ADVERSE CHILDHOOD EXPERIENCES AND ADOLESCENT GANG MEMBERSHIP: UTILIZING LATENT CLASS ANALYSIS TO UNDERSTAND THE RELATIONSHIP

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DEDICATION

This dissertation is dedicated to Grammy for reminding us constantly that someone in my generation had to keep up the family tradition of being a doctor. And to Ricky, Martha, and Maggie -- you're welcome!

ABSTRACT

Research has shown that there are a number of risk factors that increase the odds of youth joining gangs, from individual- to family- to neighborhood-level risks. Studies have identified child abuse and other childhood traumatic experiences as influences on gang membership. Adverse childhood experiences (ACEs) provide a framework for how to measure and identify these traumatic events. This dissertation study uses longitudinal data from the Pittsburgh Youth Study (PYS) to inform the relationship between early life events and later gang membership. First, the count of total ACEs experienced by gang involved youth were compared to nongang youth. Then, latent class analysis was used to create groupings of ACEs to determine if particular classes of adverse events are associated with higher odds of gang membership during later adolescence. Using the longitudinal data structure of the PYS, additional latent classes were developed when breaking up the adversity into separate age ranges. ACE categories for the youngest cohort were able to be divided into early school entry (elementary school), early adolescence (middle school), and later adolescence (high school) due to their earlier age of first survey, and then these age-graded categories were added into the latent class model to determine if age specific adversity increased odds of gang membership. Lastly, covariates were added into the model to test if time-stable elements increased odds of belonging to one of the classes identified in the initial latent class analysis. The methods described above produced results, showing that gang involved youth have significantly more childhood adversity than nongang involved youth on average. When the latent class analysis was conducted, a three-class solution was found to be the most appropriate model, with classes with higher odds of adversity leading to greater odds of gang membership. There was no significant difference between two classes that had higher odds of adversity, though both included high rates of community violence experiences and parental separation. There were mixed findings on the

impact of age specific adversity. Lastly, covariates were added into the model finding early school achievement plays a large role in predicting class membership, while familial financial strain does not. The findings from this dissertation have important implications for policy and practice around gang prevention and intervention in that they can help pinpoint constellations of risk factors. Evidence-based school intervention programs, such as The Fourth R-- an in-school intervention designed to reduce delinquency through positive relationship building with teachers, parents, and pro-social peers (Crooks et al., 2011)-- are important for reducing the odds of experiencing higher odds of adversity. Additionally, programs that work with youth who experience adversity can help reduce the hurt they perpetrate on others.

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Nearly seven years ago, I was sitting at my desk at the Philadelphia Department of Human Services openly crying about a situation at the Juvenile Justice Services Center I had just witnessed. Frustrated and sad that I couldn't do anything about it because no one would listen to me, I sent an email to a Temple professor who was helping evaluate a program I was working on for the City saying that I was considering going back to graduate school for a Ph.D. Little did I know that one email would change my life forever! That professor emailed back to say she would be happy to talk to me about graduate school, and not so subtly suggested that Temple University's Department of Criminal Justice might be a great fit, and now that professor is my dissertation chair. I am so thankful for everything Dr. Caterina Roman has done for me over the last 6+ years. She has made me the scholar I am today, always encouraging me to explore new research methods, supporting my passions in and out of school, expanding my network, and teaching me as much as she could. She has been one of my biggest cheerleaders and supporters throughout my entire graduate career, listening when personal health issues sidelined me and celebrating when wonderful life events occurred. I will be forever grateful for the opportunities I had working with and for her and I look forward to hanging out in Europe talking about gangs for years to come.

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CHAPTER 1: INTRODUCTION

Gangs and gang membership have increased significantly over the past century and with that gang violence has increased as well (Hesse, Przemieniecki, & Smith, 2016; Klein, 1995). From the mid-1990s to the early 2000s, the estimated number of gangs in the country began to decrease, but in 2004, the number began to increase again with more than one million gang members in the United States today (Hesse et al., 2016). Researchers suggest that gang members across the United States are responsible for more than six percent of all violent crimes, (Decker & Curry, 2002; Harrell, 2005). Depending on the definition of gang used by law enforcement and researchers, for example, the percentage of particular youth populations involved in gangs ranges from 3% to 37% (Chu, Daffern, Thomas & Lim 2012). In many cities, only 1 to 2% of the total youth population may be gang involved, highlighting the fact that gang-involved youths commit a disproportionate amount of crime (Harrell, 2005).

Gang involvement has been shown to increase the odds of involvement in violent incidents, both as a victim and as a perpetrator. In a study of more than 3,700 youth in the United States, periods of active gang involvement were associated with 10-20% increases in the odds of involvement in violent incidents (Melde & Esbensen, 2012). Youth involved in gangs are more likely than their peers, even those involved in antisocial behavior without a group affiliation, to exhibit high levels of violent behaviors (Boxer, Kubik, Ostermann, & Veysey, 2015).

Not only are gang members more likely to perpetrate violence, but they also are more likely to experience victimization themselves. For gang-involved youth, the homicide victimization rate is 100 times greater than that of the general public (Pyrooz & Sweeten, 2015). Numerous studies have shown that gang membership can lead to adverse risk behaviors which can hurt youth directly and be deleterious to the health of the community (Pyrooz & Sweeten, 2015; Melde & Esbensen,

2011), as well as have adverse effects on transitions into adulthood and successes in the long run (Krohn, Ward, Thornberry, Lizotte, & Chu, 2011).

With gang violence increasing over the last few decades and a better understanding of the life-course implications of gang involvement, identifying the factors for why youth join these groups in the first place has become an important question for research. A growing literature exists on how and why youth join gangs, based largely in the developmental life course framework. The process of entering a gang begins in childhood and progresses through distinct development stages (Krohn & Howell, 2017). While risk factors for the onset of offending and gang membership have been identified, the causal mechanisms on offending are not clear and there is more to learn about risk factors in general (Farrington, 2003). Krohn and Thornberry (2008) argued that even with an increased effort to combat gang violence over the last several decades, there is a need to identify key risk factors and so improve prevention. Criminological theories aim to explain why some youth offend compared to others, with many of the theories focusing on one time point (Farrington, 2003). As risk factors do not arise from a single incident, but rather develop and change over the life course, identifying a dynamic theory has been more difficult. Validated theories concerning joining a gang and gang involvement have been slow to develop, however most of the risk-factor research based in the life course has been substantiated, highlighting the need for early prevention and intervention (Curry, Decker, & Pyrooz, 2014; Wood & Alleyne, 2010).

Thornberry, Krohn, Lizotte, Smith, and Tobin (2003) helped establish an understanding that there is an accumulation of risk factors across all life domains that produces the greatest risk for gang membership, including family, individual, neighborhood, schools, and peers (see also Howell & Egley, 2005). Building on the life domains, Howell and Egley (2005) identified four periods of the life course-- preschool, school entry, childhood, and adolescence-- that are

influential for one's development, with certain aspects unique to each developmental phase. Risk factors in each of the periods of development have been shown to impact gang membership. Interactional theory argues that the causal influences of gang membership and other delinquent behavior varies developmentally (Thornberry & Krohn, 2006). Risk factors within the family domain are more pertinent in earlier developmental stages, whereas the peer domain will play a stronger role in later developmental periods. There is an understanding that research must consider the impact of all stages and domains, and not just one specific time period, to understand the causes and correlates of gang membership (Krohn & Howell, 2017).

The risk factor and developmental life course literature has shown that different types of trauma matter. In the literature, risk factors have been operationalized in a number of different ways (see e.g., Howell & Egley, 2005; Esbensen, Peterson, Taylor, & Freng., 2009; Wolff et al., 2019). Central to the current research, a set of measures known as the Adverse Childhood Experiences (ACEs have begun being utilized in studies with outcomes related to criminal behavior and delinquency (Wolff et al., 2019; Baglivio et al., 2014). The ACEs were originally developed and used by Felitti, Anda, and other researchers at the Centers for Disease Control (CDC) in a landmark study on health outcomes related to experiencing adversity before the age of 18 (Felitti et al., 1998). Using a standardized questionnaire about physical and emotional abuse, physical and emotional neglect, and other negative experiences within the home, researchers have found increased odds of pulmonary and vascular issues, increased alcoholism and drug use, early sexual behavior, and other poor health related outcomes (see e.g., Felitti et al., 1998; Anda et al., 1999; Anda et al., 2006; Dube, Anda, Felitti, Edwards, & Croft, 2002; Dube et al., 2006). As time has gone on, the broad categories of trauma and adversity have been maintained, but changes to the questions have been developed for different survey purposes and to allow for use in other data

sets (Wolff et al., 2019; Philadelphia Health Management Corporation, 2013). As ACEs provide a straightforward way of measuring childhood risk factors, the questionnaire is utilized in other fields beyond health, including criminology.

To date, there has been limited use of the ACEs questionnaire as a means to understand the relationship between childhood adversity and adolescent and adult gang membership. As ACEs cover all four of the life course stages identified, the questions provide an opportunity to identify particular interactions of risk factors that are related to increased odds of gang membership. The current study aims to identify particular groups of adverse experiences that are related to higher odds of gang involvement.

In order to complete this task, longitudinal data from the Pittsburgh Youth Study (PYS) for the youngest and oldest cohorts was used. The PYS collected data on youth as part of the Program of Research on the Causes and Correlates of Delinquency beginning in 1986 with a focus on boys' development of delinquent behaviors. The sample for the study was drawn from public schools in Pittsburgh, PA (Loeber, Farrington, Stouthamer-Loeber, Moffitt, & Caspi, 1998; Lahey, Gordon, Loeber, Stouthamer-Loeber, & Farrington, 1999).

Using data for the youngest and oldest cohorts, as they were the only two cohorts asked about gang membership, counts of adverse experiences were calculated for each youth by using equivalent questions to the original ACEs questionnaire categories. The first step of the study was to identify if there was a higher count of ACEs for boys who were ever involved in a gang. Analysis of variance (ANOVA) testing found that the gang involved youth had significantly higher counts of ACEs on average compared to youth who never identified as being gang involved. Knowing that gang members have higher counts of adversity, on average, the next step was to test if particular combinations of ACEs drove the relationship between gang membership and adversity.

To test the interaction of risk factors, latent class analysis (LCA) techniques were utilized to determine if there are particular constellations of adversity that occur. LCA is a statistical method that identifies unobservable subgroups within a population, which allows for comparisons between subgroups to inform policy and practice. The seven original ACE categories and two expanded ACE categories are included in the analysis to determine whether there are groupings of adversity that influence gang membership.

Due to time ordering challenges for some of the observed indicators of the latent class, the relationship between gang membership will be referred to as associational rather than causal. But, the longitudinal nature of the data did allow for four of the ACE categories to be broken up by age of occurrence to test if particular ages of adversity increased the odds of gang membership.

The last step of the dissertation research was the inclusion of covariates. Covariates related to financial strain, family stress, and academic stress are included, including controlling for cohort membership and race. Multinomial logistic regression was used to determine what covariates were significant in predicting membership into the classes identified in the second research question.

The longitudinal nature of the dataset provides an opportunity to inform policy and practice by identifying particular aspects of a youth's upbringing and particular time frames that may be the most crucial for preventing gang membership and intervening with youth who are most at-risk of gang involvement. A number of interventions have been implemented to help youth disengage from their groups, ranging from deterrence and incarceration programs, to cognitive behavioral therapies to promote behavior change (Hollin, 1993; Goldstein, 1993). In an evaluation of multisystemic therapy (MST) for delinquent youth, Boxer and colleagues (2015) found gang involvement reduced the likelihood of successful treatment as compared to non-associated youth. MST has been evaluated as one of the most effective violence reduction interventions, so these

findings highlight the difficult nature of interventions for gang-involved youth. In an evaluation of the Fourth R, an evidence-based, in-school intervention program, Crooks, Scott, Ellis, and Wolfe (2011) found that the program reduced the odds of violent delinquency for high school students, but the odds of reducing delinquency for a subsample of youth with a maltreatment history was more difficult as they had higher rates of delinquency than their peers. The implication is that prevention efforts may be more successful, therefore understanding the points in the life course that can alter the odds of gang membership are important for policy and practice.

In the end, the current study identifies potential prevention and intervention points for youth at risk of gang membership. Based in a developmental life course perspective using interactional theory, this study has theoretical implications in that risk factors were not unidirectional, and the combinations of adversity may influence each other as interactional theory portends. Additionally, with the opportunity to determine what risk factors and constellations of adversity are related to gang membership, there are policy and practice implications for practitioners in the educational, social work, and criminal justice systems. Researchers found that prevention programs are important for gang violence deterrence (Howell, 2010; Sherman, Farrington, Welsh & MacKenzie, 2002), therefore the current study is valuable for improving understanding about whom to intervene with early and what risk factors should be focused on to help prevent gang joining, and subsequently, gang-related violence.

CHAPTER 2: LITERATURE REVIEW

It has been estimated that there are more than one million gang-involved youth in the United States (Hesse et al., 2016). The problem is not just an urban problem, with nearly a quarter of towns with 2,500 to 25,000 residents reporting gang activity (Egley et al., 2004). Pyrooz and Sweeten (2015) estimated that about one out of every fifty persons between the ages of five and seventeen were gang members. The number of youths in gangs grew over the decades and with it violence (Hesse et al., 2016), creating a public health crisis. In order to stop the growth of gangs and the associated violence, it is essential to understand the factors that lead to gang membership. This review of the literature will be divided into three sections. First, life course theories, with a focus on interaction theory, will be outlined. Second, longitudinal studies applying risk factors for gang membership will be discussed. Lastly, an overview of adverse childhood experiences (ACEs) literature is presented, with a focus on its previous use in criminal justice literature. This dissertation argues that ACEs are one way to measure and test risk factors. In this section, studies using ACEs to examine the relationship between childhood adversity and criminal behavior are presented. The discussion of different studies using ACEs will explain why the methods discussed later on are appropriate for testing the relationship between childhood adversity and gang membership; this can help to identify policy and practice to reduce gang violence plaguing the United States.

Interactional Theory

Developmental and life course theories of crime focus on the goal of explaining the onset, persistence, and desistance of offending behaviors of individuals over their lives (McGee & Farrington, 2001). The field of developmental perspectives builds off of the adolescent limited criminology movement of the earlier 20th century, which tended to ignore individual differences

between offenders and was often based on cross-sectional data for adolescents and youth, ignoring the broader influences on behavior. The new paradigm shift recognized that crime and deviance must be explained over the entire life course of an individual, from birth through desistance and after (Laub & Sampson, 2003). Under the larger developmental and life course perspective umbrella are several theories of crime and deviance, including but not limited to general age-graded theory of crime, social developmental model, and interactional theory (Ward, 2019).

While there are many developmental and life course theories, interactional theory serves as the guiding framework for this dissertation as it was developed to explain adolescent delinquency through changing bonds and relationships that may be impacted by adversity and risk factors in a youth's life. Interactional theory proposes that the primary cause of delinquent behavior is the weakening of bonds to conventional beliefs and society (Thornberry, 1987). This idea is similar to the idea of integrated control theory, however there is an understanding that these relationships are not stable over the life course, and it is not a unidirectional causal pattern between social associations and criminal behavior or between any of the other measures of social bonds, as behaviors can influence relationships and the different bonds can alter each other as well (Thornberry et al., 1991).

Beyond simply integrating control theories with learning theories at one time point, attachment to parents has been shown to become reciprocally linked to delinquent behavior, since poor attachment to parents may lead to involvement with delinquent peers which can further weaken bonds to parents and conventional society (Thornberry, 1987). In alignment with Hawkins and Weis's (1985) and Catalano and Hawkins' (1996) social development model, socialization within families, schools, peers, and communities influence behavior sequentially, developing over time with attachments forming within each additional domain based on attachments in other life

areas. Thornberry and Krohn (2005) reinforced this notion of trajectories across different life domains interacting with each other to increase gang involvement. There is a need for theories of delinquency that include feedback effects of consequences between behavior and its causes, interactional theory challenges the idea of unidirectional causal ordering of delinquency (Thornberry, 1987; Thornberry et al., 1991).

Causal influences vary at different ages and stages on the life course and become cumulative overtime (Thornberry et al., 1991; Thornberry et al., 2003). Across the life course, different individuals will impact the social and moral constraints of youth, leading a youth to be at risk of deviant activities over time. Family influences during youth, both influenced through social learning (Akers 1973, 1998) and attachment (Hirschi, 1969), are influences on later behavior, including gang membership. Experiences in the home and surrounding environment become an additional set of risks to the youth becoming delinquent. When youth are in middle to late adolescence, the age period when there are the highest rates of delinquent involvement, peer and school risk factors are significant influences on behavior, but those early family and environmental risk factors still exist (Thornberry, 1987). Hirschi (1969) gives equal weighting to the four elements of social bonds across the life course. These elements may remain valid but will shift in importance at different developmental points due to socialization, maturation, and education (see e.g., Laub & Sampson, 2003). Interactional theory posits that there are complex patterns of linkages between life domains, developmental stages, and the onset of criminal careers which can be and should be explored (Thornberry, 2005).

This development occurs due to socialization and experiences, which affect physiological development. Adverse experiences during childhood can impair cognitive, emotional, and social functioning (Felitti et al., 1998). Understanding the relationship between risk factors for gang

membership beginning at an early age and over time are therefore imperative for understanding why youth join gangs.

Risk Factors in Longitudinal Studies

As stated earlier, interactional theory posits that risk factors increase the odds of a youth joining a gang (Thornberry et al., 2003). Rather than one risk factor at one period of time, interactional theory states that risks and adversity from numerous periods build off of each other increasing the odds of negative life outcomes. Often these risk factors fit into larger domains, including individual-, family-, school-, peer-, and community-level factors (Howell & Egley, 2005; Krohn & Thornberry, 2008; Glesmann, Krisberg, & Marchionna., 2009, O'Brien, Daffern, Chu, & Thomas, 2013). At the individual level, many of the risk factors relate to biological factors such as hyperactivity and early onset behavioral issues. Beyond these biological factors, life stressors and violent victimization are highlighted as key risk factors (Howell & Egley, 2005). The family-level risk factor domain for gang joining include a number of aspects related to broken families and poor parental relationships, which will be described in more detail below. At the community-level, feelings of safety are shown to influence gang membership, so youth in high-crime neighborhoods with high perceived availability of drugs have increased odds of joining a group (Glesmann et al., 2009; O'Brien et al., 2013).

Family-level influences on behavior begin at birth and last throughout the life course, starting with attachment to parents in the first few hours of life, and though these bonds change overtime, initial attachment has been shown to be important for future relationships and behavior (Murray & Murray, 2010). Due to this, understanding family risk factors for gang membership and violent delinquency can help to identify prevention and intervention points in a youth's childhood to prevent or end gang involvement.

Utilizing the longitudinal nature of the Pittsburgh Youth Study (PYS), Gordon and colleagues (2014) found a number of family-level predictors for gang membership. Parents having less than a high school graduation level of education was significant in predicting gang membership but not serious delinquency, defined as drug selling, serious violence, and serious theft. If the family moved during the year prior, a youth was also more likely to join a gang during the next time period of the study, but did not increase the odds of specialization in serious violence. At the individual-level, self-reported antisocial activities in previous study periods increased the odds of gang membership for a youth. A limited number of factors were included at each level of influence for gang membership within the study, not encapsulating much of the research on risk factors and gang membership. Gordon and colleagues (2014) were not able to test if there were interaction effects of the risk factors, as well.

In an earlier study of gang membership using the Pittsburgh Youth Study data, Gordon et al. (2004) examined peer influences on gang membership using fixed effects statistical models adjusted for time trends. Findings from the study indicated that boys who joined gangs often committed more delinquent acts before joining gangs than youth who never became gang members. Peer delinquency was elevated during the period of time that youth were in gangs. A limitation presented by the authors is the data do not elucidate if the boys are influenced by their friends or if they influence the friends, with no clear direction on how peer influence works with gang membership and delinquent behavior.

In a different study using the Pittsburgh Youth Study data, Stouthamer-Loeber, Loeber, Homish, and Wei (2001) did not test for gang membership directly, but they found a causal relationship between maltreatment and the development of delinquent behaviors, which they asserted was correlated with gang membership based on previous literature. A quarter of the

families from the oldest cohort of the study had been referred to social services, but only ten percent of the youth had a substantiated report of maltreatment, with the majority of those referrals for "failure to provide" (a form of neglect) and physical abuse, with nearly 40 percent of that abuse occurring before age six. Approximately five percent of the sample had been removed from their homes due to the severity of the abuse they suffered. Youth who had been referred to the child welfare system and accepted for services with substantiated cases of abuse or neglect had higher rates of aggressive behavior, fighting, and violence, which are often behaviors seen in gang involved youth (Gordon et al., 2014).

Beyond the PYS, a number of other large longitudinal studies have assessed risk factors for delinquency and gang membership. Findings from the Rochester Youth Development Study (RYDS) found that for male youth, mothers who birthed their first child before age 19 increased the odds of a child's delinquency two to three times that of youth birthed to mothers who were older than age 20. This relationship disappeared for African American boys for general delinquency but held for all boys irrespective of race for violent delinquency and odds of arrest (Pogarsky, Lizotte, & Thornberry, 2003). Smith and Thornberry (1995) found that there was a significant bivariate relationship between the likelihood of delinquency and child maltreatment for the Rochester youth. Youth who experienced the greatest number of incidents of maltreatment were significantly more likely to commit violent delinquent acts. The severity of the maltreatment experienced also increased the odds of violent and serious delinquency. In a later analysis, nearly ten percent of the Rochester youth had a substantiated report of maltreatment, and these youth had significantly higher odds of arrest, violent offending, and drug use, even when controlling for other family factors, such as parental education and family poverty (Smith, Ireland, & Thornberry 2005).

In a model of the causal processes associated with gang membership, Thornberry and colleagues (2003) created a path model to illustrate how youth joined gangs. Structural disadvantages, defined as minority status, low parental education, and nonintact families, led to less social bonding and more associations with antisocial influences. These problems led to more violent delinquency during early waves which in turn led to more life stressors. Antisocial influences, violent delinquency, and life stressors were all shown to increase gang membership for the RYDS youth (Thornberry et al., 2003). Family challenges such as separated parents and low parental attachment were included within the model.

