey et al., 2022; Lansford et al., 2019). The present studies uniquely address the extent to which health disparities may exist within longitudinal trajectories of ACEs and internalizing and externalizing problems.

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CHAPTER II  
THE CO-DEVELOPMENT OF ADVERSE CHILDHOOD EXPERIENCES AND  
INTERNALIZING PROBLEMS DURING CHILDHOOD: AN EXAMINATION OF  
DEMOGRAPHIC DISPARITIES

**Introduction**

Adverse childhood experiences (ACEs) have been consistently associated with negative internalizing problems (Evans et al., 2013; McLaughlin et al., 2012). Internalizing problems are highly prevalent in childhood and persist into adulthood. Research shows that internalizing problems are related to detrimental outcomes such as school drop-out, substance use, suicidality, criminal involvement, work incapacity, health and the development of other co-occurring mental health problems (e.g., anxiety and depression, externalizing problems; Jamnik & DiLalla, 2019; Liu et al., 2011; Narusyte et al., 2017). Existing research on the role of ACEs in the development and maintenance of internalizing problems in children is often cross-sectional and retrospective. Research utilizing longitudinal data often assess a total cumulative ACE score throughout development with limited research assessing ACEs through a developmental perspective. Research looking at longitudinal trajectories found that chronicity of ACEs across childhood relates to increased negative health outcomes at age 18, and that changes to the initial levels and change over time of internalizing problems depends on when children experienced maltreatment (i.e., early vs. late exposure; Keiley et al., 2011; Thompson et al., 2015). However, no research to date has examined the co-development of ACEs and internalizing problems across time, despite several studies discussing the importance of examining the interplay between adversity and child behavior outcomes over time

(Schroeder et al., 2020). Furthermore, disparities have been found on the number of ACEs and the prevalence rates of internalizing problems based on race/ethnicity (Anderson & Mayes, 2010; Maguire-Jack et al., 2019; Slopen et al., 2016), sex (Anderson & Mayes, 2010; Baglivio et al., 2014; Gutman & Codioli McMaster, 2020; Shanahan et al., 2014), and income (Lacey et al., 2022; Lansford et al., 2019). However, limited longitudinal research exist that assesses how trajectories of ACEs and internalizing problems differ for youth of color, and based on sex and income. The purpose of this manuscript is to examine the individual and co-developing longitudinal trajectories of cumulative ACES and internalizing problems, and demographic disparities that may exist within such trajectories in an ethnically diverse sample.

### **The Development of Internalizing Problems**

A great number of children develop mental health problems early in childhood. In the United States about 17.4% of children are diagnosed with a mental health disorder between the ages of 2 and 8 (Cree et al., 2018). Mental illnesses are categorized in two broad-band areas, one of them being internalizing disorders. Internalizing problems are experienced internally, and symptoms of disorders such as depression, anxiety, social isolation, and somatic problems are clustered in this definition (Forns et al., 2011). In the United States, 7.1% and 3.2% of children between the ages of 3 and 17 have been diagnosed with an anxiety or depressive disorder, respectively (Ghandour et al., 2019). Symptoms of anxiety and depression tend to be highly comorbid (Ghandour et al., 2019), and thus research has focused on assessing these symptoms broadly as internalizing problems.

Despite the elevated rate of internalizing problems experienced by children, the developmental trajectories of internalizing problems are not well understood. Studies have begun to use advanced methodologies to assess person-centered trajectories to identify different patterns in the development of internalizing problems. Studies have found three (Sterba et al., 2007) or four (Davis et al., 2015; Klein et al., 2019) different developmental trajectories of internalizing problems throughout childhood. Stable trajectories have been observed in childhood that are low (Davis et al., 2015; Klein et al., 2019; Sterba et al., 2007), moderate (Davis et al., 2015; Klein et al., 2019), and high (Klein et al., 2019; Sterba et al., 2007) trajectories of internalizing problems. Unstable trajectories (i.e., levels of internalizing problems fluctuate whether to increase or decrease across development) have been described but have not been consistently observed across studies. Specifically, unstable trajectories include (a) a decrease/increase pattern (i.e., children begin with elevated levels of internalizing problems that decrease by age 4.5 and began increasing again around age 7; Sterba et al., 2007), (b) a rising low to moderate trajectory (i.e., children begin with low levels of internalizing problems at age 3 and internalizing problems consistently increase through middle childhood; Klein et al., 2019), and (c) a moderate increasing trajectory (i.e., children had similar levels of internalizing problems as the moderate stable group at age 4.5, but levels increased through age 12; Davis et al., 2015). Childhood trajectories of elevated stable and fluctuating internalizing problems (i.e., increasing high levels, adolescence onset increasing high, and decreasing/increasing) have been associated with higher depressive symptoms in pre-adolescence (Sterba et al., 2007), adolescence (Dekker et al., 2007), and adulthood (Toumbourou et al., 2011).

A challenge in examining the literature on trajectories of internalizing problems during childhood is the variability in measurement approaches. Even with stable trajectories, studies have used measure-specific labels (e.g., mean *T* scores; Davis et al., 2015) that make it difficult to assess similarities of trajectories across studies. Furthermore, trajectories have been shown to differ by sex (Gutman & Codioli McMaster, 2020; Shanahan et al., 2014) and socioenvironmental factors such as adverse life experiences (Klein et al., 2019). Disparities also exist on prevalence rates of internalizing problems due to income (Lansford et al., 2019) and among youth of color (Anderson & Mayes, 2010). Therefore, it is important to consider sex, ethnicity/race, and adverse experiences when examining trajectories of internalizing problems.

### **Risk Factors for Internalizing Problems**

Ecological models have highlighted the interaction between individual (e.g., sex, age) and socioenvironmental factors (e.g., home, community; Bronfenbrenner, 1979; Sameroff, 2009). Socioenvironmental ACEs, such as parental mental health, parenting practices (e.g., harsh discipline, low nurturance), having a single mother, exposure to intimate partner violence, and exposure to multiple risk factors (e.g., single parent, parental criminal conviction, drug/alcohol problem) have been associated with increases in internalizing problems (Carneiro et al., 2016).

Bronfenbrenner's (1979) ecological systems theory helps explain how factors in the surrounding environment (e.g., ACEs) affect an individual child, and the transactional model of development (Sameroff, 2009) focuses on reciprocal processes between the experiences within the environment and the child. Thus, the environment is not only affecting the child, but the child also shapes the environment. Combined, these



two theories create an ecological/transactional model (Cicchetti & Lynch, 1993), which accounts for how proximal level factors, such as the microsystem (e.g., family), and distal factors, such as the macrosystem (e.g., culture) and exosystem (e.g., community) impact child mental health. Therefore, examining factors at various levels is important to better understand the transactionality between socioenvironmental factors, such as ACEs, and the development of internalizing problems.

ACEs comprise various factors that are included within socioecological models and they have been shown to have negative outcomes. There are 10 recognized categories of ACEs: (a) emotional abuse, (b) physical abuse, (c) sexual abuse, (d) emotional neglect, (e) physical neglect, (f) exposure to domestic violence, (g) substance use in household, (h) parental separation or divorce, (i) mental illness in the household, and (j) incarcerated household member (Center for Disease Control and Prevention [CDC], 2019a). ACEs are commonly experienced by individuals, with 61% of adults across the United States reporting experiencing at least one type of ACE, and with 1 in 6 individuals endorsing experiencing four or more ACEs (CDC, 2019b).

ACEs are often experienced by children, and they have detrimental effects on mental health outcomes. Within one study, 15.7% of individuals experiencing ACEs were diagnosed with an anxiety disorder during adolescence and 32.4% during adulthood (McLaughlin et al., 2012). Limited research exist about the longitudinal development of ACEs in relation to mental health outcome, but taking a longitudinal approach would allow researchers to understand the impact that ACEs have on sensitive periods of development (Evans et al., 2013; McMahan et al., 2003).

### **ACEs and the Development of Internalizing Problems**

Life course theory (Ben-Shlomo & Kuh, 2002; Kuh et al., 2003) supports taking a longitudinal approach to examine the relationship of ACEs and internalizing problems. According to life course theory, adverse events, such as ACEs, can impact the development of internalizing problems through accumulation of adversity or when experiencing adversity during sensitive periods. The *accumulation of risk model* poses that adversity is cumulative and thus utilizes a total sum score of adversity to assess future outcomes. Evidence has been found for the relationship of ACEs and internalizing problems using an *accumulation of risk model*. Studies have reported finding a dose-response effect, with children who have experienced a greater number of ACEs having more internalizing problems (Clarkson Freeman, 2014; Schroeder et al., 2020). However, this model does not account for timing of exposure, which can provide information about possible sensitive periods in development. Most research looking at ACEs and internalizing problems has focused on the *accumulation of risk model* despite the important contributions that work on sensitive periods may provide (e.g., prime time to provide interventions) and theory indicating that timing of exposure to adversity may affect the outcome.

Life course theory also has a *critical period model*, which states that experiencing adversity during critical periods in development can have detrimental irreversible effects (Ben-Shlomo & Kuh, 2002). However, the term *sensitive periods* (Ben-Shlomo & Kuh, 2002; Kuh et al., 2003) is preferred as this infers adaptability and the ability to change the effects of exposure, especially since some children have been shown to be resilient despite experiencing ACEs (Seery et al., 2010). To date no studies have used a *sensitive period model* to assess the impact of ACEs on internalizing problems; however, studies

have examined child physical and sexual abuse. These studies found that earlier exposure (i.e., before age 5) to physical (Dunn et al., 2020; Keiley et al., 2001) or sexual abuse (Dunn et al., 2020) was associated with greater internalizing problems later in life when compared to children who were unexposed or experienced physical or sexual abuse later in childhood. Furthermore, the effects of experiencing physical or sexual abuse were found to be delayed for children who were exposed very early in childhood (i.e., ages 0-3), with significant internalizing problems not emerging until the children were 6 years old (Dunn et al., 2020). Therefore, examining the interplay between exposure to ACEs and internalizing problems through a developmental approach may provide information about possible sensitive periods that may make children more vulnerable for detrimental mental health outcomes. It also is possible that both timing and accumulation of ACEs are important to understand the long-term effects of experiencing ACEs.

To date only one study has assessed the longitudinal trajectories of cumulative ACEs, and it focused on outcomes at age 18 (Thompson et al., 2015). This study found three different trajectories: (a) 69% of the sample was in the chronic ACEs group (i.e., high levels of ACEs with about two ACEs at each period), (b) 7% of the sample was the early ACEs Only group (i.e., high exposure to ACEs before age 6 and very few ACEs during subsequent ages), and (c) 24% of the sample was in the limited ACEs group (i.e., none or low rates of ACEs over time). This study did not find that early exposure to ACEs related to worse mental health outcomes unlike other studies examining the longitudinal relationship between child maltreatment and internalizing problems (Dunn et al., 2020; Keiley et al., 2001). However, this study did not account for prior levels of mental health outcomes, which may limit the findings. It is possible that mental health

problems emerge during childhood for children who experience adversity early in life and that they do not continue to early adulthood, especially if adversity has subsided.

Therefore, it is important to understand the transactional development of ACEs and internalizing problems.

### **Disparities in ACEs and Internalizing Problems by Race/Ethnicity, Sex, and Income**

The relationship between ACEs and internalizing problems trajectories need to include race/ethnicity, sex, and income as covariates given documented disparities. Exposure to ACEs has been found to differ based on race/ethnicity (Giano et al., 2020; Maguire-Jack et al., 2019; Slopen et al., 2016), sex (Baglivio et al., 2014) and income (Giano et al., 2020; Lacey et al., 2022; Slopen et al., 2016). Findings suggest that youth of color, such as Black and Latinx individuals, girls, and children of lower-income families experience a greater number of ACEs, therefore may be a greater risk for developing mental health problems. There is robust evidence suggesting that youth of color have elevated prevalence rates for internalizing disorders (Anderson & Mayes, 2010). Research has also found that initial levels of internalizing problems and their change over time differed based on sex (Dekker et al., 2007; Gutman & Codioli McMaster, 2020; Sterba et al., 2007). Additionally, higher income has been associated with greater decreases in child internalizing problems over time (Lansford et al., 2019). Thus, differences in trajectories of cumulative ACEs and internalizing problems may differ by race/ethnicity, sex, and income. However, limited research exists assessing race/ethnic, sex, and income differences on longitudinal trajectories of ACEs and co-developing trajectories of ACEs and internalizing symptoms. Further, to our knowledge, no studies have examined differences by race/ethnic and income on the longitudinal

trajectories of internalizing problems. Examining demographic differences could provide additional information that would allow for tailoring of prevention and intervention efforts.

### **The Current Study**

The current study aimed to address two research questions utilizing the Fragile Families and Child Wellbeing Study (FFCWS) dataset across ages 3, 5, and 9. The first aim was to examine the individual trajectories and co-development of cumulative ACEs and internalizing problems at 3, 5, and 9 years of age to better understand the interplay between ACEs and internalizing problems. We hypothesized that children who experienced chronic adversity over time and children who experienced ACEs early during childhood would have elevated internalizing problems. The second aim was to examine how ethnicity/race, sex, and income related to individual and joint trajectories of ACEs and internalizing problems. We hypothesized that youth of color, girls, youth from lower-income families would have greater levels of internalizing problems and would have experienced higher levels of ACEs. However, there is insufficient information in the literature to hypothesize how ACEs and internalizing problems would interplay over time depending on ethnicity/race, sex, and income. Thus, analyses examining the co-development of ACEs and internalizing problems were exploratory.

## **Method**

### **Participants and Procedures**

Data were taken from the FFCWS, a longitudinal study that followed 4,898 children and their families across 20 cities in United States between 1998 and 2000 using

a stratified random sample (Reichman et al., 2001). The study oversampled unmarried mothers in hospitals, during their child's birth. Black, Hispanic, and low-income families were largely represented in the sample. Participants were followed for six waves across the child's development: Wave 1 (birth/baseline), wave 2 (age 1), wave 3 (age 3), wave 4 (age 5), wave 5 (age 9), and wave 6 (age 15). For the purpose of this study, data from an in-home assessment conducted with the primary caregiver during waves 3 (age 3), 4 (age 5), and 5 (age 9) were used. These waves were selected because waves 1 and 2 did not include information about ACEs and wave 6 did not contain a questionnaire completed by the primary caregiver, but rather the questionnaire was completed by the focus child when they were 15 years old. More detailed descriptions of the FFCWS sample and procedures are included in a published article (Reichman et al., 2001).

The sample for the current study consisted of 4,655 participants out of the 4,898 total participants in the study. Participants were not included in the study if they did not participate at any of the waves being analyzed for this study ( $n = 243$ , 5%). Of the 4,655 participants included in the current study, 3,568 (72.8%) of the sample participated at each wave, 1,087 (22.2%) did not participate in one of the three waves, and 162 (3.3%) only participated during one of the three waves. The sample was greatly diverse in regard to race/ethnicity. Children were 44.7% (2,079) Black, 22.5% (1,047) Hispanic, 16.7% (777) Other, and 16.2% (752) White. The sample was had similar representation in regard to child sex, with 52.2% ( $n = 2,430$ ) boys and 47.8% ( $n = 2,225$ ) girls. Primary caregivers were predominantly biological parents at each wave (67.93%, 65.05%, 73.08%). On average, yearly income for the primary caregiver was US\$34,649.61, US\$36,453.76, and US\$44,980.35 at waves 3, 4, and 9, respectively. The Institutional Review Board at Utah

State University approved secondary analysis of the FFCWS data for this study (Protocol #11132).

## **Measures**

### ***Adverse Childhood Experiences***

ACEs included in this study include all ACEs incorporated in the original ACEs study conducted by the CDC-Kaiser Permanente (Felitti et al., 1998). ACEs included in this study were (a) emotional abuse, (b) physical abuse, (c) physical neglect, (d) emotional neglect, (e) parental domestic violence, (f) parental mental health problems, (g) parental substance use, (h) parental incarceration, and (i) parental divorce or separation. Child sexual abuse, although part of the original ACEs study, was not incorporated in this study as the FFCWS did not contain data about child sexual abuse. Information was included for mother's and father's reports. Most of the information was reported by the primary caregiver, typically a biological parent. All adverse experiences were coded as either *present* (1) or *not present* (0) at each time point and were not carried over from the prior time point (i.e., lifetime exposure) unless the adversity was still present at the following time point (e.g., parent divorce/separation was coded as present at both time points if parents were divorced/separated at age 3 and continued to be divorced/separated at age 5). ACEs were summed to create a composite score of various indicators at each age.

**Child Maltreatment.** The Conflict Tactics Scale: Parent Child Version (CTS-PC; Straus et al., 1998) was used to measure physical abuse, emotional abuse, and neglect for ages 3, 5, and 9. The CTS-PC has high reliability and validity (Straus et al., 1998). Physical abuse was assessed using five items on the physical assault subscale (i.e.,

spanking, hitting, slapping, pinching, shaking). Primary caregivers were asked to rate five items on the psychological aggression subscale to measure emotional abuse (i.e., shouting, threatening, swearing, calling names, threaten to kick child out of house). Lastly, five items from the neglect subscale were used to assess caregivers' reports of neglect. Based on prior work with this dataset (Hunt et al., 2017), items within the neglect subscale of the CTS-PC were split into physical and emotional neglect. Physical neglect was measured with four items on the neglect subscale (i.e., leaving child home alone, food insecurity, medical insecurity, lack of parenting associated with substance use). Emotional neglect was assessed with one item from the neglect subscale (i.e., lack of affection). Primary caregivers rated how many times in the past year they had engaged in these behaviors on an 8-point scale: *this has never happened* (0), *once* (1), *twice* (2), *3-5 times* (3), *6-10 times* (4), *11-20 times* (5), *more than 20 times* (6), or *not in the past year but it happened before* (7). The current study used a dichotomized score that was created for each type of maltreatment (i.e., physical abuse, emotional abuse, physical neglect, emotional neglect) based on responses to the questions within each subscale. Exposure to the specific type of child maltreatment was *present* (1) if any item was endorsed within the subscale as happening once or more (scale values between 1 and 6) and as *not present* (0) if all the items were endorsed as never happening or not happening in the past year (values of 0 or 7) within the subscales.

**Parental Domestic Violence.** Information about parental domestic violence was gathered from a qualitative interview. These structured questions have been previously used in other ACEs studies utilizing FFCWS data (Hunt et al., 2017; Jimenez et al., 2016, 2017; Schroeder et al., 2020). Mothers and fathers were asked to answer questions



regarding possible physical, psychological, and sexual abuse perpetrated by the other parent. Two questions assessed physical abuse: (a) “He/she slapped or kicked you” and (b) “He/she hit you with a fist or an object that could hurt you.” Psychological abuse items included three questions: (a) “He/she tried to keep you from seeing or talking with your family or friends”, (b) “He/she tried to prevent you from going to work or school”, and (c) “He/she withheld money, made you ask for money, or took your money.” Lastly, one question asked about sexual abuse: “He/she tried to make you have sex or do sexual things you didn’t want to do.” These questions were rated on a 3-point scale on the frequency of parent behavior: *often* (1), *sometimes* (2), *never* (3). For the present study, a dichotomous variable was created for each question to measure the presence of domestic violence: *not present* (0) and *present* (1). If questions were rated as *often* or *sometimes* then they were given a score of 1 (*present*), and if they were endorsed as *never* then it was coded as 0 (*not present*). Scores from both parents were combined to create a single domestic violence exposure variable from all the questions. If the answer to all these six questions from each parent were *never*, then exposure to domestic violence was rated (0) *not present*. Domestic violence was present if either parent had a score on any of the questions of (1) *present*.

**Parental Depression.** The Composite International Diagnostic Interview – Short Form (CIDI-SF; Kessler et al., 1998) was used to assess criteria for a major depressive episode based on the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 1994) criteria. The CIDI-SF is a well validated measure that has high internal reliability and validity (Gigantesco & Morosini, 2008). Mothers and fathers completed this measure at ages 3, 5, and 9. The CIDI-SF

contains 15 items that measure symptoms of a major depressive episode during the two weeks prior to each assessment at each wave. Mothers and fathers were asked to report on this measure. For this study, we used the liberal caseness variable created by the authors of the FFCWS following previous guidelines for possible caseness scores (Kessler et al., 1998; Walters et al., 2002). If all symptoms of anhedonia (three items) or dysphoric mood (three items) were endorsed as happening at least “half of the day” (i.e., liberal caseness criteria) then depression was coded as 1 (*present*). The CIDI-SF also has a conservative caseness score that requires individuals to endorse symptoms as occurring at least “most of the day” in order to meet criteria for depression caseness. A dichotomous variable was created with a score of possible liberal caseness for either or both parents being considered as (1) *present* and the absence of caseness for both parents being considered as (0) *not present*.

**Parental Substance Use.** Parental substance use was assessed by asking questions to the biological mother and father regarding alcohol and drug use. For this study, one question was used to ask mothers and fathers about problematic alcohol use: “In the past 12 months, was there ever a time when your drinking or being hung over interfered with your work at school, or a job, or at home?”. Mothers and fathers were also asked if they had used nine different types of drugs (i.e., sedatives, tranquilizers, stimulants, analgesics or prescription pain killers, inhalants, marijuana or hashish, cocaine, LSD or other hallucinogens, heroin) in the past 12 months without prescription from a doctor, consuming in larger amounts than prescribed, or for a longer period than prescribed. Parents were also asked if the other biological parent has “have problems such as keeping a job or getting along with family and friends because of alcohol or drug

use?”. Parents were asked to respond (1) *yes* or (2) *no* for all of these questions. For this study, a dichotomous variable was created with endorsement to any of these questions for either the mother or father being considered as (1) *present* and absence of endorsement to all questions being considered as (0) *not present*.

**Parental Incarceration.** Parental incarceration information was obtained from mother and father reports. Biological mothers and father reported whether they themselves or the other biological parent was in prison or jail during each wave. For the current study, a dichotomous variable was created with endorsement to the question for either the mother and father being considered as (1) *present* and absence of endorsement to all questions being considered as (0) *not present*.

**Parental Divorce and Separation.** Mothers and fathers were asked to report on their relationship status with the child’s other biological parent. If mother or father answered (a) *separated or divorce*, (b) *just friends*, or (c) *not in any kind of relationship* to the question, parental divorce/separation was coded as (1) *present*. If either parent responded (a) *married*, (b) *romantically involved*, or (c) *cohabitating/living together* then parental divorce and separation was coded as (0) *not present*.

### ***Child Internalizing Problems***

Three versions of the Child Behavior Checklist (CBCL) were used to measure internalizing at ages 3, 5, and 9. Primary caregivers (e.g., mothers, fathers) were asked to rate whether each behavior was *never true* (0), *sometimes or somewhat true*, (1) *very true or often true* (2). At age 3, the CBCL/2-5 (Achenbach, 1992) version was used which contained 25 items for internalizing. The CBCL/4-18 (Achenbach, 1991) was used at age 5 and included items for 20 internalizing problems. Age 9 used the CBCL/6-18

(Achenbach & Rescola, 2001), which included 21 items for the internalizing problems scale. The CBCL at all three ages utilize the anxious/depressed and withdrawn subscales to comprise the internalizing scale, however, the CBCL at age 9 also includes somatic complaints which is not included in the two previous versions. Items from the somatic complaints' subscale were not included when calculating the internalizing problems subscale at age 9 for consistency purposes. The CBCL is considered one of the most robust measures of child clinical behavior in the United States and internationally (De Groot et al., 1994), and has been tested with youth from ethnically and culturally diverse backgrounds. The measure has well established validity and reliability (Drotar et al., 1995; Dutra et al., 2004). While different version of the CBCL were utilized, internal reliability ranged from acceptable to high for the internalizing scales ( $\bar{\alpha} = .80, .71, \text{ and } .84$  for ages 3, 5, and 9 respectively) within the FFCWS data. For the present study, the raw score of the internalizing behavior problems scale were used to provide greater variability as compared to T-scores which reduces variability as many individuals score in the lower levels of the T-scores (Achenbach, 1997).

### ***Demographics***

**Race/Ethnicity.** Child race/ethnicity was constructed based on the self-identifying race/ethnicity of the parents as the child's race/ethnicity was not collected until wave 6 when the children were 15 years of age. Given that only 70% of youth from the total sample completed wave 6, parental self-identified race/ethnicity variables were used to compute a race/ethnicity variable for the child. Biological mothers and fathers were asked to report on their own race/ethnicity during the study baseline (i.e., Wave 1 birth of child) and was coded as Black, Hispanic, White, Mixed, and Other. For the

purpose of this study, child's race/ethnicity was coded as Black, Hispanic, White, and Other (i.e., youth with Mixed racial/ethnic identities; youth whose race/ethnicity did not fit into Black, Hispanic, and White). Mixed and Other race/ethnicity for child was combined into one code, Other, due to sparsity. Child race/ethnicity was coded so that if parent's race/ethnicity was the same for both parents the child's ethnicity was coded as the same race/ethnicity as the parents (e.g., Child coded as Black if they had a Black mother and father). If mother and father had a different race/ethnicity, then child race/ethnicity was coded as Other (i.e., Mixed race/ethnicity). The created child race/ethnicity variable was compared to the youth self-reported at wave 6 for accuracy. Child's created race/ethnicity based on parent's reported race/ethnicity had high consistency (84.6%) with the available data of youth's self-identified race/ethnicity at age 15) wave 6. Many of the inconsistencies were due to youth only endorsing one of their parent's race/ethnicity rather than identifying as Mixed (i.e., Other).

**Sex.** Child's binary sex was assessed at baseline (i.e., Wave 1 when child was born) using mother's and father's report. Sex was measured as a dichotomous variable where parents could endorse *boy* (1) or *girl* (2).

**Primary Caregiver's Income.** Primary's caregiver income was obtained by first identifying who the primary caregiver of each child was. Variables reporting on who the child's primary caregiver was and who the child lives with were used to select the primary caregiver. If fathers were identified as the primary caregiver, then their income was assigned. On the other hand, mother's income was selected if the mother was identified as the primary caregiver. Mothers and fathers were asked to report on their exact dollar income. If they were unable to, they were asked to provide a range. An

income variable was generated that included the income of those who provided an exact income amount, and an imputation for those who provided a range or did not provide information about their income. A separate variable was created for mother's and father's income which was utilized to create the current income for primary's caregiver. For children who do not live with their mothers or fathers, imputation was used to obtain a value. Mother's and father's income were included as covariates in the imputation.