Utilizing the longitudinal nature of the RYDS data, Augustyn and colleagues (2017) examined intergenerational continuity of gang membership. Intergenerational gang membership was found to exist for youth and their same gendered parent, so daughters with gang-involved mothers were eight times more likely to be in gangs than if the mother was never involved in a gang. This causal relationship existed for sons and their fathers but was moderated by how much the son interacts with his father and was only marginally significant. The relationship only held for sons who saw their fathers at least once a month (Augustyn, Ward, & Krohn, 2017).

For the Rochester males, the number of individual risk factors for gang membership were counted for each youth. Less than 1 percent of the males who experienced fewer than ten risk factors were gang involved. In comparison, more than 43 percent of the males who experienced more than 20 risk factors were involved in gangs (Thornberry et al., 2003; Krohn & Thornberry, 2008). Thornberry and colleagues (2003) constructed seven domains of risk: area characteristics, family sociodemographic characteristics, parent-child relations, school factors, peer relationships, individual characteristics, and early delinquency. More than three-fifths of the male youth who experienced higher than average risk in the seven domains were gang involved. Researchers using

the RYDS have found support for family-level predictors of gang membership and youth delinquency, as well as other domains such as individual-level and community-level influences (Krohn & Thornberry, 2008).

Thornberry, Ireland, and Smith (2001) have found that maltreatment is important in predicting multiple problem outcomes for youth, but the relationship between the maltreatment and the outcome can depend on when the maltreatment occurred. Using the RYDS, maltreatment was broken into four categories: early childhood only, late childhood only, adolescence only, and persistent. You who experienced maltreatment during only adolescence were 4.6 times more likely than youth who experienced no maltreatment to be involved in general delinquency. Early childhood maltreatment was no more likely than non-maltreatment group to be delinquent; in fact, the youth who experienced maltreatment only during early childhood were no more likely to be involved in almost any disruptive or problem behavior compared to the non-maltreatment group. Persistent maltreatment increased the odds of drug use and alcohol related issues four times more than for non-maltreated youth. These findings were further supported by Ireland, Smith, and Thornberry (2002), who showed that adolescence-only and persistent maltreatment increased the prevalence of official delinquency measured with abuse compared with youth who experienced no maltreatment. Youth who experienced maltreatment during only childhood did not increase their odds of official delinquency compared to youth who never experienced maltreatment. This relationship mattered for both occasional delinquents and chronic delinquent offenders (Ireland et al., 2002). If protections and interventions can be put in place to stop maltreatment early, there is a greater likelihood to stop problem behaviors during adolescence and adulthood. Data from the Gang Resistance Education and Training (GREAT) evaluation study found that more than half of the youth identified as gang members experienced more than 10 risk factors (Esbensen et al.,

2009). The GREAT program is a school-based primary prevention program focused on gang prevention in which police officers and educators teach students to avoid gang membership, develop positive relationships with law enforcement, and improve social skills. For the evaluation, a number of youths were identified as violent youth offenders and gang members prior to the program and some youth joined a gang during the evaluation period providing a large sample size of youth. Less than half a percent of gang members had experienced zero risk factors. In comparison to the gang-involved youth, only a third of violent offenders, who were not affiliated with any group, experienced more than ten risk factors, but had similar rates of experiencing no risk factors. Unlike Thornberry and colleagues' (2003) study, the risk factor domains in the GREAT evaluation were split between four risk factor domains: individual-, family-, peer-, and school-levels. For gang members, individual- and peer-level risk factors occurred at much higher rates than family and school risks, but family risks occurred at higher rates for gang-involved youth as compared to violent offenders and non-offenders who had no affiliations with groups in their study (Esbensen et al., 2009). Family influences starting at early ages had connections with gang membership. Abuse and neglect were not directly tested as family risk factors within the study.

Data from the Seattle Social Development Project identified risk factors at ages10 through 12 that increased the odds of joining a gang in later adolescence (between ages 13 and 18). Hill and colleagues (1999) examined childhood risk factors across a number of domains, including personal- and family-levels. With respect to the individual domain, youth with high externalizing behaviors and who commit more violent acts had higher odds of joining a gang. Family structure played a significant role in the odds of gang joining, and youth who had no parents living with them were almost three times as likely to join a gang as compared to youth living with two parents, including a step-parent. Using data from the same study, Herrenkohl and colleagues (2000) found

that parental violence, parental criminality, poor family management, and family conflict were all significant predictors for gang membership for youth 14 and older. Similar to Augustyn and colleagues' (2017) findings discussed above, parental attitudes towards gangs and violence were predictive of gang membership for their adolescent children, though parental attachment at ages ten to twelve and parental alcoholism were not significant (Hill, Howell, Hawkins, & Battin-Pearson, 1999). As Thornberry and colleagues (1991) indicated, attachment does not stay consistent over the life course, but connections to family and corresponding risk factors can still have relationships with gang membership. Youth with more than five risk factors were 7.2 to 10.9 times more likely to be in a gang than youth in the study who had zero or one risk factor (Herrenkohl et al., 2000).

Specifically focused on the age of onset for gang membership, Gilman, Hill, Hawkins, Howell, and Kosterman (2014) tested risk factors within multiple domains using the Seattle Social Development Project. Family prosocial environment, living with a gang member, school prosocial environment, neighborhood environment, and peer environment were all considered across the adolescents' life courses. Family environment, antisocial peers, and antisocial neighborhoods played a key role in predicting gang membership compared to nongang involved youth. Low academic achievement during early childhood was an additional risk factor for gang membership, supporting previous findings from Hill, Lui, and Hawkins, (2001). School performance has been shown to be impacted by childhood adversity, improving when there are protective factors within a home to help a child in school (Robles, Gielsvik, Hirway, Vivier, & High, 2019).

A Gang Risk of Entry Factors (GREF) assessment is a tool designed to identify youth who are most at-risk of joining a gang. The GREF includes eight risk factors and a self-reported delinquency scale which have been identified in the profiles of youth who are already gang

involved identified by Krohn and Thornberry (2008; Hennigan, Kolnick, Vindel, & Maxson, 2015). The GREF assessment was given to high-risk youth from Los Angeles County to test how accurately the assessment tool could identify gang members in the community. Youth who had four or more of any of the eight risk factors used in the assessment had a high likelihood that their label of gang involvement by law enforcement and other agencies was correct, especially for males, with one hundred percent of boys who were current gang members identified correctly with the assessment tool (Hennigan et al., 2015). For family risk factors, parental monitoring and family gang influence were found to be valid risk factors to identify a youth as gang involved.

Beyond some of the factors discussed above, poor parental supervision and monitoring, hostile family environments, and low attachment to parents and family have all been shown to be significant risk factors for gang involvement (O'Brien et al., 2013; Klein & Maxson, 2006). In a meta-analysis of risk factors for gang membership, a majority of negative life events were relevant to gang joining (Klein & Maxson, 2006), which can include undergoing traumatic experiences such as abuse, neglect, or violence in the community.

In a study of risk and protective factors for gang-involvement from Li and colleagues (2002), the Checklist of Children Distress Symptoms was used to assess the impact of exposure to community violence on emotional well-being. The study found that current and former gang involved youth had significantly higher levels of intrusive thoughts compared to nongang involved youth. In the same study, resilience was found to be significantly lower among gang involved youth, indicating that gang members were not able to cope with the stressors from their communities and their families as well (Li et al., 2002). Youth involved in gangs have higher rates of victimization and life stressors due to the enhancement effect of gang membership (Peterson, Taylor, & Esbensen, 2006). Gang involved youth in the GREAT study often said that they joined

a gang for protection, but their victimization increased during that period, adding further stress to their life.

Using a prospective cohort design, 908 individuals with substantiated cases of physical and sexual abuse and neglect were matched to a control group of 667 individuals with no official records of abuse or neglect. The study sample was drawn from validated child abuse records in a metropolitan Midwest city from 1967 to 1971, 20 years before Widom's (1989a; 1989b) study, to determine how those youth were faring as adults. The abused and neglected subjects had higher rates of having an adult criminal record and a larger number of arrests as an adult than the controls (Widom, 1989a). The higher frequency of arrests for violent offenses as adults was largely due to the abused males in the study, who had significantly higher rates for arrests than women and non-abused populations. Widom (1989b) found that nearly thirty percent of the abused and neglected child sample were arrested for criminal offenses as adults, whereas only twenty-one percent of the control sample had been arrested. Following 574 youth from ages 5 to 21-years-old, physically abused youth were significantly more likely to have violent offenses, nonviolent offenses, status offenses, and arrests compared to youth who had never been abused (Lansford et al., 2007). Widom (1989a, 1989b) suggested that abuse and neglect may impact violent criminality by creating a cycle of violence wherein abused boys believe that acting out with violence is the only way to deal with a problem, and violence becomes a learned behavior to model.

When looking to understand gang involvement due to maltreatment by an adult, in a study of nearly 2,500 youth in grades 6 to 12, Thompson and Braaten-Antrim (1998) found that physical and sexual maltreatment were significantly related to gang involvement, with youth who experienced occasional physical maltreatment being two times more likely to participate in a gang fight than youth who experienced no maltreatment. Regular maltreatment increased the odds

further, with 1.34 times greater odds of gang fighting for youth experiencing regular maltreatment compared to occasional maltreatment. Parental support, parental supervision, parental communication, and educational neglect were not. One caveat is the question asked if a parent or other adult maltreated the youth, so it is possible another adult harmed a child and a guardian was not involved in the act. Maltreatment outweighed any effect of positive parenting support on gang membership for youth in middle- and high-school. This finding shows a need to intervene with youth who have experienced abuse and neglect before they join a gang, as later improvements in parenting style may not counteract early experiences.

The above literature has highlighted the impact of adversity on children and youth and how the more childhood adversity faced by youth, the more negative the outcomes. Why do early childhood and developmental risk factors impact gang membership? The answer may lie within the youth and how their bodies handle the stressors they face in their families, their communities, and their own physiology.

Risk Factors and Impacts on Behavior

Many of the risk factors discussed above put undue stress on the youth experiencing the adversity. The stressful experiences of youth do not only impact them in the moment, but can have lasting impacts, especially if the stress is more extreme and traumatic (Pearlin, Schieman, Fazio, & Meersman., 2005). Trauma experienced by a child, whether physical or emotional, causes the release of stress hormones, which controls emotional functioning in the body (Raine, 2013). With repeated stress and the release of additional hormones, future stresses will be exaggerated as stressors leading to a cycle of wear and tear on the nervous system and brain functioning (McEwen, 1998).

Van Goozen, Fairchild, Snoek, and Harole (2007) developed the neurobiological model which suggests that the stress regulating system in the body interacts with early childhood environments. If a youth lives in a dangerous setting, the fight or flight instincts of the child can be harmed, and youth will not be able to distinguish between dangerous and safe situations. In addition, the continued stress and strain on the nervous system, will lead to a potential numbing of feelings, so a child may choose more dangerous and violent activities in order to feel excitement. Howell and Egley (2005) suggested that aggressive and disruptive behaviors, such as those consistent with these changes to the nervous system, were an important developmental piece in the etiology of gang membership.

Some of the symptoms experienced by those with high instances of trauma and abuse included panic reactions, depressed affect, anxiety, and sleep disturbances (Anda et al., 2011). These symptoms overlap with post-traumatic stress disorder (PTSD) symptoms, which have been shown to relate to involvement in violent behaviors, as both a victim and an offender. In a study of urban individuals, controlling for previous criminality, PTSD significantly increased the odds of being involved with violence (Donley et al., 2013). In a recent meta-analysis, a significant relationship between traumatic exposure for children and adolescents and the development of PTSD existed for those who were exposed to interpersonal violence (Alisic et al., 2014). A study of 235 youth at a summer camp in New York, 145 of whom had experienced maltreatment and 90 with no record of maltreatment, found that the youth who had experienced maltreatment more frequently and with more severity had significantly more behavioral problems and less social competence than the youth with no record (Manly, Cicchetti, & Barnett, 1994). In a recent study of boys in the juvenile justice system who had experienced abuse and neglect, externalizing behavioral problems, which may include physical aggression, disobeying rules, or destruction of

property, were common in victims of physical abuse and neglect, whereas boys who had experienced sexual abuse internalized their problems more often (van der Put, Lanctot, de Ruiter, & van Vugt 2015).

In a 12-year prospective study on the long-term effects of childhood physical maltreatment, youth maltreated early in life had levels of aggression, anxiety, depression, dissociation, PTSD, social problems, thought problems, and social withdrawal that were on average more than three-quarters of a standard deviation higher than those who were never maltreated (Lansford et al., 2002).These are associated with risk-taking behaviors that may include drug use or violent behaviors. These adverse experiences may therefore lead to criminal justice involvement, but there has been no direct test of whether or not an individual being involved in a gang is an intermediary step to becoming criminally involved. However, it may be expected that as involvement in gangs increases, so will involvement in acts that would lead a youth to become criminal justice involved (Thornberry et al., 2003).

The impacts of adversity during childhood alter the behavior of youth, which can include the adoption of health-risk behaviors, including gang membership, which can ultimately lead to a number of social and health problems (Felitti et al., 1998). Measuring trauma experienced by youth can be difficult without individual psychiatric evaluations, but with the assumptions presented by Felitti and colleagues (1998), the Adverse Childhood Experiences (ACEs) questionnaire provides an opportunity for a systematic look at trauma experienced during childhood for a large number of subjects. Although there are a number of different measures of trauma and childhood adversity, the ACEs questionnaire provides an opportunity to standardize measures of childhood adversity, and it is being used in a number of fields including public health and criminal justice.

Overview of ACEs

Literature on the negative side-effects of violence, maltreatment, and victimization for children is expansive, but studies often focus on one type of victimization by itself, such as child abuse, sexual abuse, or bullying (Finkelhor, Ormrod, & Turner, 2007). Looking at individual types of victimization fails to understand the impact of a complete victimization profile, as youth who experience one form of adversity often face additional types of adversity. In a nationally representative sample from the National Survey of Adolescents, latent class analysis was used to estimate six classes of mutually exclusive trauma profiles (Ford, Elhai, Connor, & Frueh, 2010). Four of the classes indicated that youth experienced multiple types of victimization (polyvictimization) during their childhoods. Altogether, these four classes represented an estimated one-third of the sample who experienced polyvictimization (multiple types of victimization). Within the victimization literature, polyvictimization is one of the constructs used to describe and quantify the exposure to multiple types or recurrent interpersonal victimizations (Musicaro et al., 2017). In children, polyvictimization is highly predictive of trauma symptoms at even higher rates than children who experience only one type of victimization multiple times (Finkelhor et al., 2006). There has been a growing recognition in the fields of public and mental health of the need to assess multiple forms of trauma and victimization for individuals in order to have a better picture of how to help those who have experienced polyvictimization (Finkelhor et al., 2007).

One of the studies that has helped shape the literature on polyvictimization and has been gaining traction as a tool to assess multiple types of victimization experienced by youth and adults is the Adverse Childhood Experiences (ACEs) study. In the landmark study, more than 13,000 adults were asked about the adversity they experienced before the age of 18, and researchers

correlated the responses with various health outcomes. The ACEs used in the original study related to psychological and physical abuse from parents, sexual abuse from an adult, substance use in the home, mental illness in the home, abuse of mothers, and household members being incarcerated during childhood (Felitti et al., 1998). Each experience is counted as an additive score, weighing each type of experience equally no matter the frequency or severity of each measure within the score. In their study, individuals who had four or more of the adverse experiences were found to have a significant increase in the odds of experiencing heart disease, cancer, diabetes, and a number of other diseases that lead to early death. In a study of polyvictimization of youth using the Developmental Victimization Survey, Finkelhor and colleagues also found that a score of four or more types of victimization, both their "low-polyvictims" and "high-polyvictims" groups, experienced significantly worse mental health outcomes than youth who did not experience multiple forms of victimization. There is a dose-response relationship, with more adverse experiences leading to more health challenges (Burke, Hellman, Scott, Weems & Carrion, 2011).

The polyvictimization literature, including ACEs, indicates that if youth experience one adversity, they are very likely to have be exposed to multiple forms of adversity and victimization (Mersky, Tonitzes, & Reynolds, 2013). For the youth in the Northwestern Juvenile Project, nearly 93 percent of the high-risk sample had experienced at least one traumatic experience, but 84 percent had experienced more than one, showing it was rare for youth in the juvenile justice system to experience only one type of traumatic event during childhood (Abrams et al., 2013). Ford, Elhai, Connor, and Frueh (2010) found that in a nationally representative sample, one-third of youth experienced multiple forms of victimization.

Several studies followed the original study assessing the impacts of ACEs on adult mental health and substance use (Merksy et al., 2013), early smoking initiation and heavy smoking (Anda

et al., 1999), premature mortality (Brown et al., 2009), and a number of other health concerns. Each additional adverse experience, for example, increased the risk of heavy drinking and self-reported alcoholism (Dube et al., 2002). Specifically, all individual ACEs, except physical neglect, were shown to increase the risk of ever using alcohol. Initiating alcohol use by age fourteen was increased two to three times with each additional ACE (Dube et al., 2006). In addition to alcohol, Dube and colleagues (2003) found that the likelihood of early initiation of drug use and alcohol addiction had a strong graded relationship with increased counts of ACEs. Alcohol and drug use have been shown to lead to other comorbid health challenges but have also been shown to influence gang membership (Wolff et al., 2019).

With the original studies, there were generalizability concerns about the samples used for those studies. In the original ACEs study, the population was largely college educated, Caucasian, and had higher socioeconomic status than many areas where these abuses are more prevalent (Wade, Shea, Rubin, & Wood, 2014). There is a disproportionate distribution of stress in disadvantaged communities, with higher levels of community stressors and abuse and neglect (Wade et al., 2014), and thus understanding the impacts of this stress and trauma on health in low-income populations is important. In a population of victims of urban community violence, the prevalence of having a score of four or more was fifty percent (Corbin et al., 2013), as compared to the findings of Felitti et al.'s of 6.2% (1998). For an urban population of those youth ranging from 0 to 20.9 years old, twelve percent of youth had at least four ACEs (Burke et al., 2011).

In 2014, an expanded set of ACEs was created that included community violence and issues that likely create stress in urban communities to capture as many stressors as possible for youth (Wade et al., 2014; Wade et al., 2015). While the original ACE studies focused on in-home trauma, the expanded ACEs added school bullying and witnessing community violence, which occur

outside of the home but have been shown to affect numerous youths. In a study of an urban population, more than forty percent of survey respondents had witnessed violence, which was the most common adversity experienced across both conventional and expanded ACEs (Wade et al., 2015). The ACEs cover thirteen constructs, providing a broad understanding of the types of adversity and trauma that may be experienced by youth: physical abuse, sexual abuse, emotional abuse, physical neglect, emotional neglect, interpersonal violence, mother treated violently, substance misuse within a household, household mental illness, parental separation or divorce, incarcerated household members, witnessing community violence, and school bullying. Table 1 shows the wording for the original ACEs and table 2 shows the expanded ACEs wording. For the questions about how often an experience occurred, if a youth said once or more it was counted as an adverse experience.

Table 1. Original Adverse Childhood Experiences Questions (Felitti et al., 1998)

Category of Exposure	Questions
Psychological Abuse	Did a parent or other adult in the household… Often or very often swear at, insult, or put you down? Often or very often act in a way that made you afraid that you would be physically hurt?
Physical Abuse	Did a parent or other adult in the household… Often or very often push, grab, shove, or slap you? Often or very often hit you so hard that you had marks or were injured?
Sexual Abuse	Did an adult or person at least 5 years older ever… Touch or fondle you in a sexual way? Have you touch their body in a sexual way? Attempt oral, anal, or vaginal intercourse with you? Actually have oral, anal, or vaginal intercourse with you?
Physical Neglect	Did you often feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Did you often feel that your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
Emotional Neglect	Did you often feel that no one in your family loved you or thought you were important or special? Did you often feel that your family didn't look out for each other, feel close to each other, or support each other?

Table 1., Continued	
Household Substance Abuse	Live with anyone who was a problem drinker or alcoholic? Live with anyone who used street drugs?
Household Mental Illness	Was a household member depressed or mentally ill? Did a household member attempt suicide?
Mother Treated Violently	Was your mother or stepmother… Sometimes, often, or very often pushed, grabbed, slapped, or had something thrown at her? Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something very hard? Ever repeatedly hit over at least a few minutes? Ever threatened with, or hurt by, a knife or gun?
Criminal Behavior in Household	Did a household member go to prison?
Parental Separation	Were your parents ever separated or divorced?

Table 2. Urban ACEs (PHMC, 2013)

Category of Exposure	**Questions**
School Bullying	How often were you bullied by a peer or classmate?
Community Violence	How often did you see or hear someone being beaten up, stabbed, or shot in real life? Did you feel safe in your neighborhood? Did you feel people in your neighborhood looked out for each other, stood up for each other, and could be trusted?

By understanding the prevalence of victimization across different populations and the health risks associated with it, it becomes possible to create plans to prevent victimization and intervene (Burke et al., 2011; Corbin et al., 2013). For early screenings of youth during their pediatric visits, it is possible to implement supports for families and help the youth improve their health through counseling and other programs (Burke et al., 2011). For populations being treated for traumatic injuries, understanding the abuses they experienced during childhood can help improve treatment within interventions, especially focused on mental health, substance abuse, and PTSD treatments (Corbin et al., 2013).

There has been some critique of ACEs as a maltreatment measure, with some arguing for the use of official and substantiated reports of abuse and neglect from child welfare agencies (e.g.,

Barrett, Kasivannis, Zhang, & Zhang, 2014; Widom, 1989a; Widom, 1989b). Relying on only official records from child protective services agencies placements may underestimate maltreatment prevalence based on cultural differences in reporting and substantiating investigations, or contextual variance in access to services (Drake, Lee, & Johnson-Reid, 2009) in addition to missing community violence that does not result in child welfare services being notified and opening an official case (Wade et al., 2014).

Additional critiques of ACEs are related to the binary measurements of each type of adversity, with no consideration of frequency, severity, or duration of the trauma experienced by children (e.g., Nofzinger & Kurtz, 2005; Smith & Thornberry, 1995). Notwithstanding these limitations, ACEs provide a number of opportunities as a research tool. The ACEs questionnaire and the broader trauma categories provide standardized and equivalent measures across different study samples and fields. The concerns must not be discounted, but as there is evidence that individual risk factors are cumulative in increasing the odds of gang involvement, the ACEs can provide a measurement tool that has been tested in a number of innovative ways.

Latent Class Analysis of ACEs

To date, a majority of research with ACEs has focused on the cumulative effects on health, equally weighting each of the types of adversity (Nofzinger & Kurtz, 2005). This idea is similar to the notion that cumulative effects of risk factors increase the odds of gang membership and violent offending, with one additional type of risk, no matter what type domain, increasing the odds of gang membership slightly (Thornberry et al., 2003; Esbensen et al., 2009). Recently, researchers have begun exploring whether particular groupings of adverse experiences have an impact on different criminogenic and health outcomes. Latent class analysis (LCA) techniques are a valid method to do just this, as LCA identifies unobserved class membership of individuals by

dividing a sample into smaller groups for comparison purposes. Identifying groups with similar rates and experiences with particular adversities may improve the ability to identify antecedents of trauma and create prevention programs in the future (Nooner et al., 2010).

In a nationally representative sample of Danish adolescents, four unique classes of adverse life events were discovered (Shevlin & Elklit, 2008). For high risk youth, serious accidents, threats of violence, childhood neglect, and physical abuse occurred at high rates compared to the other identified groups. The most prevalent group was the low-risk youth, which had low rates of all adverse life events. Accounting for nearly a third of the sample, intermediate risk group members were fairly high for having threats of violence but were low on all other adversity measures. The final group was a "pregnancy" group that made up less than four percent of the sample and had high rates of pregnancy and abortion and had experienced serious accidents and parental divorce during childhood. Nooner and colleagues (2010) looked at at-risk pre-adolescent youth to identify groups of youth with distinct abuse histories. Using LCA, four groups were determined: no physical or sexual abuse, high physical abuse/low sexual abuse, no physical abuse/moderate sexual abuse, and, high physical and sexual abuse. These studies did not provide further explanation of what might happen to youth in the future who fit into these different classes, but they did provide implications for future research efforts to look at different groupings of adverse experiences for youth.

In the previous studies, there was no distal outcome of focus, though the authors identified LCA as a tool that would be helpful for identifying impacts on future outcomes (Rebbe, Nurius, Ahrens, & Courtney, 2017). With that understanding, in a sample of American youth aging out of foster care, three subgroups of ACEs were found, and multiple distal outcomes were calculated, including gang membership (Rebbe et al., 2017). A "complex class" was found that showed

neglect, physical abuse, and substance abuse were highly likely for some youth, while the "environmental group" had high odds of witnessing violence or killings, being involved in physical fights, and experiencing a life-threatening accident. These different groups had different demographic representation between them and these youth experienced different young adult outcomes by class. Most relevant here, Rebbe and colleagues (2017) found that the odds of gang membership were significantly different between the three classes, with the highest rates of gang membership for the youth in the environmental group; 53.7 percent of youth in the environmental group were involved in gangs compared with 47.2 percent of the complex class and only 34.5 percent of the low-risk class. The findings related to the environmental group calls attention to a need for programs at the community-level to reduce exposure to witnessing violence.

Debowska and colleagues (2017) found three classes of abuse types among incarcerated men, with one group that was low on all types of abuse, a class that experienced high rates of physical and emotional abuse, and a third class that was high for all abuse types, which included physical abuse, emotional abuse, neglect, contact sexual abuse, and penetrative sexual abuse. More than half of their sample had experienced high rates of physical and emotional abuse, while only five percent had experienced high rates of all abuse types. Only the third class experienced any sexual abuse, either contact or penetrative. While gang membership was not examined, the two classes that experienced high rates of any abuse type had significantly higher odds of violent offending compared to the non-abuse class.

In a mixed gender study, Armour and colleagues (2014) analyzed abuse classes and how these classes differed in whether class members carried a gun. Four classes of ACEs were found by Armour and colleagues (2014): emotionally abused, sexually abused, abused overall, and non-abused. For their sample, a majority (86.2%) of youth had never been maltreated. In the sample,

females were overrepresented in the sexually abused group. Baglivio and colleagues (2014) reached similar findings that females in their sample of juvenile justice involved youth had higher counts of ACEs overall, and most often this was due to sexual abuse. Armour and colleagues' (2014) finding is important, because weapon carrying by girls was significantly associated with sexual abuse in early childhood, whereas there was no relationship between sexual abuse and gun carrying for boys (Leeb, Barker, & Strine, 2007).

In the field of child psychiatry, LCA with ACEs was used to explore the relationship between classes of adversity with internalizing behaviors. Lew and Xian (2019) found four distinct classes of ACE distributions: an income hardship group high on financial strains in a family, a divorce group with high rates of divorce with some income hardships experienced, a group that experienced some mental illness, substance abuse, and financial hardship in the household, and a class with high levels of multiple ACEs (family substance abuse, familial mental illness, domestic violence, parental divorce, parental incarceration, personal violence, and financial hardship). Compared to a fifth group with no ACEs, all classes experienced higher odds of comorbid internalizing disorders. Stress within the home can lead youth to internalize the pain and develop mental health disorders. Additional research is needed to understand the relationship between these adverse groups and externalizing behaviors, especially since males are often more likely to externalize trauma and stress by becoming violent or acting out in other ways (Lew & Xian, 2019).

Using LCA as a tool to study the impact of ACEs is relatively limited at this time, but there is growing support for looking at different groupings of abuse and neglect that may be correlated with specific delinquent and illegal behaviors (Rebbe et al., 2017). Though this area of research is growing slowly, the findings provide important implications for future research in this area. In

general, ACEs research has only started to look at individuals involved with the criminal justice system.

Growing ACEs Literature for Criminal Justice Populations

In the victimization literature for criminal justice and juvenile justice populations, ACEs are one way that adversity has been measured and used to compare across different samples. One study looked at a population of 151 adult male offenders who were court-ordered to outpatient psychological treatments, and found that 48.3% of the sample had a score of four or more as compared to 12.5% of males reporting four or more ACEs in the original sample (Felitti et al., 1998; Reavis, Looman, Franco, & Rojas, 2013). There has only been the one study analyzing the prevalence of ACEs in an adult criminal justice population, and even that population was small and very specific in that the model only analyzed the prevalence for criminally involved males in outpatient treatments.

Only a few more studies have been conducted analyzing the prevalence of ACEs for juvenile justice involved populations. A number of studies have used juvenile justice involved youth from the Florida Department of Juvenile Justice (FDJJ) who received an official referral, the equivalent of an adult arrest, which provides a sample of more than 64,000 youth who have received screeners about childhood adversity (Baglivio et al., 2014; Baglivio et al., 2015; Fox, Perez, Cass, Baglivio, & Epps, 2015). The data have been used to examine a number of criminal justice outcomes ranging from involvement in the system in the first place, identifying the seriousness of an offense, reentry and recidivism rates for juvenile offenders, and a number of additional outcomes. Each study conducted with the FDJJ data calls for the implementation of screeners for help with prevention and intervention practices. In the full sample, half of the juvenile justice involved youth reported a score of four or more ACEs and only 2.8% reported no ACEs

(Baglivio et al., 2014; Baglivio & Epps, 2016). Juvenile offenders were 13 times less likely to have no adverse experiences than Felitti et al.'s (1998) original study. The offenders were also four times more likely to have to four or more ACEs than the normative sample (Baglivio et al., 2014).

For the FDJJ youth, the relationship between ACEs and gang involvement was tested using structural equation modeling to test whether higher exposure to childhood trauma predicted later gang involvement. It was found that much of the effect of ACEs on gang membership is mediated through substance abuse and difficult temperament, a measure created with confirmatory factor analysis including impulsivity, belief in the ability to control one's own behavior, empathy, respect for property, respect for authority, attitude toward law-abiding behavior, frustration tolerance, hostile interpretation of other's intent, belief in using verbal aggression, and belief in using physical aggression (Wolff et al., 2019). Though there was no significant direct effect of ACE scores on gang involvement, measured by police reports at time 2, there was a strong relationship between high ACE scores and difficult temperament and current drug use. Poor temperament and high levels of drug use significantly predicted gang involvement during time 2. Though the pathway between ACEs and gangs was not direct, this study provided evidence that ACE exposure negatively impacts adolescent development and behavioral problems (Wolff et al., 2019). These findings indicate that prevention and intervention programs for substance abuse and emotional troubles may help reduce gang involvement.

Fox and colleagues (2015) broke the juvenile justice involved population into two groups: those who have committed only one crime and never committed another and labeled this group "one and done" (O&D) and those who are serious, violent, and chronic offenders (SVC) who have committed more than one serious, delinquent act. The SVC offenders experienced significantly more ACEs than O&D offenders and ACE scores were shown to predict SVC offending versus

O&D offending (Fox et al., 2015). In addition to looking at the count of ACEs, Fox and colleagues looked at individual ACEs to determine if they predicted membership in the SVC offending group. Each measured ACE with the exception of household mental illness increased the odds of membership in the SVC group compared to the O&D group. The authors suggested that early screeners can help reduce juvenile offending no matter what, but especially help with reductions in serious offending with proper evidence-based therapies and programs put in place (Fox et al., 2015).

Using a subsample of the same dataset who had been released, structural equation modeling techniques helped researchers find ACEs had a direct and indirect effect on recidivism for more than 25,000 juvenile offenders (Wolff & Baglivio, 2017). In the study, negative emotionality was a measure created with confirmatory factor analysis using tolerance for frustration, hostile interpretation, dealing with emotions, and anxiety/depression. Nearly half of the total effect of reoffending operated through negative emotionality, with youth externalizing the traumatic experiences in their lives. ACEs were also shown to decrease the time to recidivism for juvenile offenders (Wolff et al., 2017). Supporting Widom's (1989a, 1989b) conclusions around the cycle of violence, the youth in the juvenile detention sample had experienced violence and then many acted out themselves leading them to being arrested, which further upset them, leading to additional arrests.

For the FDJJ youth, ACEs varied significantly across racial and ethnic groups in addition to varying across offense types. Experiencing more ACEs was strongly associated with committing a sexual offense, but there were differential effects on homicide based on race. For example, DeLisi and colleagues (2017) found Hispanics with four ACEs were significantly more likely to commit homicides, whereas Whites with higher ACEs were actually less likely to be arrested for homicide.

DeLisi and colleagues (2017) supported findings from Duke, Pettingell, McMorris, and Borowsky (2009) who examined more than 136,000 youth in Minnesota, finding that there were different associations between ACEs by race and gender with regard to different antisocial behaviors, including delinquency and fighting. When considering the impact of ACEs on criminal behaviors, some time-stable descriptors and covariates should be included in additional studies.

In a study aiming to understand the impacts of ACEs on recidivism, the analysis showed that stronger social bonds did not reduce the deleterious effects of exposure to more types of ACEs for youth in the juvenile justice system (Craig, Baglivio, Wolff, Piquero, & Epps, 2017). The reason for this may be explained by a study conducted by Augustyn and colleagues (2017), who found that stronger bonds to parents who are themselves involved in gang or criminal behavior, may actually increase the odds of their child being involved in similar activities. As discussed previously, parental support was not able to counteract the impact of physical and sexual abuse on youth joining gangs (Thompson & Braaten-Antrim, 1998).

Using the FDJJ data, latent class analysis was used to examine ACEs typologies and then used multilevel multinomial logistic regression to assess the relationship between individual- and community-level factors with class membership (Wolff, Cuevas, Intravia, Baglivio, & Epps, 2018). Community-level measures of immigrant concentration, residential instability, concentrated disadvantage, and concentrated affluence were significantly related to class membership – the two disadvantage/affluence measures were used in separate models. Youth who lived in communities characterized by a higher concentration of immigrants were less likely to be in a class characterized by a greater number of ACE exposures, whereas youth residing in communities characterized by greater amounts of residential instability were more likely to be in classes with moderate-to-high numbers of ACEs. Youth with high levels of disadvantage in their

communities overall were associated with membership in classes with moderate-to-high levels of adversity such as emotional abuse and family violence but not physical abuse. For youth living in communities classified by concentrated affluence, there was a lower probability of being in a class characterized by high levels of adversity.

In a study of adults involved in a hospital-based violence intervention program in Philadelphia, three-quarters of the participants in the program met full post-traumatic stress disorder (PTSD) criterion and half of the program participants had an ACE score of 4 or more (Corbin et al., 2013). All participants in this program, who had been victims of gun violence and other street violence, had at least one ACE. Of the adults in the program, a majority experienced some form of household dysfunction with fewer experiencing neglect and abuse (Corbin et al., 2013). The high prevalence of both PTSD and ACEs among victims of interpersonal street violence highlights the needs to understand why this prevalence is occurring in high-risk populations.

Though there are critiques of ACEs as a measure of trauma, significant evidence is available to show the correlational relationship between counts of traumatic experiences during childhood and delinquent and criminal behavior. As some studies have found specific types of maltreatment to impact specific behaviors in some populations --for example, sexual abuse in girls (Leeb et al., 2007)-- other research has found that polyvictimization is prevalent in high risk populations and cannot and should not be parsed apart in relation to delinquent behaviors (Ford et al., 2010). Conducting LCA on ACEs provides insight into the relationship between polyvictimization in childhood with gang membership.

CHAPTER 3: METHODOLOGY

Research Questions and Hypotheses

The overarching goal of the current study was to gain a deeper understanding of how childhood trauma can influence gang membership for adolescents and how groupings of adverse events can further relate to gang joining. This study utilized an ACEs framework to organize traumatic childhood events to allow for comparisons across literature on childhood abuse and adversity. For the purposes of this research, ACEs are used as a proxy for childhood trauma. By using a data set expressly designed to include both high-risk and low-risk male populations in an urban area, it is possible to identify if traumatic events during childhood are different for those youth who join gangs and youth who never become gang-involved. All study participants were from similar neighborhoods and schools in the same city, allowing for a focus on the individual family differences and childhood experiences to understand the relationship between these influences and gang membership. These are novel contributions to this body of literature.

This study sought to tackle four research questions to understand the association between ACEs and gang membership for boys.

Research Question 1: What is the prevalence of adverse childhood experiences for youth involved in a gang versus youth who do not identify as gang involved?

> **Hypothesis 1:** Youth who have ever been involved in a gang will have significantly higher counts of total ACEs as compared to youth who have never been involved in a gang.

Research into reasons gang members join gangs shows that there is no single reason youth join. Ten to twenty percent of youth living in high-risk, marginalized communities may join a gang during adolescence due to a number of risk factors (Hennigan et al., 2015). What has been

highlighted in the literature is that there are numerous risk factors across the life course that increase the odds for delinquent behaviors, including gang membership; these factors are not simply additive but interact with one another to increase the odds for negative outcomes (Thornberry et al., 2003). Gang risk factors fall into a number of domains, with different domains being especially salient at particular developmental periods (Howell & Egley, 2005).

The existing literature has shown that youth in the juvenile justice system and adult criminal justice system experience higher counts of adversity measured using the ACEs questions than non-incarcerated individuals (Reavis et al., 2013; Baglivio et al., 2014; Fox et al., 2015). ACEs as a framework provides the opportunity for a more standardized and recognized measure of adversity during childhood (age 18 and younger; Felitti et al., 1998). With this research in mind, the hypothesis that gang involved youth will have experienced higher counts of adversity during their childhood is formed.

Research Question 2: Are there particular classes or combinations of ACEs that amplify risk for gang membership?

Hypothesis 2A: Latent classes will emerge highlighting different groups of adverse experiences.

Hypothesis 2B: Classes with high rates of parental physical and emotional abuse and neglect will have higher rates of gang involvement than youth who do not experience adversity in the home.

Hypothesis 2C: Youth who experience environmental abuses, including witnessing community violence and bullying, will be more likely to be involved in gangs than youth who do not experience community trauma.

In the past, ACEs have been used in an additive scale with any experience with a particular category of adversity receiving a score of 1 and then summing all of the categories together (Felitti et al., 1998), which treats all adversity equally. There is a dose-response relationship between adversity and health outcomes such that each additional adversity faced increases negative health outcomes for individuals (Burke et al., 2011). Individual categories of adversity do not occur in a vacuum though, with many individuals who experience one type of adversity experiencing other types of adversity as well (Abrams et al., 2013; Mersky et al., 2013). The multiple categories of adversity faced by individuals may be experienced in particular patterns that may be important for policy makers and practitioners to recognize.

Limited research has been conducted to date looking at ACEs using LCA techniques to date, but there is some. Research that has been conducted LCA to create constellations of trauma and adversity has highlighted a few categories of trauma that group together and increase negative outcomes. Rebbe and colleagues (2017) found that there was a complex class of abuse with neglect, physical abuse, and substance abuse that were highly likely and grouped together for some individuals. Another group t found involved higher counts of traumatic experiences in the community called the environmental group, including witnessing violence and killings, being involved in fights, and experiencing life-threatening accidents. The researchers found that the environmental group has the highest rates of gang membership compared to the complex trauma group and other classes with lower odds of each adversity. This supports the hypothesis that youth who experience environmental abuses and adversity have a higher chance of being gang-involved compared to youth in the study who did not experience adversity.

Additional LCA research has looked at violent offending as an outcome after childhood adversity. In a three class model where one class experienced low odds of all abuse types, one class experienced high rates of physical and emotional abuse, and a third class had high rates of physical abuse, emotional abuse, and sexual abuse, the two classes that experienced higher odds of these abuses were more likely to be violent offenders (Debowska& Boduszek, 2017). These results do not directly equate to gang membership but being a gang member has been shown to increase violent behaviors (Hennigan et al., 2013; Pyrooz & Sweeten, 2015).

Some LCA research has been conducted without distal outcomes in place, but still used ACEs to identify patterns and groupings of traumas for sample populations. Armour and colleagues (2014) used LCA with ACEs and found four distinct classes, with a majority of individuals experiencing no trauma. The classes that had experienced adversity were classes that were high on emotional abuse and neglect, a class with high odds of sexual abuse with other abuses, and a class that experienced numerous abuse and neglect types. Though this does not directly help to explain if these classes with multiple adversity categories increase gang membership, risk factor research provides support for increased odds of gang membership with multiple risk factor experiences (Thornberry et al., 2003). I have therefore hypothesized that gang membership will be higher for classes experiencing high rates of community violence and abuses compared to classes with lower incidences of adversity.

Research Question 3: Does experiencing trauma during different developmental stages affect gang membership in different ways?

Hypothesis 3: Adverse childhood experiences at older ages will lead to gang involvement at higher rates since the youth may choose to get protection immediately.

Risk factors for gang membership fit into five life domains (individual-, family-, school-, peer-, and community-level) as described previously. Howell and Egley (2005) identified four risk factor periods in which these domains fit during the life course of a youth: preschool, school entry, childhood, and adolescence. Risk factor domains are not the same across these different periods of life. When youth are younger in the preschool and early school entry phase of life, risk factors within the family and around the household in the community are especially salient as these are the domains youth have access to. Peer and school factors become more important as youth spend less time in the home and more time at school with others of a similar age. Krohn and Howell (2017) have called for research to consider the impact of all stages and domains to understand the correlates of gang membership.

Typical ACEs research has focused on whether or not an individual ever experienced a particular category of trauma in an additive scale. One of the common critiques of ACE research is the discounting of frequency, severity, and duration of exposure to each ACE (Nofzinger & Kurtz, 2005). A majority of ACE research includes questionnaires that ask individuals older than 18 years of age about experiences they had when they were children. The cross-sectional data limits the opportunity to determine if there are particular categories of adversity at certain ages that are related to negative outcomes.

Prior work has indicated that the timing of exposure matters. Exposure to trauma during adolescence can be more detrimental than childhood-only exposure (Ireland et al., 2002; Thornberry et al., 2001). Ireland and colleagues (2002) identified four categories of age-specific maltreatment: no history of maltreatment, childhood-only maltreatment, adolescence-only maltreatment, and persistent maltreatment (maltreatment during childhood and adolescence).

Using the Rochester Youth Development Study data, adolescence-only and persistent maltreatment increased the prevalence of official delinquency measured with abuse compared with youth who experienced no maltreatment. This relationship held for both occasional delinquents and chronic delinquent offenders. There was no significant difference in the odds of involvement for the early maltreatment group compared to youth who never experienced maltreatment (Ireland et al., 2002; Thornberry et al., 2001). Later onset of maltreatment has been shown to increase the odds of delinquency.

Young children who experience maltreatment only during early childhood may have an opportunity for system actors to assist and protect them from future harm and improve their resiliency (Widom, 1989b). On the other hand, youth who slip through the cracks and experience continued maltreatment or adolescents who begin to experience adversity may not have the support and learned resiliency to improve their circumstances. Rather than receiving support from schools or outside agencies, adolescents may choose to turn to gangs for protection and support.

As life course perspective research has shown, experiencing adversity during later adolescence increases delinquent behaviors. Though gang membership has not been directly studied, I hypothesized that experiencing adversity during teen years may increase the odds of gang membership. Latent classes with adversity experienced during high school years, therefore, are expected to have higher odds of gang membership compared to classes with either younger adversity or no adversity.

Research Question 4: What early life indicators predict membership into the individual classes of adverse childhood experiences?

Hypothesis 4a: Low family socioeconomic status, housing instability, and unstable family structure will increase the odds of experiencing ACEs and will lead to higher odds of gang-involvement.

Hypothesis 4b: Youth who struggle academically during early years of schooling will be more likely to become gang involved than youth who are achieving at or above grade level.

For policy purposes, it is important to identify what combinations of risk factors may increase the odds of gang membership. There are additional opportunities for prevention when one considers what indicators may have led to membership into individual classes of adversity. Stresses within the home, for example, may lead a parent or guardian to lash out at a child or financial struggles may mean a child has to live in a less safe community increasing the odds of witnessing violence regularly.