### **Analysis Plan**

Latent Class Growth Analysis (LCGA, Nagin, 1999) was used to assess individual trajectories of ACEs and internalizing problems separately following guidelines from Jung and Wickrama (2008), and Ram and Grimm (2009). Analysis were completed in Mplus 8.6 (Múthen & Múthen, 2017). First, a Latent Growth Curve Analysis was used to confirm significant variances of intercept and slope for the univariate trajectories ACEs and internalizing problems. Second, an unconditional univariate linear LCGA was used to assess individual trajectories of ACEs and internalizing problems separately. Models examining two to seven classes were estimated. Model fit and selection of classes of trajectories were determined using fit statistics such as Bayesian Information Criteria (BIC), Akaike Information Criteria (AIC), and sample-size-adjusted Bayesian Information Criteria (a-BIC), entropy, Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR), Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT), and Bootstrap Likelihood Ratio Test (BLRT). Lower AIC, BIC, and a-BIC values, and higher entropy (values nearing 1.0 indicate better classification accuracy) specify better fitting models (Nylund et al., 2007; Ram & Grimm, 2009). Statistically significant VLMR-LRT, LMR-LRT, and BLRT tests ( $p < .05$ ) suggest that

the model with fewer classes, from the models being compared, should be rejected as the model with more classes is significantly better (Lo et al., 2001). Optimal number of classes was determined by the interpretability of trajectories in the different classes and fit statistics.

Once the best fitting model was found for both the univariate trajectories of ACEs and internalizing problems, an unconditional linear parallel process LCGA was utilized to examine the co-development of ACEs and internalizing problems trajectories. This method allows to account for both trajectories of ACEs and internalizing problems concurrently (Chen et al., 2022; Zhou et al., 2022). The same steps used on the univariate LCGA trajectories were utilized to determine the optimal number of classes for the parallel process LCGA trajectories.

After selecting the univariate and parallel process trajectories of ACEs and internalizing problems, we tested differences in representation on the univariate and parallel process trajectories of ACEs and internalizing problems by race/ethnicity and sex. A chi-square test assessed differences in univariate ACEs trajectories. Fisher's exact tests with Monte Carlo simulations were utilized for the univariate internalizing problems, and parallel process trajectories as some of the cells within the contingency tables were sparse (i.e., below five participants per cell). Monte Carlo simulations (a) allow to test contingency tables large than 2x2, which is the limit for a Fisher's Exact test, (b) help resolve issues encountered due to computational burden (i.e., insufficient memory errors), and (c) provide more accurate results for small sample sizes (Amiri & Modarres, 2017; IBM, 2020; Kim, 2017). Standardized adjusted residual scores (i.e., z-scores) were obtained when conducting the chi-square/Fisher's exact tests in SPSS in

order to perform post hoc analysis with Bonferroni corrections to identify differences between the cells in the chi-square/Fisher's exact tests (Beasley & Schumacher, 1995). Kruskal-Wallis, a non-parametric test, was utilized to assess differences in the univariate and parallel process trajectories by primary caregiver's income at each age because income was non-normally distributed. Analyses were conducted on SPSS version 29 (IBM Corp, 2022).

## **Results**

### **Missing Data**

Data from 4,655 participants were included in the current study. Across all waves, 28.05% of data were missing. There were significant associations between observed variables and the overall pattern of missingness, which suggests that the data was Missing at Random (MAR). MAR is defined as the systematic relationship between one or more observed variables and the probability of missing data (Enders, 2010). When data are MAR, observed variables can be used to impute missing values (Enders, 2010). Missing data were imputed at the individual item level using a Random Forest algorithm in order to reduce biases associated with mean imputation methods (Donders et al., 2006). Random Forest imputation also generates a single data set which decreases methodological challenges in pooling fit statistic and classes from statistical software programs that do not allow the use of multiple imputations (Asparouhov, 2020; Muthén, 2017). Further, Random Forest imputation accurately estimate missing data in longitudinal data sets that have moderate to high levels of missingness (Ribeiro & Freitas, 2021; Tang & Ishwaran, 2017). The Random Forest imputation was carried out in R version 4.2.0 (RCore Team, 2022) and RStudio version 2022.07.2 (RStudio Team, 2022).



## Sample Characteristics

The overall sample, on average, experienced three ACEs at each time point and had levels of internalizing problems that slightly decreased from age 3 ( $M = 41.07$ ,  $SD = 5.30$ ) to age 5 ( $M = 40.16$ ,  $SD = 3.47$ ), and then increased to the highest levels of all time points by age 9 ( $M = 44.30$ ,  $SD = 3.71$ ). Further, primary caregiver's income was the lowest at age 3 ( $M = \$34,649.61$ ,  $SD = \$43,574.61$ ) and increased at age 5 ( $M = \$36,453.76$ ,  $SD = \$43,625.70$ ) and age 9 ( $M = \$44,980.35$ ,  $SD = \$48,091.55$ ). Differences were found for all study variables by race/ethnicity and primary caregiver's income at age 9 by sex. Specifically, Black youth had the most ACEs at all ages followed by Other, Hispanic, and White youth. Hispanic youth had the highest levels of internalizing problems at all ages, followed by Black, Other, and White youth. White youth had higher levels of internalizing problems than Black and Other youth at age 9 but not earlier ages. Lastly, primary caregiver's income was highest for White youth at all ages followed by Other youth. Black and Hispanic youth had lower income than White and Other youth, with Hispanic youth having the lowest income at age 3 and Black youth having the lowest income for subsequent ages. Primary caregivers for boys also had higher income than those of girls at age 9 but there were no other differences by sex for earlier ages. There were differences in the rates of divorced/separation by race/ethnicity but not sex. White youth were found to have the lowest proportions of divorced parents and was followed by Hispanic, Other, and Black youth with the highest rates. See Table 1 for information on descriptive statistics of study variables for the total sample, and by race/ethnicity and sex at each time point.

## ACEs Univariate Trajectories Classes

Latent growth curve analysis revealed that significant variance was found for the intercept ( $p < .001$ ) but not the slope of the ACEs trajectory ( $p = .95$ ). This suggests significant individual differences in the initial levels of ACEs but not in change over time. The results confirmed that a LCGA would be helpful to better capture the significant variance in the intercept.

Unconditional univariate linear LCGAs were conducted on two to seven classes to identify the most optimal number of classes. The six-class model was the best fitting model. See Table 2 for fit statistics of ACEs LCGA. This model had lower AIC, BIC, and a-BIC fit statistics than those with fewer classes. The entropy was also the highest for this model (0.67). The LMR-LRT test was not significant ( $p = .055$ ) and suggested that the six-class model was not significantly better than the five-class model; however, both the VLMR ( $p = .049$ ) and BLRT ( $p < .001$ ) tests suggested the six-class model was statistically significantly better. Further, interpretation of the classes suggested that the extra class added by the six-class model was different than the other classes and was a substantial class as it captured a subsample of children who had increasing ACEs over time. The six-class model was selected.

Classes in the six-class model were labeled (a) Class 1: 1 ACE, (b) Class 2: 2 ACEs, (c) Class 3: 3 ACEs, (d) Class 4: 3 ACEs and increasing, (e) Class 5: 4 ACEs, and (f) Class 6: 6 ACEs. The six classes are shown in Figure 1. Youth in Class 1 accounted for 2.0% of the total sample ( $n = 94$ ) and they experienced one ACE at each age. Children in Class 2 experienced two ACEs at each age and accounted for 30.1% of the total sample ( $n = 1,403$ ). Class 3 accounted for 49.9% of the total sample ( $n = 2,323$ ) and consisted of youth who experienced three ACEs at each time point. Youth in Class 4

accounted for 2.3% of the total sample ( $n = 107$ ) and they experienced three ACEs at age 3 and they continued to experience more ACEs over time—they experienced 5 ACEs at age 9. Class 5 accounted for 15.0% of the total sample ( $n = 694$ ) and was characterized by children who experienced four ACEs at each time point. Lastly, Class 6 accounted for 0.7% of the total sample ( $n = 34$ ) and consistent of children who experienced about six ACEs at each age.

### **Internalizing Problems Univariate Trajectories Classes**

Similar to the ACEs trajectory, the latent growth curve analysis for internalizing problems revealed significant variance for the intercept ( $p < .001$ ) and neared significance for the variance of the slope ( $p = .056$ ). Results suggested there were significant individual differences at the initial levels of internalizing problems and some, but not significant, difference in the growth of internalizing problems over time. Thus, utilizing a LCGA was warranted to better capture the significant variance in the intercept.

Models with two to seven classes of unconditional univariate linear LCGA were conducted to assess trajectories of internalizing problems. The four-class model was the best fitting model. See Table 2 for fit statistics of the internalizing problems LCGA. This model had lower AIC, BIC, a-BIC than models with fewer classes. The four-class model also had the highest entropy (0.93), and statistically significant LMR-LRT ( $p = .002$ ), VLMR ( $p = .002$ ), and BLRT ( $p < .001$ ) tests, suggesting that the four-class model was significantly better than the three-class model. While the models with more classes had lower AIC, BIC, and a-BIC, and statistically significant LMR-LRT, VLMR, and BLRT tests, these models were not selected as they had lower entropy values and their interpretation was not meaningful given that there was a lot of overlap between classes.

Classes for internalizing problems were described in reference to the average trajectory of all participants for ease. Classes in the four-class model were categorized as (a) Class 1: below average increasing to average internalizing problems, (b) Class 2: above average stable internalizing problems, (c) Class 3: average increasing to high internalizing problems, and (d) Class 4: below average increasing to very high internalizing problems. The four classes are shown in Figure 2. Class 1 accounted for 86.5% of the total sample ( $n = 4,028$ ) and had children with the second lowest levels of internalizing problems at age 3 and levels increased to average levels by age 9. Youth in Class 2 accounted for 7.9% of the total sample ( $n = 368$ ) and had above average internalizing problems at age 3 and their levels of internalizing problems stayed relatively stabled in the above average range across time. Class 3 accounted for 5.4% of the total sample ( $n = 251$ ) and was characterized by youth who started with average levels of internalizing problems at age 3 and the levels increased to above average by age 9—this class had the second highest levels of internalizing problems by the last time point. Youth in Class 4 accounted for 0.2% of the total sample ( $n = 8$ ) and consisted of youth who had the lowest levels of internalizing problems at age 3 and the levels increased to have the be very high by age 9—this class had the highest internalizing problems by the last time point.

### **ACEs and Internalizing Problems Parallel Process Trajectories Classes**

Latent growth curve analysis of the parallel process trajectories of ACEs and internalizing problems showed significant variance for both the ACEs ( $p < .001$ ) and internalizing problems trajectories ( $p < .001$ ), but not the slope of neither the ACEs ( $p = .600$ ) or internalizing problems ( $p = .223$ ) trajectories. These results suggest that there are

individual differences in the starting levels of ACEs and internalizing problems, but not the change over time of either trajectory. These results indicate that conducting an LCGA would aid in accounting for individual differences.

Parallel process LCGA was conducted with two to seven classes to examine trajectories of ACEs and internalizing problems simultaneously. The six-class model was the best fitting model. See Table 2 for fit statistics of ACEs and internalizing problems parallel process LCGA. This model had the highest entropy (0.80), and lower AIC, BIC, a-BIC than models with fewer classes. While the LMR-LRT ( $p = .063$ ) and VLMR ( $p = .060$ ) suggested that the six-class model was not statistically significantly better than the five-class model, the BLRT showed it was significantly better ( $< .001$ ). Further, the interpretation of the classes suggested that the six-class model had more meaningful interpretation as it helped better distinguish two classes that were very similar in the five-class model (i.e., experienced similar amounts of ACEs and internalizing problems over time). The extra class added allowed for clearer differentiation of the classes to make it so that no two classes had similar/overlapping ACEs and internalizing problems trajectories.

Trajectories of internalizing problems were described in reference to the average trajectory of all participants for ease. Classes in the six classes were labeled as (a) Class 1: 2 ACEs and average internalizing problems, (b) Class 2: 3 ACEs and average internalizing problems, (c) Class 3: 2-3 ACEs and average and increasing to above average internalizing problems, (d) Class 4: 4 ACEs and above average/stable internalizing problems, (e) Class 5: 3-4 ACEs and above average increasing to high internalizing problems, and (f) Class 6: 2-3 ACEs and below average increasing to very high internalizing problems. The six classes are shown in Figure 3. Class 1 accounted for

40.2% of the total sample ( $n = 1,872$ ) and had youth with the lowest levels of ACEs, two ACEs at each time point, and had average levels of internalizing problems at every time point. Youth in Class 2 accounted for 41.8% of the total sample ( $n = 1,947$ ) and had children who experienced three ACEs at each time point—the average amount of ACEs for the overall sample—and had average levels of internalizing problems over time. Class 3 accounted for 8.8% of the total sample ( $n = 410$ ) and consisted of youth who experienced two ACEs at age 3 and three at age 5 and 9, as well as average levels of internalizing problems at age 3 that increased over time to above average levels of internalizing problems by age 9. Youth in Class 4 accounted for 6.0% of the total sample ( $n = 278$ ) and they experienced four ACEs at each time point and internalizing problems that were above average and stable over time. Class 5 accounted for 3.0% of the total sample ( $n = 141$ ) and consisted of youth who experienced three ACEs at age 3 and four at age 5 and 9, as well average levels of internalizing problems at age 3 that increased over time to high levels of internalizing problems by age 9. Lastly, youth in Class 6 accounted for 0.2% of the total sample ( $n = 7$ ) and consisted of youth who experienced two ACEs at age 3 and three at age 5 and 9, as well as the lowest levels of internalizing problems of all classes at age 3 that increased to the very high levels—the highest levels of internalizing problems of all classes—by age 9.

### **Race/Ethnicity, Sex, and Income Differences in Trajectory Class Membership**

#### ***ACEs Univariate Trajectories Classes***

Chi-square test results suggested that class membership significantly differed on the ACEs univariate trajectories classes by race/ethnicity,  $\chi^2 = 305.41$ ,  $df = 15$ ,  $p < .001$ , but not by sex,  $\chi^2 = 10.70$ ,  $df = 5$ ,  $p = .058$ . More specifically, for race/ethnicity, White

and Hispanic youth were more likely to be in Class 1 (i.e., 1 ACE;  $z = 3.63$ ;  $z = 4.21$ , respectively) and Class 2 (i.e., 2 ACEs;  $z = 11.31$ ;  $z = 6.23$ , respectively), and less likely to be in the Class 3 (i.e., 3 ACEs;  $z = -7.99$ ;  $z = -3.76$ , respectively) and Class 5 (i.e., 4 ACEs;  $z = -3.48$ ;  $z = -5.04$ , respectively) than Black and Other youth. On the other hand, Black children were less likely to be in the Class 1 and 2 ( $z = -6.07$ ;  $z = -11.80$ , respectively), and more likely to be in Class 3 (i.e., 3 ACEs;  $z = 9.23$ ) and 5 ( $z = 4.23$ ) than White, Hispanic, and Other children. See Table 3 for Chi-square test results.

Kruskal-Wallis test revealed that ACEs univariate trajectories classes significantly differed by primary caregiver's income at age 3 ( $H = 318.58$ ,  $p < .001$ ), age 5 ( $H = 432.27$ ,  $p < .001$ ), and age 9 ( $H = 388.96$ ,  $p < .001$ ). The same pattern was seen at each age, where income decreased as the trajectories had more ACEs: Class 1 had the highest income followed by Class 2, Class 3, Class 4 (i.e., 3 ACEs and increasing), Class 5, and lastly Class 6 (i.e., 6 ACEs) had the lowest income. See Table 4 for Kruskal-Wallis test results.

### ***Internalizing Problems Univariate Trajectories Classes***

Fisher's exact test revealed that there were differences in class membership of internalizing problems univariate trajectories classes by race/ethnicity ( $p < .001$ ) but not by sex ( $p = .675$ ). Specifically, Hispanic youth were less likely to be in Class 1 (i.e., below average increasing to average internalizing problems;  $z = -4.73$ ), and more likely to be in Class 2 (i.e., above average stable internalizing problems;  $z = 3.41$ ) and Class 3 (i.e., average increasing to high internalizing problems;  $z = 2.88$ ) than White, Black, and Other youth. White youth were less likely to be in the Class 2 ( $z = -3.76$ ) than Hispanic, Black, and Other youth. Further, Class 4 (i.e., below average increasing to very high

internalizing problems class), while a small class, was completely represented by Black and Hispanic children as no White and Other children were in this class. See Table 3 for Fisher's Exact test results. A similar pattern to the ACEs trajectories classes was encountered for the classes of internalizing problems, in regard to primary caregiver's income, with class membership of internalizing problems differing on primary caregiver's income at age 3 ( $H = 84.32, p < .001$ ), age 5 ( $H = 75.25, p < .001$ ), and age 9 ( $H = 76.67, p < .001$ ). Trajectories with lower internalizing problems over time had higher income, and those with higher starting internalizing problems at age 3 or increasing levels over time had lower income. More specifically, Class 1 had the highest income followed by Class 3, Class 2, and Class 4 had the lowest income. This pattern was consistent across the three time points. See Table 4 for Kruskal-Wallis test results.

#### ***ACEs and Internalizing Problems Parallel Process Trajectories Classes***

Parallel process trajectories classes of ACEs and internalizing problems also significantly differed by race/ethnicity ( $p < .001$ ) and primary caregiver's income at age 3 ( $H = 357.16, p < .001$ ), age 5 ( $H = 417.95, p < .001$ ), and age 9 ( $H = 365.82, p < .001$ ), but not by sex ( $p = .114$ ). White and Hispanic youth were more likely to be in the Class 1 (i.e., 2 ACEs and average internalizing problems;  $z = 9.55$ ;  $z = 4.58$ , respectively) and less likely to be in the Class 2 (i.e., 3 ACEs and average internalizing problems;  $z = -8.68$ ;  $z = -7.47$ , respectively) as compared to Black and Other youth. On the other hand, Black children were less likely to be in the Class 1 ( $z = -9.32$ ) and more likely to be in Class 2 ( $z = 10.78$ ) than White, Hispanic, and Other children, suggesting that Black youth on average experience an extra ACE each year than children of other races/ethnicities. Hispanic youth were also more likely to be in the Class 3 (i.e., 2-3 ACEs and average and



increasing to above average internalizing problems;  $z = 4.56$ ) while Black youth were less likely to be in this same class ( $z = -3.34$ ) than White and Other youth. Lastly, Class 6 (i.e., 2-3 ACEs and below average increasing to very high internalizing problems)—the class with the highest internalizing problems by the last time point—was comprised of only Black and Hispanic youth. See Table 5 for Fisher’s Exact test results.

Differences by primary caregiver’s income were also observed; classes that had fewer ACEs and more optimal internalizing problems trajectories (i.e., lower starting and ending values) had higher incomes than those with more ACEs and more severe internalizing trajectories. Specifically, the Class 1 had the highest income followed by the Class 3, Class 2, Class 5 (i.e., 3-4 ACEs and above average increasing to high internalizing problems), Class 4 (i.e., 4 ACEs and above average/stable internalizing problems), and Class 6 having the lowest income. This pattern was mostly consistent across the three ages with the exception of Class 5 that had slightly higher income than the Class 2 at age 5. See Table 4 for Kruskal-Wallis test results.

### **Discussion**

The current study adds to the literature by documenting the trajectories of ACEs, internalizing problems, as well the joint development of both trajectories. To our knowledge, this is the first study assessing the co-development of ACEs and internalizing problems longitudinally using a person-centered approach. Using longitudinal data (ages 3, 5, and 9) from the FFCWS, we identified six classes of ACEs trajectories, four classes of internalizing problems trajectories, and six classes of parallel process trajectories of ACEs and internalizing problems. Differences by race/ethnicity and primary caregiver’s income, but not sex, were found among trajectories of the univariate and parallel process

trajectories of ACEs and internalizing problems. Our findings suggest that youths within the current sample experienced chronic and consistent ACEs over time, and stable or increasing internalizing problems across childhood. Further, nuances were found in the relationship between the number of ACEs experienced and levels of internalizing problems. Lastly, findings also suggest that disparities exist in the number of ACEs experienced and levels of internalizing problems. Our findings document the complex relationship between ACEs and the development of youth internalizing problem across childhood, and highlights specific groups that are particularly at risk for negative mental health outcomes.

### **ACEs Univariate Trajectories**

Six ACEs trajectories were identified with the current study. All trajectories were stable over time, with the exception of the *3 ACEs and increasing* class, meaning that youth were exposed to the same number of ACEs at each time point. This suggests that exposure to ACEs may be chronic whereas low (e.g., 1 ACE) or high (e.g., 6 ACEs). These findings are concerning as research has found that individuals with lifetime exposure of four or more ACEs are at a significantly greater risk of developing physical and mental health problems (Felitti et al., 1998). Some youths within the current sample exceeded this benchmark at each time point.

Classes identified by the present study are similar to some of the findings from another study examining longitudinal trajectories of ACEs across childhood that identified three classes of trajectories: (a) chronic ACEs, (b) early ACEs only, and (c) limited ACEs (Thompson et al., 2015). The current study found more trajectories and none of the trajectories within the two studies were identical; however, we noticed a

similar pattern with some youth experiencing chronic ACEs and some having lower levels of ACEs relatively to the other trajectories. Lastly, unlike Thompson et al. (2015) we did not find a class that only experienced ACEs in early childhood, and instead found various classes wherein the baseline number at age three of ACEs persisted over time.

There were demographic differences within the classes of ACEs trajectories by race/ethnicity and income, but not sex. Specifically, Black youth were more likely to be in classes with higher number of ACEs as compared to all other youth, White and Hispanic youth were more likely to be in classes with lower ACEs, and income decreased as trajectories increased in the number of ACEs experienced. Findings are consistent with previous studies documenting that Black youth experience greater exposure to ACEs than Whites, although not consistent with finding that Hispanic were more likely to be in classes with fewer ACEs (Giano et al., 2020; Maguire-Jack et al., 2019; Slopen et al., 2016). It is possible that there might be differences in characteristics of Hispanic families (e.g., immigration status, cultural values, economic resources, parent wellbeing and stress) within the samples of these studies as heterogeneity exists within the Hispanic population (Cabrera et al., 2021). Future research should consider these attributes when researching adversity within the Hispanic/Latinx population to understand what factors may put individuals at greater risk. Further, findings from this study suggest that income decreases as the trajectories have greater number of ACEs. This finding is consistent with previous literature suggesting that lower-income youth experience greater adversity than youth with higher income (Giano et al., 2020; Lacey et al., 2022; Slopen et al., 2016). It is important to highlight that there were significant differences between race/ethnicity and income, with White youth having the highest income followed by Other, Black, and

Hispanic youth. Importantly, the income distributions by race/ethnicity of our sample matched those reported in the Census of 2020, the same year youth participated on this study at age 3, except for White families who had a lower income (US\$45,900) than youth in our sample (United States Census Bureau, 2001). Given that differences by race/ethnicity and income it is possible systemic factors such as structural racism may be driving inequities in exposure to adversity (Schoon & Melis, 2019; Shonkoff et al., 2020).

### **Internalizing Problems Univariate Trajectories**

Classes of the trajectories of internalizing problems found within the current study were similar to trajectories of internalizing problems found in previous studies. Similar to previous studies, we found both stable and unstable trajectories; however previously studies mostly found stable trajectories and very few unstable trajectories (Davis et al., 2015; Klein et al., 2019; Sterba et al., 2007). In contrast, most trajectories in this within the current study, a finding that has not been observed on three previous studies (Davis et al., 2015; Klein et al., 2019; Sterba et al., 2007). More unstable trajectories with an increase pattern may have been observed within our study because our sample consisted of at-risk families that may make them more susceptible to experience greater mental health problems.

Most of the sample within the current study was represented within the below average increasing to average internalizing problems (86.5%), which is not surprising as this was the trajectory with the lowest levels of internalizing problems over time and may be representative of a normative trajectory of internalizing problems. The rest of the sample were in the remaining three classes of trajectories which depicted higher levels of

internalizing problems over time. While the other three classes are relatively smaller than the below average increasing to average internalizing problems class, these classes are concerning as they might be at higher risk for subsequent mental health outcomes. Studies have found that children with trajectories showing elevated stable and increasing patterns of internalizing problems have higher depressive symptoms in adolescence (Dekker et al., 2007; Sterba et al., 2007) and adulthood (Toumbourou et al., 2011) as compared to those who have more normative trajectories. While some of the classes with higher levels of internalizing problems make up a smaller proportion of the overall sample (e.g., below average increasing to very high internalizing problems; 0.2%), they are important to extrapolate as these youths may be most at risk for unfavorable outcomes later in life. These classes highlight the importance of utilizing methods that take into consideration heterogeneity of trajectories, as these methods could distinguish individuals who are at higher risk.

We were able to identify who might be a greater risk to experience less optimal trajectories of internalizing problems by examining differences due to demographic variables. No differences on the classes of trajectories of internalizing problems were found by sex, but there were differences by race/ethnicity and primary caregiver's income. We hypothesized all youth of color would have higher representation in trajectories with higher internalizing problems as compared to White youth based on previous literature (see Anderson & Mayes, 2010 for review). However, we found that only Hispanic youth were more likely to be represented in less optimal trajectories (i.e., above average stable internalizing problems, average increasing to high internalizing problems, below average increasing to very high internalizing problems) as compared to

White, Black, and Other youth. We don't know why Hispanic youth are more likely to be in trajectories depicting higher internalizing problems over time; however, some research points to culture-specific factors such as preferred language, nativity, values (e.g., familism, traditional gender attitudes), and acculturation stress as possible explanations for why Hispanic youth experience greater rates of internalizing problems (Anderson & Mayes, 2010; Cruz et al., 2019). Future research should consider culture-specific factors as possible moderators of trajectories of internalizing problems. Additionally, income appears to play a role in the development of internalizing problems, as youth with lower income were more likely to have trajectories illustrating higher levels of internalizing problems. This finding is consistent with findings from previous studies (Lansford et al., 2019). Importantly, since race/ethnicity was found to be related to primary caregiver's income in the current study—with youth of color having lower income—it is important to disentangle the effects of income from race/ethnicity (Jones et al., 2016). Future research would benefit from examining the interaction between race/ethnicity and income to provide more insight into who is at greater risk which can help inform intervention efforts.

### ***ACEs and Internalizing Problems Parallel Process Trajectories***

When analyzing both the ACEs and internalizing problems trajectories simultaneously, we found six distinct classes. Youth who experienced the greatest number of ACEs at each time point (Class 4) had the highest levels of internalizing problems during the first time point (age 3) but not during the last point (age 9). In fact, youth who went from three ACEs at age 3 to four at age 5 and 9 (Class 5) ended with higher internalizing problems than youth in Class 4. However, children in Class 6 had the

highest ending levels of internalizing problems by age 9 despite starting with the lowest level of internalizing problems of all classes and experiencing similar ACEs to classes with lower internalizing problems over time (Class 3). This finding is interesting as previous studies have found a dose-response effect pattern, with youth who experienced greater ACEs having higher levels of internalizing problems (Clarkson Freeman, 2014; Schroeder et al., 2020) and individuals who experience four more ACEs being more likely to have mental health problems (Felitti et al., 1998).