The first hypothesis for this research question is that low family socioeconomic status and housing instability may increase the odds of experiencing ACEs. In the Pittsburgh Youth Study, a family moving within a year increased the odds of a youth being gang involved (Gordon et al., 2014). When a youth moves from one community to another regularly, there may be a lack of comfort, but also increased odds of witnessing negative behaviors as the social networks may not look out for each other and social control will be lessened (Sampson, 2013).

Housing stability may also be indicative of financial strength for a family. Families where the head of household does not have high levels of education and works more menial jobs can increase the financial strains felt within the home, which may in turn lead to an increased likelihood for maltreatment in the household. This does not mean that a child will be abused, but financial

challenges can lead to a lack of proper nutrition or health care access, a form of neglect that families experiencing poverty can encounter. Maternal depression has been associated with financial strains that are correlated with poor parenting risks (Conron, Beardslee, Koenen, Buka, & Gortmaker, 2009). These financial challenges may increase with more children in the home. Having more siblings to feed in the household adds additional strain and can increase the feelings of neglect within in the household. It is hypothesized that respondents with more financial difficulties, measured by maternal education, employment, and family size will be more likely to be assigned to a class with more adverse experiences.

For this dissertation, adversity is considered to be experienced in the home and outside of the household, in school and in the community. Hill and colleagues (2001) found that low academic achievement was shown to predict joining and remaining in a gang. Students who do not do well in school may face increased bullying or be pushed out of the classroom and into more negative experiences in the community. Poor school performance may also be an indicator of parental support for a student and if students are falling through the cracks within the education system. Studies have found that students who hear gun violence in their communities will have suppressed reading IQ measures (Raine, 2013), so this measure may be related to latent classes where community violence and the expanded ACEs are highest. It is hypothesized that lower educational success early in life will be related to higher rates of adversity within latent classes.

Data

Pittsburgh Youth Study

The research uses data from the Pittsburgh Youth Study (PYS). The PYS collected data on three age groups of youth as part of the Program of Research on the Causes and Correlates of Delinquency beginning in 1986 with a focus on boys' development of delinquent behaviors. The

total sample includes 1,517 total students, with 506 from the oldest sample, 508 were in the middle sample, and 503 were in the youngest sample (Loeber et al., 1998). These youth represent a sample of boys who were enrolled in 7th grade, 4th grade, and 1st grade, respectively, in the 1987-1988 school year in public schools in Pittsburgh, PA (Lahey et al., 1999). A majority of the boys sampled were Black (62%) and from lower socioeconomic status households (Gordon et al., 2014). Each cohort of youth started with a recruitment of 250 boys at-risk of delinquency, identified by the Pittsburgh Board of Education, from each grade across the city and then 250 other boys were randomly selected to create the final cohort for each year. Youth and some of their support network (parents and teachers) were surveyed and assessed semi-annually and then annually between 1987 and 2000, with follow up interviews and surveys conducted when they were adults[1]. The oldest sample was assessed from ages 13-25 with an additional survey at 35, the middle sample was assessed from 9-13 and again at age 23, and the youngest sample was surveyed from ages 9-13 and then again at 23 (Loeber et al., 1998). Due to financial limitations affecting the original project, the middle cohort was interviewed less frequently than others and received different questionnaires (Gordon et al., 2014). Due to dissimilar questions and a divergent timeline with the middle cohort, the youngest and the oldest samples are utilized for the current dissertation, which is common for studies using the PYS data (Loeber & Farrington, 1999).

Gang Membership for Pittsburgh Youth

Beginning a few years into the survey and for a total of 10 survey periods, interviewers asked each participant whether they had been a member of a gang since their last interview (Gordon et al., 2014). The youth self-nominated for gang membership, which has been shown to be a valid and accepted way of denoting gang affiliation (Esbensen et al., 2001). For the oldest

[1] The youngest cohort was surveyed twice annually in 2nd, 3rd, 4th, and 5th grade and then annually until the age of 19. The oldest cohort was surveyed twice annually in 8th and 9th grades and then annually until the age of 25.

cohort, the first interview that asked about gang membership was in their 4th wave, 2 years after the initial baseline interview, when they were 14.6 years old on average (Lahey et al., 1999). At each wave following the 4th interview, youth were asked again if they had belonged to a gang since the previous survey. For the youngest cohort, they were asked about their gang membership for the first time during their 8th wave, when they were 10.2 years of age on average, and then for each wave after. At the first wave of gang questions, 11.5% of the oldest cohort and 4.0% of the youngest cohort stated that they were ever in a gang (Table 3), but there was no follow up question about what age they were when they joined a gang. A majority of each cohort never joined a gang, but more than twenty percent of each cohort was gang-involved during at least one period of the study (Table 4). For a majority of the youth who identified as gang members, age of onset is available, but as many of the adversity measures cannot be time ordered in relation to membership, gang involvement is treated as a binary measure of ever/never involvement in a gang.

Table 3. Gang Membership at First Available Wave

In a Gang	Youngest Cohort [Avg Age 10.2] N=503	Oldest Cohort [Avg Age 14.6] N=506
No	96.0%	88.5%
Yes	4.0%	11.5%

Table 4. Gang Membership Overall

Gang Membership	Youngest Cohort N=503	Oldest Cohort N=506
No	79.2%	77.5%
Yes	20.8%	22.5%

Operationalizing ACEs

When the boys were young adults (average age 25 for the oldest cohort, average age 19 for the youngest cohort), they were given a questionnaire about their experiences with abuse and

neglect. In addition to the abuse survey itself, multiple surveys include questions about parental relationships with their sons, relationships between parents (such as marriage status and living conditions), parental mental health and addiction, and a few additional questions. Though the specific ACEs questions were not asked, many of the questions on the PYS survey can be directly mapped onto the original ACEs questionnaire, which is a technique used by a number of studies to date to use proxies for the ACE items (see Baglivio et al., 2014, Baglivio et al., 2015, Fox et al., 2015, Wolff et al., 2019).

As discussed earlier, the expanded ACE questionnaire includes questions about the community in which a child lives and his/her experiences with bullying in schools. The PYS includes questions about drugs and crime perceptions in the community in which the youth live. As Rebbe and colleagues (2017) found, witnessing violence in the community and environmental trauma were significantly related to gang membership, so these are important questions to include in the analysis. Questions about experiences at school, including being bullied are also included. The sections below describe in greater detail which PYS questions align with the ACEs, and a summary is shown in tabular format in Table 5. More detail on when the questions were asked by cohort and age can be found in Appendix B.

For the PYS data, there are many questions that overlap with the original ACEs, while other questions overlap with the general topics of the original questionnaire. Within the PYS, some questions are asked over multiple surveys and some questions are only asked once in later waves of data to encompass all previous years. Below is an explanation of what questions from the PYS were used to calculate ACEs and how often these questions were asked. Presented in Table 5 is a side-by-side comparison of the original ACE questionnaire with the PYS operationalized measures

of adversity. Each measure for the PYS operationalization is described in more detail below the table.

Table 5. Comparison of ACEs to PYS Operationalized Measures

ACE	ACE Questionnaire	PYS Question
Physical Abuse	Did a parent or other adult in the household… Often or very often push, grab, shove, or slap you? Often or very often hit you so hard that you had marks or were injured?	How many times has an adult in your family, responsible for you, hit you with something like a belt, hairbrush, a stick, or some other hard object? How many times has an adult in your family, responsible for you, hit you with a fist or kicked you hard? How many times has an adult in your family responsible for you, beaten you severely? How many times has an adult in your family, responsible for you, hurt you so badly that you were cut, had bruises on your body, or had a broken bone or something like that? Has an adult in your family, responsible for you, severely punished you in some other way that I have not mentioned?
Sexual Abuse	Did an adult or person at least 5 years older ever… Touch or fondle you in a sexual way? Have you touch their body in a sexual way? Attempt oral, anal, or vaginal intercourse with you? Actually have oral, anal, or vaginal intercourse with you?	During your childhood or adolescence, did anyone, including people outside of your family, ever try to do something sexual that you did not want?
Emotional Abuse	Did a parent or other adult in the household… Often or very often swear at, insult, or put you down? Often or very often act in a way that made you afraid that you would be physically hurt?	How many times did an adult in your family react to you by swearing or cursing at you?
Physical Neglect		

Table 5., Continued

	Did you often feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Did you often feel that your parents were too drunk or high to take care of you or take you to the doctor if you needed it?	How many times did an adult in your family react to you by leaving you alone, even when an adult should have looked after you? How many times did an adult in your family react to you by leaving you without the food you needed? How many times did an adult in your family react to you by not taking you to a doctor or hospital when you needed it? How many times has an adult in your family, responsible for you, been so drunk or high that you could not be taken care of?
Emotional Neglect	Did you often feel that no one in your family loved you or thought you were important or special? Did you often feel that your family didn't look out for each other, feel close to each other, or support each other?	You feel that no one loves you
Substance misuse within household	Live with anyone who was a problem drinker or alcoholic? Live with anyone who used street drugs?	In the past year, have you or your partner sought help for emotional problems, drugs, alcohol, or relationships?[1]
Parental Stress[2]	Was a household member depressed or mentally ill? Did a household member attempt suicide?	Have you been upset because of something that happened unexpectedly? Have you felt that you were unable to control the important things in your life? Have you felt nervous and stressed? Have you successfully dealt with irritating life hassles? Have you felt that you were coping well? Have you felt confident about your ability to handle personal problems? Have you felt things were going your way? Have you found that you could not cope with all the things that you had to do?

Table 5., Continued

		Have you been able to keep the irritations in your life under control? Have you felt that you were on top of things? Have you been angry about things that happened to you? Were you behind with things you needed to do? Have you been able to control the way that you spend your time? Have you felt that difficulties were piling up so high that you could not overcome them?
Parental separation or divorce	Were your parents ever separated or divorced?	Marital status
Incarcerated household member	Did a household member go to prison?	What was the result/outcome of biological mother's police contact?[3] What was the result/outcome of biological father's police contact?[2]
Witnessing community violence	How often did you see or hear someone being beaten up, stabbed, or shot in real life? Did you feel safe in your neighborhood? Did you feel people in your neighborhood looked out for each other, stood up for each other, and could be trusted?	Muggings and violence are a problem in the neighborhood
School bullying	How often were you bullied by a peer or classmate?	In the past year, have other kids bullied you in school? In the past year, have other kids bullied you going to and from school?

Table Notes:
[1]Question only asked of youngest cohort parents so it is not included in the LCA
[2]PYS questions were asked to guardians about their stress in comparison ACE questionnaire in which youth answered questions about their guardians' mental health
[3]Outcome of interest is incarceration

In the original ACE questionnaire (Felitti et al., 1998), physical abuse was operationalized by asking respondents if they had ever been pushed, grabbed, shoved, or slapped by a parent and whether or not a parent ever hit the respondent so hard they had marks or were injured. In the PYS,

five questions from the abuse checklist asked once were used for equivalency: how many times has an adult in your family, responsible for you, hit you with something like a belt, hairbrush, stick, or some other hard object; how many times has an adult in your family, responsible for you, hit you with a fist or kicked you hard; how many times has an adult in your family, responsible for you, beaten you severely; how many times has an adult in your family, responsible for you, hurt you so badly that you were cut, had bruises on your body, or had a broken bone or something like that; and, has an adult in your family, responsible for you, severely punished you in some other way that I have not mentioned. Similar to the scoring from the original ACE study, if the PYS respondent said any of these events had ever occurred, they received a score of one (1) for physical abuse, and if none had occurred, they received a zero (0). Due to the binary nature of each ACE measure, with different numbers of questions covering the same adverse experience in the two questionnaires, there should be no significant differences in results. All abuse questions were asked when the youngest cohort was 19 and the oldest cohort was 25.

Psychological abuse was determined with two questions: did a parent or another adult in your household swear at, insult, or put you down; and, did a parent act in a way that made you afraid that you would be physically hurt. Emotional abuse was assessed in the PYS with one question: how many times did an adult in your family react to you by swearing or cursing at you? A majority of children had been cursed at by a parent at least once, so experiencing this event at least fifteen times, which was a natural cut point in the data and nearly all youth said this had ever occurred which would impact analysis, received a score of one.

Sexual abuse occurred for twenty-two percent of study respondents (Felitti et al., 1998). In the PYS, respondents were asked if anyone, including people outside of their family, ever try to do something sexual that they did not want. Less than two percent of all study participants

answered yes, with only two boys in the youngest cohort stating they had experienced this event. In latent class analysis, overly sparse data can impact models. In addition, the data agreement for receiving and using the PYS data states that variables cannot be used if fewer than five percent of the total population is represented by the variable. Due to the limited count, these questions cannot be included in analysis.

Physical neglect questions for the PYS respondents were also asked once at later waves of data collection. Physical neglect is composed of four questions: how many times did an adult in your family react to you by leaving you alone, even when an adult should have looked after you; how many times did an adult in your family react to you by leaving you without the food you needed; how many times did an adult in your family react to you by not taking you to a doctor or hospital when you need it; and, how many times has an adult in your family, responsible for you, been so drunk or high that you could not be taken care of. If any of these events had occurred in the respondent's life, they received a score of one (1) for physical neglect, while no instances of this event were scored zero (0).

Unlike the questions described above, emotional neglect is calculated across multiple phases, but with the same question for each questionnaire. The youngest cohort was asked about emotional neglect from ages 10 to 16, while the oldest cohort had the same questions asked from age 13 to 18. The youth were asked if they felt that no one loved them. If they ever mentioned that this event was true, they received a score of one (1). If they said it was false for all surveys, they received a score of zero (0).

In the original ACEs questionnaire, and many follow-up iterations, mental illness and substance abuse of family members are separate measures (Felitti et al., 1998). Due to the nature of the PYS focused on the young male subject's mental health, behavior, and experiences, the

questions about parents' mental health and substance abuse were not asked to every parent in the PYS. In the first official wave after screening, when the youngest cohort was 6.7 years old on average and the oldest cohort was 13.1 years old on average, parents were asked about their perceived stresses. For the purpose of this study, the questions in the perceived stress checklist is being used to mark parental mental health as it relates to how parents handle stressful situations. Fourteen questions were asked to the respondent's primary guardian: have you been upset because of something that happened to you unexpectedly; have you felt that you were unable to control the important things in your life; have you felt nervous and stressed, have you successfully dealt with irritating life hassles; have you felt that you were coping well; have you felt confident about your ability to handle personal problems; have you felt things were going your way; have you found that you could not cope with all the things that you had to do; have you been able to keep the irritations in your life under control; have you felt that you were on top of things; have you been angry about things that happened to you; were you behind with things you needed to do; have you been able to control the way that you spend your time; and, have you felt that difficulties were piling up so high that you could not overcome them. After recoding so all measures had more stress measured as higher, I constructed a multi-item scale of perceived parental stress. Each question was on a Likert scale from one to three where one means never stressed or upset, two is sometimes, and three means often stressed or upset. In the created scale, those with a score greater than two on the construct were deemed to be stressed sometimes or often. This scale had good internal validity as measured with a Cronbach alpha score of greater than 0.8.

Parental divorce or separation was a question that was asked to the parents during multiple surveys, with the youngest cohort asked starting at age 6.5 through age 16 and the youngest cohort asked from age 12 through 17. If a parent was married and living with their partner for all surveys

they received a score of zero (0), but if a parent said that they were divorced, separated, or never married to the father of their child, they received a score of one (1) for parental separation or divorce.

Family criminal history was only asked in one phase of the study and encompassed all previous criminal history for all family members. For the purpose of this study, the result/outcome of biological mother's and biological father's police contact was analyzed. If the respondent said either their mother or their father had been incarcerated in a correctional facility, they received a score of one (1). Other results/outcomes for police contact included therapy, outpatient treatment, and other diversion options. Due to the lack of removal from the home, these answers received a score of zero (0), which also included families that had no contact with police. In addition, the original ACE studies focused on parental incarceration rather than other criminal justice outcomes. This may have been due to some of the additional challenges faced by families when a parent is incarcerated, from financial to systemic challenges beyond the emotional impact (Geller, Garfinkel, Cooper, & Mincy, 2009). Parental incarceration also interferes with a child's attachment to a parent (Murray & Murray, 2010), shown to negatively influence social control over a child's behavior (Hirschi, 1969).

In more recent studies, additional adverse experiences that occur outside of the home have been included, specifically bullying and witnessing community violence. For the bullying question, youth were asked questions across multiple phases if they had been bullied in school and if they had been bullied on their way to and from school. If a respondent said they had ever experienced bullying they received a score of one (1). Unfortunately, there was no question that directly asked if a youth had witnessed violence in their neighborhood, but there were questions about violence in the community in which the families lived that could be a valid equivalent. The

question asked if muggings and violence are a problem in the neighborhood in every other survey. If this statement was true for any phase, they received a score of one (1). The average ages youth were asked these questions are available in Appendix B.

As described previously, the survey asked more questions about the boys in the study and focused less on parents. For that reason, there is no question to encapsulate mothers being treated violently. In the original ACE study by Felitti and colleagues (1998), respondents stated if they had witnessed their mother being hit, kicked, or abused in another way. In the PYS, there are questions about whether the study respondent had hit his mother, but nothing about witnessing their mother's abuse by other individuals.

In total, each study respondent will receive a score of zero or one for each ACE variable for a total of 10 ACEs. Overall, the questions asked in the PYS were equivalent to the ACE questionnaire, though there are a few differences in the ways the questions are asked. Additionally, there are a few questions that are only asked once and encompass ever experiencing an event, such as physical abuse, so it is difficult to determine early or late experiences of these events. Lastly, it should be noted that there are few ACEs questions that could not be easily replicated or there were limited experiences, such as sexual abuse, that cannot be included in this study. Table 6 shows the frequency of each ACE by cohort upon initial cleaning of the data.

Table 6. Frequency of Calculated ACEs

ACE	% Youngest Cohort	% Oldest Cohort
Physical Abuse	16.70	34.39
Sexual Abuse	.69	1.90
Emotional Abuse	61.75	64.89
Physical Neglect	9.15	10.67
Emotional Neglect	26.04	32.61
Parental Stress	27.74	28.29
Parental Separation or Divorce	75.10	67.39

Table 6., Continued		
Incarcerated Household Member	11.33	24.11
Witnessing Community Violence	78.09	70.95
School Bullying	37.84	6.01

Missing Data

Throughout the PYS data collection period, attrition was relatively low with 89.7 percent of participants still actively involved in the 10th wave of data collection. Across all waves, the participation rate ranged from 88.5 to 100 percent (Stouthamer-Loeber et al., 2001). In latent class analysis, having a significant amount of missing data for one variable can create a sparseness issue leading to conversion issues (Goetghebeur, Liinev, Boelaert, & Van der Stuyft, 2009). In LCA, multiple iterations are run for each model until the model converges to a final result finding the estimated mean for each class within the model. When there are blanks or too many zeros in the data, the model will not be able to converge to a final solution and there may be two or three results that appear to be best for a particular number of classes. Wurpts and Geiser (2014) replicated LCA with conditional response probabilities in multiple ranges (30%-70%, 20%-80%, and 10%-90%). Categorical response percentages of 10% are considered sparser than 30%. The sparseness can be assisted with larger sample sizes, but with small or medium sized samples, convergence to a final solution remains difficult (Wurpts & Geiser, 2014).

In order to assess sparseness issues, after the initial operationalization and calculation of each ACE category, a missing table was run. A majority of categories experienced minimal missing data. For only six youth were missing parental stress; and one individual was missing parental separation and witnessing neighborhood violence. Within the SEM modelling for the latent classes, if there are one or two variables missing, the respondent will still receive a posterior probability for being in specific classes. For the twelve respondents who never answered questions

related to gang membership, they are left out of the analysis to determine odds of gang membership for each class, so a total of 997 respondents are assessed in the outcome analysis.

Whereas most categories of adversity had a handful of missing data, nearly one-third of the sample did not have a response for emotional abuse (311 of 1,009 individuals were missing observations). Tests were run using Stata's multiple imputation command to ensure that these responses were not "missing not at random." Complete case analysis has been used in many studies, but this leads to eliminating important data for analysis and can skew results (Zhang et al., 2017). Multiple imputation methods were used to impute the missing responses for emotional abuse. Multiple imputation is an iterative form of stochastic imputation that uses the distribution of observed data to estimate multiple values reflecting uncertainty about the unobserved and true values on a response category. Multiple imputation methods have been shown to reduce the bias in estimations for larger percentages of missing data, including 40 to 60 percent of a variable having missing data (Madley-Dowd et al., 2019). Due to the co-occurrence of the abuse and neglect categories, emotional neglect, physical abuse, and physical neglect were used to impute the missing values of emotional abuse, leading to results for the complete sample. Prior to imputation, with the missing values treated as zeros, 25.4% percent of respondents experienced emotional abuse. When imputed, 29% of the sample were deemed to be emotionally abused. Without imputing emotional abuse, the percentage of individuals experiencing that form of adversity would have been underrepresented in the dataset.

Analytic Plan

ANOVA and t-tests

The first research question asks if there are any differences in the prevalence of childhood trauma for youth in gangs versus youth who do not identify as gang members. To answer this

question, youth are classified into two groups: youth who are ever in a gang and youth who never identify as a gang member.

Every participant in the study has an ACE score out of nine[2]. The appropriate PYS questions were mapped onto the ACE questionnaire and youth received a score of one for each of the following categories that they experience: physical abuse, emotional abuse, physical neglect, emotional neglect, parental stress, parental separation or divorce, incarcerated household member, witnessing community violence, and school bullying. The youth received a total ACE score by summing the number of these adversities they have experienced. T-tests were run to see if there are significant differences between the gang and nongang member groups in their total count of ACEs. A Cohen's d test was performed on the results to determine effect size in the difference between these two groups. Additional t-tests were run on the individual categories of ACEs. Due to the multiple tests, Bonferroni corrections were used. With nine variables, the corrected p-value is .006 to indicate significant differences between the percentage of gang involved youth and youth never involved in a gang experiencing each measure of adversity.