There are possible explanations to this finding, including factors not accounted in this study such as youth's resilience, and the frequency and severity of adversity. It is possible that lower levels of internalizing problems were seen from youth who experienced greater adversity because of individual (e.g., coping mechanisms, temperament) or systemic influences (e.g., family and community support) which promote resilience (Masten, 2001). Future research would benefit from examining possible protective factors as moderators in the relationship between exposure to ACEs and internalizing problems, which can provide insight into novel avenues of intervention. Moreover, this study used an *accumulation of risk model* which sums individual dichotomized ACEs. This method has drawbacks, including not accounting for frequency and severity of each individual ACE (Evans et al., 2013), both which have been shown to be important to predict mental health outcomes (DeLisi et al., 2021). Individuals may experience few ACEs but with high frequency and/or severity at each time point, which may explain why some youth with fewer ACEs had higher internalizing problems in the current study. Future research should consider frequency and severity of ACEs within each time point to better assess what facets of adversity put youth at higher risk for

developing mental health problems. Lastly, this study did not support findings by previous studies about possible sensitive periods in development (Dunn et al., 2020; Keiley et al., 2001), as adversity was experienced chronically and not in one isolated time period which later associated with increases in internalizing problems. It is possible that sensitive periods may be better uncovered with more data points, a sample that has more variable exposure to ACEs (i.e., not an at-risk sample), and by utilizing different methods such as machine learning algorithms (Dunn et al., 2018; Khan et al., 2015). Machine learning algorithms allow to assess a large number of variables concurrently and rank the variables based on the amount of variance explained of the outcome. As such, individual and/or cumulative ACEs can be paired with each age (e.g., cumulative ACEs at age 3, physical abuse at age 5) to determine which variables explain the most variance of internalizing problems, and those most highly associated with internalizing problems.

We expected there would be differences by race/ethnicity, sex, and income on the parallel trajectories of ACEs and internalizing problems; however, only differences by race/ethnicity and income were found. While previous studies have found differences by sex on both levels of ACEs (Baglivio et al., 2014) and internalizing problems (Dekker et al., 2007; Gutman & Codiroli McMaster, 2020; Sterba et al., 2007), we did not find differences which might be due to variations in samples as data used for this study oversampled at-risk youth as compared to other studies that used less targeted sampling. Findings by race/ethnicity indicate that Black and Hispanic youth experience greater ACEs and internalizing problems while White youth have fewer ACEs and lower internalizing problems over time, which coincides with findings from previous studies (Anderson & Mayes, 2010; Giano et al., 2020; Maguire-Jack et al., 2020; Slopen et al.,



2016). Black youth were more likely to be in Class 2 than Class 1 and White youth had the opposite effect with more representation in Class 1 and less in Class 2 than youth from other races/ethnicity. This suggests that Black youth tend to have trajectories depicting more ACEs and White youth have more optimal trajectories of ACEs. Further, Hispanic youth were more likely to be in Class 3, which represented an increasing trajectory of internalizing problems over time. This finding concurs with findings from the univariate trajectories of internalizing problems, showing that Hispanic youth experience greater rates of internalizing problems over time. Finally, the most concerning class—Class 6 which has the highest ending internalizing problems—consisted of only Black and Hispanic youth, further supporting the notion that youth of color are at increased risk for experiencing negative outcomes.

Similar findings as the univariate ACEs and internalizing problems trajectories were found regarding primary caregiver's income on the co-developing trajectories of ACEs and internalizing problems. Trajectories with greater number of ACEs and/or higher internalizing problems were observed in youth whose primary caregiver's had lower income. Previous studies have had similar findings suggesting that youth with lower income experience more ACEs and those with higher income have less internalizing problems as compared to low-income youth (Giano et al., 2020; Lacey et al., 2022; Lansford et al., 2019; Slopen et al., 2016). It is concerning that all three set of trajectories—univariate and co-occurring trajectories of ACEs and internalizing problems—had similar findings further evidencing that low-income youth experience greater consequences (Evans & Kim, 2013) including increased exposure to adversity and mental health problems as compared to more affluent youth.

## Strengths and Limitations

This study has several notable strengths including the large sample size, and the inclusion of ethnically/racially diverse families. The sample also largely consists of at-risk families (i.e., single mothers, lower income families), thus findings from this study may provide insight into the wellbeing and stressors experienced by marginalized members of our society and ways to better support these families. Moreover, by leveraging longitudinal data and utilizing a person-center approach, we helped distinguish various subgroups of ACEs and internalizing problems trajectories. This aids in identify individuals who may be a greater risk for detrimental outcomes by pinpointing trajectories of concern (e.g., high ACEs and internalizing problems). Lastly, this study filled a gap of needing to understand the interplay between ACEs and mental health problems for children that has been highlighted by researchers as an area of need (Schroeder et al., 2020).

Despite the listed strengths, this study has several limitations. First, ACEs were dichotomized in order to examine the *accumulation of risk model*. This precludes taking into consideration the individual weight that each adversity may carry, and how the frequency and severity of the adversity impact mental health outcomes (DeLisi et al., 2021; Evans et al., 2013; Flouri, 2008). Future research should assess these different facets of adversity to help determine who might be at greater risk for negative outcomes. Second, ACEs examined in this study were the same as those included in the original ACEs study conducted by the CDC-Kaiser Permanente, which consistent of a predominantly White sample (Felitti et al., 1998). Consequently, adversities which may affect marginalized youth (e.g., discrimination, racism, witnessing violence, living in an

unsafe neighborhood, immigration related adversity; Bernard et al., 2021; Conway & Lewin, 2022; Cronholm et al., 2015), were not accounted for in this study. This may underestimate the adversity experienced by this marginalized youth who were already found to be at greater risk within this study. Third, the study relies on caregiver report on measures of ACEs and child mental health, which may lead to from caregivers due to fear of consequences or shame. Fourth, the three time points examined in this study—ages 3, 5, 9—may not be sufficient to adequately plot changes in trajectories. Data including more densely spaced (e.g., yearly) time points that extent into later ages in development (e.g., adolescence) might help better distinguish sensitive periods in development. Lastly, the current sample consists of at-risk families given their demographic makeup (i.e., predominantly single mothers, lower incomes families, youth of color; Stith et al., 2009; Walsh et al., 2019), which might limit the generalizability of our findings to families that do not share these demographic characteristics. While the current dataset has available sample weights that could help improve the generalizability of our findings, these weights were not included in our analyses due to difficulties with consolidating weights at different data waves, from various reporters (e.g., mother, father), and in distinct geographic regions (i.e., national, city; FFCWS, 2023). Furthermore, prior research using the FFCWS dataset has recommended excluding sample weights from multivariate analysis due to the statistical complexity this would introduce (Catena et al., 2021). Thus, these limitations precluded the use of sample weights in the current study, which may limit inferences regarding the generalizability of these findings to the general population.

### **Implications for Practice**

The current study has several implications for screening, intervention, prevention, and social policy efforts. Given that youth were found to experience high levels of adversity at a very young age, conducting early screenings of ACEs in settings where youth are more likely to be seen such as pediatric offices and schools could help identify families who might benefit from early interventions (Kia-Keating et al., 2019; Rariden et al., 2021). This is especially helpful in engaging youth of color, who are less likely to seek specialized service after exposure to adversity (Martinez et al., 2013). Second, we advocate for the need to implementing culturally responsive trauma-informed care which can increase effectiveness and acceptability of interventions by understanding and addressing contextual factors that might be impacting marginalized families (Meléndez Guevara et al., 2021). Such adaptations can be made to parenting interventions and Trauma-Focused Cognitive Behavioral Therapy; both have been shown decrease exposure to adversity and internalizing problems (Fraser et al., 2013; Lindstrom Johnson et al., 2018; Prinz, 2016). It is important that our findings are not interpreted as blaming marginalized families for exposing youth to increased ACEs, and instead should be understood through a critical lens that emphasizes how positions of social vulnerability increases the risk for experiencing adversity among marginalized individuals. Thus, interventions and preventions efforts should not only focus on the individual, but also in multiple levels (e.g., organizational, community, social policy) that address social determinants of health and promote social equity (Castillo et al., 2019; Garner & Yogman, 2021). Efforts might include advocating for financial support for low-income families (e.g., basic income; Wilson & McDaid, 2021), connecting with community organizations to decrease housing and food insecurity (Garner & Yogman, 2021; Pickett

et al., 2022) as well as increase safety in neighborhoods, and removing barriers to accessing care which disproportionately affect families of low-income and color (Ho et al., 2006; Hodgkinson et al., 2017).

### **Conclusion**

This study adds to the growing of literature by identifying trajectories of ACEs, internalizing problems, and co-development over time. Findings suggest that youth experience chronic and high levels of ACEs starting at a young age, have stable or increasing trajectories of ACEs, and that higher ACEs do not necessarily relate to increased internalizing problems and vice-versa. Further, disparities were found by income and race/ethnicity, with low-income and youth of color having less optimal trajectories, highlighting the long-lasting impact of being socially vulnerable. Future research is needed to understand mechanism of adversity (i.e., frequency, severity, importance of individual adversities weights, timing of adversity using different statistical methods) and resilience. Our findings call attention to the importance of providing trauma-informed and culturally sensitive services at multiple levels (i.e., individual, community, social policy).

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**Table 1***Descriptive Statistics by Race/Ethnicity and Sex (N = 4655)*

Variable	Total	Race/Ethnicity				<i>p</i>	Sex		<i>p</i>
	Sample	White	Black	Hispanic	Other		Boy	Girl	
	<i>N</i> = 4655	<i>n</i> = 752	<i>n</i> = 2079	<i>n</i> = 1047	<i>n</i> = 777		<i>n</i> = 2430	<i>n</i> = 2225	
	<i>M</i> ( <i>SD</i> )/ <i>n</i> (%)	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )		
ACEs Age 3 <sup>a</sup>	3.20 (1.31)	2.84 (1.30)	3.44 (1.25)	2.90 (1.32)	3.31 (1.33)	< .001	3.21 (1.30)	3.18 (1.32)	.501
ACEs Age 5 <sup>a</sup>	3.14 (1.27)	2.76 (1.26)	3.37 (1.19)	2.87 (1.31)	3.28 (1.27)	< .001	3.17 (1.27)	3.12 (1.26)	.312
ACEs Age 9 <sup>a</sup>	3.41 (1.50)	2.94 (1.49)	3.61 (1.43)	3.26 (1.57)	3.55 (1.48)	< .001	3.46 (1.51)	3.37 (1.49)	.081
Internalizing Problems Age 3 <sup>a</sup>	41.07 (5.30)	39.64 (4.52)	41.32 (5.46)	41.74 (5.49)	40.87 (5.06)	< .001	41.21 (5.46)	40.91 (5.12)	.217
Internalizing Problems Age 5 <sup>a</sup>	40.16 (3.47)	39.70 (3.17)	40.07 (3.40)	40.75 (3.93)	40.03 (3.13)	< .001	40.22 (3.54)	40.08 (3.39)	.194
Internalizing Problems Age 9 <sup>a</sup>	44.30 (3.71)	44.43 (3.66)	44.07 (3.61)	44.71 (3.99)	44.25 (3.58)	< .001	44.34 (3.85)	44.25 (3.54)	.688
Primary Caregiver's Income Age 3 <sup>a</sup>	34649.61 (43574.61)	65728.90 (71867.12)	26384.71 (31426.95)	25329.40 (23346.56)	39243.38 (41859.63)	< .001	34655.90 (44466.93)	34642.74 (42588.71)	.722
Primary Caregiver's Income Age 5 <sup>a</sup>	36453.76 (43625.70)	66947.02 (67066.65)	27801.74 (27796.94)	28151.26 (25053.07)	41279.15 (54112.86)	< .001	37277.13 (45724.96)	35554.52 (41202.53)	.450
Primary Caregiver's Income Age 9 <sup>a</sup>	44980.35 (48091.55)	80,404.90 (77240.33)	34135.05 (31372.61)	36719.87 (30025.44)	50845.00 (50876.43)	< .001	46401.92 (50972.06)	43427.80 (44694.09)	.036
Divorced/Separated Parents Age 3 <sup>b</sup>	2168 (46.6%)	193 (25.7%)	1239 (59.6%)	364 (34.8%)	372 (47.9%)	< .001	1147 (47.2%)	1021 (45.9%)	.385
Divorced/Separated Parents Age 5 <sup>b</sup>	2586 (55.6%)	244 (32.4%)	1423 (68.4%)	473 (45.2%)	446 (57.4%)	< .001	1354 (55.7%)	1232 (55.4%)	.834
Divorced/Separated Parents Age 9 <sup>b</sup>	2959 (63.6%)	326 (43.4%)	1556 (74.8%)	555 (53.0%)	522 (67.2%)	< .001	1540 (63.4%)	1419 (63.8%)	.800

*Note.* <sup>a</sup>Kruskal-Wallis Tests; <sup>b</sup>Chi-Square Test of Independence.

**Table 2**

*Fit Statistics for Univariate and Parallel Process Latent Class Growth Analyses of ACEs and Internalizing Problems*

Number of Classes	AIC	BIC	a-BIC	Entropy	LMR-LRT	VLMR	BLRT
ACEs Univariate LCGA Trajectories Classes							
2	45918.32	45969.89	45944.47	0.64	< .001	< .001	< .001
3	45436.22	45507.12	45472.17	0.63	< .001	< .001	< .001
4	45352.20	45442.44	45397.95	0.65	.060	.055	< .001
5	45320.74	45430.32	45376.30	0.67	.007	.006	< .001
<b>6</b>	<b>45287.34</b>	<b>45416.25</b>	<b>45352.70</b>	<b>0.67</b>	<b>.055</b>	<b>.049</b>	<b>&lt; .001</b>
7	45280.58	45428.84	45355.75	0.60	.087	.082	< .001
Internalizing Problems Univariate LCGA Trajectories Classes							
2	77417.83	77469.39	77443.97	0.95	.009	.007	< .001
3	76511.03	76581.94	76546.98	0.92	.072	.067	< .001
<b>4</b>	<b>75866.57</b>	<b>75956.81</b>	<b>75912.32</b>	<b>0.93</b>	<b>.002</b>	<b>.002</b>	<b>&lt; .001</b>
5	75386.05	75495.63	75441.61	0.90	.045	.040	< .001
6	75031.93	75160.84	75097.29	0.90	.001	.001	< .001
7	74786.34	74934.59	74861.51	0.90	.024	.022	< .001
ACEs and Internalizing Problems Parallel Process LCGA Trajectories Classes							
2	124894.62	124991.31	124943.65	0.66	< .001	< .001	< .001
3	123058.37	123187.29	123123.74	0.76	.008	.007	< .001
4	122351.33	122512.48	122433.04	0.78	.264	.258	< .001
5	121708.72	121902.09	121806.76	0.80	.048	.046	< .001
<b>6</b>	<b>121226.87</b>	<b>121452.47</b>	<b>121341.25</b>	<b>0.80</b>	<b>.063</b>	<b>.060</b>	<b>&lt; .001</b>
7	120881.37	121139.20	121012.09	0.79	.097	.093	< .001

*Note.* Boldface indicates the selected model. AIC = Akaike Information Criterion; BIC =

Bayesian Information Criterion; a-BIC = sample-size-adjusted Bayesian Information

Criterion; LMR-LRT = Lo–Mendell–Rubin adjusted likelihood ratio test; VLMR =

Vuong–Lo–Mendell–Rubin Likelihood Ratio Test; BLRT = Bootstrapped Likelihood

Ratio Test.

**Table 3**

*Chi-Square Test of Independence and Fisher's Exact Test for Univariate Trajectories of ACEs and Internalizing Problems by Race/Ethnicity and Sex*

Classes of Trajectories	Total	Race/Ethnicity				<i>p</i>	Sex		<i>p</i>
		White	Black	Hispanic	Other		Boy	Girl	
	<i>n</i> = 4655	<i>n</i> = 752 (16.1%)	<i>n</i> = 2079 (44.7%)	<i>n</i> = 1047 (22.5%)	<i>n</i> = 777 (16.7%)		<i>n</i> = 2430 (52.2%)	<i>n</i> = 2225 (47.8%)	
ACEs <sup>a</sup>						<.001			.058
Class 1: 1 ACE	<i>n</i> = 94 (2.0%)	28 (3.7%/ 29.8%)	13 (0.6%/ 13.8%)	38 (3.6%/ 40.4%)	15 (1.9%/ 16.0%)		39 (1.6%/ 41.5%)	55 (2.5%/ 58.5%)	
Class 2: 2 ACEs	<i>n</i> = 1403 (30.1%)	357 (47.5%/ 25.4%)	443 (21.3%/ 31.6%)	397 (37.9%/ 28.3%)	206 (26.5%/ 14.7%)		733 (30.2%/ 52.2%)	670 (30.1%/ 47.8%)	
Class 3: 3 ACEs	<i>n</i> = 2323 (49.9%)	275 (36.6%/ 11.8%)	1194 (57.4%/ 51.4%)	469 (44.8%/ 20.2%)	385 (49.5%/ 16.6%)		1201 (49.4%/ 51.7%)	1122 (50.4%/ 48.3)	
Class 4: 3 ACEs and Increasing	<i>n</i> = 107 (2.3%)	6 (0.8%/ 5.6%)	52 (2.5%/ 48.6%)	31 (3%/ 29.0%)	18 (2.3%/ 16.8%)		61 (2.5%/ 57.0%)	46 (2.1%/ 43.0%)	
Class 5: 4 ACEs	<i>n</i> = 694 (15.0%)	81 (10.8%/ 11.7%)	361 (17.4%/ 52.0%)	105 (10%/ 15.1%)	147 (18.9%/ 21.2%)		372 (15.3%/ 53.6%)	322 (14.5%/ 46.4%)	
Class 6: 6 ACEs	<i>n</i> = 34 (0.7%)	5 (0.7%/ 14.7%)	16 (0.8%/ 47.1%)	7 (0.7%/ 20.6%)	6 (0.8%/ 17.6%)		24 (1.0%/ 70.6%)	10 (0.4%/ 29.4%)	

*Note.* Variable frequency is displayed by row/column; <sup>a</sup>Chi-Square Test of Independence; <sup>b</sup>Fisher's Exact Tests.

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**Table 3**

*Chi-Square Test of Independence and Fisher's Exact Test for Univariate Trajectories of ACEs and Internalizing Problems by Race/Ethnicity and Sex – Continued*

Classes of Trajectories	Total	Race/Ethnicity				<i>p</i>	Sex		<i>p</i>
		White	Black	Hispanic	Other		Boy	Girl	
	<i>n</i> = 4655	<i>n</i> = 752 (16.1%)	<i>n</i> = 2079 (44.7%)	<i>n</i> = 1047 (22.5%)	<i>n</i> = 777 (16.7%)		<i>n</i> = 2430 (52.2%)	<i>n</i> = 2225 (47.8%)	
Internalizing Problems <sup>b</sup>						<.001			.675
Class 1: Below Average Increasing to Average Internalizing Problems	<i>n</i> = 4028 (86.5%)	669 (89%/ 16.6%)	1813 (87.2%/ 45.0%)	860 (82.1%/ 21.4%)	686 (88.3%/ 17.0%)		2089 (86%/ 51.9%)	1939 (87.1%/ 48.1%)	
Class 2: Above Average Stable Internalizing Problems	<i>n</i> = 368 (7.9%)	34 (4.5%/ 9.20%)	178 (8.6%/ 48.4%)	109 (10.4% 29.6%)	47 (6%/ 12.8%)		202 (8.3%/ 54.9%)	166 (7.5%/ 45.1%)	
Class 3: Average Increasing to High Internalizing Problems	<i>n</i> = 251 (5.4%)	49 (6.5%/ 19.5%)	83 (4%/ 33.1%)	75 (7.2%/ 29.9%)	44 (5.7%/ 17.5%)		135 (5.6%/ 53.8%)	116 (5.2%/ 46.2%)	
Class 4: Below Average Increasing to Very High Internalizing Problems	<i>n</i> = 8 (0.2%)	0 (0%/ 0%)	5 (0.2%/ 62.5%)	3 (0.3%/ 37.5%)	0 (0%/ 0%)		4 (0.2%/ 50.0%)	4 (0.2%/ 50.0%)	

*Note.* Variable frequency is displayed by row/column; <sup>a</sup>Chi-Square Test of Independence; <sup>b</sup>Fisher's Exact Tests.

**Table 4***Kruskal-Wallis Tests for Univariate and Parallel Process Trajectories of ACEs and Internalizing Problems by Primary Caregiver's**Income*

Classes of Trajectories	Primary Caregiver's Income Age 3	<i>p</i>	Primary Caregiver's Income Age 5	<i>p</i>	Primary Caregiver's Income Age 9	<i>p</i>
ACEs		< .001		< .001		< .001
Class 1: 1 ACE	60115.21 (72053.03)		71913.26 (105327.24)		77585.73 (78184.54)	
Class 2: 2 ACEs	48409.69 (59878.35)		52087.93 (56170.22)		62348.74 (62296.29)	
Class 3: 3 ACEs	29889.03 (32106.30)		30619.95 (31785.10)		39029.24 (38456.36)	
Class 4: 3 ACEs and Increasing	24319.72 (20664.18)		25257.18 (22762.58)		28780.82 (28054.18)	
Class 5: 4 ACEs	21952.89 (22927.42)		22319.12 (20424.73)		28913.73 (23910.65)	
Class 6: 6 ACEs	13369.47 (13649.40)		15614.62 (12790.60)		23664.26 (19558.82)	
Internalizing Problems		< .001		< .001		< .001
Class 1: Below Average Increasing to Average Internalizing Problems	36273.20 (45306.53)		37865.37 (44073.38)		46884.62 (49527.02)	
Class 2: Above Average Stable Internalizing Problems	21868.35 (24553.05)		25709.19 (44079.62)		31300.51 (30865.89)	
Class 3: Average Increasing to High Internalizing Problems	28202.36 (32379.85)		30106.22 (32150.61)		35227.08 (41092.11)	
Class 4: Below Average Increasing to Very High Internalizing Problems	7389.50 (4558.78)		19111.50 (9814.02)		21460.50 (18005.32)	

**Table 4**

*Kruskal-Wallis Tests for Univariate and Parallel Process Trajectories of ACEs and Internalizing Problems by Primary Caregiver's Income – Continued*

Classes of Trajectories	Primary Caregiver's Income Age 3	<i>p</i>	Primary Caregiver's Income Age 5	<i>p</i>	Primary Caregiver's Income Age 9	<i>p</i>
ACEs and Internalizing Problems Parallel Process		< .001		< .001		< .001
Class 1: 2 ACEs and Average Internalizing Problems	46116.54 (56104.42)		49587.81 (56691.89)		59333.68 (59542.58)	
Class 2: 3 ACEs and Average Internalizing Problems	26238.23 (26656.63)		27193.44 (27124.70)		34781.22 (31731.96)	
Class 3: 2-3 ACEs and Average and Increasing to Above Average Internalizing Problems	37466.02 (45491.05)		35188.77 (37166.21)		45378.59 (51290.54)	
Class 4: 4 ACEs and Above Average/Stable Internalizing Problems	18202.67 (20302.81)		19884.16 (19398.45)		26647.85 (22287.18)	
Class 5: 3-4 ACEs and Above Average Increasing to High Internalizing Problems	24208.62 (29347.90)		27199.60 (33943.51)		31339.17 (41740.15)	
Class 6: 2-3 ACEs and Below Average Increasing to Very High Internalizing Problems	6159.43 (3181.85)		18270.29 (10284.10)		22812.00 (19004.62)	

**Table 5**

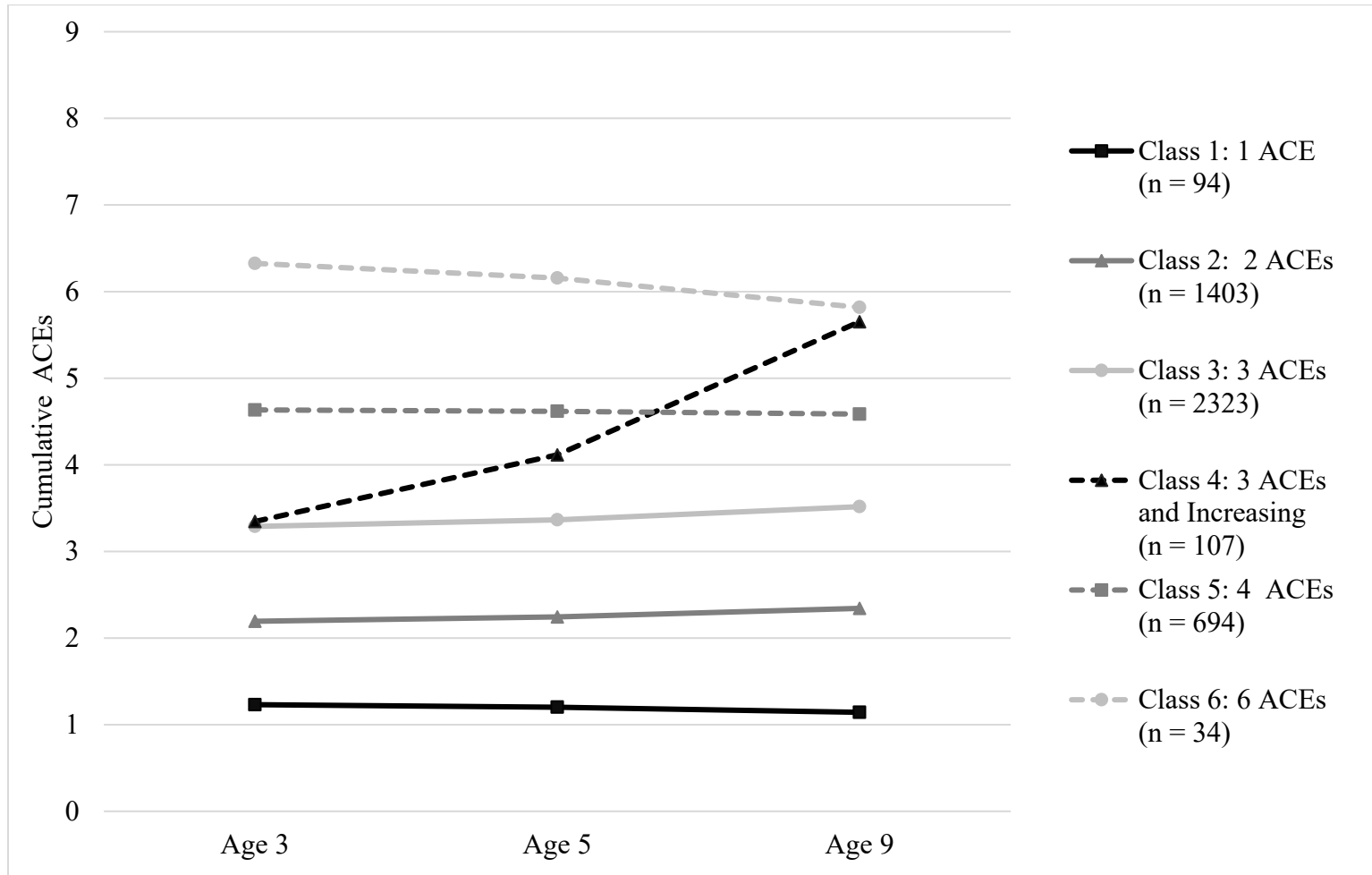
*Fisher's Exact Tests for Parallel Process Trajectories of ACEs and Internalizing Problems by Race/Ethnicity and Sex*

Classes of Trajectories	Total	Race/Ethnicity				<i>p</i>	Sex		<i>p</i>
		White	Black	Hispanic	Other		Boy	Girl	
	<i>n</i> = 4655	<i>n</i> = 752 (16.1%)	<i>n</i> = 2079 (44.7%)	<i>n</i> = 1047 (22.5%)	<i>n</i> = 777 (16.7%)		<i>n</i> = 2430 (52.2%)	<i>n</i> = 2225 (47.8%)	
ACEs and Internalizing Problems Parallel Process						<.001			.114
2 ACEs and Average Internalizing Problems	<i>n</i> = 1872 (40.2%)	420 (55.9%/ 22.4%)	681 (32.8%/ 36.4%)	485 (46.3%/ 25.9%)	286 (36.8%/15.3%)		966 (39.8%/ 51.6%)	906 (40.7%/ 48.4%)	
3 ACEs and Average Internalizing Problems	<i>n</i> = 1947 (41.8%)	207 (27.5%/ 10.6%)	1050 (50.5%/ 53.9%)	333 (31.8%/ 17.1%)	357 (45.9%/ 18.3%)		991 (40.8%/ 50.9%)	956 (43%/ 49.1%)	
2-3 ACEs and Average and Increasing to Above Average Internalizing Problems	<i>n</i> = 410 (8.8%)	71 (9.4%/ 17.3%)	151 (7.3%/ 36.8%)	129 (12.3%/ 31.5%)	59 (7.6%/ 14.4%)		227 (9.3%/ 55.4%)	183 (8.2%/ 44.6%)	
4 ACEs and Above Average/Stable Internalizing Problems	<i>n</i> = 278 (6.0%)	29 (3.9%/ 10.4%)	144 (6.9%/ 51.8%)	57 (5.4%/ 20.5%)	48 (6.2%/ 17.3%)		158 (6.5%/ 56.8%)	120 (5.4%/ 43.2%)	
3-4 ACEs and Above Average Increasing to High Internalizing Problems	<i>n</i> = 141 (3.0%)	25 (3.3%/ 17.7%)	48 (2.3%/ 34.0%)	41 (3.9%/ 29.1%)	27 (3.5%/ 19.1%)		84 (3.5%/ 59.6%)	57 (2.6%/ 40.4%)	
2-3 ACEs and Below Average Increasing to Very High Internalizing Problems	<i>n</i> = 7 (0.2%)	0 (0%/ 0%)	5 (0.2%/ 71.4%)	2 (0.2%/ 28.6%)	0 (0%/ 0%)		4 (0.2%/ 57.1%)	3 (0.1%/ 42.9%)	

*Note.* Variable frequency is displayed by row/column.

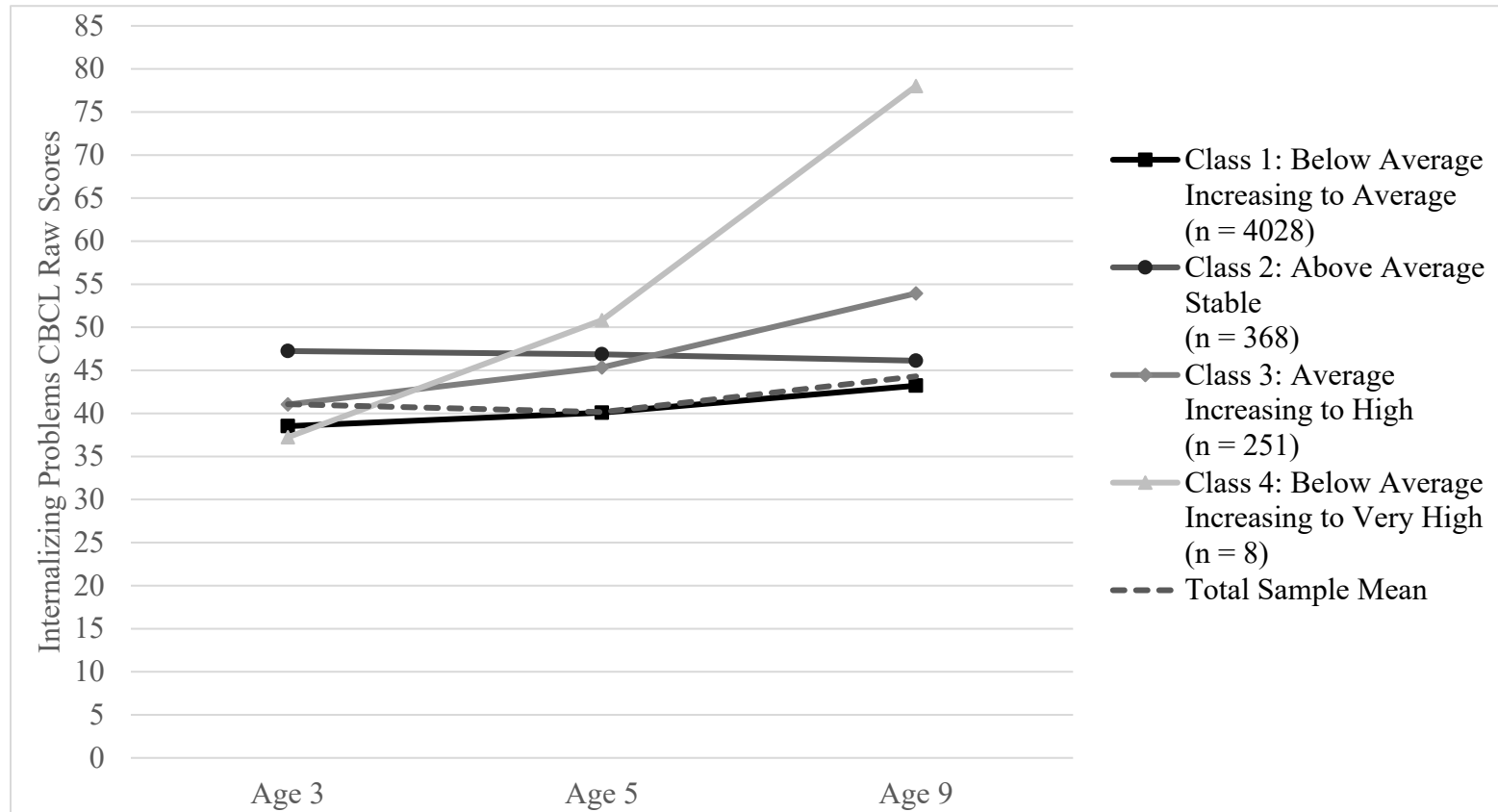
**Figure 1**

*ACEs Univariate Trajectories Classes*



**Figure 2**

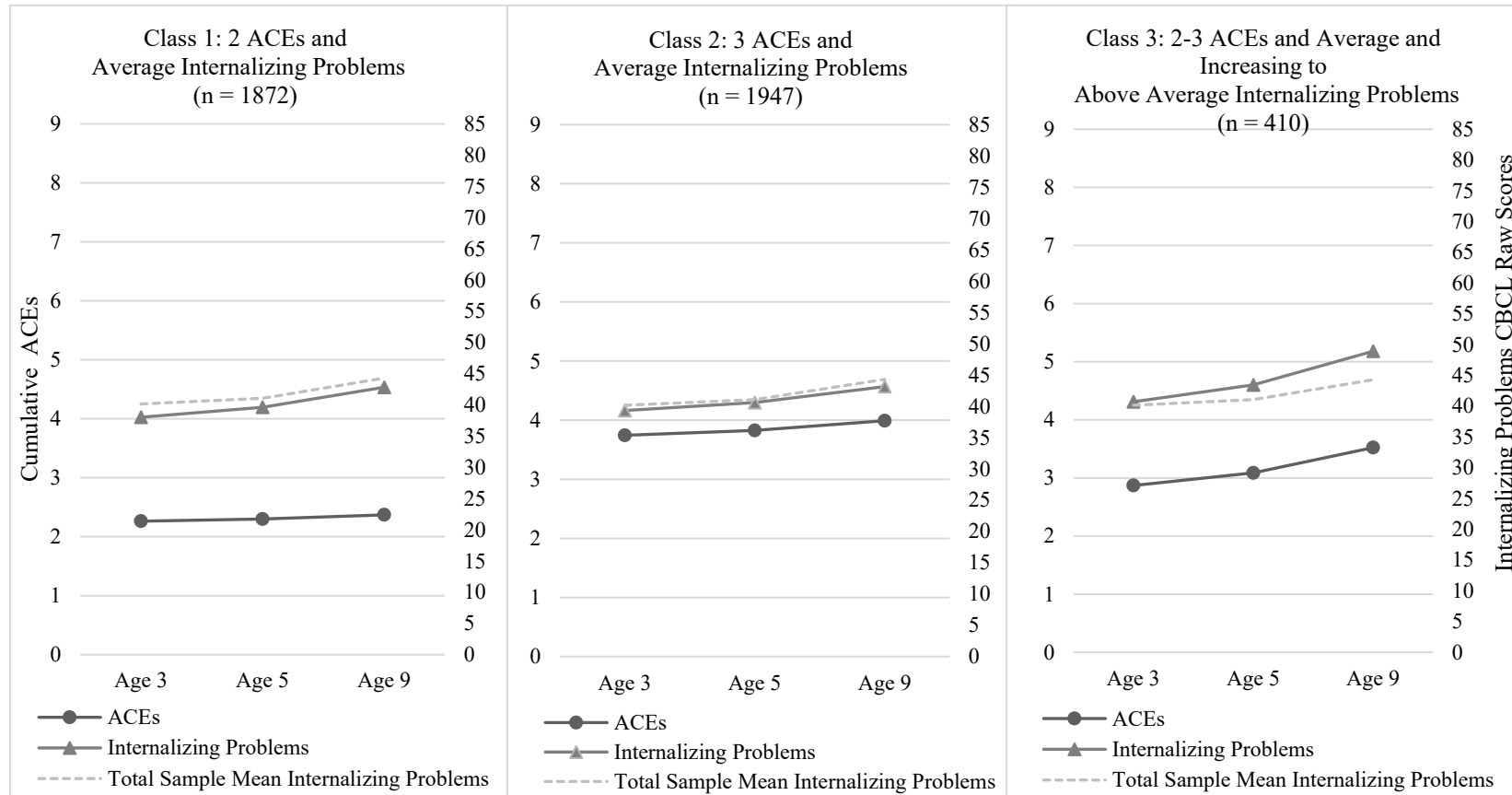
*Internalizing Problems Univariate Trajectories Classes*



*Note.* Child Behavior Checklist (CBCL); Total Sample Mean is the mean of the overall sample at each time point which is provided for interpretability of classes.

**Figure 3**

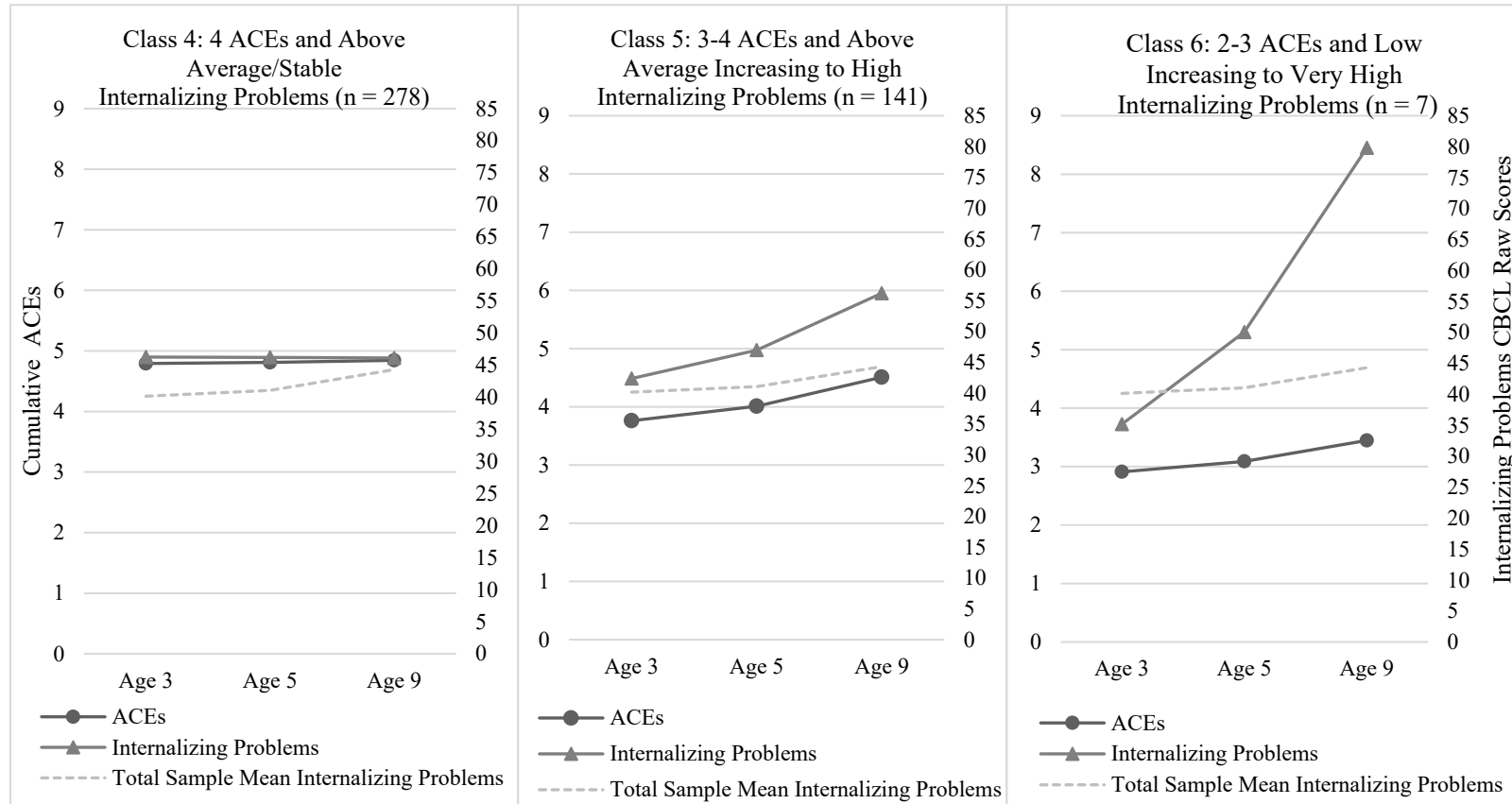
*ACEs and Internalizing Problems Parallel Process Trajectories Classes*



*Note.* Child Behavior Checklist (CBCL); Total Sample Mean is the mean of the overall sample at each time point which is provided for interpretability of classes.

**Figure 3**

*ACEs and Internalizing Problems Parallel Process Trajectories Classes – Continued*



*Note.* Child Behavior Checklist (CBCL); Total Sample Mean is the mean of the overall sample at each time point which is provided for interpretability of classes.



## CHAPTER III

### DEMOGRAPHIC DISPARITIES ON THE LONGITUDINAL CO-DEVELOPMENT OF ADVERSE CHILDHOOD EXPERIENCES AND EXTERNALIZING PROBLEMS

#### **Introduction**

An estimated 7.1% of children between the ages of 3 and 17 meet diagnostic criteria for an externalizing disorder (e.g., behavioral or conduct problem; Ghandour et al., 2019). Children with externalizing disorders can experience detrimental outcomes later in life such as substance use, criminal involvement, sexual risk-taking, and mental illness (e.g., anxiety, depression; Fergusson et al., 2013; Narusyte et al., 2017). Adverse childhood experiences (ACEs) are highly correlated with externalizing problems (Evans et al., 2013; McLaughlin et al., 2012); however, there is limited longitudinal research to identify when in development ACEs have the most detrimental effects.

Most research on ACEs and externalizing problems is cross-sectional and focuses on retrospective reports of ACEs, which limits specific information about timing of exposure. Furthermore, a larger portion of longitudinal research focuses on measuring cumulative ACEs (i.e., summing the presence or absence of ACEs) which clusters all ACEs into one variable without accounting for age of exposure. Studies evaluating longitudinal trajectories found that initial levels and increases on psychopathology vary depending on the age of exposure (i.e., early vs. late exposure) to child maltreatment, and that worse health outcomes are experienced at age 18 when individuals experience ACEs chronically (Keiley et al., 2001; Thompson et al., 2015). However, no studies have assessed the co-development of ACEs and externalizing problems despite researchers stating the importance of this (Schroeder et al., 2020) and studies demonstrating the

association between timing of exposure to adversity and the development of mental health problems (Keiley et al., 2001). Moreover, the extent of disparities that may exist within longitudinal trajectories of ACEs and externalizing problems based race/ethnicity, sex, and income is unknown, despite research showing that ACEs and externalizing problems are experienced at greater rates based on race/ethnicity (Lansford et al., 2006; Maguire-Jack et al., 2019; McLaughlin et al., 2007; Slopen et al., 2016), sex (Baglivio et al., 2014; Tiet et al., 2001), and income (Lacey et al., 2022; Lansford et al., 2019). The purpose of this study is to assess the individual and co-developing longitudinal trajectories of ACEs and externalizing problems.

### **Developmental Psychopathology for Externalizing Problems**

Mental health problems can start developing early in life. In the United States, 17.4% of children between the ages of 2 and 8 have at least one diagnosis (Cree et al., 2018). Mental health problems are often classified within two broad-band categories: externalizing and internalizing. This study will focus on externalizing problems.

Externalizing problems refer to a cluster of behaviors that are manifested outwardly such as aggression, delinquency (i.e., conduct disorder [CD]), rule-breaking behavior (i.e., oppositional defiant disorder [ODD]), and hyperactivity (i.e., attention-deficit/hyperactivity disorder [ADHD]; Forns et al., 2011; Liu, 2004). ADHD is often comorbid with ODD and CD (Beauchaine et al., 2010; Harvey et al., 2016), thus researchers often chose to assess these symptoms broadly by focusing on externalizing problems rather than individual disorders. While there is no exact prevalence rate for externalizing problems, research suggests that in the United States, 7.4% of children between 3 and 17 years old have been diagnosed with a behavioral/conduct problem and

9.4% of children ages 2 to 17 have an ADHD diagnosis (Danielson et al., 2018; Ghandour et al., 2019).

The limited research that has assessed developmental trajectories of externalizing problems suggests that stable trajectories are most prevalent from infancy and early childhood through early adolescence (Kjeldsen et al., 2014; Thompson et al., 2011) and late childhood through adolescence (Figge et al., 2018). The trajectories that have been documented are stable low and high (Figge et al., 2018; Kjeldsen et al., 2014; Thompson et al., 2011), stable low-medium and moderate (Thompson et al., 2011), and medium-high (Figge et al., 2018). Unstable trajectories have been reported but findings are inconsistent. Unstable trajectories include (a) high childhood limited (i.e., high levels of externalizing problems during childhood and low levels during early adolescence), (b) medium childhood limited (i.e., medium levels of externalizing problem during childhood and low levels during early adolescence), (c) adolescent onset (i.e., low levels of externalizing problem during childhood and high levels during early adolescence; Kjeldsen et al., 2014), (d) mid-increasing (i.e., medium level of externalizing problems during late childhood with increasing levels across adolescence), (e) mid-decreasing (i.e., medium level of externalizing problems during late childhood with decreasing levels across adolescence (Figge et al., 2018), and (f) increasing-high (i.e., moderately low levels of externalizing problems during early childhood with dramatically increasing levels through adolescence; Thompson et al., 2011).

Trajectories of externalizing problems vary slightly by study, possibly due to the ages being assessed within the study. The examination of these trajectories is crucial as they can provide insight into future outcomes of mental health. For example, youth with

trajectories that were constantly moderate or increasing to high levels of externalizing problems across childhood were two and three times, respectively, more likely to engage in violent or delinquent behavior at age 12 than those with low stable trajectories, while those with stable high trajectories were three times more likely to use substances than youth in the low stable trajectory (Thompson et al., 2011). Moreover, there is limited information about factors that may help differentiate the trajectories of externalizing problems. Some research has found that factors, such as adverse life experiences (Kjeldsen et al., 2021; Lansford et al., 2006), sex (Figge et al., 2018; Lansford et al., 2006), race/ethnicity (Figge et al., 2018; Lansford et al., 2006), and income (Lansford et al., 2019) predict why children may be in different trajectories of externalizing problems. Further research is needed to better understand factors that discriminate between trajectories of externalizing problems.

### **Risk Factors for Externalizing Problems**

Risk factors such as parental substance use, parental mental health, parenting practices (e.g., harsh discipline, low emotional responsiveness), exposure to domestic violence, and cumulative risk factors (e.g., single parent, parent criminal conviction, substance use) have been found to contribute to the emergence of externalizing problems (Carneiro et al., 2016). All of these factors are considered within ecological theories, such as the ecological/transactional model (Cicchetti & Lynch, 1993), which helps explain the transactionality between individual factors (e.g., sex, age) and the environment (e.g., home, family, community) and their effects on the development of mental health problems.

The ecological/transactional model (Cicchetti & Lynch, 1993) was developed to combine (a) Bronfenbrenner's (1979) ecological systems theory, that emphasized how several environmental levels impact the individual, and (b) the transactional model of development (Sameroff, 2009), which focused on the reciprocal interaction between the environmental context and the child. The ecological/transactional model (Cicchetti & Lynch, 1993) posits that child development and the child's context are influenced by an interaction between several ecological levels (i.e., microsystem, exosystem, macrosystem) and individual factors. Some of the ecological levels are more proximal to the child, such as the microsystem (e.g., family), and others are levels are more distal, such as the exosystem (e.g., community) and the macrosystem (e.g., culture). However, all of these different ecological levels have a transactional process with individual factors within the child and thus this influences a child's developmental trajectory. Thus, to better understand what differentiates developmental trajectories of externalizing problems it is best to account for factors at these various ecological levels (e.g., ACEs). This approach may provide insight as to who is most at risk for deleterious outcomes.

Some variables that cover a range of elements covered by socioecological models include ACEs. Adverse experiences that are incorporated within the ACEs framework include: (a) emotional abuse, (b) physical abuse, (c) sexual abuse, (d) emotional neglect, (e) physical neglect, (f) exposure to domestic violence, (g) substance use in household, (h) parental separation or divorce, (i) mental illness in the household, and (j) incarcerated household member (Center for Disease Control and Prevention [CDC], 2019a). The onset of more than 40% of behavioral problems has been attributed to ACEs (McLaughlin et al., 2012), and ACEs are highly prevalent. Within the United States, 61% of adults

reported experiencing at least one type of ACE during their childhood, with about 16% endorsing four or more ACEs in childhood (CDC, 2019b). Furthermore, elevated levels of ACEs have been encountered at young ages, with about 70% of children reporting three or more ACEs by the time they were six years old (Clarkson Freeman, 2014). Given the high prevalence of ACEs and their strong link to externalizing problems, it is crucial to understand these two factors interplay during child development. Taking a developmental approach to assess this relationship could provide researchers with information about possible sensitive periods (Evans et al., 2013; McMahon et al., 2003). The present study seeks to address this gap by examining ACEs and externalizing problems using longitudinal data.

### **ACEs and the Development of Externalizing Problems**

Most research on ACEs has focused on investigating the cumulative effects of ACEs, also known as cumulative risk. This concept comes from the *accumulation of risk model* from life course theory (Ben-Shlomo & Kuh, 2002; Kuh et al., 2003), which states that adversity can have a cumulative effect, such that more adversity is related to worse the outcomes. Studies examining cumulative risk obtain a total summed score of dichotomized ACEs and have documented dose-response effects, with externalizing problems increasing along with the number of ACEs (Clarkson Freeman, 2014; Schroeder et al., 2020). However, this approach does not take timing of exposure to ACEs into account despite theory indicating the importance of timing of exposure to adversity and research highlighting the effect that timing of exposure has on predicting the extent of mental health outcomes experienced later in life (Schroeder et al., 2020).

Another model that is included within life course theory is the *critical period model* (Ben-Shlomo & Kuh, 2002). This model posits that the timing at which adversity is experienced—critical periods of development—can be crucial and can cause permanent detrimental effects. However, research has revealed that some individuals have positive outcomes despite facing adversity (Seery et al., 2010), and thus the term *sensitive periods* has been recommended instead. *Sensitive periods* suggests that there is malleability when dealing with adversity, with some people showing resiliency, which mitigates the negative effects associated with experiencing adversity (Ben-Shlomo & Kuh, 2002; Kuh et al., 2003).

Little research has focused on examining critical or sensitive periods on the development of externalizing problems as a consequence of experiencing ACEs. Studies that have done this, have focused on specific types of ACEs (i.e., physical abuse, sexual abuse). Children who have been exposed to physical (Dunn et al., 2020; Keiley et al., 2001) or sexual abuse (Dunn et al., 2020) very early in life (i.e., before age 3 and 5) have had increased levels of externalizing problems compared to those who were not exposed at all or exposed later in childhood. A delayed effect was also found in one study, wherein children with very early exposure to physical or sexual abuse did not show effects of the adverse experience until they were 6 years of age (Dunn et al., 2020). Thus, employing a developmental perspective to assess the trajectories of externalizing problems in relation to exposure to ACEs may provide information about the developmental window when children are most vulnerable to experiencing adversity.

Only one study has assessed ACEs through longitudinal trajectories, and this study only examined outcomes at age 18 (Thompson et al., 2015). The authors identified

three trajectories of ACEs: (a) chronic, (b) early, and (c) limited . In this study, exposure to early ACEs did not relate to worse mental health outcomes as it has in other studies (Dunn et al., 2020; Keiley et al., 2001). Thompson and collages (2015) only assessed the outcome at one time point, which may not account for children whose mental health problems may have diminished, especially if adversity is no longer present in their life. It is crucial to understand the interplay between these factors over time, as information may be missing to better understand sensitive periods in development which may make children more vulnerable to developing externalizing problems. This can provide key information about when in development intervention and prevention efforts should be delivered.