Latent Class Analysis

Latent class analysis (LCA) is a statistical method that identifies unobservable, or latent, subgroups within a population using categorical response variables (Eid et al., 2003). Each class is mutually exclusive to the others so that all individuals within a particular class will have similar attributes that were used to determine that class and these will differ from individuals within another class (Lanza et al., 2007), providing the percentage of the population that is assigned to each group. LCA explains the frequencies of response patterns and summarizes these into a reduced number of classes. Item-response probabilities conditional on class membership show

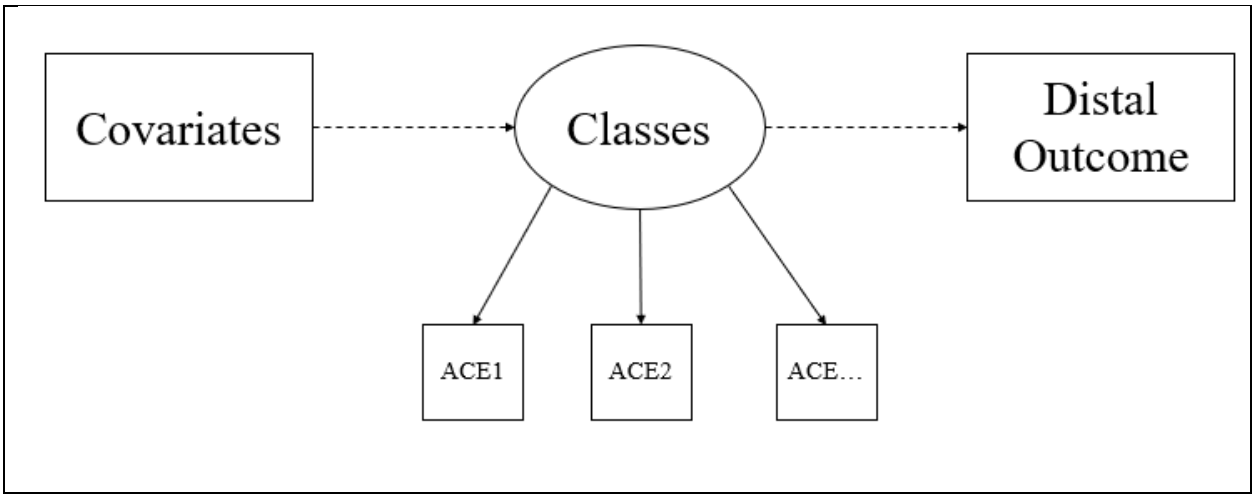
[2] Due to data sharing agreement, items that pertain to a small percentage (less than 5%) of the study sample cannot be included in the analysis as it might identify.

what the average response was on a variable used to predict class membership for each class (Lanza et al., 2007; Eid et al., 2003).

In order to determine the how many classes are most appropriate, multiple models are run with different numbers of classes identified. To choose the most appropriate number of classes, model selection is done using a number of post hoc tests. Akaike information criterion (AIC) and Bayesian information criterion (BIC) are the standard values used with the best fitting model identified where the information criterion values are at their lowest (Eid et al., 2003; Lanza & Rhoades, 2013). These values are not always at the lowest for the same number of classes. BIC scores penalize model complexity more heavily than AIC, so the lowest AIC may indicate a larger number of classes as having the best model fit (Dziak et al., 2012). Depending on what the results indicate, more classes may be better due to allowing for more diversity between groups but too many classes will be unreasonable for practitioners to use. Ultimately, reviewing what the indicated models look like, including analyzing the class membership and the item-response conditional probabilities, is the best way to truly identify the ideal number of classes (Collins & Lanza, 2010).

Covariates can be added into the model to test whether there are predictors or specific descriptive indicators of members of each class. Latent class analysis with covariates regresses a latent class variable on predictors, allowing for the estimation of odds that an individual will fall into a particular latent class (Lanza et al., 2007). Lastly, a distal outcome can be added into the model to test whether a particular class is more or less likely to experience a particular outcome (Lanza et al., 2007). A graphical depiction of the latent class analysis model is displayed below in Figure 1. Squared boxes are measured variables, whereas a round item is a latent construct.

Figure 1. Graphical Depiction of LCA with Covariates and Distal Outcomes



The developmental perspective of delinquency and gang involvement highlights the impact of cumulative risk (Thornberry et al., 2003). In ACEs research, experiencing four events or more has been shown to have the most extreme impacts on future health and is often used as a cut point in results (Felitti et al., 1998). With that in mind, this question seeks to understand if there are combinations of experiences that are the most impactful for gang membership. Utilizing latent class analysis (LCA), adverse experiences can be grouped together, similar to research done by Rebbe and colleagues (2017). LCA is completed through generalized structural equation models (GSEM) in which the variables included in the models are binary and logistic regression is used within the GSEM (Skronal & Rabe-Hasketh, 2004).

All nine categories of ACEs as described in RQ1 are loaded into the LCA model. Because each ACE has a binary value, there are 2^9 or 512 distinct variations on potential answers. These results include expanded ACE measures related to community violence and bullying. Additional tests with the same analysis will be used with the original ACE measures to see if there are any differences between the classes created when factors outside of the home are included. Utilizing

the Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) values, the best fitting model will be selected. The model with the lowest BIC and AIC determines the appropriate number of classes. When BIC and AIC are not the lowest with the same class count, additional considerations are made about what those separate models look like and which is most appropriate. Goodness of fit indicators were run for each model to determine if it performed better than a fully saturated model For the purposes of policy making, sometimes a more parsimonious model is necessary as too much nuance is not possible for system actors (Raftery, 1999).

Gang membership is used as the outcome of focus. Gang membership will be added into the model as an outcome variable to test what class has the highest odds of being gang involved. After the LCA is run to determine the most appropriate class size, posterior probabilities were calculated using Nagin's (2005) maximum-probability assignment rule, individuals were assigned based on their posterior probabilities when their posterior probability was greater than .70. Chi-squares were used to determine if there were between class differences from the expected to the realized results. To determine where the differences were and what the effect sizes were in differences in gang membership for each class, binominal regressions were run to identify differences.

The two cohorts are combined to create the latent classes. With approximately twenty percent of the respondents in gangs and with some of the individual ACE measures representing only ten percent of the sample, there are concerns about power within the analysis. By combining the two cohorts, the larger sample size improves the power. Power in LCA is a concern first for class selection, as sparse data or small numbers may limit the ability to find the appropriate and adequate classes (Dziak et al., 2014), therefore combining the two cohorts together will assist in limiting these challenges. Adding a distal outcome can also create power problems, especially with

twenty percent of the sample stating they have ever been gang involved. Finch and Bronk (2011) reported that sample sizes of 300 had low power for detecting correct models within LCA, and 500 may lead to convergence challenges.

There is some support that 500 individuals in a sample may provide adequate strength for conducting LCA, though 1,000 has been shown to be better when including distal outcomes (Lanza et al., 2013; Ulbricht et al., 2015). The analysis described above was repeated for both cohorts separately to see if the sizes and classes developed are similar. If the latent classes are the same or very similar between the youngest and the oldest cohorts when separated, this will provide strength to the identification of key combinations of trauma that are associated with gang membership for youth. When the two cohorts were separated, the oldest cohort did not experience issues with convergence for identifying the most appropriate number of classes. The AIC was lowest at a much higher number of classes, though, and there were convergence issues for the model at those values with forced convergence after 5 classes in the first LCA model. The combined count of individuals had better power for identifying the best number of classes.

Age Specific Adversity

Howell and Egley (2005) identified four periods of the life course that were important for understanding youth's development: preschool, school entry, childhood, and adolescence. The third research question seeks to understand if different developmental ages of experiencing particular adversity may increase gang membership odds. Due to the longitudinal nature of the PYS, it is possible to add in additional variations on ACEs, with trauma and adversity at different ages identified for the youngest cohort who began their surveys during the school entry period of their lives at the age of six. Then respondents were surveyed into their twenties, so there are opportunities to look at their experiences with ACEs up until the age of 18, which is the standard

used in the original study (Felitti et al., 1998). For questions about marital status, bullying, community violence, and emotional neglect, these categories were broken up into different time frames to see if the age of experiencing adversity changes the odds of joining a gang. The timing of the adversity is measured as occurring during elementary school, middle school, and high school grades for ease of interpretation and for practice implications, which are similar to school age, childhood, and adolescent age domains described by Howell and Egley (2005) and the early childhood, late childhood, and adolescence domains used by Thornberry et al. (2001). The age-specific adversity is included as binary measures rather than nominal as the developmental stage of adversity occurring is important, with binary measures allowing identification of the adversity during a particular phase.[3] Similar LCA methods as described above were used with the new categories for the youngest cohort with gang membership as the distal outcome.

Adversity for the oldest cohort was measured until the youth were 18 years old, which was only 5.5 years after the screening interview and pertains mostly to the adolescent age stage and does not provide much opportunity for variation in age ranges. The oldest cohort began their surveys in 7th grade but questions about bullying were not asked until they were at the end of their high school careers (11th and 12th grade) when some students were no longer enrolled in school, for example. The oldest cohort has no early school entry period questions about neglect, bullying, or community violence.

The youngest cohort has only 503 cohort members, so with limited missing data for this cohort there are 490 individuals to include in the analysis. The small size may limit the convergence and power in the latent class models (Lanza et al., 2013), which occurred when

[3]Binary timing variables allow for identification of early childhood-only adversity, late childhood-only adversity, and adolescent-only maltreatment similar to research by Thornberry et al. (2001).

running the model fit tests. This question is still important as it will indicate if future research breaking ACEs down into developmental stages may be reasonable and important.

Covariates

The last Research Question seeks to understand the covariates that may influence membership into individual classes of adverse childhood experiences. Using the classes identified in Research Question 2, descriptive factors will be added into the model in order to determine further prevention and intervention opportunities. Family structure (family size and living arrangements), socioeconomic status (family income), and community features (poverty) have been identified in previous literature to be related to association with gang membership and/or childhood adversity (see e.g., Duke et al., 2009; DeLisi et al., 2017; Gordon et al., 2014).

Family size is measured with the number of siblings the participant has, ranging from 0 to 8. Family income and poverty will be assessed with the education level and employment of the primary caretaker, who for most of the respondents is a mother or female head of household. Maternal education will be measured by whether or not the guardian has more than a high school education or not and whether or not the mother was employed during the screening phase.

Educational achievement of the study participant is also used as struggles in school can lead to adversity in the home and social challenges in the school and the community. A scale was created based on teachers' knowledge of students' grade level performance, -- far below grade level (1), below, at, above, or far above (5) grade level for reading, writing, spelling, and math. The youngest cohort had an alpha value of .94 and the oldest cohort had an alpha value of .96 for the scale creation, showing this scale has high internal validity.

Finch and colleagues (2014) have suggested a number of different methods to predict membership into these classes ranging from linear regression to mixture discriminant analysis.

Following a number of studies (see e.g., Marotta et al, 2018), a multinomial regression is used to identify differences in covariates in predicting membership into each of the classes.

CHAPTER 4: RESULTS

Roadmap for Results Section

The first step in the results is introducing the sample with descriptive statistics showing each ACE category mean for the entire sample. These categories are used for Research Questions 1 and 2. Research Question 3 used a subsample of the full sample, using the youngest cohort sample alone to determine if specific ages at which adversity occurred had an impact on gang membership. The fourth and final research question will add covariates to the model, which will have descriptive statistics presented within that results section. Summaries of each research question appear at the end of each section of the chapter.

Table 7 shows the descriptive statistics for the 1,009 respondents for each of the ACEs included in the latent classes and the mean of individuals who stated they were ever gang-involved. These categories were used in the first three research questions to determine the relationship between adversity groupings and gang membership. Descriptive statistics for the covariates used in Research Question 4 appear in that section.

Table 7. Descriptive Statistics

ACE Category	N	Mean	Min	Max
Gang Involvement	997	21.7%	0	1
Physical Abuse	1,009	25.6%	0	1
Physical Neglect	1,009	9.1%	0	1
Emotional Abuse	1,009	29.0%	0	1
Emotional Neglect	1,009	29.3%	0	1
Parental Stress	1,009	28.0%	0	1
Parental Separation	1,008	71.2%	0	1
Parental Incarceration	1,009	14.5%	0	1
School Bullying	897	23.1%	0	1
Community Violence	1,008	74.5%	0	1

Research Question 1: Descriptive Analyses

Using the operationalized ACEs questions, described in Chapter 3, each respondent received an ACE score. Scores range from 0, indicating no forms of adversity, to 9, indicating experiences of all forms of adversity. Each respondent was also assigned to a group of whether they were ever in a gang or never gang involved. Table 8 shows the breakdown in ACE frequency by gang involvement

Table 8. Adverse Childhood Experience Scores Summed

ACE Total	No Gang Involvement	Gang Involved	Total
0	5.5%	0%	4.3%
1	12.2%	4.2%	10.4%
2	23.6%	24.1%	23.7%
3	26.6%	23.1%	25.9%
4	18.4%	23.1%	19.5%
5	8.6%	12.0%	9.3%
6	3.7%	8.3%	4.7%
7	.8%	4.2%	1.5%
8	.6%	.9%	.7%
9	0%	0%	0%

A score of four or more is often used to indicate a turning point in the risk for negative health outcomes (Felitti et al., 1998). In this sample, 32.1% of the non-gang sample and 48.6% of the youth who were ever gang involved indicated having a score of four or more. A t-test was used to determine if the mean count of ACEs were different for the gang and non-gang involved subsamples. With only two categories, a t-test and an ANOVA find the same significance level. As indicated in Table 9, there was a significant difference in the average ACE score for the participants who stated they were involved in a gang during at least one wave of data collection (M=3.61, SD=.11) and participants who were never gang involved (M=2.89, SD=.05); t(995)=-

6.13, $p<.0001$. Cohen's d indicated that the average count of ACEs differed by approximately -0.50 standard deviations with a 95% confidence interval of (-0.62, -0.32). An effect size of .5 to .8 indicates a medium effect size. Gang involved youth experienced a significantly higher rate of adversity than their nongang involved peers.

Table 9. Two Sample t-test Results of Differences in ACEs by Gang Involvement

No Gang Involvement Avg. (N=781)	Gang Involved Avg. (N=216)	t (df=995)	Significance	Cohen's d
2.89 (.05)	3.61 (.11)	-6.13	$p<.0001$	-.50 (-.62, -.32)

With support for a significant difference in the average count of ACEs, chi-square analyses were done to determine significant between-group differences on specific ACEs categories, with Bonferroni corrections applied to the p-value to adjust for type 1 error. For 9 comparisons, the p-value must be below .006. As Table 10 indicates, individuals involved in a gang for at least one period were significantly more likely to experience emotional neglect, parental separation, and community violence. Without the Bonferroni correction, additional measures of physical neglect and parental stress would have appeared to be significant.

Table 10. Comparing Non-Gang and Gang Involved on Individual ACE Categories

	No Gang Involvement (N=781)	Gang Involved (N=216)	Significance	Risk Ratio
Physical Abuse	25.1%	28.70%	$p=.28$	1.14
Physical Neglect	9.1%	13.4%	$p<.10$	1.47
Emotional Abuse	28.2%	33.3%	$p=.14$	1.18
Emotional Neglect	27.0%	39.4%	$p<.001$*	1.46
Parental Stress	26.2%	34.7%	$p<.05$	1.32
Parental Separation	67.2%	86.1%	$p<.001$*	1.28
Parental Incarceration	14.1%	16.7%	$p=.34$	1.18

Table 10., Continued				
School Bullying	22.8%	24.2%	p=.69	1.06
Community Violence	71.2%	88.0%	p<.001*	1.24
*Indicates significance with a Bonferroni correction of p<.006 due to 9 comparisons				

I had hypothesized that youth who had ever identified as being gang involved would have significantly higher rates of total ACEs compared to youth who had never been involved in a gang. The findings from the t-test indicate that this hypothesis is supported, with gang involved youth having significantly higher counts of ACEs on average than youth who were not gang involved. For the individual ACE categories, gang involved youth experienced significantly higher percentages of emotional neglect, parental separation, and community violence than the youth who never identified as gang involved.

Research Question 2: Latent Class Analysis

Research Question 2 focuses on whether particular groups of adversity exist and whether these particular classes are related to higher odds of gang membership. Using the nine, binary ACE categories, generalized structural equation modeling techniques were used. First, the model was run multiple times with different class counts, beginning with one class. In order to determine the best model fit, the AIC and BIC were calculated for each of the class counts.

Table 11. Model Fit Statistics for Full Model

Classes	df	AIC	BIC	LRT
1	9	9601	9645	
2	19	9348	9442	p<.001
3	29	9286	*9429*	p<.001
4	39	9267	9458	p<.01
5	46	*9259*	9485	p<.10
6*	57	9261	9541	p<.10
*6 class model had a forced convergence				

The BIC and the AIC were not the lowest at the same class count, with the BIC indicating a three-class measure would be best and the AIC indicating a five-class model is preferred. In Stata, a likelihood-ratio test was run comparing each model to the previous model to determine if each additional class improved the model. Likelihood-ratio tests indicated that adding additional classes after a four-class solution was only marginally preferred. To further test which class size was the most appropriate, similar analysis was run on each of the individual cohorts, youngest and oldest. The youngest cohort had the lowest AIC with seven classes and the lowest BIC at three classes. The oldest cohort hit the lowest AIC value at three classes and the lowest BIC value at two classes, (tables with the results are in Appendix 4). Both cohorts indicated that a two or three class solution would be preferred, providing additional support for a smaller number of classes. BIC scores penalize model complexity more heavily than AIC (Dziak et al., 2012), therefore choosing the three-class model allows for more parsimony and a clearer understanding of the groupings developed for policy and practice purposes. Raftery (1999) argues that BIC provides a reasonable representation of a situation where there is little prior information known. The conservative BIC also minimizes the total error rate for posterior probabilities (Raftery, 1999), which will be used in determining if particular groupings of ACEs are associated with higher percentages of gang involvement.

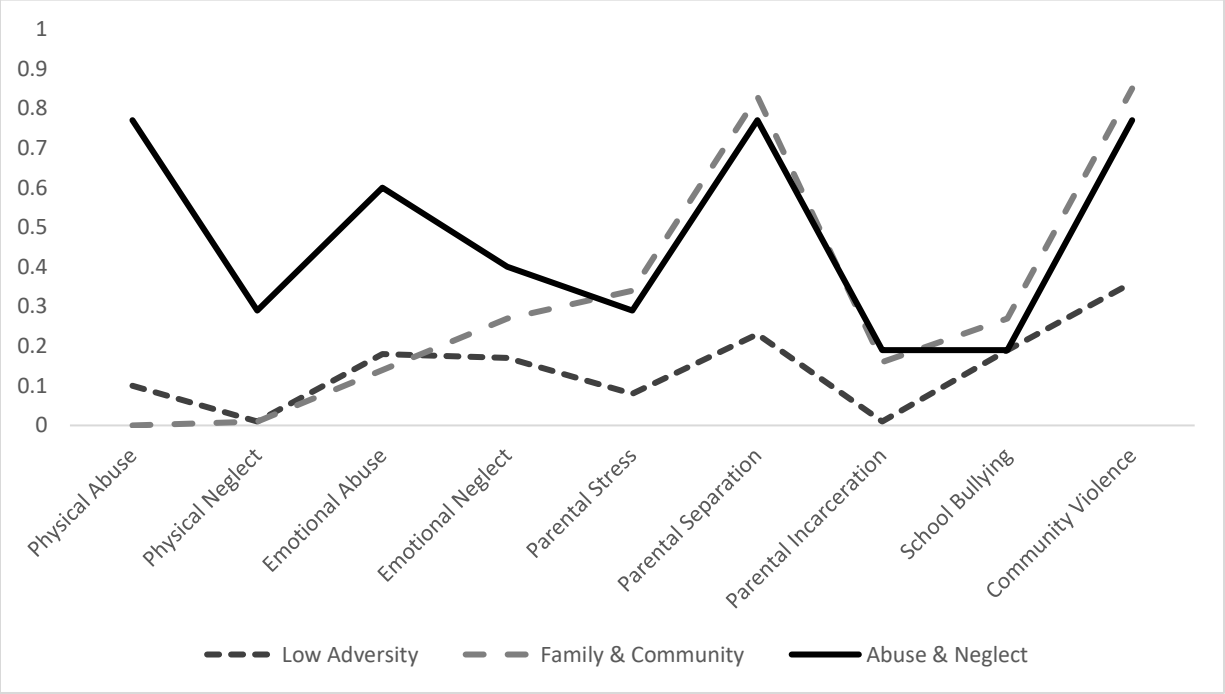
After determining the most appropriate class size, the class probabilities and marginal means for each of the ACE categories was determined using Stata's estimation tools within their LCA modeling tool. Table 12 shows the class probabilities for the three classes and the marginal means for each ACE category. A percentage of 0 would indicate that across the estimated members of that class, no one would have experienced that form of adversity. Conversely, a value of 1 indicates that the estimated members would all have experienced a form of abuse.

Table 12. Full Model, Three-Class Solution Results

Class	**1 Low Adversity**	**2 Family & Community Adversity**	**3 Abuse & Neglect**
Probability of Class Membership	16.4%	52.6%	31.0%
Physical Abuse	.10	.00	.77
Physical Neglect	.01	.01	.29
Emotional Abuse	.18	.14	.60
Emotional Neglect	.17	.27	.40
Parental Stress	.08	.34	.29
Parental Separation	.23	.83	.77
Parental Incarceration	.01	.16	.19
School Bullying	.19	.27	.19
Community Violence	.36	.85	.77

To better visualize the above results, Figure 2 shows the above results in a line graph.

Figure 2. Three Class Solution Graphical Depiction



The low adversity class (16.4%) experiences generally low probability of adversity across all categories in comparison to the other classes. These measures are lower than the abuse and neglect class across all categories. Interestingly, the low adversity class has higher percentages of physical and emotional abuse compared with the family and community adversity class. The highest probabilities of adversity for the low adversity class were for witnessing community violence (.36), parental separation (.22), and bullying (.18), which are all below the full sample means shown in Table 7. All measures of adversity for this class fell well below the full sample average for each measure." Notably, the low adversity class diverges from both groups for emotional neglect, parental stress, parental separation, parental incarceration, and community violence.