### **Disparities in ACEs and Externalizing Problems by Race/Ethnicity, Sex, and Income**

Demographic variables, such as race/ethnicity, sex, and income are a few of the factors that have helped explain some of the disparities that exist on the prevalence rates of externalizing problems and ACEs. Black youth (Lansford et al., 2006; McLaughlin et al., 2007) and boys have been shown to have greater rates of externalizing problems, with girls only presenting with elevated externalizing problems when they were considered to be high-risk (Lansford et al., 2006; Tiet et al., 2001). Higher income appears to protect against externalizing problems (Lansford et al., 2019). Females (Baglivio et al., 2014) and youth of color, such as Black and Latinx individuals (Giano et al., 2020; Maguire-Jack et al., 2019; Slopen et al., 2016), experience more ACEs than their male and White counterparts. Finally, lower income is associated with increases in ACEs exposure (Giano et al., 2020; Lacey et al., 2022). Despite these findings, limited research has



focused on assessing how these demographic factors influence co-development of ACEs and externalizing problems over time. Further, little is known about how differences that exists by race/ethnicity, sex, and income on the longitudinal trajectories of ACEs, and how trajectories of externalizing problems vary by race/ethnicity and income.

### **The Current Study**

To address gaps in the literature, the current study aimed to answer the following questions: (a) how do externalizing problems and ACEs develop individually and simultaneously over time? And (b) how do individual and dual trajectories of externalizing problems and ACEs differ by race/ethnicity, sex, and income? We used data from Fragile Families and Child Wellbeing Study (FFCWS) for children ages 3, 5, and 9. We hypothesized that children who experienced adversity early in childhood and those with high stable levels of adversity across childhood would also have trajectories depicting higher levels of externalizing problems. We hypothesized that individual and joint trajectories of ACEs and externalizing problems would differ based on race/ethnicity, sex, and income, specifically that (a) Black youth would have greater levels of externalizing problems and youth of color would have higher ACEs than White youths, (b) boys would have greater externalizing problems relative to girls, and girls would have a greater number of ACEs relative to boys, and (c) youth with higher income would have trajectories with lower externalizing problems and fewer ACEs.

## **Method**

### **Participants and Procedures**

The FFCWS collected longitudinal data using a stratified random sampling procedure from 1998 to 2000 (Reichman et al., 2001). Unmarried mothers were

oversampled by a ratio of three unmarried mothers to one married mother which resulted in a strong representation from Black, Hispanic, and low-income families. The total study sample included 4,898 children that resided within 20 cities in the United States.

Participants were recruited from hospitals across the cities at the time of the focus child's birth. Those who chose to participate were surveyed across the child's development. The data includes information from six waves of data collection: Wave 1 (birth/baseline), wave 2 (age 1), wave 3 (age 3), wave 4 (age 5), wave 5 (age 9), and wave 6 (age 15). The FFCWS dataset has a published article where more detailed information about the sample and procedures can be obtained (Reichman et al., 2001). This study will focus on data gathered during waves 3 (age 3), 4 (age 5), and 5 (age 9). We did not use data from waves 1 and 2 because there was no ACEs data in these waves. Data from wave 6 was not used because reporting shifted from the primary caregiver to the youth, and we opted to maintain reporter consistency.

Of the total study sample of 4,898 youths, 243 (5%) did not participate at any of the waves, and thus were not included in the study. The final total sample was 4,655. Of the 4,655 participants, 3,568 participated at every wave in the study (72.8%), 925 did not participate at one of the waves (18.9%), and 162 (3.3%) did not participate during two of the three waves. Children in the study were nearly equally divided regarding sex (52.2%,  $n = 2,430$  were boys). The final sample consisted of mostly Black youth (44.7%,  $n = 2,079$ ), followed by Hispanic (22.5%,  $n = 1,047$ ), Other (16.7%,  $n = 777$ ), and White (16.2%,  $n = 752$ ) youth. Biological mothers and fathers constituted most of the primary caregivers at each wave (67.93%, 65.05%, 73.08%). Primary caregiver's income was on average US\$34,649.61 at age 3, US\$36,453.76 at age 5, and US\$44,980.35 at age 9.

Approval to conduct secondary analysis of the extant dataset was approved by the Utah State University Institutional Review Board (Protocol #11132).

## **Measures**

### ***Adverse Childhood Experiences***

The ACEs within this study include those that were collected on the CDC-Kaiser Permanente ACEs study (Felitti et al., 1998). ACEs in this study consist of measures of (a) emotional abuse, (b) physical abuse, (c) physical neglect, (d) emotional neglect, (e) parental domestic violence, (f) parental mental health problems, (g) parental substance use, (h) parental incarceration, and (i) parental divorce or separation. No information was collected regarding child sexual abuse within the FFCWS, which is part of the original ACEs study, thus child sexual abuse was not included in the ACEs assessed. For this study, ACEs were re-coded as *present* (1) or *not present* (0) at each age. ACEs were coded as present and not present if endorsed since the last time point visit, thus adversities were not carried over through time points unless the adversity continued to be present (e.g., child whose parents divorced/separated at age 3 and were still divorced/separated at age 5 were coded as present at both ages). The information included was reported mainly by the primary caregiver, usually a biological parent. The different adversities were summed to create a total ACEs score at each time point.

**Child Maltreatment.** Reports from primary caregivers on The Conflict Tactics Scale: Parent Child Version (CTS-PC; Straus et al., 1998) at ages 3, 5, and 9 were used to measure physical abuse, emotional abuse, and neglect. The CTS-PC has been shown to have high reliability and validity (Straus et al., 1998). Emotional abuse was assessed using five items from the psychological aggression subscale (i.e., swearing, calling

names, shouting, threatening, say they would kick child out of house). Five items from the physical assault subscale were used to measure physical abuse (i.e., hitting, slapping, shacking, pinching, spanking). Reports of neglect were gathered from five items on the neglect subscale. Items within the neglect subscale were separated into categories of emotional and physical neglect following prior research utilizing the FFCWS study dataset (Hunt et al., 2017). One item was used to measure emotional neglect from the neglect subscale on the CTS-PC (i.e., lack of affection). The remaining four items of the neglect subscale were used to assess physical neglect (i.e., leaving child home alone, food insecurity, medical insecurity, lack of parenting associated with substance use). Primary caregivers were asked to rate on an 8-point scale—*this has never happened* (0), *once* (1), *twice* (2), *3-5 times* (3), *6-10 times* (4), *11-20 times* (5), *more than 20 times* (6), or *not in the past year but it happened before* (7)—how many times in the past year the caregivers and other adults caring for the child had engaged in these behaviors. In the current study, each type of child maltreatment (i.e., emotional abuse, physical abuse, emotional neglect, physical neglect) was coded as *present* (1) if caregivers rated any item within each subscale as happening once or more (scale values between 1 and 6) and as *not present* (0) if caregivers endorsed all items within the individual subscales as never happening or not happening in the past year.

**Parental Domestic Violence.** Parental domestic violence was assessed using information from a qualitative interview previously used by ACEs studies that utilized the FFCWS dataset (Hunt et al., 2017; Jimenez et al., 2016, 2017; Schroeder et al., 2020). Mothers and fathers were asked to report on possible psychological, physical, and sexual abuse perpetrated by the other biological parent. Three questions assessed psychological

abuse: (a) “He/she tried to keep you from seeing or talking with your family or friends”, (b) “He/she tried to prevent you from going to work or school”, and (c) “He/she withheld money, made you ask for money, or took your money.” Two questions measured physical abuse: (a) “he/she slapped or kicked you” and “he/she hit you with a fist or an object that could hurt you.” One question asked about sexual abuse perpetuated by the other parent: “He/she tried to make you have sex or do sexual things you didn’t want to do.” Parents rated questions on a 3-point scale: *often* (1), *sometimes* (2), *never* (3). For the current study, a dichotomous score was created using all items to indicate whether parental domestic violence was *present* (1) or *not present* (0). Ratings of *often* or *sometimes* to any of the items by mothers or fathers was considered to *present* (1). Parental domestic violence was *not present* (0) when mothers and fathers who rated all questions as *never*.

**Parental Depression.** Parental depression was measured using the Composite International Diagnostic Interview – Short Form (CIDI-SF; Kessler et al., 1998). Parents reported on symptoms of a major depressive episode based on the Diagnostic and Statistical Manual of Mental Disorders (4<sup>th</sup> ed.; DSM-IV; American Psychiatric Association, 1994) criteria when the child was 3, 5, and 9 years old. The CIDI-SF has been found to have high internal reliability and validity (Gigantesco & Morosini, 2008). Parents were individually asked to report on 15 items based on symptoms of a major depressive episode they experienced during the prior two weeks. Following scoring guidelines from (Kessler et al., 1998; Walters et al., 2002), a possible caseness score was created. For the present study, the liberal caseness variable within the FFCWS dataset was used to create a dichotomous variable combining possible depression casenesses for mothers and fathers. If mothers or fathers endorsed all anhedonia (three items) or

dysphoria (three items) questions as occurring at least “half of the day” (i.e., liberal caseness criteria) then depression was scored as 1 (*present*). Conservative caseness requires questions to be rated as occurring at least “most of the day”. If any parent met liberal caseness then a score of (1) *present* was given and if neither parent meet caseness for depression a score of (0) *not present* was given.

**Parental Substance Use.** Parents were asked questions regarding their alcohol and substance use. For the current study, both parents were asked one question about problematic alcohol use (i.e., “In the past 12 months, was there ever a time when your drinking or being hung over interfered with your work at school, or a job, or at home?”), nine questions about different types of drugs they may have used (i.e., sedatives, tranquilizers, stimulants, analgesics or prescription pain killers, inhalants, marijuana or hashish, cocaine, LSD or other hallucinogens, heroin) in the 12 months prior to the data collection at each wave without prescription from a doctor or taking for longer than prescribed. Responses to all questions were *yes* (1) or *no* (2). For this study, a dichotomous variable was created for substance use with a code for *present* (1) when mothers or fathers endorsed any of the previous questions as *yes* (1) and *not present* (0) when none of the questions were endorsed.

**Parental Incarceration.** Biological mothers and fathers reported if they or the other parent had been in prison or jail at each wave. For this study, a dichotomous code was constructed with the previous questions. If any of the questions were endorsed as “yes”, then parental incarceration was *present* (1) and non-endorsement to all question was coded as *not present* (0).

**Parental Divorce and Separation.** Biological parents reported on the marital status with the child's other biological parent at each wave. Mothers and fathers were asked if they were (a) *married*, (b) *romantically involved*, (c) *cohabitating or living together*, (d) *separated or divorced*, (e) *just friends*, or (f) *not in any kind of relationship*. If parents endorsed being *married*, *romantically involved*, or *cohabitating/living together* then parental divorce or separation was *not present* (0). However, if parents reported they were *separated or divorced*, *just friends*, or *not in any kind of relationship*, then divorce and separation was coded as *present* (1).

### ***Child Externalizing Problems***

The Child Behavior Checklist (CBCL) was used to assess externalizing problems at ages 3, 5, and 9. Primary caregivers (e.g., mothers, fathers) were asked to rate the occurrence of each behavior on a 3-points scale: *never true* (0) *sometimes or somewhat true*, (1) *very true or often true* (2). Three different versions of the CBCL were used to account for child development across childhood. The CBCL/2-5 (Achenbach, 1992) was used when the children were 3 years of age, and it includes 22 questions about externalizing problems. The CBCL/4-18 (Achenbach, 1991) was utilized when children were 5 years old and includes 28 items asking about externalizing problems. Lastly, at age 9, 35 items from the CBCL/6-18 (Achenbach & Rescola, 2001) were used to assess externalizing problems. The CBCL tools have good validity and reliability (Drotar et al., 1995; Dutra et al., 2004) and have been tested with ethnically and culturally diverse children in the United States and internationally (De Groot et al., 1994). Within this study, the CBCL had adequate reliability for externalizing problems ( $\sqrt{\alpha} = .84, .82, \text{ and } .91$  for ages 3, 5, and 9 respectively). Raw scores from the externalizing problems scale

were used as recommended by Achenbach (1997) for research studies given that *T* scores get truncated at the lower end of the scale and raw scores provide greater variability.

### ***Demographics***

**Race/Ethnicity.** Child's race/ethnicity was constructed from biological parents reports of their own race/ethnicity at child's birth (i.e., Wave 1 study baseline). Child race/ethnicity was not collected until the children were 15 years of age (i.e., wave 6); however, this variable could not be used due to attrition; only 70% of participants completed wave 6 and thus there was missing information. Therefore, reports of mother's and father's self-identifying race/ethnicity—coded as Black, Hispanic, White, Mixed, and Other—was utilized to create a child race/ethnicity variable. Categories of race/ethnicity within the study included Black, Hispanic, White, and Other. Youth under the Mixed and Other categories were combined into the Other category due to the sparsity within these categories as compared to other races/ethnicities. If the mother and father of a child had the same race/ethnicity, then the child was coded as the same race/ethnicity as the parents (e.g., Hispanic for child that had a Hispanic mother and father). Child's ethnicity was coded as Other if the mother and father differed on their race/ethnicity (i.e., Mixed race/ethnicity youth). The variable that was created for child's race/ethnicity was compared youth's self-report at age 15 (wave 6) for assure correctness. Consistency was high (84.6%) between the created child's race/ethnicity variable and youth's self-identified race/ethnicity at age 15. Those who did not have a consistent race/ethnicity with that they reported was often due to youth's identifying with the race/ethnicity of one of their parents rather than as Mixed (i.e., Other).



**Sex.** Primary caregiver's report was used to assess child's sex at birth (i.e., Wave 1 baseline). Sex was coded as binary with options to select *boy* (1) or *girl* (2).

**Primary Caregiver's Income.** Mothers and fathers were asked to report on the exact amount of income at each year. If they were unable to recall, they were asked to provide a range. The FFCWS constructed a mother and father income variable by utilizing the information of those who provided an exact amount, and imputing the income of those who provided a range or were unable to provide information about their income. Given that not all children within the sample resided with both parents, an income variable was created to include the income of the primary caregiver. Variables from the data set providing information about the child's primary caregiver and primary residence were utilized to identify the primary caregiver. The income of the primary caregiver was assigned to create the variable (i.e., mothers' income if mother was identified as primary caregiver, father's income if father was identified as primary caregiver). For individuals whose primary caregiver was neither their mother or father, their data was imputed utilizing mother's and father's income as covariates.

### **Analysis Plan**

Individual trajectories of ACEs and externalizing problems were examined independently using Latent Class Growth Analysis (LCGA; Nagin, 1999). These analyses were conducted in Mplus 8.6 (Múthen & Múthen, 2017) and following guidelines from Jung and Wickrama (2008), and Ram and Grimm (2009). Latent Growth Curve Analyses were employed to assess if the individual trajectories of ACEs and externalizing problems had significant intercept and slope variances. Significant variance suggests there is between-subject heterogeneity and thus a LCGA would be helpful to help identify

distinct subgroups of trajectories. Unconditional univariate linear LCGA were then used to identify latent classes of trajectories of ACES and externalizing problems independently if significant variances were found in the intercept or slope of the Latent Growth Curve Analysis. Models were estimated with two to seven classes. Fit statistics such as Bayesian Information Criteria (BIC), Akaike Information Criteria (AIC), and sample-size-adjusted Bayesian Information Criteria (a-BIC), entropy, Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR), Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT), and Bootstrap Likelihood Ratio Test (BLRT) were utilized to assess model fit and select the number of classes. Statistically significant VLMR-LRT, LMR-LRT, and BLRT tests ( $p < .05$ ) would suggest the model with more classes should be retained as it is significantly better than the model with one fewer class (Lo et al., 2001). Further, better fitting models would have lower AIC, BIC, and a-BIC values and higher entropy values (nearing 1.0 specify better classification accuracy; Nylund et al., 2007; Ram & Grimm, 2009). Lastly, the classes were assessed for meaningful interpretability of the trajectories. The optimum number of classes was selected based on fit statistics and substantial interpretability of the trajectories.

Once the univariate trajectories ACEs and externalizing problems were determined separately, the co-development of ACEs and externalizing problems trajectories were examined using unconditional linear parallel process LCGA. The optimal number of classes for the parallel process trajectories of ACEs and externalizing problems was identified using the same procedures as the univariate LCGA trajectories. This method has been implemented successfully in previous studies (Chen et al., 2022; Zhou et al., 2022). Chi-square tests were used to examine differences by sex and

race/ethnicity on the univariate trajectories of ACEs. We used Fisher's exact test to determine group differences in the univariate trajectories of externalizing problems and parallel process trajectories of ACEs and externalizing problems by sex and race/ethnicity. Fisher's exact test with Monte Carlo simulations accommodated sparsity in the cells of the contingency tables whereas Fisher exact test only allows testing 2x2 contingency tables (Kim, 2017). Monte Carlo simulations can estimate contingency tables bigger than 2x2 and have also been shown to provide accurate estimates even with small sample sizes (Amiri & Modarres, 2017; IBM Support, 2020). We conducted post hoc analysis utilizing standardized adjusted residual scores (i.e., z-scores) with Bonferroni corrections to determine where the differences were within the cells in the chi-square/Fisher's exact tests (Beasley & Schumacher, 1995). Standardized adjusted residual scores were obtained when conducting the chi-square/Fisher's exact tests within SPSS. Finally, given that income was not normally distributed, we ran Kruskal-Wallis analyses to test whether differences by income at each age on the univariate and parallel process trajectories of ACEs and externalizing problems. Analyses were conducted in SPSS version 29 (IBM Corp, 2022).

## **Results**

### **Missing Data**

The total missing data was 28.05% for the 4,655 participants at all time points. The data was found to be Missing at Random (MAR). Data are MAR when the missing data is related to other variables in the analysis (Enders, 2010). Imputation of missing values is recommended when data are MAR (Enders, 2010). For the current study, we used random forest to impute missingness at the item level before the items were

summed. Random forest imputation has been employed successfully in studies with longitudinal data and with moderate to high levels of missing data (Ribeiro & Freitas, 2021; Tang & Ishwaran, 2017). Random forest imputation provides the benefit of generating a single imputed data set as compared multiple imputations which causes difficulties when extracting classes and conducting tests to be able to compare between models (i.e., VLMR-LRT, LMR-LRT, and BLRT; Asparouhov, 2020; Muthén, 2017). Random forest imputation was conducted using R version 4.2.0 (Rcore Team, 2022) and Rstudio version 2022.07.2 (Rstudio Team, 2022)

### **Sample Characteristics**

On average, youth experienced about three ACEs at each age. Differences were found by race/ethnicity but not by sex on the number of ACEs experienced at each time point. Black youth experienced the most ACEs at each time point followed by Other, Hispanic, and White youth. Externalizing problems for the whole sample increased from age 3 ( $M = 39.94$ ,  $SD = 6.66$ ), to age 5 ( $M = 50.96$ ,  $SD = 6.03$ ), and then significantly decreased by age 9 ( $M = 5.59$ ,  $SD = 6.08$ ). Differences were found by race/ethnicity and sex at each age. More specifically, Black youth had the highest levels of externalizing problems at each age, followed by Hispanic, Other, and White youth. Hispanic youth had the second highest levels of externalizing problems at age 3 and 5, but by age 9 Hispanic youth had the lowest CBCL mean of all racial/ethnic groups. Boys also had higher levels of externalizing problems at each age as compared to girls. Primary caregiver's income was on average US\$34,649.61 ( $SD = US\$43,574.61$ ) at age 3 and it increase progressively by age 5 ( $M = US\$36,453.76$ ,  $SD = US\$43,625.70$ ) and 9 ( $M = US\$44,980.35$ ,  $SD = US\$48,091.55$ ). Differences were found on primary caregiver's

income by race/ethnicity but not youth's sex, except for primary caregivers of boys having higher income at age 9 than girls. Overall, caregivers of White children had the highest income at each age followed by Other, Hispanic, and Black. Lastly, rates of divorced/separated parents differed by race/ethnicity but not sex, with Black youth having the highest proportion of divorced/separated parents at each age and was followed by Other, Hispanic, and White youth with the lowest rates. See Table 6 for descriptive statistics for the overall sample, and by race/ethnicity and sex.

### **ACEs Univariate Trajectories Classes**

Results of ACEs trajectories were shown in the previous chapter of this dissertation. To summarize, the six-class model was selected. See Table 7 for fit statistics of ACEs LCGA. The six classes are shown in Figure 2. For more detailed information see ((Navarro Flores et al., 2023).

### **Externalizing Problems Univariate Trajectories Classes**

Latent growth curve analysis revealed there was significant variance for the slope ( $p < .001$ ) and intercept ( $p < .001$ ) on the trajectory of externalizing problems. These findings suggest that there are individual differences among participants at the starting levels and change over time of externalizing problems. Thus, running LCGA analysis would be beneficial to help capture individual variances at the level of the intercept and slope by identify different latent trajectories found within the sample.

Unconditional univariate linear LCGA models with two to seven classes were conducted to examine trajectories of externalizing problems. The four-class model was identified as the best fitting model based on fit and interpretation of the classes. See Table 7 for fit statistics of the externalizing problems LCGA. The four-class model had the

lower AIC, BIC, a-BIC values than models with less classes and it had the highest entropy (0.93). Further, results from the LMR-LRT ( $p < .001$ ), VLMR ( $p < .001$ ), and BLRT ( $p < .001$ ) test started becoming significant on the four-class model, suggesting that the four-class model was significantly better than the three-class model. While the models with more than four classes had AIC, BIC, a-BIC values that continued to decrease as more classes were added and LMR-LRT, VLMR, and BLRT tests that were statically significant, the entropy levels continued to decrease which suggested lower classification accuracy. Further, when examining meaningful interpretability of the classes, the four-class model had the best interpretability of the best fitting models. Models with more classes continued to split classes into two very alike classes.

Trajectories of the classes of externalizing problems were interpreted in comparison to the mean trajectory of the overall sample. Classes in the four-class model of externalizing problems were identified as (a) Class 1: average decreasing to very low, (b) Class 2: above average decreasing to low, (c) Class 3: above average decreasing to moderate, and (d) Class 4: above average and increasing to very high externalizing problems. The four classes are shown in Figure 4. Class 1 accounted for 82.3% of youth in the sample ( $n = 3,832$ ) and were children with the lowest starting and ending levels of externalizing problems. Class 2 accounted for 14.5% of the total sample ( $n = 676$ ), and children in this class had a similar parallel trajectory to Class 1 but with higher levels of externalizing problems over time—started with above average externalizing problems at age 3 and decreased to low levels by age 9. Children in Class 3 accounted 3.0% of the total sample ( $n = 140$ ) and consisted of children with above average externalizing problems that continued to decrease to moderate levels of externalizing problems. This

class has the highest levels of externalizing problems from all classes at age 3 and the second highest at age 9. Lastly, Class 4 accounted 0.2% of the total sample ( $n = 7$ ) and was characterized by youth with above average levels of externalizing problems at age 3—similar to the levels of Class 2—that continued to increase exponentially to reach very high levels of externalizing problems by age 9. This class had the highest levels of externalizing problems at the last time point.

### **ACEs and Externalizing Problems Parallel Process Trajectories Classes**

Results from the latent growth curve analysis of the parallel process trajectories of ACEs and externalizing problems showed that there was significant variance for the intercept of the ACEs ( $p < .001$ ) and externalizing problems ( $p < .001$ ) trajectories, and slope of the externalizing problems trajectory ( $p < .001$ ) but not the ACEs trajectory ( $p = .315$ ). These results suggest that individual differences exist at the initial levels of both ACEs and externalizing problems, as well as change over time of externalizing problems for participants. Thus, utilizing a LCGA would be justified as this would aid in capturing the significant variance in the intercept and slope of both trajectories.

Models with two to seven classes of unconditional univariate parallel process LCGA were conducted to concurrently assess the trajectories of ACEs and externalizing problems. Results suggested that the five-class model was the best fitting model. See Table 7 for fit statistics of ACEs and externalizing problems parallel process LCGA. This model and the four-class model had the highest entropy (0.93), but the five-class model had lower AIC, BIC, a-BIC values than the models with less classes. The five-class model also had statistically significant LMRT-LRT ( $p < .001$ ), VLMR ( $p < .001$ ), and BLRT ( $p < .001$ ) test suggesting that the five-class model was significantly better than

the four-class model. While the AIC, BIC, a-BIC values continued to decrease as more classes were added after the five-class model, the entropy kept getting worse suggesting inferior classification accuracy. In addition, interpretation of the classes also suggested that the five-class model had meaningful classes thus the five-class model was selected as having the optimal number of trajectories.

Classes in the five-class model were identified as (a) Class 1: 2 ACEs and average decreasing to very low externalizing problems, (b) Class 2: 3-4 ACEs and average decreasing to very low externalizing problems, (c) Class 3: 3-4 ACEs and above average decreasing to low externalizing problems, (d) Class 4: 4 ACEs and above average decreasing to moderate externalizing problems, and (e) Class 5: 2-3 ACEs and above average increasing to very high externalizing problems. Trajectories of externalizing problems were interpreted in comparison to the mean trajectory of the overall sample. The five classes are shown in Figure 5. Class 1 accounted for 46.4% of the total sample ( $n = 2,159$ ) and it was characterized by youth who experienced two ACEs at each time point and had average externalizing problems that decreased to very low levels—this class experienced the fewest ACEs and had the lowest externalizing problems over time as compared to the other classes. Youth in Class 2 accounted for 38.7% of the total sample ( $n = 1,804$ ) and these youth experienced three ACEs at age 3 and 5 and four at age 9, as well as average externalizing problems that continued to decrease to very low levels by age 9. They experienced 1-2 more ACEs and had slightly higher externalizing problems than Class 1 over time. Class 3 accounted for 12.0% of the total sample ( $n = 560$ ) and children in this class experienced three ACEs at age 3 and 5 and four at age 9 and had above average externalizing problems that decreased to low levels of



externalizing problems. The trajectory of externalizing problems for Class 3 paralleled that of Class 2; however, the levels were higher than Class 2 at each time point, thus Class 3 experienced more externalizing problems over time than Class 2 despite having similar experienced ACEs over time. Children in Class 4 accounted for 2.7% of the total sample ( $n = 125$ ) and was comprised of children who experienced four ACEs at each time point and had above average externalizing problems at age 3 which continued to decrease to moderate levels of externalizing problems by age 9. This class experienced the most ACEs at each time point of all classes and had the highest starting levels of externalizing problems and ended at the second highest level at age 9. Lastly, Class 5 accounted for 0.2% of the total sample ( $n = 7$ ) and included youth who experienced two ACEs at age 3 and three at age 5 and 9, as well as above average levels of externalizing problem at age 3 that increased at each time point and reached very high levels of externalizing problems by age 9—the highest ending levels of all classes.