The family and community adversity class (52.6%) was the largest group of the sample population. This class had relatively low rates of physical abuse (.00) and physical neglect (.01), but experienced high probabilities of parental separation (.83), community violence (.85). This class also experienced the highest rates of parental stress (.34) and school bullying (.26) compared to the other classes. Abuse and neglect categories of adversity diverged significantly from the abuse and neglect class, but followed similar patterns and percentages for parental stress, parental separation, parental incarceration, school bullying, and community violence.

The third, and final, class is the abuse and neglect class (31.0%) characterized by high probabilities of physical abuse (.77) and emotional abuse (.60). In addition, this class has the highest rates of physical neglect (.29) and emotional neglect (.40) compared to the other classes. This class also had the highest percentage for having a parent incarcerated when they were a youth (.19), but this was not significantly higher than the two other classes. As Figure 5 indicates, below, there was no significant differences between the abuse and neglect class and the family and

community adversity class on any measures other than the abuse and neglect measures, both having higher percentages of parental separation, witnessing community violence, and parental stress.

With the three classes defined (low adversity, family and community adversity, and abuse and neglect classes), the next step is to determine if these different classes have different probabilities of being gang involved. Using Nagin's (2005) maximum-probability assignment rule, individuals were assigned based on their posterior probabilities when the group's average posterior probability was greater than .70[4]. Less than six percent (5.5%) of the low adversity class was estimated to be involved in a gang, compared to the family and community adversity class where a quarter (25.8%) of the class was estimated to be gang involved and the abuse and neglect class estimated to have 22.6% of the class gang involved. Chi-square results indicate that there is a significant difference in the expected distribution of gang members.[5]

Table 13. Probabilities Chi-Square for of Endorsement of Gang Involvement by Class for Three-Class Solution

	Low Adversity	**Family & Community**	**Abuse & Neglect**
Gang Membership	5.5%	25.8%	22.6%
N=958[6], $\chi^2(2)=24.41$, $p<.001$			

Chi-square results indicated that there was a significant difference between the expected probabilities for endorsement for gang involvement and the results. Binomial regression techniques were used to highlight the between class differences. Results indicate that individuals

[4] Mean posterior probabilities for group assignments available in Appendix E.
[5] Due to a data sharing agreement with ICPSR, results that show less than 10 respondents in a particular box cannot be included for publication, so chi-square results can be shown with the probability of endorsement, but not the full chi-square results table.
[6] The percentages shown represent the percentage of each class that is estimated to be gang involved, not the percentage of the full sample

in the family and community adversity class are nearly six times more likely to be gang involved than individuals in the low adversity class. The abuse and neglect class is nearly five times more likely to be gang involved. There is no significant difference between the odds of being in a gang for individuals in the family and community adversity and the abuse and neglect classes.

Table 14. Between Class Differences in Gang Membership in the Three-Class Model

	Coeff. (SE)	OR	z(sig)
Family & Community vs. Low Adversity	1.78 (.40)	5.91	4.43 (p<.001)
Abuse & Neglect vs. Low Adversity	1.60 (.41)	4.97	3.87 (p<.001)
Abuse & Neglect vs. Family & Community	-.17 (.17)	.84	-1.00 (p=.318)

To understand the differences between the two classes with higher adversity compared with the low adversity class, Figures 3 through 5 show the estimated percentages for each ACE category with the confidence intervals for the two classes being compared. For ease of view, these three comparisons are made in separate figures. First, in figure 3, the family and community adversity class is compared with the low adversity class, there are significant differences between the estimated probabilities for parental stress, parental separation, and community violence. For the abuse and neglect class compared to the low adversity class, see figure 4, there is no difference between the percentage experiencing bullying, but experience significantly greater percentages for all other abuse types. In both figures 3 and 4, the higher adversity classes have significantly higher probabilities for parental stress, parental separation, and community violence. As the low adversity class was low for a majority of the measures, comparing the probabilities of each ACE category for the two higher adversity classes is important to understand what might be driving the relationship with Figure 5 shows the confidence intervals for the family and community adversity

class and the abuse and neglect class for each measure. These classes differ significantly in the probability of experiencing physical neglect, emotional abuse, and emotional neglect. For parental stress, parental separation, and community violence, the measures they both had significantly higher percentages than the low adversity class on, there was no significant difference between those percentages.

Figure 3. Family & Community Adversity compared with Low Adversity Class

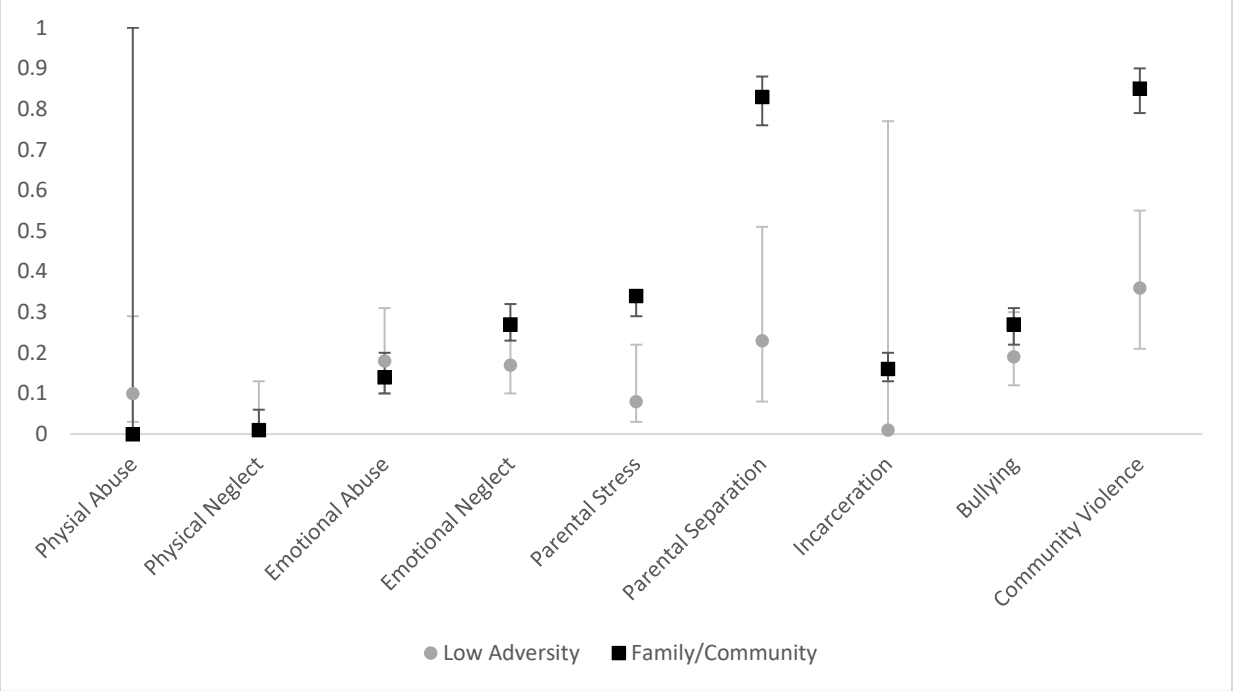


Figure 4. Abuse & Neglect Class compared with Low Adversity Class

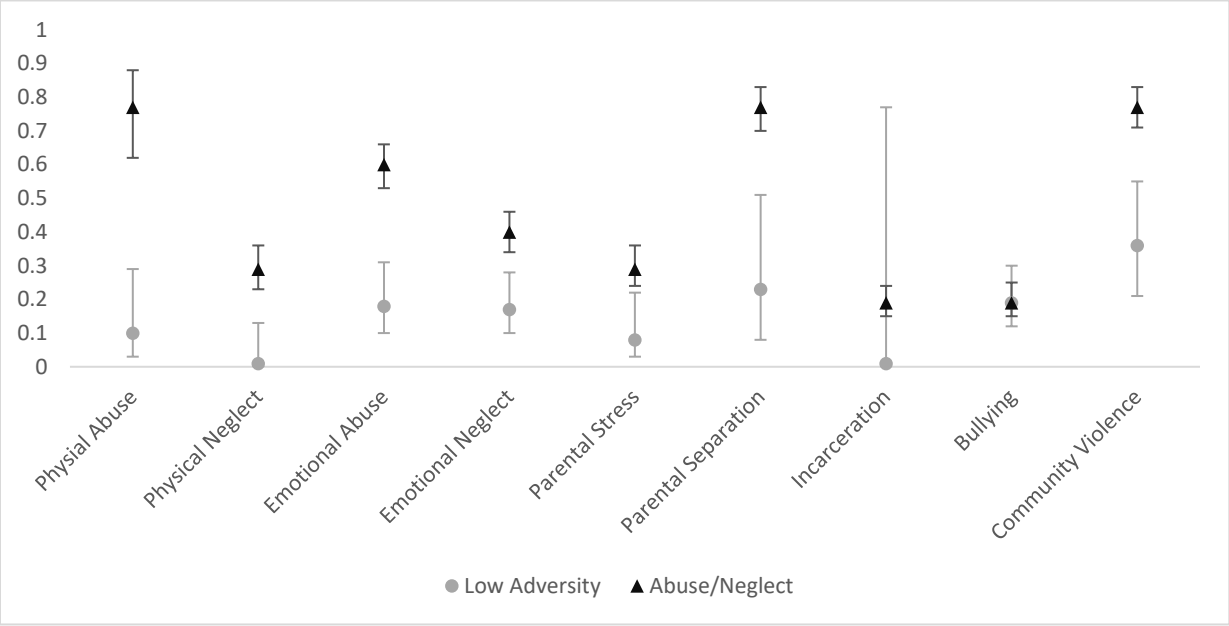
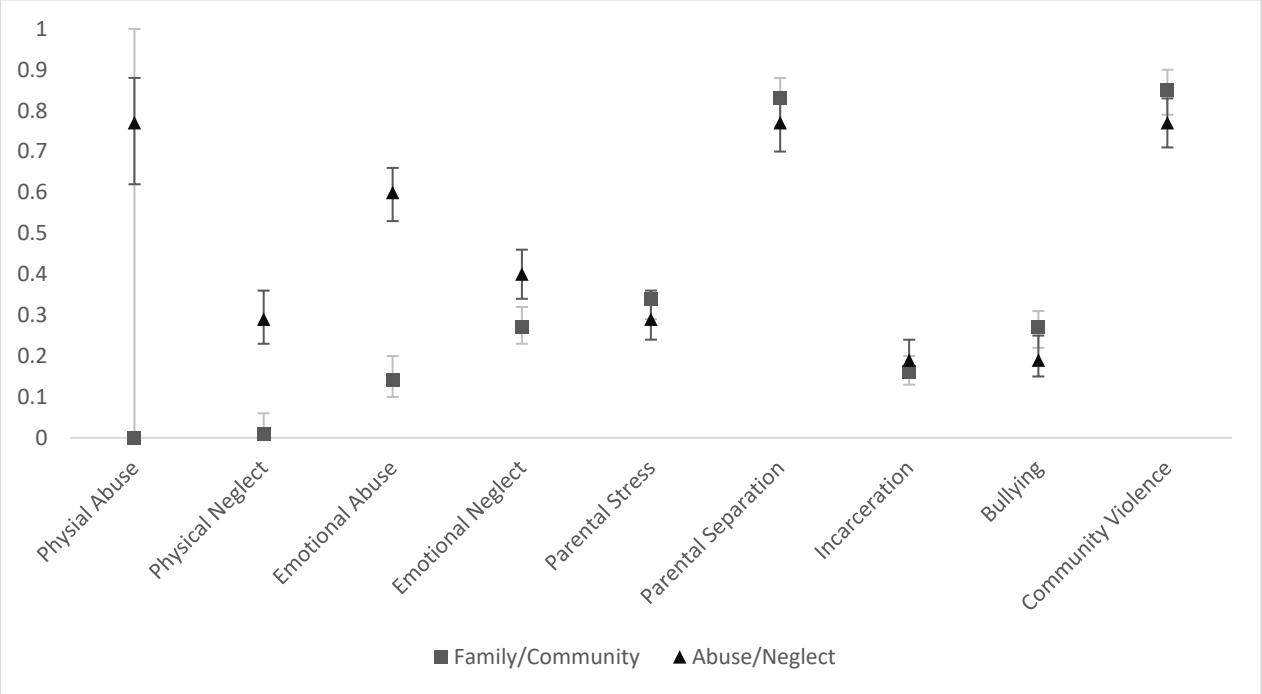


Figure 5. Family & Community Adversity compared with Abuse & Neglect



Though there were significant differences in the estimated percentages for some of the ACEs categories between the two high adversity classes, they did not differ on parental stress, parental separation, parental incarceration, school bullying, and community violence. Of those, they both had significantly higher percentages of parental stress, parental separation, and witnessing of community violence compared to the low adversity class. These final three categories may provide opportunities for prevention and intervention strategies, which will be examined further in the discussion.

Latent Class without Bullying

Though there is some support in the literature for bullying to be associated with gang membership (see e.g., Shelley & Peterson, 2019). In the literature, bullying is often operationalized as both perpetrator and victim of the behavior, so the relationship between gang member and bullying may be driven by the perpetration of the act rather than as the victim. In addition, bullying measures in studies often include online perpetration and victimization which were not measured in this study sample as the internet was not widely used during much of the study period. In the first model presented above with nine measures of adversity included, the percentage of each class experiencing bullying did not vary significantly. For these two reasons, bullying was removed from the model to run additional LCA models.

Model selection shown in table 15, indicated the BIC was lowest at a three-class solution and the AIC was lowest for a five-class solution, similar to the full ACEs model shown above. Similar tests for the individual classes indicated that a lower number of classes was the most appropriate number of classes, as well.

Table 15. Model Selection for Classes Removing Bullying

Classes	df	AIC	BIC
1	8	8630	8669
2	17	8378	8462
3	26	8315	*8443*
4	33	8294	8456
5	43	*8292*	8504
6	50	8295	8541

As bullying had not played a significant role in class membership, it is understandable that the probability of class membership and the estimated percentages for each category of adversity would be similar to the results from the nine category ACE model described previously. There are slightly fewer individuals estimated to be in the first class and they shifted to the second and third classes. The only slight change was the decrease in percentages of parental incarceration, parental separation, and parental stress compared to the full model. The low adversity class continued to have low percentages of all included ACEs categories, while the family and community adversity and abuse and neglect classes had similarly high percentages for the parental stress, parental separation, parental incarceration, and community violence in comparison.

Table 16. Three-Class Solution Removing Bullying

Class	1 **Low Adversity**	**2** **Family & Community Adversity**	**3** **Abuse & Neglect**
Probability of Class Membership	15.9%	52.8%	31.3%
Physical Abuse	.10	.00	.77
Physical Neglect	.01	.01	.29
Emotional Abuse	.18	.14	.60
Emotional Neglect	.17	.27	.40
Parental Stress	.07	.34	.29
Parental Separation	.20	.83	.77
Parental Incarceration	.00	.16	.19
Community Violence	.36	.84	.77

Posterior probabilities were calculated, and individuals were assigned to a class (Appendix E shows the mean posterior probability by class assignment). With a slight shift in estimated class membership, the endorsement of gang membership shifted slightly with 6.7% of low adversity class members identifying as gang involved. 25.6% of the family and community adversity class were gang involved, while 23.1% of the abuse and neglect class members endorsed gang membership. Table 17 shows the chi-square results for the distribution of gang membership between the three classes. Binomial regressions were run to determine the odds ratios for membership into the different classes, shown in table 18. The family and community adversity class was nearly five times more likely to be gang involved than the low adversity class when bullying was not included in the LCA model. The abuse and neglect class was a little more than four times more likely to be gang involved. As shown previously, there was no significant difference between the percentage of gang membership of those in family and community adversity and abuse and neglect classes.

Table 17. Chi-Square Results for the Endorsement of Gang Membership

	Low Adversity	**Family & Community**	**Abuse & Neglect**
Gang Membership	6.7%	25.6%	23.1%
N=910, $\chi^2(2)=15.23$, $p<.001$			

Table 18. Between Class Differences of Gang Membership in the Bullying Removed Model

	Coeff. (SE)	OR	z(sig)
Family & Community vs. Low Adversity	1.56 (.43)	4.74	3.58 ($p<.001$)
Abuse & Neglect vs. Low Adversity	1.43 (.45)	4.18	3.20 ($p<.001$)
Abuse & Neglect vs. Family & Community	-.13 (.17)	.88	-.73 ($p=.468$)

With similar results to the full model, these findings indicate that bullying may not be a necessary measure to include in LCA models using ACEs as their inclusion does not change the results drastically. The two classes that had higher percentages of parental stress, parental separation, and community violence significantly percentages of individuals who identified as gang involved in at least one wave of data collection.

Original ACE Operationalization

Because bullying did not distinguish classes in the preceding analysis, and bullying was not part of the original operationalization of ACEs, LCA was utilized to see how the original ACE categories grouped for comparison purposes. As shown above, witnessing community had been significantly higher for the family and community adversity class and the abuse and neglect classes compared to the low adversity class, whereas removing bullying did not impact the models much, removal of the community violence measure may result in differences. The final ACEs categories included in this final LCA model were physical abuse, physical neglect, emotional abuse, emotional neglect, parental stress, parental separation, and parental incarceration as the original ACE categories. As occurrences of maltreatment is hypothesized to increase the odds of gang membership, this analysis will allow for a parsing apart of the impact of abuse and neglect that may be overwhelmed by the high odds of community violence in the previous models.

With similar methods as described above, the first step was to determine the appropriate number of classes. Table 19 shows the AIC and BIC values for these models. The lowest BIC occurs at the two-class solution whereas and the lowest AIC occurs for a four-class solution.

Table 19. Model Selection for Original ACE Classes

Classes	df	AIC	BIC
1	7	7484	7518
2	15	7230	*7304*
3	23	7217	7330
4	30	*7205*	7352
5	46	9259	9485

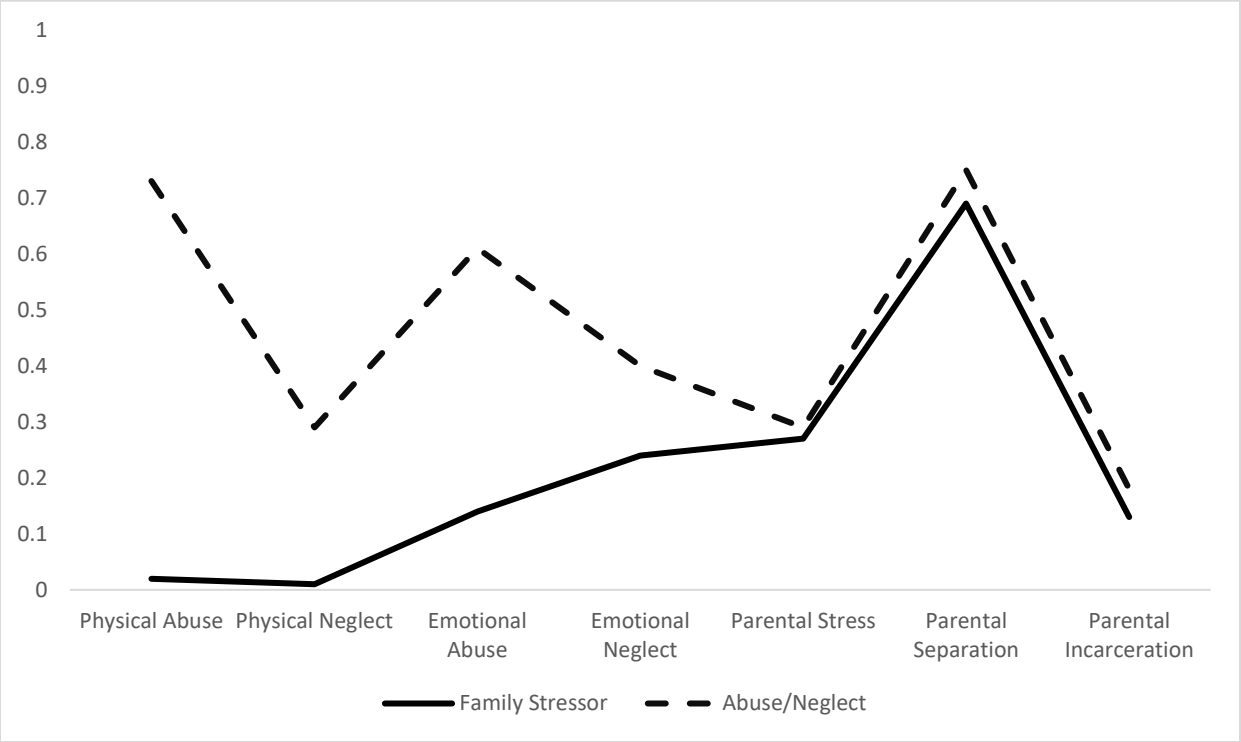
The two-class solution creates a family stressors class with 67.3% of the sample and an abuse and neglect class with 32.7% of the sample. Marginal means are shown in Table 20 and graphically depicted in Figure 6. The family stressors class (67.3%) in this solution has low percentages of physical abuse (.02), physical neglect (.01), emotional abuse (.14), and emotional neglect (.24). Though lower than the second class on all categories, the first class follows a similar pattern of percentages for parental stress (.27), parental separation (.69) and parental incarceration (.13). The abuse and neglect class (32.7%) has significantly higher marginal means for physical abuse (.73), physical neglect (.29), emotional abuse (.61), and emotional neglect (.40). A chi-square test shows that there is no significant difference in members of these two groups being involved in gangs (χ^2=1.01, df=1, p>.10). This may be due to the loss of nuance within the two classes. This may also be due to the importance of community violence in increasing membership into gangs. As argued previously, the BIC provides for a conservative estimation with greater parsimony in class selection (Raftery, 1999), In this case, the parsimony may indicate that the original ACE categories are not directly related to gang membership.

Table 20.Original ACE Operationalization, Two Class Solution Results

Class	**1** **Family Stressors**	**2** **Abuse & Neglect**
Probability of Class Membership	67.3%	32.7%

Table 20., Continued		
Physical Abuse	.02	.73
Physical Neglect	.01	.29
Emotional Abuse	.14	.61
Emotional Neglect	.24	.40
Parental Stress	.27	.29
Parental Separation	.69	.75
Parental Incarceration	.13	.18

Figure 6. Graphical Depiction of Two Class Original ACE Solution



Summary of Research Question 2

Including the expanded ACE categories led to three distinct latent classes of adversity, supporting the first hypothesis for this research question. Even removing community violence and school bullying from the analysis still lead to at least two classes of adversity, indicating that there are distinct groupings of adversity that occur for youth.

The second hypothesis was that parental abuse and neglect would increase the odds of gang membership. This hypothesis is more complicated to answer as results from the LCA when the expanded ACE measures were removed indicated that classes with significantly higher percentages of abuse and neglect did not associate with higher percentages of gang membership in the classes. In the models including community violence, the abuse and neglect class had significantly higher percentages of the four abuse and neglect categories than both of the other identified classes, but there was not a significant difference in members of this class being involved in gangs compared to the family and community adversity class. This means that the relationship might be driven most by the community violence and the family stress of parental mental health and parental separation rather than the direct abuse of a child. These results are further supported by the results in Research Question 1 in which only emotional neglect out of the abuse and neglect measures was significantly higher for the gang involved youth compared to the non-gang involved youth, but community violence was significantly higher.

With concerns that the community adversities were solely driving the relationship and quieting the impact of abuse and neglect on the relationship between child abuse and neglect with gang membership, the two expanded ACE categories were removed. Even moderate levels of abuse and neglect were not significantly higher than the low adversity group in increasing the odds of gang membership. Therefore, the second hypothesis was not entirely supported.

The third research hypothesis specifically sought to include the expanded ACEs, with higher rates of experiencing community violence and bullying increasing the odds of being gang involved. In the full model, there were three classes of adversity identified: low adversity, family and community adversity, and abuse and neglect classes. Both the family and community adversity class and the abuse and neglect class had significantly higher percentages of witnessing community

violence. Bullying was not significantly different between any of the classes found. This hypothesis is therefore only partially correct. Witnessing violence in the community was seen to increase the odds of gang membership, whereas direct victimization from bullying in the community and at school was not different across the classes.

Research Question 3: Age of Adversity Latent Classes

A majority of ACE research has ignored the timing of adversity on outcomes, sometimes due to the cross-sectional data used in the studies and with the recognition that the cumulative risk of adversity has been shown to have negative health consequences without regard to age of occurrence. The life-course perspective argues that there are different time frames for when different domains of life matter the most and the age of experiencing adversity can impact outcomes (Howell & Egley, 2005; Ireland et al., 2002). From previous research, adversity during adolescence leads to delinquent behaviors more than adversity during only childhood (Ireland et al., 2002). For Research Question 3, I sought to determine if there were particular ages of adversity for data measured throughout the study that increased the odds of gang membership.

Due to the oldest cohort only taking surveys during adolescence and early adulthood, they were taken out of the study sample for this research question, leaving the 503 youngest cohort members for analysis. Smaller sample sizes can increase difficulties with convergence in the models and can lead to sparseness in the data, so convergence for larger numbers of classes may be difficult (Dziak et al, 2014).

There were four categories of the ACEs categories that were measured over multiple waves of data for the youngest cohort: school bullying, emotional neglect, community violence, and parental separation. Using Howell and Egley's (2005) age categories, these categories were measured as binaries. School bullying and emotional neglect could be separated into middle school

(childhood) and high school (adolescence) age groupings. Community violence and parental separation were measured during early elementary school (school entry), middle school (childhood), and high school (adolescence). If the adversity occurred during those ages, they received a score of 1.[7]

Similar to the methods used for Research Question 2, the first step in the analysis was to determine the best fitting model and the appropriate number of classes. The maximum number of classes is 2^{15} (32,768), which is why there are more classes than in Research Question 2. The BIC and AIC values were not lowest at the same time, with AIC indicating that a nine-class model would be best. Due to the somewhat small sample size, this result may be due to convergence issues and the sparseness of the data could lead to errors within the calculations, with forced convergence for class sizes of 7 and greater. Therefore, the BIC indicating a five-class model is the preferred model for analysis. Table 21 shows the AIC and BIC values for the latent class models that include 15 variables.

Table 21. Model Selection for Age Graded Measures Latent Classes

Classes	df	AIC	BIC
1	15	7919	7983
2	31	7259	1930
3	47	7216	7414
4	63	7144	7410
5	76	7065	*7385*
6	93	7058	7451
7[8]	104	7055	7494
8	122	7047	7562
9	122	*7028*	7543
10	143	7050	7654

[7] Additional analysis was run where a 1 was assigned to a category of adversity only for the first time the adversity occurred, but this left significant sparseness in measures during high school leading to convergence challenges. In addition, Ireland and colleagues (2002) & Thornberry et al. (2001) measured adversity as childhood only, adolescent only, and during both so accounting for the adversity occurring during the period at all even if it wasn't for the first time was a valid measure.

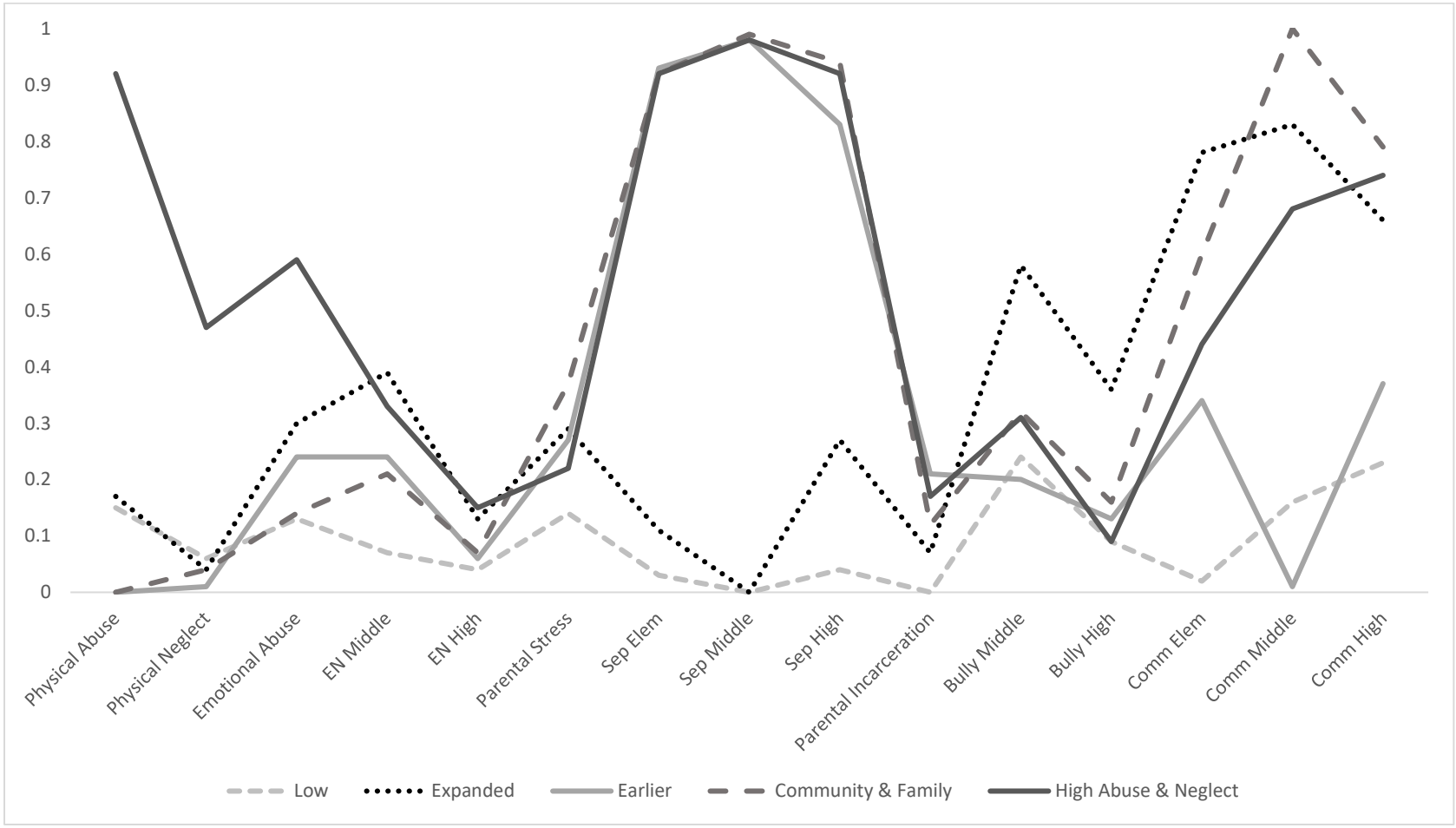
[8] Due to power issues, 7 to 10 class solutions had forced convergence so estimates of AIC and BIC may not be true.

The five-class model's class probabilities and marginal means for the ACE variables are shown in Table 22 and the percentages of each ACE category represented by individual classes are depicted in Figure 7. The classes represent an estimated 16.6, 14.2, 18.9, 35.8, and 14.5% of the sample.

Table 22. Results for Age-Specific ACEs Model, Five-Class Solution

Class	**1 Low Adversity**	**2 Expanded Adversity**	**3 Earlier Adversity**	**4 Community & Family Adversity**	**5 High Abuse & Neglect**
Probability of Class Membership	16.6%	14.2%	18.9%	35.8%	14.5%
Physical Abuse	.15	.17	.00	.00	.92
Physical Neglect	.06	.04	.01	.04	.47
Emotional Abuse	.13	.30	.24	.14	.59
Emotional Neglect					
Middle School	.07	.39	.24	.21	.33
High School	.04	.13	.06	.07	.15
Parental Stress	.14	.29	.27	.37	.22
Parental Separation					
Elementary School	.03	.11	.93	.92	.92
Middle School	.00	.00	.98	.99	.98
High School	.04	.27	.83	.94	.92
Parental Incarceration	.00	.07	.21	.12	.17
School Bullying					
Middle School	.24	.58	.20	.32	.31
High School	.09	.36	.13	.16	.09
Community Violence					
Elementary School	.02	.78	.34	.60	.44
Middle School	.16	.83	.01	1.0	.68
High School	.23	.66	.37	.79	.74

Figure 7. Graphical Depiction of Age Specific ACEs



The low adversity class (16.6%) has relatively low rates of adversity compared to the other four classes. Within this class, respondents experience very little parental separation (.00-.04) during the life course, and significantly lower percentages of community violence (.02-.23) compared to the expanded adversity, community and family, and high abuse and neglect classes. The amount of community violence they witness increases over the life course but remains low. Across the board, this class experiences low levels of adversity, similar to the low adversity class in Research Question 2.

The expanded adversity class (14.2%), based on higher percentages of the expanded ACEs categories, is the smallest of the classes and experiences fairly low levels of parental separation during early childhood, but higher rates during high school. In addition, this group experiences the highest rates of school bullying (.36-.58) and high levels of community violence (.66-.83). There are not significant differences in the percentages experiencing community violence than community and family and high abuse and neglect classes.

The earlier adversity class represents nearly a fifth of the sample (18.9%) and has extremely high rates of parental separation during all phases of the life course (.83-.98. This class also experiences early emotional neglect during middle school (.24) but not during high school (.06).

The community and family adversity (35.8%) class is the largest group, with low levels of physical abuse (.00) and neglect (.04), similar to the earlier adversity class. This class experiences high rates of community violence (.60-1.0). The category of adversity that the community and family adversity scores highest on is for parental separation with nearly all members of the class estimated to have parental separation during the life course (.92-.99), which is significantly greater than the percentages for the low adversity and expanded adversity classes. Parental stress is the highest for this class (.37) which is significantly higher than the average (.28, $p<.01$).

The high abuse and neglect class has similarly high rates of parental separation (.92-.98) as the community and family adversity class, but whereas the fourth class experienced low levels of abuse and neglect, the high abuse and neglect class has the highest rates of physical abuse (.92), physical neglect (.47), emotional abuse (.59), and emotional neglect (.15-.33). Physical abuse, physical neglect, and emotional abuse are significantly greater in the low adversity and earlier adversity classes. This class experiences community violence at similar rates as the community and family adversity and expanded adversity classes.

With the five classes defined, the next step is to determine if there are significant differences in the classes in relation to gang involvement. Though gang involvement is measured over multiple waves of data collection, only four categories of adversity were measured in multiple waves. In addition, there is no question that specifically asked the boys at what age they began their gang involvement. Even with some age specific adversity measures, there is no way to create a causal relationship between the adversity and gang membership, so these results are correlational.

Table 23. Chi-Square Results for Involvement in Gang Membership for Age Specific Classes

	Low Adversity	**Expanded Adversity**	**Earlier Adversity**	**Family & Community**	**Abuse & Neglect**
Gang Membership	7.1%	13.4%	15.3%	30.7%	25.0%
N=490, $\chi^2(2)=25.40$, $p<.001$					

Table 24. Between Class Differences and Odds of Gang Membership in the Age-Specific Model

	Coef. (SE)	**OR**	**z(sig)**
Expanded vs. Low	.71 (.55)	2.04	1.29(p=.198)
Earlier vs. Low	.87 (.52)	2.38	1.67(p<.10)
Comm/Family vs. Low	1.76 (.45)	5.83	3.90(p<.001)

Table 24., Continued			
Abuse/Neglect vs. Low	1.48 (.51)	4.39	2.89(p<.01)
Earlier vs. Expanded	.15 (.47)	1.16	.32(p=.746)
Comm/Family vs. Expanded	1.05 (.39)	2.85	2.68(p<.01)
Abuse/Neglect vs. Expanded	.76 (.46)	2.15	1.66(p<.10)
Comm/Fam vs. Earlier	.90 (.34)	2.45	2.64(p<.01)
Abuse/Neglect vs. Earlier	.61 (.42)	1.85	1.47(p=.142)
Abuse/Neglect vs. Comm/Family	-.28 (.33)	.75	-.86(p=.388)
N=490			

Binomial regressions highlighted the differences between pairs of classes. The community and family adversity and the high abuse and neglect were nearly 6 and 4.5 times more likely to report gang membership than individuals in the low adversity class. These two higher adversity classes were also both more than two times more likely to be gang-involved than individuals in the expanded adversity class. Interestingly, community and family adversity was significantly more likely to be identified as gang-involved compared to the earlier adversity class, whereas the odds of gang membership in the high abuse and neglect class did not differ significantly. Interesting, the expanded adversity class did not have significantly higher odds of gang involved members compared to the low and earlier adversity classes despite having significantly higher percentages of witnessing community violence which was shown to be impactful in the non-age-specific models in Research Question 2.

Summary of Research Question 3

Four categories of ACEs could be represented at different age periods in the life course. Dissimilar to results in Research Question 2, experiencing any form of adversity did not necessarily increase the percentages of the classes that identified as gang-involved over the life

course. Also, the high abuse and neglect class was shown to experience higher percentages of gang membership compared to the low adversity class, but the relationship may still be driven by the significantly higher percentages of group members who witnessed community violence. As expected, based on Ireland et al. (2002), earlier adversity did not significantly increase the percentage of gang membership compared to other classes. There was no class that only represented adversity later in life, which may be due to persistent adversity in the items that were measured over multiple time periods and a lack of availability in some of the other adversity measures that may have differed more by age. These findings, therefore, cannot support the hypothesis that adversity experienced during later adolescence will lead to higher rates of gang membership.

Research Question 4: Covariates of Class Identification

The fourth research question sought to determine if there are certain covariates that predict membership into the classes of adversity determined in the second research question. In the second research question, three classes were identified: low adversity, family and community adversity, and abuse and neglect. Based on literature about financial stability, family structure, and educational attainment (Gordon et al., 2014; Hill et al., 2001), covariates were selected controlling for race and cohort in the models. The variables are described below with descriptive statistics of variables shown in Table 25.

Table 25. Covariate Descriptive Statistics

Covariate	N	Mean	Min	Max
Parental College Education	999	.36	0	1
Maternal Employment	1,002	.46	0	1
Siblings	1,009	1.87	0	10
Grade Level	956	2.71	1	5

Table 25., Continued				
Black	1,009	.55	0	1
Youngest Cohort	1,009	.50	0	1

Parental education is a measure of the primary guardian's educational attainment, with a score of 1 indicating more than a high school level of education. Maternal employment is a measure of whether or not the mother was employed during the screening wave of data, with part-time or full-time employment measured as 1. Siblings is a count variable ranging from 0, indicating the study participant is an only child, to 10, which is the largest number of siblings in the study. The sibling question was asked during the screening process when the participants were in either 1st or 7th grade, so it is possible there were more siblings by the end of the study. Lastly, grade level is measured as a combined scale in which teachers of the study participants were asked if the boys were far below, below, at, above, or far above grade level for reading, writing, spelling, and math. These four categories were combined in one scale with an alpha of .93 for the youngest cohort and .96 for the oldest cohort, which indicates good internal validity for the scale. A score of 1 indicates the participant is far below grade level for all subjects and a 5 indicates being far above grade level for all subjects.

For the three classes, the family and community and the abuse and neglect classes had significantly higher odds of participants being gang involved during the life course compared to the low adversity group. For this reason, in the multinomial logistic regression, the low adversity group is being used as the comparison with the covariates loaded into the model, with results shown in Table 26.

Table 26. Multinomial Logistic Regression

	Family & Community vs. Low Adversity		**Abuse & Neglect vs. Low Adversity**		**Abuse & Neglect vs. Family & Community**	
	Coeff. (SD)	RRR	Coeff. (SD)	RRR	Coeff. (SD)	RRR
Parental College Education	-.11 (.24)	.89	-.06 (.26)	.94	.05 (.17)	1.05
Maternal Employment	.07 (.24)	1.07	.21 (.26)	1.24	.14 (.17)	1.16
Siblings	-.02 (.09)	.98	-.03 (.09)	.97	-.01 (.06)	.99
Grade Level	-.49* (.11)	.61	-.29*** (.11)	.75	.20*** (.08)	1.22
Black	2.38* (.30)	10.82	2.26* (.32)	9.60	-.12 (.17)	.89
Youngest Cohort	.41 (.23)	1.51	-.62*** (.25)	.54	-1.03* (.17)	.36
Constant	1.93 (.43)	6.88	1.13 (.46)	3.11	-.79 (.30)	.45
N=908, R^2=.11						
*p<.001, **p<.01, ***p<.05						

Maternal stress and financial strain--measured here by parental college education, maternal employment, and siblings--on a family were hypothesized to increase the odds of being in a class with more adversity. In the table above, if a guardian received at least one year of college education, the child was no more or less likely to be in the classes with higher levels of adversity compared to the low adversity class. Maternal employment was not significant in either model, as well. Having more siblings was not significant in predicting membership into either of the higher adversity classes than the low adversity class or between the two higher adversity groups. None of the indicators of additional financial stress on the family were found to influence class membership. Parental mental health and stress was included in the LCA and was significantly higher for the family and community adversity and abuse and neglect classes, so the strain indicated in those measures may not be caused or influenced by financial strains.

Significant in all three comparisons was grade level of the student. Boys who were significantly above grade level were significantly less likely to be in the low adversity group compared to the higher adversity classes. Moving from grade level to above grade level in courses decreased the odds of being in the family and community adversity class by nearly 40% and the abuse and neglect class by 25% compared to the low adversity class. Interestingly, grade level of the boys was also a predictor in the high adversity comparison. Boys who were above grade level were more likely to be in the abuse and neglect class compared to the family and community adversity class, or conversely, boys who did not perform well in school were more likely to be family and community adversity class.

Black participants were more likely to be in the higher adversity classes compared to the low adversity class Black respondents were nearly 11 and 10 times more likely to

identify within the family and community adversity and abuse and neglect classes. Race was not a predictor for class membership between the two higher adversity groups. Lastly, boys in the youngest cohort were significantly less likely to be in the abuse and neglect class compared to the low adversity and the family and community adversity classes.

Summary of Research Question 4

In the final research question, multinomial logistic regressions were used to determine if particular covariates increased the odds of being in a particular latent class that was determined in the second research question. It was hypothesized that economic stresses from unemployment and low parental educational attainment would increase the odds of being in a class with higher levels of adversity. None of these measures significantly increased the odds of being in any particular class, which does not support the original hypothesis.

The second hypothesis suggested that educational troubles for the participants would increase their odds of being in a particular class. This hypothesis was supported in that higher grade level achievement lead to higher odds of being in the low adversity group, potentially keeping students engaged with school and out of the streets. This finding is further supported by the significant differences in grade level performance between the two high adversity groups, and poorer school achievement led to increased odds of being in the family and community adversity class. Poor academic performance may lead to a youth feeling unwelcome or uncomfortable in school which may push them out of the classroom, increasing the opportunities for witnessing violence or choosing gang membership as a coping mechanism.

CHAPTER 5: DISCUSSION

The aim of this dissertation research project was to answer the following questions about the relationship between childhood adversity and gang membership in an urban, male sample:

RQ1: What is the prevalence of childhood trauma for youth involved in a gang versus youth who do not identify as gang involved?

RQ2: Are there particular classes or combinations of ACEs that amplify risk for gang membership?

RQ3: Does experiencing trauma during different developmental stages affect gang membership in different ways?

RQ4: What early childhood indicators predicts membership into the individual classes of adverse childhood experiences?

Main Findings

Childhood Adversity and the Relationship with Gang Membership

The ACEs questionnaire provided a comparable framework of childhood trauma for study participants. Before breaking the sample into smaller classes of adversity, which was the larger goal of the study, it was important to identify whether or not gang members experienced increased counts of adversity compared to youth who were never gang involved. A t-test found that there was a significant difference between the mean counts of ACEs for two groups, with youth who were in a gang for at least one period experiencing 3.61 categories of ACEs on average. With a Cohen's d of .5, the effect size is moderate, indicating that more categories of adversity faced by youth may increase the odds of gang membership. It has been well established in the literature that four categories of ACEs are

considered a turning point for increasing the odds of negative health outcomes and poor health behaviors, including heart disease, COPD, early smoking and alcohol consumption, and diabetes (see Anda et al., 1999; Felitti et al, 1998; Dube et al., 2006). Almost fifty percent of the gang sample, experienced four or more categories of adversity. This percentage of the sample is similar to the percentage of youth in the Florida Department of Juvenile Justice sample (Baglivio et al., 2014), but it must be noted the same ACEs measures were not used in both studies. Nonetheless, with nearly half of the gang-involved subsample experiencing four or more types of adversity, there is strong support that this cut-off has implications for criminal justice outcomes as well as health.