### **Race/Ethnicity, Sex, and Income Differences in Trajectory Class Membership**

#### ***ACEs Univariate Trajectories Classes***

Significant differences were found in class membership of ACEs univariate trajectories by race/ethnicity and primary caregiver's income at each age, but not by sex. Results of these tests were discussed in depth on the previous chapter of this dissertation. See Tables 8 and 9 for Chi-square and Kruskal-Wallis test results. For more detailed information see (Navarro Flores et al., in preparation).

#### ***Externalizing Problems Univariate Trajectories Classes***

Fisher's exact test results showed that class membership significantly differed on univariate trajectories of externalizing problem by race/ethnicity ( $p = .001$ ) and sex ( $p <$

.001). For race/ethnicity specifically, Hispanic youth were significantly more likely to be in Class 1 (i.e., average decreasing to very low externalizing problems;  $z = 3.87$ ) than White, Black, and Other youth. Further, Hispanic youth were less likely to be in Class 2 (i.e., above average decreasing to low externalizing problems;  $z = -2.89$ ) and Class 3 (i.e., above average decreasing to moderate externalizing problems;  $z = -2.77$ ) than youth from all other race/ethnicities, although this was not statistically significant but neared significance. These findings suggest that Hispanic youth are more likely to have trajectories of externalizing problems that are less severe (i.e., lower starting and ending levels) as compared to other ethnic/racial groups. On the other hand, Black children were significantly less likely to be in Class 1 ( $z = -3.74$ ) and more likely to be in Class 2 ( $z = 3.44$ ) as compared to youth from all other races/ethnicities, suggesting that Black children are less likely to have more optimal trajectories of externalizing problems (i.e., lowest starting and ending levels) and more likely to have higher starting and ending values of externalizing problems as compared to children from other ethnicities/races. Lastly, the class with the most concerning trajectory—Class 4 (i.e., above average and increasing to very high externalizing problems)—only consisted of Black and Hispanic youth, but no statistically significant differences were found between racial/ethnic groups on this class.

Statistically significant differences were found by sex, with girls more likely to be in Class 1 (i.e., average decreasing to very low externalizing problems;  $z = 5.64$ ) and less likely to be in Class 2 (i.e., above average decreasing to low externalizing problems;  $z = -5.17$ ) than boys; the opposite was true for boys ( $z = -5.64$ ;  $z = 5.17$ , respectively). These findings suggest that girls have less severe trajectories of externalizing problems (i.e., lower starting and ending values) as compared to boys who have trajectories that are

parallel but have higher starting and ended values. See Table 10 for Fisher's Exact test results. Classes of externalizing problems trajectories also differed significantly by primary caregiver's income at age 3 ( $H = 76.68, p < .001$ ), age 5 ( $H = 68.06, p < .001$ ), and age 9 ( $H = 94.85, p < .001$ ). Specifically, more optimal trajectories of externalizing problems were related to higher income and more severe trajectories with lower income. Class 1 class had the highest income followed by Class 2, and Class 3. Class 4 had the lowest income. This pattern was seen across all three ages. See Table 9 for Kruskal-Wallis test results.

### ***ACEs and Externalizing Problems Parallel Process Trajectories Classes***

Significant differences were found on the classes of parallel process trajectories of ACEs and externalizing problems by race/ethnicity (Fisher's exact test,  $p < .001$ ), sex (Fisher's exact test,  $p < .001$ ), and primary caregiver's income at age 3 ( $H = 76.68, p < .001$ ), age 5 ( $H = 68.06, p < .001$ ), age 9 ( $H = 94.85, p < .001$ ). White and Hispanic youth were statistically significantly more likely to be in Class 1 (i.e., 2 ACEs and average decreasing to very low externalizing problems;  $z = 8.88$ ;  $z = 7.56$ , respectively) and less likely to be in Class 2 (i.e., 3-4 ACEs and average decreasing to very low externalizing problems;  $z = -8.05$ ;  $z = -5.24$ , respectively) as compared to Black and Other youths. On the other hand, Black youth were significantly less likely to be in Class 1 ( $z = -11.19$ ), and more likely to be in Class 2 ( $z = 8.79$ ) and Class 3 (i.e., 3-4 ACEs and average decreasing to low externalizing problems;  $z = 3.43$ ) as compared to White, Hispanic, and Other youth. These findings suggest that Black youth are more likely to experience one to two more ACEs and higher externalizing problems over time than youth from all other races/ethnicities, while White and Hispanic youth are more likely to

experience less ACEs and less severe trajectories of externalizing problems (i.e., lower starting and ending values). However, it is important to note that Class 5 (i.e., 2-3 ACEs and above average increasing to very high externalizing problems)—the class with the highest ending levels of externalizing problems—consistent of only Black and Hispanic youth.

Significant differences were also found by sex, with girls less likely ( $z = -4.7$ ) and boys more likely ( $z = 4.7$ ) to be in Class 3 . On the other hand, a lower percentage of boys ( $z = -2.4$ ); and higher percentage of girls ( $z = 2.4$ ); were present in Class 2 but this was not statistically significant although it neared significance. Findings suggest that boys have more severe trajectories externalizing problems trajectories as compared to girls. Youths in Class 2, and Class 3 experienced the same number of ACEs, but boys were more likely to be in Class 3 than girls, which had higher externalizing problems over time. See Table 10 for Fisher’s Exact test results. Lastly, differences were found by primary caregiver’s income, with higher incomes being observed in the trajectories were youth experienced fewer ACEs and had more optimal trajectories of externalizing problems (i.e., lower starting and ending values) and lower incomes being observed in trajectories with more ACEs and severe externalizing problems over time. Youths in Class 1 had the highest income followed by Class 2, Class 3, and Class 4 (i.e., 4 ACEs and above average decreasing to moderate externalizing problems). Youths in Class 5 had the lowest income. This finding was observed at every age except for age 5, where the Class 4 had higher income than Class 2 and Class 3. See Table 9 for Kruskal-Wallis test results.

## Discussion

This study takes a developmental approach to examine individual trajectories of externalizing problems and the co-development of ACEs and externalizing problems in hopes of better understanding the interplay between adversity and externalizing problems. Our findings fill a gap in the literature highlighted by researchers (Schroeder et al., 2020). Specifically, we found four classes of externalizing problems trajectories and five classes of parallel process trajectories of ACEs and externalizing problems. We also found differences by race/ethnicity, sex, and primary caregiver's income on the univariate externalizing problem trajectories and the co-developing trajectories of ACEs and externalizing problems. In this study, externalizing problems overall decrease over time, boys have trajectories depicting higher externalizing problems as compared to girls, Black and low-income youth have less optimal trajectories of ACEs and externalizing problems than other ethnic groups and more affluent youth, and accumulation of ACEs is not always predictive of higher externalizing problems as we originally expected.

### Externalizing Problems Univariate Trajectories

The four classes of trajectories of externalizing problems were all unstable and three of four trajectories were decreasing. This finding does not coincide with previous studies that predominantly found stable trajectories (Figge et al., 2018; Kjeldsen et al., 2014; Thompson et al., 2011). Only one previous study found an unstable trajectory that started with medium levels of externalizing problems and decreased over time (Figge et al., 2018). In trying to understand the difference between existing research and the current study, we note that published studies examined the trajectories of externalizing problems starting earlier in childhood and ending later into adolescence, covering a larger

developmental span than the current study. Studies that have examined trajectories of externalizing problems across similar ages have found that externalizing problems decrease over childhood (Gilliom & Shaw, 2004; Mesman et al., 2009). We did find one trajectory that started in the above average levels and increased to very high levels of externalizing problems by age 9 (i.e., Class 4), which is consistent with some studies that have found trajectories that start with moderate levels of externalizing problems and increase over childhood (Figge et al., 2018; Thompson et al., 2011). Despite this class comprising a smaller proportion of the sample ( $n = 7$ , 0.2%), it is important to extrapolate this class as they might be at greater risk for subsequent negative outcomes given their increasing trajectory to high levels (Thompson et al., 2011).

The differences in the trajectories of externalizing problems by race/ethnicity, sex, and primary caregiver's income we found are consistent with previous literature finding that Black youth have greater externalizing problems (Lansford et al., 2006; McLaughlin et al., 2007), higher income is associated with less externalizing behaviors (Lansford et al., 2019), and boys have higher externalizing problems than girls (Lansford et al., 2006; Tiet et al., 2001). We also found that Hispanic youth were more likely to be in classes with lower externalizing problems. It seems like Hispanic youth instead tend to display more internalizing problems as compared to youth from other racial/ethnic groups (Bitsko et al., 2022; Navarro Flores, in preparation). That said, it is important to note that the class with the highest levels of externalizing problems in this study (i.e., Class 4), only consisted of Black and Hispanic youth, signaling that youth of color may be the most vulnerable to extreme negative outcomes. We did find that youth with lower income

experienced more externalizing problems and as primary caregiver's income decreased, trajectories of externalizing problems increased.

### **ACEs and Externalizing Problems Parallel Process Trajectories**

We found five classes of parallel trajectories. Unlike expected, we discovered that ACEs in our sample were mostly chronic and stable (see Navarro Flores, in preparation), and the relationship between ACEs and externalizing problems is nuanced, with some youth who experienced fewer ACEs over time having higher symptoms of externalizing problems (i.e., Class 5), and others who experienced similar or greater ACEs having lower externalizing problems over time (i.e., Class 1, 2, 3, 4). This is surprising as previous research has found dose-response effects, with youth who experienced the highest ACEs having greater externalizing problems (Clarkson Freeman, 2014; Schroeder et al., 2020). Possible sensitive periods in development have been identified in previous studies, wherein early childhood exposure to adversity increases the risk of developing subsequent mental health problems (Dunn et al., 2020; Keiley et al., 2001). However, we did not find support for a possible sensitive period in development as there was no clear relationship of increases in externalizing problems following exposure to adversity in the classes of joint trajectories. This might be due to the analysis starting at age three, which omits examining earlier exposure and possible sensitive periods in development, or youth experiencing chronic levels of adversity throughout childhood, which might be due to the demographics of our sample (i.e., low-income, single parents, predominantly youth of color) that may put them at increased risk for experiencing adversity. Additionally, it is possible that the statistical method utilized was not able to adequately capture it. Future studies might employ machine learning algorithms, as this method has uncovered some

sensitive periods for specific adversity exposure (Dunn et al., 2018; Khan et al., 2015). Machine learning allows to simultaneously assess a large number of variables—such as which adversity occurred at what time in develop—and ranks variables based on their explained variance of the outcome (e.g., externalizing problems). Thus, individual and/or cumulative ACEs can be paired with age of exposure to identify which adversities at what age are better at predicting externalizing problems.

As hypothesized, we found demographic differences on the joint trajectories of ACEs and externalizing problems by race/ethnicity. Black youth were more likely to be in be in classes with higher ACEs and/or externalizing problems (i.e., Classes 2, 3) and less likely to be in the class with lower ACEs and externalizing problems (i.e., Class 1). On the other hand, White and Hispanic youth were more likely to be in more optimal trajectories with the lowest ACEs and externalizing problems (i.e., Class 1) and less likely to be in classes with increased severity of both variables (i.e., Class 2). Consistent with previous studies we found that White youth experience less adversity and externalizing problems as compared to Black youth; however, we did not find differences in exposure to adversity between Hispanic and White youth (Giano et al., 2020; Lansford et al., 2006; Maguire-Jack et al., 2019; McLaughlin et al., 2007; Slopen et al., 2016). Given that the Hispanic population has great heterogeneity, it is possible that some characteristics within the Hispanic sample of the current study (e.g., cultural values, parental stress, immigration status; Cabrera et al., 2021) might differ from those of previous studies that might explain differences in adversity exposure. Thus, future research might benefit from examining how cultural and contextual factors might explain intra-ethnic variations in risk within the Hispanic/Latinx population. We also found that,



overall, Hispanic youth had trajectories depicting lower externalizing problems. However, one should not assume that all Hispanic youth have low levels of externalizing problems. In fact, the most severe and concerning class in regard to levels of externalizing problems experienced (i.e., Class 5), was solely comprised of Black and Hispanic youth, suggesting that some Hispanic youth have elevated rates of externalizing problems.

We also found differences in the co-development of the trajectories of ACEs and externalizing problems by sex and primary caregiver's income. Boys were more likely to be in a class with higher externalizing problems than girls (i.e., Class 3). However, this difference did not appear to be due to exposure to ACEs as girls were more likely to be in class with a similar ACEs trajectory but with lower levels of externalizing problems over time (i.e., Class 2). This aligns with findings from the univariate trajectories of externalizing problems and previous studies (Lansford et al., 2006; Tiet et al., 2001). Differences by primary caregiver's income suggested that lower income youth had trajectories depicting greater ACEs and/or externalizing problems and higher income youth had more optimal trajectories of ACEs and externalizing problems (i.e., lower starting and ending values). Similar findings—with higher income youth having fewer externalizing problems and lower income associating with greater exposure to ACEs—have been documented before (Giano et al., 2020; Lacey et al., 2022; Lansford et al., 2019). Importantly, in our sample we found significant differences on primary's income by race/ethnicity, and the distribution of the incomes among race/ethnicities matched those found in the census of 2020—with the exception of White youth whose primary caregiver's had higher incomes in our sample than the Census (US\$45,900; United States

Census Bureau, 2001)—which is the year the youth in our sample were age 3 (i.e., study baseline). It is important for future studies to further assess the interaction between income and race/ethnicity given their high overlap observed in the current study and previous research (Jones et al., 2016). This may allow researchers to better understand inequities that might be due to systemic factors (e.g., structural racism; Schoon & Melis, 2019; Shonkoff et al., 2020).

### **Strengths and Limitations**

This study fills a gap in the literature by better understanding the joint development of ACEs and externalizing problems across childhood (Schroeder et al., 2020). We utilized an innovative person-centered statistical approach that allowed us to classify subgroups of individuals based on their joint trajectories. Findings highlight the nuanced association between exposure to ACEs and the development of externalizing problems, and identifies areas of need for future research to better understand this relationship. Further, the composition of our sample also has unique qualities (i.e., large proportions of single mothers, lower income families, youth of color) that provide implications for better supporting youth who might be most marginalized and at greater risk in our society.

We also acknowledge limitations in the current study. First, our study may be undercounting ACEs experienced particularly for youth of color and low-income families. The current ACEs examined were taken from the CDC-Kaiser Permanente ACEs study, which largely consisted of White participants (Felitti et al., 1998), and is not a comprehensive assessment of ACEs. It is important for future studies to consider adversities that might be experienced by marginalized youth including discrimination,

racism, witnessing violence, living in an unsafe neighborhood, immigration related adversity (Bernard et al., 2021; Conway & Lewin, 2022; Cronholm et al., 2015). Second, ACEs examined did not include information about exposure to adversity through other people that youth might live with (e.g., stepparents, grandparents) as this information was not consistently available in the data, thus levels of ACEs reported may not completely represent adversity experience by youth. Third, we utilized reports from caregivers on ACEs and externalizing problems, which may lead to underreporting especially if caregivers experience shame or are afraid of possible consequences of reporting on certain adversity (e.g., child maltreatment). Fourth, ACEs within the current study were dichotomized to assess the *accumulation of risk model* in conjunction with possible sensitive periods in development. This prevented consideration of the severity and frequency of ACEs, as well as the individual weight of each adversity (i.e., relative importance of each adversity). These aspects of adversity have been shown to be important in how adversity predicts mental health outcomes (DeLisi et al., 2021; Evans et al., 2013; Flouri, 2008) and thus it is important to consider in future research. Lastly, generalizability of the current study might be limited due to our sample mainly including at-risk families (e.g., low-income, single parents, youth of color). Although the FFCWS has sample weights available which could be used to make the data more generalizable, there are several limitations that precluded their use in the current analyses. Sample weights exist for each year the data was collected, for national or city levels, and for several reporters (e.g., mother, father; FFCWS, 2023) which creates difficulties identifying which weight to use. Further, it is recommended that sample weights are not

used when conducting multivariate analyses as this creates severe statistical complexity (Catena et al., 2021).

### **Implications**

Understanding the trajectories of ACEs and externalizing problems has various implications for research and practice. First, while our study and previous studies have found an overall decreasing pattern of externalizing problems over time (Gilliom & Shaw, 2004; Mesman et al., 2009), all these studies only examined trajectories of externalizing problems through late childhood (i.e., ages 5, 6, 9). Future research should expand on this study by looking at trajectories that go into adolescent or adulthood as other research has found similar patterns of decreasing externalizing problems until age 8 at which point some trajectories start to show increases (Korhonen et al., 2018).

This study provides important information about the need for early screening and intervention of externalizing problems. Pediatric primary care settings are a good front line to integrate emotional, behavioral, and ACEs screeners for youth given that youth are likely to attend such setting for wellness checks (Kia-Keating et al., 2019; Rariden et al., 2021; Trafalis et al., 2021). Such practice could help identify youth presenting with externalizing problems or exposure to ACEs who might benefit from intervention and more importantly aid in reducing disparities, especially as youth of color often do not receive specialty mental health services following exposure to trauma despite youth experiencing externalizing problems (Martinez et al., 2013).

Targeting parenting practices for prevention and intervention purposes could be effective in ameliorating externalizing problems and exposure to ACEs. Various parenting interventions have been found to be efficacious in reducing child maltreatment

and externalizing problems, as well as increasing positive parenting practices and treating trauma-exposed youth (Alvarez et al., 2021; Fraser et al., 2013; Lindstrom Johnson et al., 2018). More importantly, disseminating parenting interventions through community-wide or public health approaches can help target a large portion of parents who might need support, especially those from marginalized families (e.g., low-income families) who are a greater risk of experiencing ACEs due to increased parenting stress (Crouch et al., 2019; Prinz, 2016). Blended approaches that deliver parenting interventions in addition to case management could help alleviate parental stress by connecting families with needed resources and support (e.g., housing, food; Allen, 2007; Garner & Yogman, 2021; Pickett et al., 2022; Prinz, 2016).

It is important that our findings suggesting that that low-income and families of color have worst outcomes and exposure to ACEs is not understood as a fault of the parents or any of their characteristics. Instead, we invite the readers to take a critical lens and consider how their situations may be consequence of systemic issues, which put marginalized families in positions of social vulnerability (Schoon & Melis, 2019; Shonkoff et al., 2020). Thus, it is imperative for providers to consider contextual factors that may be impacting marginalized families in order to effectively implement culturally sensitive and trauma-informed approaches (Meléndez Guevara et al., 2021). Furthermore, it is crucial that interventions efforts target different levels (i.e., community, social policy) in order to target the root of these inequities that are needed to create long-lasting change (Castillo et al., 2019; Garner & Yogman, 2021). In addition to the necessity of case management as previously mentioned, efforts should focus on advocating for basic income—that has been shown to significantly improve individuals' mental wellbeing—

and removing barriers to care that are more likely to impact marginalized families (Ho et al., 2006; Hodgkinson et al., 2017; Wilson & McDaid, 2021).

### **Conclusion**

Our study adds to the literature by better understanding the developmental and contextual factors that play a role in the association between ACEs and externalizing problems throughout childhood. Findings from our study suggest that externalizing problems decrease for most at-risk youths from age three to nine, and that the relationship between ACEs and externalizing problems does not always have a dose-response pattern. We discovered disparities in trajectories, with marginalized youth (i.e., Black, low-income) having less optimal trajectories of ACEs and externalizing problems—accentuating how social determinants of health have long-lasting effects on youth’s wellbeing—and boys having trajectories with higher externalizing problems. Research is needed to understand how the frequency and severity of ACEs, and the relative importance of the individual ACEs and timing relate to youth’s externalizing problems, as well as the moderating effect of resilience. We advocate for individual intervention efforts that are culturally sensitive, trauma-informed, and connect families to needed resources, as well larger scale efforts that include public health approaches to promote social equity.

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**Table 6***Descriptive Statistics by Race/Ethnicity and Sex (N = 4655)*

Variable	Total Sample N = 4655	Race/Ethnicity				p	Sex		p
	M (SD)/ n (%)	White n = 752 M (SD)	Black n = 2079 M (SD)	Hispanic n = 1047 M (SD)	Other n = 777 M (SD)		Boy n = 2430 M (SD)	Girl n = 2225 M (SD)	
ACEs Age 3 <sup>a</sup>	3.20 (1.31)	2.84 (1.30)	3.44 (1.25)	2.90 (1.32)	3.31 (1.33)	< .001	3.21 (1.30)	3.18 (1.32)	.501
ACEs Age 5 <sup>a</sup>	3.14 (1.27)	2.76 (1.26)	3.37 (1.19)	2.87 (1.31)	3.28 (1.27)	< .001	3.17 (1.27)	3.12 (1.26)	.312
ACEs Age 9 <sup>a</sup>	3.41 (1.50)	2.94 (1.49)	3.61 (1.43)	3.26 (1.57)	3.55 (1.48)	< .001	3.46 (1.51)	3.37 (1.49)	.081
Externalizing Problems Age 3 <sup>a</sup>	39.94 (6.66)	38.93 (6.03)	40.35 (6.98)	39.98 (6.38)	39.79 (6.62)	< .001	44.34 (3.85)	44.25 (3.54)	< .001
Externalizing Problems Age 5 <sup>a</sup>	50.96 (6.03)	50.19 (5.53)	51.34 (6.36)	50.89 (5.94)	50.78 (5.60)	< .001	40.33 (6.83)	39.52 (6.43)	< .001
Externalizing Problems Age 9 <sup>a</sup>	5.59 (6.08)	5.49 (5.76)	5.99 (6.43)	4.87 (5.70)	5.58 (5.80)	< .001	51.30 (6.21)	50.58 (5.80)	< .001
Primary Caregiver's Income Age 3 <sup>a</sup>	34649.61 (43574.61)	65728.90 (71867.12)	26384.71 (31426.95)	25329.40 (23346.56)	39243.38 (41859.63)	< .001	34655.90 (44466.93)	34642.74 (42588.71)	.722
Primary Caregiver's Income Age 5 <sup>a</sup>	36453.76 (43625.70)	66947.02 (67066.65)	27801.74 (27796.94)	28151.26 (25053.07)	41279.15 (54112.86)	< .001	37277.13 (45724.96)	35554.52 (41202.53)	.450
Primary Caregiver's Income Age 9 <sup>a</sup>	44980.35 (48091.55)	80,404.90 (77240.33)	34135.05 (31372.61)	36719.87 (30025.44)	50845.00 (50876.43)	< .001	46401.92 (50972.06)	43427.80 (44694.09)	.036
Divorced/Separated Parents Age 3 <sup>b</sup>	2168 (46.6%)	193 (25.7%)	1239 (59.6%)	364 (34.8%)	372 (47.9%)	< .001	1147 (47.2%)	1021 (45.9%)	.385
Divorced/Separated Parents Age 5 <sup>b</sup>	2586 (55.6%)	244 (32.4%)	1423 (68.4%)	473 (45.2%)	446 (57.4%)	< .001	1354 (55.7%)	1232 (55.4%)	.834
Divorced/Separated Parents Age 9 <sup>b</sup>	2959 (63.6%)	326 (43.4%)	1556 (74.8%)	555 (53.0%)	522 (67.2%)	< .001	1540 (63.4%)	1419 (63.8%)	.800

*Note.* <sup>a</sup>Kruskal-Wallis Tests; <sup>b</sup>Chi-Square Test of Independence

**Table 7**

*Fit Statistics for Univariate and Parallel Process Latent Class Growth Analyses of ACEs and Externalizing Problems*

Number of Classes	AIC	BIC	a-BIC	Entropy	LMR-LRT	VLMR	BLRT
ACEs Univariate LCGA Trajectories Classes							
2	45918.32	45969.89	45944.47	0.64	< .001	< .001	< .001
3	45436.22	45507.12	45472.17	0.63	< .001	< .001	< .001
4	45352.20	45442.44	45397.95	0.65	.060	.055	< .001
5	45320.74	45430.32	45376.30	0.67	.007	.006	< .001
<b>6</b>	<b>45287.34</b>	<b>45416.25</b>	<b>45352.70</b>	<b>0.67</b>	<b>.055</b>	<b>.049</b>	<b>&lt; .001</b>
7	45280.58	45428.84	45355.75	0.60	.087	.082	< .001
Externalizing Problems Univariate LCGA Trajectories Classes							
2	101321.85	101373.42	101348.00	0.95	0.083	0.077	< .001
3	100451.34	100522.24	100487.28	0.93	0.293	0.286	< .001
<b>4</b>	<b>99672.75</b>	<b>99762.99</b>	<b>99718.50</b>	<b>0.93</b>	<b>&lt; .001</b>	<b>&lt; .001</b>	<b>&lt; .001</b>
5	99249.53	99359.10	99305.08	0.90	0.011	0.010	< .001
6	99052.59	99181.50	99117.95	0.89	0.008	0.007	< .001
7	98933.94	99082.20	99009.11	0.87	0.046	0.042	< .001
ACEs and Externalizing Problems Parallel Process LCGA Trajectories Classes							
2	148290.78	148387.47	148339.80	0.67	< .001	< .001	< .001
3	146622.91	146751.82	146688.27	0.76	0.073	0.070	< .001
4	145851.04	146012.19	145932.75	0.81	< .001	< .001	< .001
<b>5</b>	<b>145160.34</b>	<b>145353.71</b>	<b>145258.38</b>	<b>0.81</b>	<b>&lt; .001</b>	<b>&lt; .001</b>	<b>&lt; .001</b>
6	144672.11	144897.71	144786.49	0.79	0.057	0.054	< .001
7	144303.02	144560.85	144433.74	0.80	0.011	0.010	< .001

*Note.* Boldface indicates the selected model. AIC = Akaike Information Criterion; BIC

= Bayesian Information Criterion; a-BIC = sample-size-adjusted Bayesian Information

Criterion; LMR-LRT = Lo–Mendell–Rubin adjusted likelihood ratio test; VLMR =

Vuong–Lo–Mendell–Rubin Likelihood Ratio Test; BLRT = Bootstrapped Likelihood

Ratio Test.

**Table 8**

*Chi-Square Test of Independence and Fisher's Exact Test for Univariate Trajectories of ACEs and Externalizing Problems by Race/Ethnicity and Sex*

Classes of Trajectories	Total	Race/Ethnicity				<i>p</i>	Sex		<i>p</i>
		White	Black	Hispanic	Other		Boy	Girl	
	<i>N</i> = 4655	<i>n</i> = 752 (16.1%)	<i>n</i> = 2079 (44.7%)	<i>n</i> = 1047 (22.5%)	<i>n</i> = 777 (16.7%)		<i>n</i> = 2430 (52.2%)	<i>n</i> = 2225 (47.8%)	
ACEs <sup>a</sup>						<.001			.058
Class 1: 1 ACE	<i>n</i> = 94 (2.0%)	28 (3.7%/ 29.8%)	13 (0.6%/ 13.8%)	38 (3.6%/ 40.4%)	15 (1.9%/ 16.0%)		39 (1.6%/ 41.5%)	55 (2.5%/ 58.5%)	
Class 2: 2 ACEs	<i>n</i> = 1403 (30.1%)	357 (47.5%/ 25.4%)	443 (21.3%/ 31.6%)	397 (37.9%/ 28.3%)	206 (26.5%/ 14.7%)		733 (30.2%/ 52.2%)	670 (30.1%/ 47.8%)	
Class 3: 3 ACEs	<i>n</i> = 2323 (49.9%)	275 (36.6%/ 11.8%)	1194 (57.4%/ 51.4%)	469 (44.8%/ 20.2%)	385 (49.5%/ 16.6%)		1201 (49.4%/ 51.7%)	1122 (50.4%/ 48.3)	
Class 4: 3 ACEs and Increasing	<i>n</i> = 107 (2.3%)	6 (0.8%/ 5.6%)	52 (2.5%/ 48.6%)	31 (3%/ 29.0%)	18 (2.3%/ 16.8%)		61 (2.5%/ 57.0%)	46 (2.1%/ 43.0%)	
Class 5: 4 ACEs	<i>n</i> = 694 (15.0%)	81 (10.8%/ 11.7%)	361 (17.4%/ 52.0%)	105 (10%/ 15.1%)	147 (18.9%/ 21.2%)		372 (15.3%/ 53.6%)	322 (14.5%/ 46.4%)	
Class 6: 6 ACEs	<i>n</i> = 34 (0.7%)	5 (0.7%/ 14.7%)	16 (0.8%/ 47.1%)	7 (0.7%/ 20.6%)	6 (0.8%/ 17.6%)		24 (1.0%/ 70.6%)	10 (0.4%/ 29.4%)	

*Note.* Variable frequency is displayed by row/column; <sup>a</sup>Chi-Square Test of Independence; <sup>b</sup>Fisher's Exact Tests.

**Table 8**

*Chi-Square Test of Independence and Fisher's Exact Test for Univariate Trajectories of ACEs and Externalizing Problems by Race/Ethnicity and Sex – Continued*

Classes of Trajectories	Total	Race/Ethnicity				<i>p</i>	Sex		<i>p</i>
		White	Black	Hispanic	Other		Boy	Girl	
	<i>N</i> = 4655	<i>n</i> = 752 (16.1%)	<i>n</i> = 2079 (44.7%)	<i>n</i> = 1047 (22.5%)	<i>n</i> = 777 (16.7%)		<i>n</i> = 2430 (52.2%)	<i>n</i> = 2225 (47.8%)	
Externalizing Problems <sup>b</sup>						.001			<.001
Class 1: Average Decreasing to Very Low Externalizing Problems	<i>n</i> = 3832 (82.3%)	628 (83.5%/ 16.4%)	1663 (80%/ 43.4%)	904 (86.3%/ 23.6%)	637 (82%/ 16.6%)		1927 (79.3%/ 50.3%)	1905 (85.6%/ 49.7%)	
Class 2: Above Average Decreasing to Low Externalizing Problems	<i>n</i> = 676 (14.5%)	97 (12.9%/ 14.3%)	343 (16.5%/ 50.7%)	123 (11.7%/ 18.2%)	113 (14.5%/ 16.7%)		415 (17.1%/ 61.4%)	261 (11.7%/ 38.6%)	
Class 3: Above Average Decreasing to Moderate Externalizing Problems	<i>n</i> = 140 (3.0%)	27 (3.6%/ 19.3%)	68 (3.3%/ 48.6%)	18 (1.7%/ 12.9%)	27 (3.5%/ 19.3%)		84 (3.5%/ 60.0%)	56 (2.5%/ 40.0%)	
Class 4: Above Average and Increasing to Very High Externalizing Problems	<i>n</i> = 7 (0.2%)	0 (0%/ 0%)	5 (0.2%/ 71.4%)	2 (0.2%/ 28.6%)	0 (0%/ 0%)		4 (0.2%/ 57.1%)	3 (0.1%/ 42.9%)	

*Note.* Variable frequency is displayed by row/column; <sup>a</sup>Chi-Square Test of Independence; <sup>b</sup>Fisher's Exact Tests.

**Table 9***Kruskal-Wallis Tests for Univariate and Parallel Process Trajectories of ACEs and Externalizing Problems by Primary Caregiver's Income*

Classes of Trajectories	Primary	<i>p</i>	Primary	<i>p</i>	Primary	<i>p</i>
	Caregiver's Income Age 3		Caregiver's Income Age 5		Caregiver's Income Age 9	
ACEs		< .001		< .001		< .001
Class 1: 1 ACE	60115.21 (72053.03)		71913.26 (105327.24)		77585.73 (78184.54)	
Class 2: 2 ACEs	48409.69 (59878.35)		52087.93 (56170.22)		62348.74 (62296.29)	
Class 3: 3 ACEs	29889.03 (32106.30)		30619.95 (31785.10)		39029.24 (38456.36)	
Class 4: 3 ACEs and Increasing	24319.72 (20664.18)		25257.18 (22762.58)		28780.82 (28054.18)	
Class 5: 4 ACEs	21952.89 (22927.42)		22319.12 (20424.73)		28913.73 (23910.65)	
Class 6: 6 ACEs	13369.47 (13649.40)		15614.62 (12790.60)		23664.26 (19558.82)	
Externalizing Problems		< .001		< .001		< .001
Class 1: Average Decreasing to Very Low Externalizing Problems	36559.33 (45441.65)		38341.18 (45711.71)		47548.52 (50140.99)	
Class 2: Above Average Decreasing to Low Externalizing Problems	26398.27 (32971.65)		27700.97 (30485.94)		33482.73 (35335.66)	
Class 3: Above Average Decreasing to Moderate Externalizing Problems	23644.46 (28061.94)		27964.74 (32473.49)		31311.31 (32069.41)	
Class 4: Above Average and Increasing to Very High Externalizing Problems	6159.43 (3181.85)		18270.29 (10284.10)		22812.00 (19004.62)	

**Table 9***Kruskal-Wallis Tests for Univariate and Parallel Process Trajectories of ACEs and Externalizing Problems by Primary**Caregiver's Income - Continued*

Classes of Trajectories	Primary Caregiver's Income Age 3	<i>p</i>	Primary Caregiver's Income Age 5	<i>p</i>	Primary Caregiver's Income Age 9	<i>p</i>
ACEs and Externalizing Problems Parallel Process		< .001		< .001		< .001
Class 1: 2 ACEs and Average Decreasing to Very Low Externalizing Problems	44839.43 (54575.95)		47879.86 (54869.99)		58062.68 (59051.96)	
Class 2: 3-4 ACEs and Average Decreasing to Very Low Externalizing Problems	26348.53 (27339.02)		26595.18 (26817.08)		34275.53 (31744.50)	
Class 3: 3-4 ACEs and Above Average Decreasing to Low Externalizing Problems	25147.52 (31891.77)		26451.72 (27179.15)		32606.24 (33008.84)	
Class 4: 4 ACEs and Above Average Decreasing to Moderate Externalizing Problems	22617.08 (23768.41)		27208.52 (31615.61)		30191.66 (30797.72)	
Class 5: 2-3 ACEs and Above Average Increasing to Very High Externalizing Problems	6159.43 (3181.85)		18270.29 (10284.10)		22812.00 (19004.62)	

**Table 10**

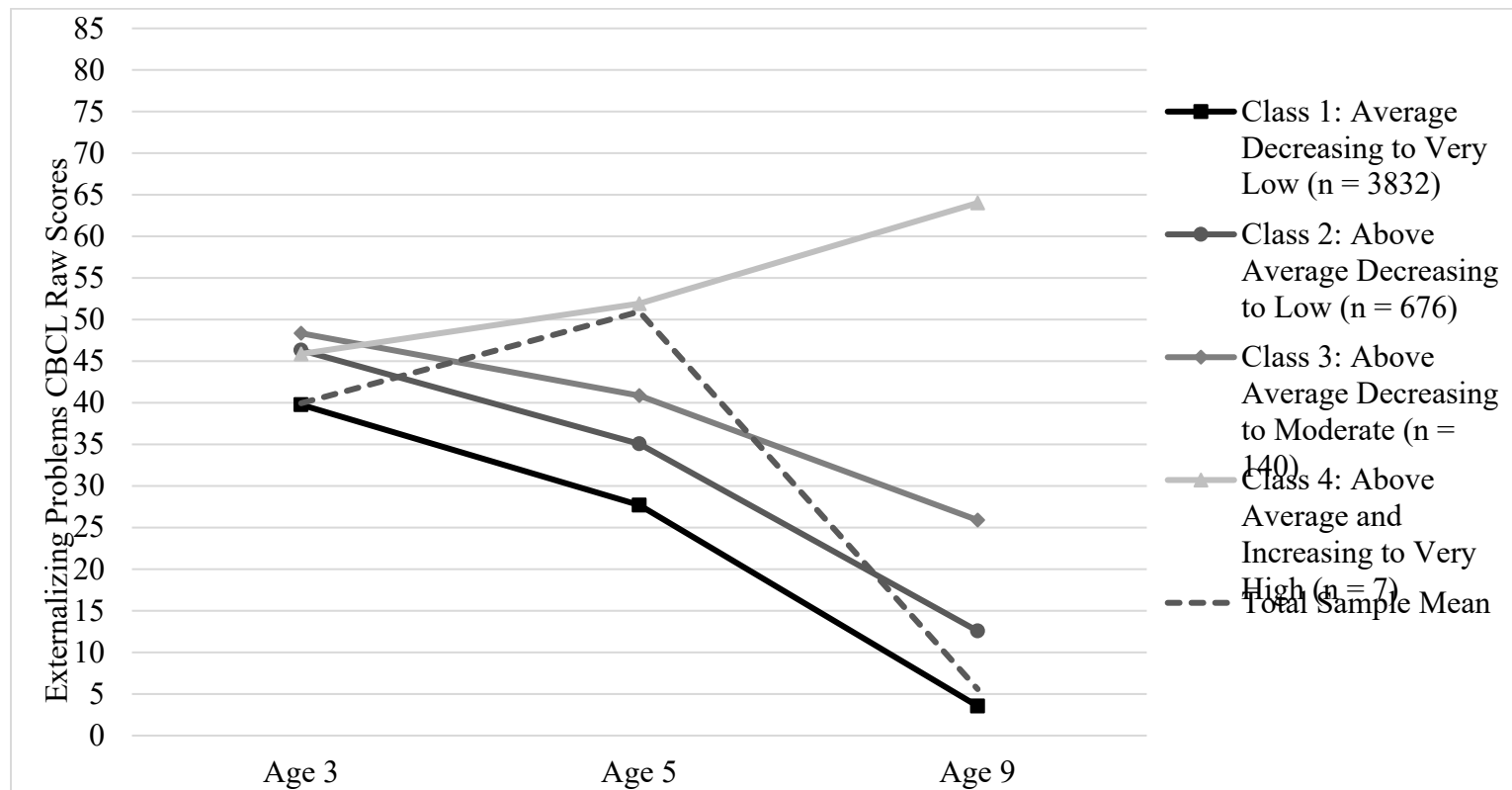
*Fisher's Exact Tests for Parallel Process Trajectories of ACEs and Externalizing Problems by Race/Ethnicity and Sex*

Classes of Trajectories	Total	Race/Ethnicity				<i>p</i>	Sex		<i>p</i>
		White	Black	Hispanic	Other		Boy	Girl	
	<i>n</i> = 4655	<i>n</i> = 752 (16.1%)	<i>n</i> = 2079 (44.7%)	<i>n</i> = 1047 (22.5%)	<i>n</i> = 777 (16.7%)		<i>n</i> = 2430 (52.2%)	<i>n</i> = 2225 (47.8%)	
ACEs and Externalizing Problems Parallel Process						<.001			<.001
Class 1: 2 ACEs and Average Decreasing to Very Low Externalizing Problems	<i>n</i> = 2159 (46.4%)	460 (61.2%/21.3%)	775 (37.3%/35.9%)	593 (56.6%/27.3%)	331 (42.6%/15.3%)		1106 (45.5%/51.2%)	1053 (47.3%/48.8%)	
Class 2: 3-4 ACEs and Average Decreasing to Very Low Externalizing Problems	<i>n</i> = 1804 (38.7%)	193 (25.7%/10.7%)	951 (45.7%/52.7%)	333 (31.8%/18.5%)	327 (42.1%/18.1%)		902 (37.1%/50.0%)	902 (40.5%/50.0%)	
Class 3: 3-4 ACEs and Above Average Decreasing to Low Externalizing Problems	<i>n</i> = 560 (12.0%)	73 (9.7%/13.0%)	288 (13.9%/51.4%)	103 (9.8%/18.4%)	96 (12.4%/17.1%)		344 (14.2%/61.4%)	216 (9.7%/38.6%)	
Class 4: 4 ACEs and Above Average Decreasing to Moderate Externalizing Problems	<i>n</i> = 125 (2.7%)	26 (3.5%/20.8%)	60 (2.9%/48.0%)	16 (1.5%/12.8%)	23 (3.0%/18.4%)		74 (3.0%/59.2%)	51 (2.3%/40.8%)	
Class 5: 2-3 ACEs and Above Average Increasing to Very High Externalizing Problems	<i>n</i> = 7 (0.2%)	0 (0%/0%)	5 (0.2%/71.4%)	2 (0.2%/28.6%)	0 (0%/0%)		4 (0.2%/57.1%)	3 (0.1%/42.9%)	

*Note.* Variable frequency is displayed by row/column.

**Figure 4**

*Externalizing Problems Univariate Trajectories Classes*

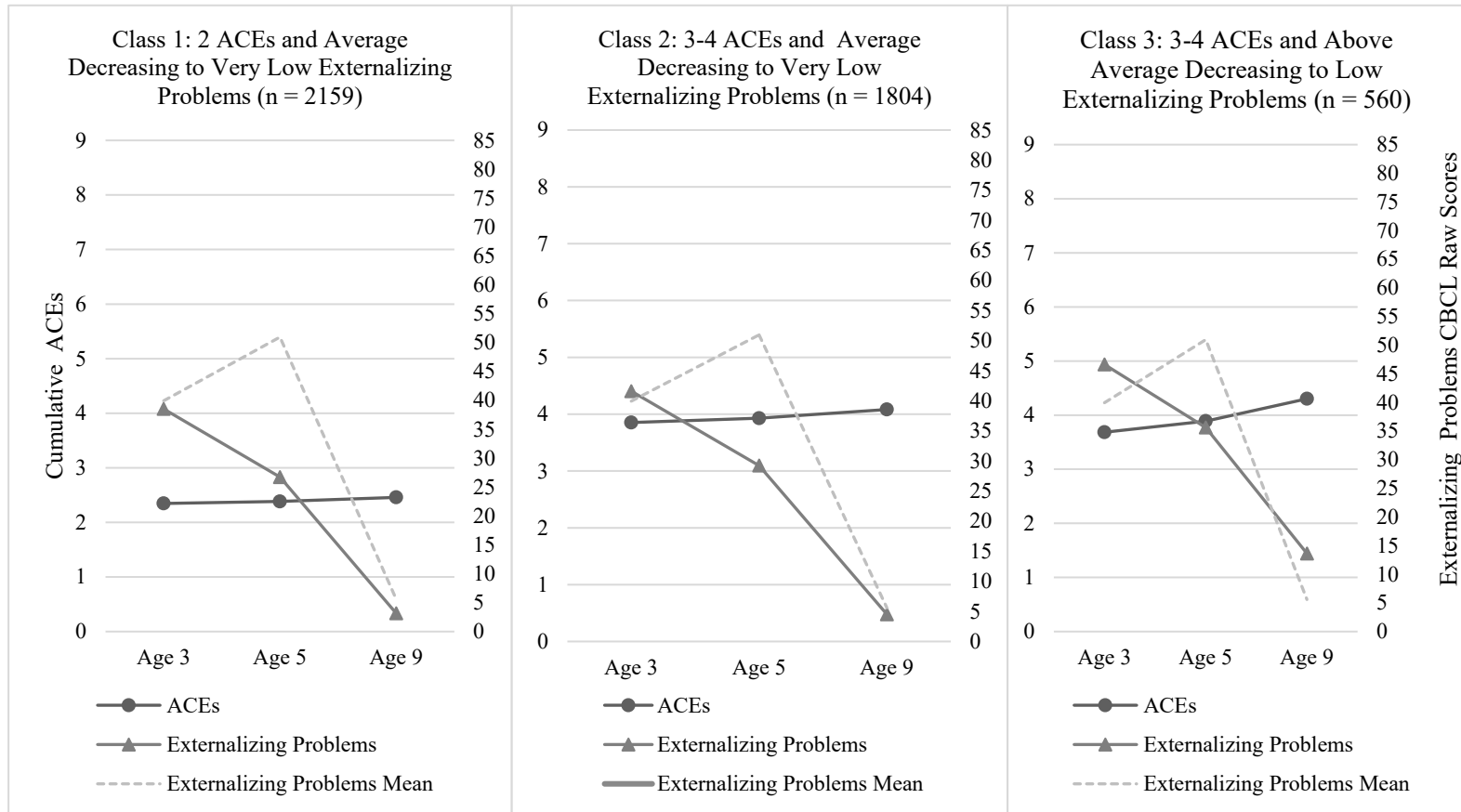


Note. Child Behavior Checklist (CBCL); Total Sample Mean is the mean of the overall sample at each time point which is provided for interpretability of classes.



**Figure 5**

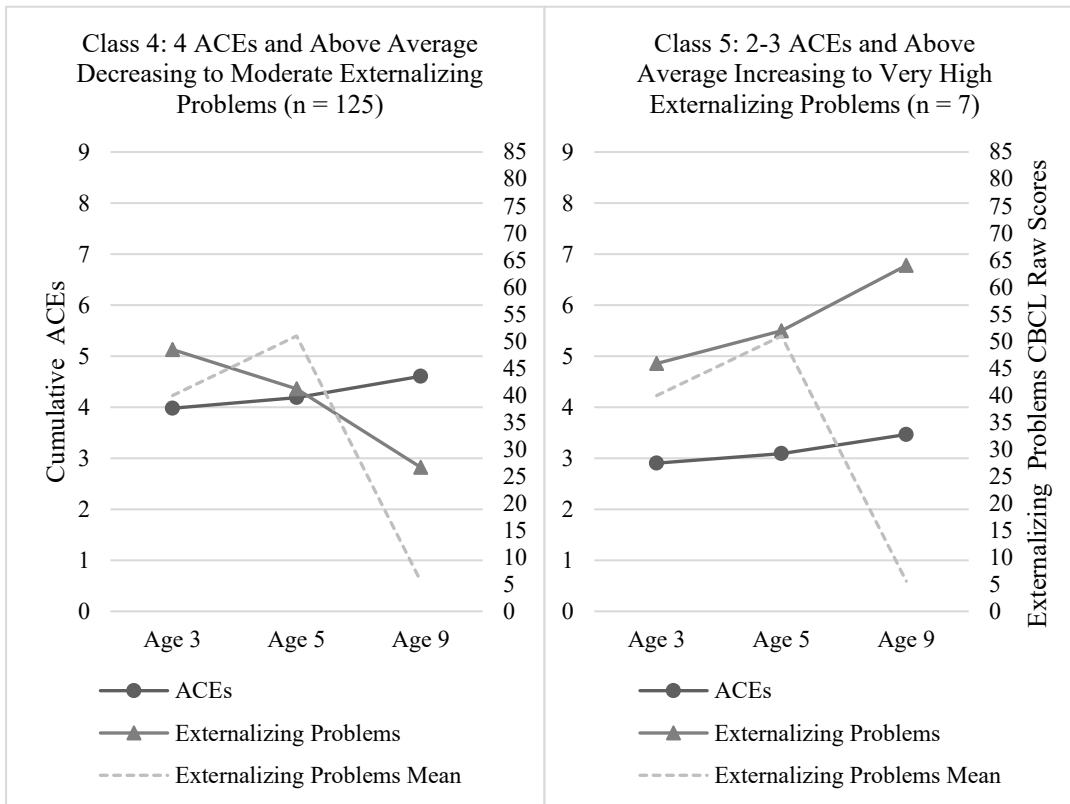
*ACEs and Externalizing Problems Parallel Process Trajectories Classes*



*Note.* Child Behavior Checklist (CBCL); Total Sample Mean is the mean of the overall sample at each time point which is provided for interpretability of classes.

**Figure 5**

*ACEs and Externalizing Problems Parallel Process Trajectories Classes - Continued*



*Note.* Child Behavior Checklist (CBCL); Total Sample Mean is the mean of the overall sample at each time point which is provided for interpretability of classes

## CHAPTER IV

### SUMMARY AND CONCLUSIONS

This dissertation took a developmental and contextual approach to examine the interplay between Adverse Childhood Experiences (ACEs), and internalizing and externalizing problems over time. Two manuscripts focused on understanding the individual and co-developing trajectories of ACEs and (a) internalizing problems, and (b) externalizing problems across childhood, as well as health disparities that may exist within the trajectories based on demographic factors. Findings from these studies may inform future research, and prevention and intervention efforts to support at-risk youth and diminish health disparities.

Only one previous study has examined the individual trajectories of ACEs, wherein youth were found to have chronic, early exposure, and low exposure—usually none—to ACEs (Thompson et al., 2015). Unlike this study, we did not find any youth who experienced little to no ACEs, or ACEs that were exclusively experienced in early childhood. Rather, we found six stable trajectories of ACEs, with youth experiencing the same number of ACEs at each time point that they started with at age 3 (i.e., chronic adversity at various levels). Youth with the least exposure to adversity experienced three ACEs by age 9 while youth with the most exposure experienced eighteen ACEs. This may be an artifact of having an at-risk sample that puts families at greater risk for experiencing adversity. Nonetheless, this is concerning, especially since previous research has found that individuals who are exposed to four or more ACEs throughout their lifetime are at greater risk for subsequent physical and mental health problems

(Felitti et al., 1998). Findings highlight the importance of early screening of ACEs for prevention and early intervention efforts.

Several previous studies have examined the trajectories of internalizing and externalizing problems; however, variabilities in trajectories have been found across. Findings from the current studies indicated that trajectories of internalizing problems are stable or increasing over childhood (study one), and trajectories of externalizing problems decrease for most youth from age 3 to 9, with a very few displaying an increasing trajectory of externalizing problems across childhood (study two). Internalizing and externalizing problems do not develop similarly across childhood, despite both types of problems having similar prevalence rates among children (Ghandour et al., 2019). Previous research and findings from our study—with significant correlations being observed for internalizing and externalizing problems at each time point ( $p < .001$ )—suggest that internalizing and externalizing problems have a strong positive association (Achenbach et al., 2016). Nonetheless, it is essential to assess both internalizing and externalizing problems individually within the same sample as these two broad band categories of emotional and behavioral problems are not mutually exclusive (Achenbach et al., 2016). Further, most studies assessing the trajectories of internalizing and externalizing problems have found mostly stable trajectories and very few unstable (Davis et al., 2015; Figge et al., 2018; Kjeldsen et al., 2014; Klein et al., 2019; Sterba et al., 2007; Thompson et al., 2011). However, we found mostly unstable trajectories that increased for internalizing problems and decreased for externalizing problems—except for one that increased over time—which might be due to our sample being an at-risk sample or the range of ages examined in these studies. More research is needed to better

understand the trajectories of internalizing and externalizing problems across a larger developmental span, especially among at-risk youth.

To our knowledge, this is the first study to examine the joint trajectories of internalizing and externalizing problems with ACEs. Researchers have stressed the need to understand the interplay between ACEs and mental health across childhood (Schroeder et al., 2020), thus these studies fill a gap in the knowledge of the co-development of adversity exposure and mental health problems. Both studies aimed to examine for the *accumulation of risk* and *sensitive periods* components of adversity (Ben-Shlomo & Kuh, 2002; Kuh et al., 2003). Findings from both studies suggested that association between ACEs, and internalizing and externalizing problems is not fully a dose-effect relationship, but it is rather nuanced. We found that youth experiencing two to three ACEs over time—which is not the highest number of ACEs experienced by youth in the sample—were found to have the greatest levels of internalizing or externalizing problems. This finding does not fully support the *accumulation of risk model*. Further, neither study exposed any sensitive periods in development as expected based on previous studies suggesting that experiencing adversity early in childhood puts youth at greater risk for subsequent mental health problems (Dunn et al., 2020; Keiley et al., 2001).

This dissertation aimed to fill a gap in the literature regarding demographic disparities in the longitudinal trajectories of ACEs, internalizing and externalizing problems, as limited research has focused on this. Low-income youth were the most affected across all variables, with more severe trajectories of ACEs (i.e., greater exposure to ACEs), internalizing and externalizing problems (i.e., higher starting values and ending values), and joint trajectories of ACEs and internalizing and externalizing

problems (i.e., higher ACEs or greater internalizing or externalizing problems) as compared to more affluent youth. Black youth were also more likely to be in the univariate and co-developing trajectories with greater exposure to ACEs and/or externalizing problems as compared to youth from other races/ethnicities. Hispanic youth were also more likely to have trajectories with higher levels of internalizing problems, and boys of externalizing problems. It is alarming that youth with the most severe trajectories were from marginalized communities. It is also important to highlight that we found that youth of color had lower income as compared to White youth. Combined, these findings might be suggestive of underlying systemic inequities that may not be observed but may greatly impact youths wellbeing (e.g., structural racism; Schoon & Melis, 2019; Shonkoff et al., 2020), and the need for future research to consider intersectionality to better understand the conditions that historically disenfranchised communities experience in hopes of providing a voice to their suffering to create change (Cole, 2009) .

### **Challenges and Opportunities**

We aimed to fill a gap in the literature and extend the knowledge about the individual and joint trajectories of ACEs, internalizing and externalizing problems, as well disparities that may exist in such trajectories to aid in understanding what youth may be at greater risk for detrimental outcomes. While our findings point to differences in how internalizing and externalizing problems develop from early to middle childhood, more research including a larger coverage of the developmental span is needed to understand the progression of these trajectories. It is especially important to incorporate ages in adolescence, as it might be a formative time that may make youth vulnerable to

mental health problems when exposed to adversity (World Health Organization, 2021). Our results were not indicative of sensitive periods in development, and had complex findings about the accumulation of risk. It is possible that different approaches for sensitive periods (e.g., machine learning algorithms; Dunn et al., 2018; Khan et al., 2015), and considerations of distinctive aspects of adversity (e.g., frequency, severity, individual weight of adversity; DeLisi et al., 2021; Evans et al., 2013; Flouri, 2008), might provide more clarity into how adversity impacts mental health across childhood.

There is also opportunity for the ACEs framework and literature to expand and consider adversities that are more likely to be experienced by marginalized youth (e.g., discrimination, racism, witnessing violence, living in an unsafe neighborhood, immigration related trauma; Bernard et al., 2021; Conway & Lewin, 2022; Cronholm et al., 2015), which might reveal greater disparities than those already observed in this study. Indeed, previous research has observed demographic disparities with this expanded ACEs framework, with youth and adults of color and low-income individuals being more likely to endorsed expanded ACEs (e.g., discrimination, community violence) than their White and more affluent counterparts (Cronholm et al., 2015; Maguire-Jack et al., 2019). There is a crucial need for research to utilized expanded ACEs to help fill a critical gap in understanding and addressing inequities in exposure to adversity that are more likely to impact the most marginalized in our society.

While we identified resilience as a possible moderating factor in the relationship between ACEs and mental health problems on both studies, it is imperative that this suggestion is not taken as the need to pinpoint strength-based traits to apply to interventions. Certainly, resilience is an important factor that can help mitigate negative

outcomes (Masten, 2001). However, the expectation of resilience can be harmful as it is often imposed on marginalized communities as a way to have them overcome and adapt to trauma induced by systemic issues rather than attending to the root cause of the problems (i.e., structural and systemic discrimination; Suslovic & Lett, 2023). Instead, we suggest the deployment of individual interventions that are trauma-informed and culturally sensitive, in addition to larger parallel interventions that target the source of the problems (i.e., structural inequities) and promote social equity. Such interventions might start with focusing on case management to connect families with needed resources (e.g., housing, food; Garner & Yogman, 2021; Pickett et al., 2022). Larger scale systemic interventions might involve providing basic income which alleviate inequities and foster wellbeing (Wilson & McDaid, 2021). Nonetheless, addressing the effects of adversity on wellbeing may require shifting our paradigm towards taking a liberation health approach—that conceptualizes individuals’ problems as being inflicted by society—and promoting collective healing (Cowan et al., 2022; Suslovic & Lett, 2023).

### **Conclusion**

Our studies fill a gap in the literature regarding the dual development of ACEs with internalizing and externalizing problems, and disparities that exist within such trajectories. Findings from our studies highlight differences in developmental processes between internalizing and externalizing problems throughout childhood and the need to continue assessing these trajectories throughout larger developmental spans (i.e., early childhood to adolescence or adulthood). Further, both studies illustrate the complex relationship between exposure to adversity and mental health outcomes, and aid in identifying areas of growth within the ACEs framework including consideration of



severity, frequency, and relative importance of individual adversities throughout childhood, as well as the expansion of studied adversities. Findings from both studies elucidate how social determinants of health can impact youth's wellbeing and exposure to adversity, as well as the importance for future research to continue examining demographic factors through a critical lens in order to identify health disparities and ways to effectively eradicate them. In order to heal and diminish such disparities, we emphasize the necessity for interventions that are culturally sensitive and trauma-informed, and the crucial need of larger scale interventions (e.g., social policy) that target the root cause of health disparities and work to promote social equity.

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Wilson, N., & McDaid, S. (2021). The mental health effects of a Universal Basic Income: A synthesis of the evidence from previous pilots. *Social Science & Medicine, 287*, 114374. <https://doi.org/10.1016/j.socscimed.2021.114374>

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Curriculum Vitae

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Updated: 06/2023

**EDUCATION AND TRAINING**

- Ph.D., Utah State University** Anticipated 2023  
 Combined Clinical/Counseling Psychology, APA accredited  
 Dissertation: *The longitudinal effects of adverse childhood experiences on internalizing and externalizing problems: In search of demographic disparities*  
 Advisor: Melanie M. Domenech Rodríguez, Ph.D.
- Charleston Consortium – Child Psychology Track** August 2022 – Present  
 Predoctoral Psychology Internship  
 Research preceptors: Rosaura E. Orenge-Aguayo, Ph.D. & Regan W. Stewart, Ph.D.
- M.A., California State University, Northridge** 2017  
 Clinical Psychology  
 Thesis: *Associations between coping mechanisms and young adult psychopathology: An investigation of the importance of specific adverse life experiences*  
 Advisor: Sara R. Berzenski, Ph.D.
- B.A., California State University, Northridge** 2014  
 Psychology  
 Dean's List, Cum Laude

**PEER-REVIEWED PUBLICATIONS**

8. Vázquez, A. L., Domenech Rodríguez, M. M., **Navarro Flores, C. M.**, Abreu, R. L., & Barrett, T. S. (2023). La vergüenza [the shame]: Measuring affiliate stigma associated with youth mental health problems among Latinx caregivers. *Journal of Latinx Psychology*. Advanced online publication. <https://doi.org/10.1037/lat0000235>
7. **Navarro Flores, C. M.**, Vázquez, A. L., Galvan, T., & Garcini, L. (2023). Cuento de nunca acabar [never-ending story]: Compounding trauma and mental health among undocumented Latinx immigrants. *Journal of Traumatic Stress*. Advanced online publication. <https://doi.org/10.1002/jts.22929>
6. Vázquez, A. L., Cullianos, D., **Navarro Flores, C. M.**, Alvarez, M. C., Barrett, T. S., & Domenech Rodríguez, M. M. (2022). Psychometric evaluation of a barriers to treatment questionnaire for Latina/o/x caregivers of children and adolescents. *Child & Youth Care Forum*, 51, 847-864. <https://doi.org/10.1007/s10566-021-09656-8>



5. Vázquez, A. L., Alvarez, M. C., **Navarro Flores, C. M.**, González Vera, J. M., Barrett, T. S., & Domenech Rodríguez, M. M. (2021). Youth mental health service preferences and utilization patterns among Latinx caregivers. *Children and Youth Services Review, 131*, 106258. <https://doi.org/10.1016/j.childyouth.2021.106258>
4. Vázquez, A. L., Chou, T., **Navarro Flores, C. M.**, Barrett, T. S., Villodas, M. T., & Domenech Rodríguez, M. M. (2021). High value correlates of caregiver reported counseling service need and utilization for adolescents at-risk for childhood maltreatment and neglect. *PLoS ONE, 16*(10), e0258082. <https://doi.org/10.1371/journal.pone.0258082>
3. Vázquez, A. L., **Navarro Flores, C. M.**, Alvarez, M. C., & Domenech Rodríguez, M. M. (2021). Latinx caregivers' perceived need for and utilization of youth telepsychology services during the coronavirus pandemic. *Journal of Latinx Psychology, 9*(4), 284–298. <https://doi.org/10.1037/lat0000192>
2. Cruz, R. A., **Navarro, C.**, Carrera, K., Lara, J., Mechammil, M., & Robins, R. W. (2019). Mexican-origin youths' trajectories of internalizing symptoms from childhood into adolescence and associations with acculturation processes. *Journal of Clinical Child & Adolescent Psychology, 50*(1), 118–130. <https://doi.org/10.1080/15374416.2019.1622120>
1. Levin, M. E., **Navarro, C.**, Cruz, R. A., & Haeger, J. (2018). Comparing in-the-moment skill coaching effects from tailored versus non-tailored acceptance and commitment therapy mobile apps in a non-clinical sample. *Cognitive Behaviour Therapy, 48*(3), 200–216. <https://doi.org/10.1080/16506073.2018.1503706>

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### BOOK CHAPTERS

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1. Alvarez, M. C., Garcia, B. H., **Navarro Flores, C. M.**, Vázquez, A. L., Lara, J., & Domenech Rodríguez, M. M. (2023). Parent training interventions. In B. Halpern-Felscher (Ed.), *Encyclopedia of child and adolescent health* (Vol. 2; pp. 800-820). Elsevier. <https://doi.org/10.1016/B978-0-12-818872-9.00030-3>

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### PUBLISHED REPORTS

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2. Barrientos, W., Cadenas, G. A., Domenech Rodríguez, M. M., Garcia Mendoza, J., Garcini, L.M., Mercado, A., **Navarro Flores, C. M.**, Paris, M., Silva, M., & Venta, A., Linares, S. (2021). UndocuHealth Report: Mental Health and Wellbeing in United We Dream Community. <https://osf.io/zskvx>
1. Barrientos, W., Cadenas, G. A., Domenech Rodríguez, M. M., Garcia Mendoza, J., Garcini, L.M., Mercado, A., **Navarro Flores, C. M.**, Paris, M., Silva, M., & Venta, A. (2021). Two pandemic snapshots: Immigrant Health In the Time of COVID. <https://osf.io/2btw3>

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### MANUSCRIPTS UNDER PEER REVIEW

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5. Vázquez, A. L., Culianos, D., Gudiño, O. G., **Navarro Flores, C.M.**, Barrett, T. S., & Domenech Rodríguez, M.M. (2022). Dimensions of caregiver strain may mediate the relationship between youth symptomology and counseling utilization among Latinxs. [Manuscript submitted for publication].
4. Vázquez, A. L., Garcia, B. H., **Navarro Flores, C. M.**, Barrett, T. S., Domenech Rodríguez, M. M. (2021). An ecological examination of early adolescent e-cigarette use: A machine learning approach to understanding a health epidemic. [Manuscript submitted for publication].
3. Vázquez, A. L., **Navarro Flores, C. M.**, Gonzalez, J., Feinberg, D. K., Young, J., Stewart, R., Orengo-Aguayo, R. (2023). Lo malo pasó, la substancias son mi doctor: A network analysis of Hurricane Maria related traumatic stress and substance use among Puerto Rican youths. [Manuscript submitted for publication].
2. Vázquez, A. L., Domenech Rodríguez, M. M., Cadenas, G. A., Barrett, T. S., & **Navarro Flores, C. M.** (2022). Barriers to accessing telepsychology services questionnaire: structure and language-based performance in a sample of Latinx caregivers. [Revision submitted for publication].
1. Domenech Rodríguez, M. M., **Navarro Flores, C. M.**, Venta, A., Vázquez, A. L., Alvarez, M. C., González Vera, J. M., Galvan, T., Moreno, O., & Lara, J. (2022). Latinx immigrant caregiver stress and health during pandemic times. [Manuscript submitted for publication].

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### MANUSCRIPTS IN PREPARATION

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9. **Navarro Flores, C. M.**, Vázquez, A. L., Young, J., Orengo-Aguayo, R., Stewart, R. (2023). Después de la tempestad, no vino la calma: Differential impact of Hurricane Maria related stressors on PTSD symptoms among Puerto Rican youth. [Manuscript in preparation].
8. Pavlacic, J. M., Hampton, B., Young, J., Vázquez, A. L., **Navarro Flores, C. M.**, Witcraft, S. M., Rheingold, A. A. (2023). A Systematic Review of Mindfulness-Based Ecological Momentary Interventions: Examining Current Methods and Identifying Directions for Future Research. [Manuscript in preparation].
7. **Navarro Flores, C. M.**, Vázquez, A. L., & Domenech Rodríguez, M. M. (2023). Coping styles associated with dimensions of caregiver strain among Latinx families. [Manuscript in preparation].

6. **Navarro Flores, C. M.**, Vázquez, A. L., & Domenech Rodríguez, M. M. (2023). Understanding coping mechanisms used by Latinx caregivers in response to youth mental health problems. [Manuscript in preparation].
5. **Navarro Flores, C. M.**, Domenech Rodríguez, M. M., Gomer, B., Barrett, T. S., Park, H., Tehee, M. A., & Crowley S. L. (2023). Demographic disparities on the longitudinal co-development of adverse childhood experiences and externalizing problems. [Manuscript in preparation].
4. **Navarro Flores, C. M.**, Domenech Rodríguez, M. M., Gomer, B., Barrett, T. S., Park, H., Tehee, M. A., & Crowley S. L. (2023). The co-development of adverse childhood experiences and internalizing problems during childhood: An examination of demographic disparities. [Manuscript in preparation].
3. **Navarro Flores, C. M.**, Domenech Rodríguez, M. M., Venta, A. C., Garcia Mendoza, J., Garcini, L., Mercado, A., Cadenas, G. A., & Vázquez, A. L. (2023). Undocumented psychological health and coping during the COVID-19 pandemic. [Manuscript in preparation].
2. Domenech Rodríguez, M. M., **Navarro Flores, C. M.**, Venta, A.C., Garcia Mendoza, J., Garcini, L., Mercado, A., Cadenas, G.A., & Vázquez, A. L. (2023). Stress and health in pandemic time: A snapshot of undocumented experience. [Manuscript in preparation].
1. **Navarro Flores, C. M.** & Berzenski, S. R. (2023). Profiles of adverse life experiences: Associations with mental health outcomes among emerging adults. [Manuscript in preparation].

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## CONFERENCE PRESENTATIONS

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22. **Navarro Flores, C. M.**, Teves, J. B., Petty, K., Cammack, N., Traylor, S. (2023). Navigating microaggressions in therapy. [Clinical round table accepted for presentation]. Association for Behavioral and Cognitive Therapies (ABCT), Seattle, WA, United States.
21. Pavlacic, J. M., Hampton, B., Young, J., Vázquez, A. L., **Navarro Flores, C. M.**, Witcraft, S. M., Rheingold, A. A. (2023). *A Systematic Review of Mindfulness-Based Ecological Momentary Interventions: Examining Current Methods and Identifying Directions for Future Research*. [Poster accepted for presentation]. Association for Behavioral and Cognitive Therapies (ABCT), Seattle, WA, United States.
20. Vázquez, A. L., **Navarro Flores, C. M.**, Alvarez, M. C., & Domenech Rodríguez, M. M. (2021, October). *Latinx caregivers' perceived need for and utilization of youth telepsychology services during the Coronavirus pandemic* [Poster presentation]. National Latinx Psychological Association, virtual conference.

19. **Navarro Flores, C. M.**, Vázquez, A. L., Domenech Rodríguez, M. M., & Berzenski, S. R. (2020, October). *Differential coping with patterns of child maltreatment and its impact on psychopathology among Latinx emerging adults* [Poster presentation]. National Latinx Psychological Association, Denver, CO, United States.
18. Vázquez, A. L., **Navarro Flores, C. M.**, Domenech Rodríguez, M. M., Barrett, T.S., Amador Buenabad, N. G., & Villatoro Velazquez J. A. (2020, October). *Parent characteristics and practices classify lifetime substance use among Mexican children* [Poster presentation]. National Latinx Psychological Association, Denver, CO, United States.
17. Carrera, K., Mechammil, M., Garcia, B., **Navarro Flores, C. M.**, Lara, J., & Cruz, R. A (2020, October). *Latinx college students' levels of acculturation, emotion expression and regulation as predictors of mental health help-seeking attitudes* [Poster presentation]. National Latinx Psychological Association, Denver, CO, United States.
16. Garcia, B., Vázquez, A. L., **Navarro Flores, C. M.**, Alvarez, M. C., Domenech Rodríguez, M. M., Amador Buenabad, N. G., & Villatoro Velazquez J. A. (2020, October). *Mexican adolescent's perception of their caregivers' parenting practices* [Poster presentation]. National Latinx Psychological Association, Denver, CO, United States.
15. Vázquez, A. L., Chou, T., **Navarro, C.**, Barrett, T. S., Villodas, M. T., & Domenech Rodríguez, M. M. (2019, November). Understanding caregiver perceived need for and utilization of adolescent counseling services through machine learning. In M. D. Hetzel- Riggin (Chair). *Addressing violence, abuse, and trauma throughout the socioecological model* [Symposium]. Association for Behavioral and Cognitive Therapies, Atlanta, GA, United States.
14. **Navarro, C.**, Ueno, L. & Berzenski, S. R. (2019, March). *Child maltreatment and its relation to behavior and emotion regulation Profiles* [Poster presentation]. Society for Research in Child Development Biennial Conference, Baltimore, MD, United States.
13. Vázquez, A. L., Chou, T., **Navarro, C.**, Barrett, T. S., & Domenech-Rodríguez, M. M. (2019, March). *Examining caregiver perceived need for and utilization of adolescent counseling services through machine learning* [Poster presentation]. Society for Research in Child Development Biennial Conference, Baltimore, MD, United States.
12. **Navarro, C.** & Cruz, R. A. (2018, October). Patterns of child maltreatment and substance use among Latinx emerging adults: A person-centered analysis. In A. L. Vázquez (Chair). *Latinx substance use: Advanced methods for identifying factors*

*associated with risk and resilience* [Symposium]. National Latina/o Psychological Association Biennial Conference, La Jolla, CA, United States.

11. Cruz, R. A., **Navarro, C.**, Barrett, T., Mechammil, M., Carrera, K., & Lara, J. (2018, October). Optimizing prediction of substance use among Latino youth using machine learning. In A. L. Vázquez (Chair). *Latinx substance use: Advanced methods for identifying factors associated with risk and resilience* [Symposium]. National Latina/o Psychological Association Biennial Conference, La Jolla, CA, United States.
10. Levin, M. E., Haeger, J., **Navarro, C.**, & Cruz, R. A. (2018, July). *Using mobile apps to tailor ACT skill training in-the-moment: Results from the ACT Daily app* [Paper presentation]. 16<sup>th</sup> Annual Word Conference of the Contextual Behavioral Science Conference, Montréal, Québec, Canada.
9. Cruz, R. A., **Navarro, C.**, Carrera, K., Mechammil, M., Lara, J., & Robins, R. (2018, April). *Longitudinal trajectories of depression and anxiety: Characterizing change, symptom covariation and association with cultural factors* [Conference paper presentation]. Society for Research on Adolescence Biennial Conference, Minneapolis, MN, United States.
8. Cruz, R. A., Barrett, T., Mechammil, M., **Navarro, C.**, Carrera, K., & Lockhart, G. (2018, April). *Leveraging machine learning methods for research with Latino youth* [Poster presentation]. Society for Research on Adolescence Biennial Conference, Minneapolis, MN, United States.
7. Carrera, K., Mechammil, M., **Navarro, C.**, Lockhart, G., & Cruz, R. A. (2017, October). *Are cultural and familial factors associated with Latino youth self-regulation?* [Poster presentation]. National Hispanic Science Network Annual Conference, Phoenix, AZ, United States.
6. **Navarro, C.**, Galindo, J., Berzenski, S. R., & Yates, T. M. (2017, April). *Configurations of risk and their differential impact on psychopathology among ethnic groups: A latent class analysis* [Poster presentation]. Society for Research in Child Development Biennial Conference, Austin, TX, United States.
5. Galindo, J., **Navarro, C.**, & Berzenski, S. R. (2017, April). *Teen parenting and the influence of associated contextual risks on child conduct problems* [Poster presentation]. Society for Research in Child Development Biennial Conference, Austin, TX, United States.
4. **Navarro, C.**, Berzenski, S. R., & Yates, T. M. (2016, August). *Sexual abuse and internalizing in foster youth: The role of family support and placement instability* [Poster presentation]. American Psychological Association Annual Conference, Denver, Colorado, United States.

3. **Navarro, C.**, Galindo, J., Berzenski, S. R., & Yates, T. M. (2015, August). *Indirect effects of parental violence and avoidance coping on adjustment among Hispanic children* [Poster presentation]. American Psychological Association Annual Conference, Toronto, Ontario, Canada.
2. Galindo, J., **Navarro, C.**, Berzenski, S. R., & Yates, T. M. (2015, August). *An investigation of intergenerational transmission of criminality and concurrent maltreatment risk* [Paper presentation]. American Psychological Association Annual Conference, Toronto, Ontario, Canada.
1. Felt, J., **Navarro, C.**, Van Bogart, K., & Plunkett, S. (2013, May). *Parenting, self-esteem, and Latino emerging adults' depression: A multi-group mediation SEM* [Poster presentation]. American Psychological Sciences Annual Conference, Washington, D.C., United States.

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### AD HOC REVIEWER

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Child Maltreatment  
 Current Opinion in Psychology  
 Family Process  
 Journal of Traumatic Stress

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### PROFESSIONAL TRAINING AND DEVELOPMENT

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Fragile Families Summer Data Workshop  
 2021  
*Columbia Population Research Center*

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### RESEARCH EXPERIENCE

---

**Research Assistant** May 2020 – August 2020  
 Culture & Mental Health Lab  
*Utah State University: Department of Psychology*

**Research Assistant** June 2017 – May 2018  
 Cruz Lab August 2019 – April 2020  
*Utah State University: Department of Psychology*

**Research Assistant** January 2014 – June 2017  
 Researching Emotion Across Childhood Lab  
*California State University, Northridge: Department of Psychology*

**Research Assistant** September 2012 – January 2014  
 Adolescent and Adult Adjustment Lab  
*California State University, Northridge: Department of Psychology*

**Program Student Evaluator** January 2013 – May 2013

Family Preservation Program  
*California State University, Northridge: Valley Trauma Center, Northridge, CA*

---

## TEACHING EXPERIENCE

---

**Instructor** Fall 2020 – Summer 2021

*Utah State University, Logan, UT*  
 Multicultural Psychology (PSY 4240 Online)

**Invited Lecturer** February 18, 2020

*Idaho State University, Pocatello, ID* September 28, 2021

Independent Problems in Physician Assistant Studies (PAS 4498)

Instructor: Cathleen Tarp, Ph.D.

**Teaching Assistant**

*Utah State University, Logan, UT*

General Psychology (PSY 1010 In-Person/Online) Fall 2017 – Spring 2018

Analysis of Behavior: Advanced (PSY 3400 Online) Summer 2019

Multicultural Psychology (PSY 4240 Online) Summer 2020

**Teaching Assistant** Fall 2015

*California State University, Northridge, Northridge, CA*

Research Methods in Psychology and Lab (Psy 321/L)

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## CLINICAL EXPERIENCE

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**Predoctoral Intern Therapist** January 2023 – Present

Developmental and Behavioral Pediatrics

*Medical University of South Carolina; Charleston, SC*

*Supervisor: Laura Arnstein Carpenter, Ph.D. and Rosmary Ros-Demarize, Ph.D.*

**Predoctoral Intern Therapist** January 2023 – Present

Couples & Family Clinic

*Ralph H. Johnson VA Medical Center; Charleston, SC*

*Supervisor: Jenna B. Teves, Ph.D. and Julian Libet, Ph.D.*

**Predoctoral Intern Therapist** August 2022 – January 2023

Community Outreach Program - Esperanza (COPE)

*Medical University of South Carolina; Charleston, SC*

*Supervisor: Rosaura Orengo-Aguayo, Ph.D.*

**Predoctoral Intern Therapist** August 2022 – January 2023

Pediatric Primary Care

*Medical University of South Carolina; Charleston, SC*

*Supervisor: Rochelle Hanson, Ph.D.*

**Graduate Assistant** August 2021 – May 2022

*Box Elder School District; Brigham City, UT*

*Supervisor: Marietta Veeder, Ph.D.*

**Practicum Intern**

February 2019 – May 2020

*Utah State University; Logan, UT*

*Supervisor: Melanie M. Domenech Rodríguez, Ph.D.*

**Practicum Intern**

August 2019 – August 2021

*The Family Place; Logan, UT*

*Supervisors: Melanie M. Domenech Rodríguez, Ph.D.; Reece Nielson, Ph.D.; Kindra Sealy Bean, LCSW*

**Practicum Intern/ Graduate Assistant**

August 2018 – August 2019

Psychology Community Clinic

*Utah State University; Logan, UT*

*Supervisors: Susan Crowley, Ph.D.; Sara Boghosian, Ph.D.; Marietta Veeder, Ph.D.*

**Graduate Assistant**

May 2018 – May 2019

Center for Persons with Disabilities

*Utah State University; Logan, UT*

*Supervisor: Martin Toohill Ph.D.*

**Graduate Intern**

August 2015 – May 2017

Diagnostic Assessment Clinic

*California State University, Northridge; Northridge, CA*

*Supervisor: Gary Katz, Ph.D.*

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**COMMUNITY PRESENTATIONS, OUTREACH AND SERVICE**

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**Feria de la Salud**

April 20, 2019

*Logan Community Recreation Center; Logan, UT*

**California Forum for Diversity in Graduate Education Recruiter**

October 26 – 27,  
2018

*University of San Diego; San Diego, CA*

**Feria de Educación**

December 1, 2018

*Logan High School; Logan, UT*

Logan Community Recreation Center, Logan, UT

**Feria de la Salud**

April 28, 2018

*Logan Community Recreation Center; Logan, UT*

**Community Presentation: Frente Unido**

February 16, 2018

Navarro, C., Lara, J., & Vázquez, A. L.

*The Family Place; Logan, UT.*

**Presentation: Comunicación de Parejas**

February 9, 2018

Navarro, C., Carrera, K., & Vazquez, A. L.



*The Family Place; Logan, UT.*

**SACNAS Recruiter**

October 19, 2017

*Salt Palace Convention Center; Salt Lake City, UT*

**PROFESSIONAL SERVICE**

**Student Representative**

August 2022 – Present

Internship Diversity Training Committee

*Medical University of South Carolina; Charleston, SC*

**AWARDS AND HONORS**

**Chancellor's Doctoral Incentive Program Dissertation Fellowship**

May 2022

Awarded: \$5,000

**Elwin C. Nielsen Scholarship**

April 2021

*Utah State University; Department of Psychology*

Awarded: \$2,000

**Anthony La Pray Scholarship**

April 2020

*Utah State University; Department of Psychology*

Awarded: \$1,000

**Donald Butler Quantitative Research Award**

May 2017

*California State University Northridge; Department of Psychology*

**Chancellor's Doctoral Incentive Program**

May 2017

*California State University System*

Awarded: \$30,000 subsidized loan

**Sally Casanova Pre-Doctoral Program Scholarship**

July 2016

*California State University System*

Awarded: \$3,000 grant and \$4,875 grant for summer research support

**Dean's List**

Fall 2011 – Spring 2014

*California State University Northridge: College of Social and Behavioral Sciences*

**PROFESSIONAL AFFILIATIONS**

American Psychological Association (APA)

2016 – Present

Association for Psychological Science (APS)

2018 – 2019

National Latinx Psychological Association (NLPA)	2018 – Present
Society for Research in Child Development (SRCD)	2019 – Present
APA, Division 53, Society of Clinical Child and Adolescent Psychology	2020 – Present

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### **ADDITIONAL EXPERIENCE**

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Bilingual: Fluent in English and Spanish

Trained in SPSS, R, RStudio, and Mplus

Trained in advanced statistical methods: Structural Equation Modeling (SEM),

Longitudinal Analysis, Multilevel Modeling, and Machine Learning