Multiple t-tests with Bonferroni corrections applied were then run to determine if there were significant differences in the individual ACEs for the subsamples. The percentages of emotional neglect, parental separation, and community violence experiences were significantly higher for the gang-involved subsample than for the non-gang involved which may drive the differences in the counts for total ACEs.

Latent class analysis was performed to determine if specific groupings of this adversity increased the odds of gang membership. A three-class model included a low adversity class that experienced fairly low rates of all adversity types, a family and community adversity class with the highest odds of parental separation, parental stress, school bullying, and community violence, and an abuse and neglect class which experienced the highest rates of physical abuse, physical neglect, emotional abuse, and emotional neglect. Similar to Debowska and Boduszek's (2017) an abuse and neglect class was identified, but this group did not significantly increase the odds of gang membership compared to the family and community adversity class. In both of the higher adversity

classes, the percentage of the classes experiencing parental stress, parental separation, and witnessing community violence were not significantly different from each other but were significantly higher than the percentage experiencing those categories in the low adversity class. These three measures may be especially important for understanding the relationship between childhood adversity and gang membership.

Supporting Thornberry and colleagues' (2003) findings that cumulative risk increases the odds of gang membership, this study found that individuals with a higher count of adverse measures and a combination of multiple adversity measures that were significantly greater than a low adversity class- increased the odds of gang membership. There were no differences between the odds of gang membership for the two high adversity classes, so it may be the consistently high percentages of witnessing violence that drive this relationship.

Witnessing Violence and Gang Membership

Overwhelming support for the relationship between witnessing violence in the community and gang membership was found, including in combination with family stress and parental separation. Consistent with the literature (see Li et al., 2002; Madan, Mrug, & Windle, 2011; Rebbe et al., 2017), classes with significantly higher percentages of witnessing violence in the community had significantly higher odds of gang involvement. To further test this, community violence was removed from the analysis. When this was done a two-class solution indicated that neither was more likely than the other to have a higher likelihood of class members be gang involved.

The relationship between witnessing violence and becoming gang involved may be due to reactions to the fear or increased opportunity for joining. For youth in the Birmingham Youth Violence Study, community violence was highly correlated with gang membership (Madan et al., 2011). The relationship young gang members had with internalizing behavior problems were moderated by their involvement in delinquent behaviors and community violence, highlighting the association between community violence and experiencing PTSD and other internalized feelings. When faced with internalized feelings male study participants externalized their behaviors in the form of delinquent acts. For the youth in the PYS sample who identify as being a gang member, they may be witnessing community violence perpetrated by other gang involved individuals in their communities and internalizing the fear and then presenting externalizing behaviors of joining the gangs themselves. Having gangs and violence in the communities the respondents reside in may also drive their decision to join of a gang for protection and safety in their neighborhoods programs focused on family relationships can be put in place to assist in this relationship maintenance, including Functional Family Therapy (discussed in more detail in the implications subsection).

This dissertation only includes witnessing community violence as one of the ACE measures in the latent class analysis and did not include community-level disadvantage measures as a covariate in the multinomial logistic regression. Wolff et al. (2018) found that community-level features such as concentrated disadvantage, immigrant concretion, and residential stability were significant in explaining exposure to ACEs for a juvenile justice sample. Future research should seek to include these variables for explaining membership into classes of adversity.

Alternatively, findings from the latent class analysis did not support the notion that abuse and neglect perpetrated by parents would increase the odds of gang membership. Measures of emotional and physical abuse and neglect were found to be significantly higher in the abuse and neglect class compared with both the low adversity and family and community adversity classes. With similar odds of gang membership but different percentages experiencing abuse and neglect for the family and community adversity class and the abuse and neglect classes, there cannot be a clear relationship between combinations of abuse and neglect and gang membership. When witnessing community violence was removed from the LCA modelling, the abuse and neglect class did not have significantly higher odds of gang membership than the family and community adversity class.

In previous studies, abuse has been shown to be a very strong predictor of gang membership for female gang members (see De La Rue & Espelage, 2014; Baglivio et al., 2014; Leeb et al., 2007), but should not be ignored for males. Debowska and Boduszek (2017) and Rebbe and colleagues (2017) have shown that classes with abuse and neglect increase odds of gang membership. Ireland and colleagues (2002) highlight the importance of the age of abuse and neglect in the criminal behavior, finding that abuse and neglect closer to the age of delinquent behavioral onset is important in predicting negative behaviors, though gang membership was not tested directly. Unfortunately, the abuse measures and measure of physical neglect could not be broken down into age specific categories for this study, so it is possible more recent abuse and neglect would have shown higher odds of gang membership than a class with high odds of abuse or neglect during

early childhood; future research is needed to test the relationship between abuse and gang membership.

Family-level risk factors had mixed findings for explaining the relationship between adversity and gang membership. Attachment to family members has long been supported as an important social control for youth (Hirschi, 1969). Abuse, neglect, parental separation, and parental incarceration may influence the social control and connection youth have to their families. In this dissertation research, only parental separation appeared to be significantly higher in the classes with higher odds of gang membership. The overall percentage of youth experiencing parental incarceration was low; a lack of findings may be due to the nature of the small sample in the data. Future research with a dataset with more youth experiencing family-level risk factors such as incarcerated family members and substantiated abuse and neglect claims can better explain the relationship between family adversity and gang membership.

School Failure as a Covariate

Covariates were added into the model in the fourth research question to see if particular risk factors increased the odds of being in a particular class of adversity. While parental education and employment were not significant in increasing the odds of being in a particular class of adversity, early educational achievement was correlated with membership in the two classes with higher odds of adversity and most strongly in the class with the highest rates of family separation and witnessing community violence. The measure of grade level reading was conducted during the screening phase when the youngest cohort was in first grade and the oldest cohort was in seventh grade. Hickman and colleagues (2008) found a relationship between grade level performance and dropping

out that began as early as kindergarten. The early school challenges may have decreased the attachment and affection students have for school. Hirschi (1969) argued that attachment to school staff and involvement in the school system would decrease the odds of delinquency for young males, which this covariate in the model supports as males who were above grade level were significantly less likely to be gang involved.

Youth who choose to drop out of school may spend more time in the community rather than in school where there is additional social control. Being out of school may increase the odds of witnessing community violence at higher rates and may become more involved with street culture, including gang membership. Suh and Suh (2007) found three risk factors for dropping out of school with academic failure being one of the largest predictors for the decision to leave. In addition, Hill and colleagues (2001) found that youth in a Seattle sample who had low academic achievement and low school attachment are more likely to be gang involved and remain in a gang. Future research looking at the school completion and success for the PYS sample would help parse apart the relationship between grade level performance and gang membership with community violence as a potential mediator.

Previous literature on school attachment indicates that positive relationships in school can curb delinquent behavior (Hirschi, 1969). Interactional theory posits this relationship is not static overtime and there is not a unidirectional causal pattern between social control measures as they can alter each other (Thornberry et al., 1991).

Studies show that school engagement has a dynamic relationship with gang membership (Escribano, 2010). Children who are labeled early as being below grade level and are not sufficiently helped due to assumptions about children creating a feedback loop

about school achievement and attachment that may ultimately lead to the disenfranchisement of the student. Programs designed to help students with learning difficulties, such as the individualized education program (IEP), disproportionately, and often incorrectly, refer Black students to the program and label students (Cartledge & Dukes, 2009). In addition, school grade retention has been shown to lower these bonds more and exacerbate the preexisting school failings, further labeling the student for failure (Hickman et al., 2008). Youth who feel they do not belong in school, from teachers and other students, may engage with others outside of the school, finding themselves involved with delinquent peer groups and therefore may witness additional community violence which may in turn lead to the desire to get more involved in a delinquent street gang for protection, strengthening the relationship between community violence and gang membership with no clear direction between this relationship. Social bonds and learning work together and change dynamically with each other to increase the odds of these young students becoming gang involved during adolescence, supporting interactional theory (Thornberry, 1987; Thornberry et al., 1991).

Race as a Covariate

A goal of the dissertation was to identify early risk factors of membership into classes with higher odds of gang involvement. The PYS data provides a diverse sampling strategy, surveying both high-risk and low-risk students throughout the Pittsburgh school system, with slightly more than half of the sample identifying as Black (Gordon et al., 2004). When race was included in the negative binomial regression, being Black increased the odds of being in the family and community adversity and the abuse and neglect classes by nearly 11 and 9.6 times, respectively, that of the low adversity class.

These data highlight the need to understand the broader context related to disparities in economics, education, criminal justice, and other systems in society (Delgado & Stefancic, 2001). Maternal employment was not significant within the model, but the financial strain may still exist because studies show that minority families seeking loans, jobs, or housing are rejected at higher rates than similarly qualified White families (Delgado & Stefancic, 2001). It is also true that Black women are paid less than White women, and both are paid less than White men. Redlining and housing discrimination have forced minority families to live in less safe, more socially disorganized communities (Curry & Spergel, 1988). Focused on gang homicides, Curry and Spergel (1988) found that violence concentrated in communities that were low-income and in public housing projects, especially in areas where poor Blacks and Hispanics lived. The cultural and economic challenges in America limit where minority families can move to, leading to increased odds of witnessing violence or other criminal behaviors in their communities (Delgado & Stefancic, 2001), that have been shown to increase the odds of gang membership in this study sample.

Age Specific Adversity

Turning to the importance of age in experiencing adversity, a critique of ACE literature is that the questionnaire ignores the severity, frequency, and age of onset of the adversity faced by study participants (Nofzinger & Kurtz, 2005). Often the questions asked are from cross-sectional surveys in which older individuals are asked to recall if an event occurred during their childhood, often before the age of 18 with some surveys focused on earlier age cut-offs (see Widom, 1989a; 1989b). Ireland and colleagues (2002) identified that the age of experiencing abuse and neglect plays a role in whether a youth becomes

delinquent with older experiences of abuse or persistent abuse across the life course increasing the odds of delinquency and arrest. Though this research does not control for frequency, 103his notion inspired the research question related to age-specific adversity in latent class analysis.

As of writing, there are no published papers that include age domains of ACEs in an LCA model, Therefore the question of age-specific adversity measures in an LCA is exploratory using a novel approach with longitudinal data. A small sample size lead to convergence challenges in the LCA, but still provided an opportunity to test if age-specific adversity had a relationship with gang membership.

The findings indicated that age-specific adversity was not important in explaining the relationship between adversity and gang membership. This may be due to limited variance in the odds of experiencing an adverse experience during only one period of time or the limited number of variables measured over multiple time periods. In future research, exploring these questions with data sets where abuse categories vary across ages and are not cross-sectional would be important, but the data set must include a large sample size to avoid measurement issues.

Implications for Theory and Future Research

The findings of this dissertation have implications for life course and developmental theories related to gang membership. Thornberry and colleagues (2003) established that an accumulation of risk factors across life domains increased the greatest risk for gang membership, rather than one particular risk factor. Findings from this dissertation support this notion with gang-involved youth having a higher mean count of adversity compared to non-involved peers. Additionally, the odds of being gang involved

increased significantly in classes that had significantly higher percentages who witnessed community violence. When community violence was removed from the analysis, the identified classes with higher percentages of different family-level adversity measures no longer differed significantly in the odds of gang membership found. Accumulation of adversity was significant but witnessing community violence may be the driver for the difference.

The importance of community violence in the relationship with gang involvement is important, but future research should explore how this adversity relates to additional delinquent behavior, beyond gang membership. Research on the cycle of violence has shown there are increased odds of delinquency, adult criminality, and violence perpetrated by individuals who experience childhood maltreatment and adversity (Widom, 1989a; 1989b; Maxfield & Widom, 1996). This research sought to understand the relationship this adversity had with gang membership, but additional criminal behaviors and outcomes are important for understanding the relationship between accumulation of risk and other criminal behaviors.

In addition, future research should utilize a data set with adversity measured across more age domains in order to test age-specific adversity more thoroughly. Findings from this dissertation indicate that cumulative adversity matters but was unable to determine age-specific adversity as the measures of adversity available did not vary greatly across the life course. Ireland and colleagues (2002) found that experiencing abuse and neglect during early childhood only was less likely to lead to negative outcomes than persistent and adolescent experiences of maltreatment. In addition, beyond simply analyzing gang membership as a binary – ever vs. never – additional consideration should be made for

looking at stable, short-term, early, and late gang joining. Future research should explore these relationships more in-depth using latent class analysis techniques.

Implications for Policy and Practice

Important implications for policy and practice can be made based on findings from a longitudinal dataset with both high-risk youth and members of the general school population allows for comparisons between non-delinquent and delinquent groups to identify risk factors for delinquency. Though some of the Pittsburgh Youth Study respondents ultimately ended up in the juvenile or criminal justice systems, they began the study as students in the Pittsburgh school system allowing for the identification of risk factor combinations that lead to higher odds of gang membership in particular.

Latent class analysis and t-tests indicated that witnessing community violence and experiencing parental stressors increased the odds of gang membership. For practice purposes, identifying youth who have experienced these adversity types are important for interventions to prevent gang membership or intervene with youth already involved in the system. Schools and social service providers should recognize that multiple risk factors significantly increase the odds of gang membership so programs and services can be provided to youth and families.

The inclusion of covariates identified poor school achievement as a risk factor for experiencing greater adversity. Schools play an important role in intervening and working with youth, so additional supports for these children struggling with reading, writing, and arithmetic are important. As discussed above, learning and control theories are dynamic so improving youths' relationships with school and performances in school can improve later interactions with negative peers or time spent in communities where they may witness

community violence. Universal strategies, programs delivered to a school or classroom, that improve the teachers' skills and focus on skills-based learning for students have been shown to be effective for younger students in elementary school and for youth of lower socioeconomic status at all grade levels (Welsh & Harding, 2015). In addition, targeted school interventions that do not label the student, such as Check & Connect, which monitors school performance and provides mentoring and case management supports, are important for preventing school dropouts and poor school performances shown to increase gang involvement (Suh & Suh, 2007; Hill et al., 2001). Check & Connect has even been adapted for juvenile offenders to continue the intervention through high school to keep students engaged (Feshir, 2015). Future research should include additional covariate measures related to schools and peers to further understand their impact on gang membership outcomes.

There are a few evidence-based programs that can be considered for implementation to prevent gang membership or intervene with youth already imbedded in a group. The Fourth R has been demonstrated to provide a protective effect on delinquency for maltreated youth. In a randomized control trial with students from 20 schools, the Fourth R intervention buffered the impact of child maltreatment history developing violent delinquent behaviors (Crooks et al., 2011). Though gang membership was not tested directly, violent delinquency is highly correlated with gang membership. Proper school-based interventions can help reduce gang membership and violent delinquency.

Results indicated that the percentages of family stress and separation were significantly higher for the family and community adversity and abuse and neglect classes compared to the low adversity class, indicating family-level interventions may be

important in reducing the odds for gang membership. Functional Family Therapy (FFT) is a family-based prevention and intervention program for high-risk youth and their families to change behaviors. The program was adapted in 2010 for youth in gangs or at-risk for joining, developing Functional Family Therapy- Gangs (FFT-G). In a recent evaluation of FFT-G, the program was shown to significantly reduce delinquency for program participants. Study participants deemed highest risk for gang involvement had the largest reduction in delinquency (Gottfredson et al., 2018). Interventions with children and their parents can change behaviors for the whole family unit and therefore may be most effective in reducing the risks for gang membership and subsequent violence.

Witnessing community violence was significantly higher for the gang involved subsample, as it was for Rebbe and colleagues' (2017) study. Programs to keep kids safe and engaged off the streets where the violence occurs is also paramount for reducing gang membership. Afterschool programs can provide a safe space for students to continue to learn and engage in healthy decision making, while reducing risks of becoming delinquent. In an evaluation of programs across the country, it was determined that many programs can be effective as long as they have staff training, engagement in educational opportunities and activities for students, and time spent on skill development (Durlak, Weissberg, & Pachan, 2010). Keeping students off the street and in engaged environments can greatly decrease the opportunity to witness and engage in violence in the community.

As Boxer and colleagues (2015) highlighted in their evaluation of MST, early interventions and prevention strategies are important for reducing gang membership and gang violence. Family risk factors and early education indicators were associated with groups of adversity that had significantly higher percentages of gang membership.

Understanding the importance of adversity during childhood provides support for the promotion of evidence-based prevention programs.

Study Limitations

With implications in mind, some limitations of the current study must be addressed. First, the data come from only one moderately sized city in the United States. Though the study's primary investigators designed the study to find a good cross-section of boys across the city, these youth are still sampled from only one jurisdiction. Pittsburgh, the city in which the sample derives, is often considered an emerging gang city and does not have some of the larger, more hierarchical gang structures that a few other American cities experience. That is not to say comparisons cannot be made between the youth in Pittsburgh and gang involved youth in other jurisdictions. As the Eurogang Program argues, there are general attributes of youth gangs despite differences in the sizes and hierarchies of gangs across the globe (Weerman et al., 2009; Klein & Maxson, 2006). What is important to note about Pittsburgh is that it experienced a similar crack epidemic during the 1980s and 1990s, when these surveys were conducted, that influenced gang growth in a number of communities and lead to increased rates of violence for gang involved youth (Klein, 1995). The geographic limitation of the data should not discount the validity of the findings but is still a limitation in the generalizability to all jurisdictions.

What it means to be a gang member has been fraught with conflict within academia and research for decades (Weerman et al., 2009; Bjerregaard, 2002). For this research, gang membership is defined by a self-report measure in which the boys are asked if they had been in a gang since the previous wave. Some argue that more is needed in defining gang membership, with additional questions about delinquent behaviors, but this ignores how

delinquent acts are often perpetrated by peer groups that may not identify as gang involved (Bjerregaard, 2002).Though the youth self-identify in the PYS data, the ten-plus years of surveys the youth participated in helped build rapport and trust with the boys to provide additional confidence in the answers provided. A self-identifying question used as the outcome of interest, thus, allows for important policy and theoretical implications.

The ACEs score is useful for research purposes and is growing in popularity across multiple fields; but, use of the score as a diagnostic tool to assign individuals to programs and interventions requires additional considerations (Anda, Porter, & Brown, 2020). An individual who receives a score of one may have experienced physical abuse multiple times whereas another individual may have only experienced parental separation through an amicable divorce. The scores may over or underestimate the actual risk a youth has for adopted a health-risk behavior. While latent class analysis in this study identified groupings of adversity that may relate to gang membership as a health-risk behavior, additional screeners and trained staff members should only seek to consider ACEs as one factor in deciding an intervention. Scholars seek to caution the use of ACEs as a tool to make decisions about treatment (Anda et al., 2020).

The PYS data included only male subjects. A number of studies have identified the growing phenomenon of girls in gangs and identified that this is an important area of gang literature (Esbensen & Deschenes, 1998; Miller, 2002). Baglivio and colleagues (2014) identified the high prevalence of sexual abuse among female juvenile offenders and Leeb and colleagues (2007) were able to explain a significant amount of variance in gun carrying based on sexual abuse for girls (Leeb et al., 2007). In the PYS, the female experience is lost so this relationship cannot be tested. Only including boys in the study provided the

opportunity to explore the relationship between adversity and gang membership for males, but there are limitations in generalizability since females may have different reasons for joining a gang.

Turning to limitations of the methodology, the longitudinal nature of the data provided an opportunity to build on Ireland and colleague's (2002) work exploring adversity during different time periods of the life course, but this was only possible for a few of the adversity measures. During young adulthood, respondents were asked about their experiences with physical abuse, emotional abuse, and physical neglect during their entire life course. Only four diversity categories could be broken up into different age periods for the youngest cohort and for those categories there was little variance in responses over time. The data could not be time ordered for this reason, so all relationships are correlational.

Additionally, when matching questions from the PYS to the original ACEs questionnaire and framework, there were a few points of the framework that could not be separated. The focus of the PYS was to understand and study juvenile behavior and development of youth over time. While the PYS sought to understand the family, school, and community that a youth was positioned within, there were few questions that specifically focused on attributes of the surrounding influences on the youth, and more on the youth directly. These limitations inhibit the ability to directly equate the prevalence of ACEs for the PYS study youth to other populations in other studies on ACEs, but there is enough overlap between the ACE-equivalent questions in this study to those in previous ACE studies. Though additional categories of adversity may have been significantly higher

in the classes with higher adversity than the low adversity class, the categories included in the study still provide clear implications for practice.

There will be some limitations in the ability to compare the findings from this study to other studies that have used the ACE, but more and more research has used comparable questionnaires to understand childhood adversity and negative outcomes (see e.g., Rebbe et al., 2017, Wolff et al., 2019, Hennigan et al., 2014). Additional measures of adversity that were included in other studies may have created additional or different classes in the latent class modeling, but that does not mean that the identified classes will not be meaningful for policy and practice.

Cycle of Violence

Hurt people hurt people. In her landmark work on trauma, Herman (1992) found that individuals who were disempowered and disconnected from others, who had fewer social connections with family were more likely to develop PTSD and other mental health challenges after a traumatic incident. Post-traumatic stress disorder can lead to acting out quickly which can hurt others. Though Herman's study began with soldiers at war, not child abuse and neglect or community violence, her initial findings have set the stage for a focus on healing those who have been traumatized to reduce the cycle of violence. Li and colleagues (2002) highlighted that those who witnessed higher amounts of community violence had higher rates of PTSD and many dealt with this by acting out and becoming more hostile themselves.

In communities where violence is prevalent, many assume that the young men involved in gangs are not innocent bystanders, but the truth is many of these individuals experienced a negative life event and numerous traumatic experiences that pushed them to

the streets as they saw no other options (Rich, 2009). In the life course literature, the early onset of abuse and neglect within the home is expected to lead to life-course-persistent offenders (Moffitt, 1993; Widom et al., 2018). In the case of this research, higher adversity during childhood increases the odds of gang membership with young men who have experienced increased odds of adversity in their homes and their communities having increased odds of gang involvement during adolescence.

By identifying specific risk factors for gang membership and then identify the risks that lead to the initial adversity, there are opportunities for schools and other system actors to identify at-risk youth and connect them with evidence-based programs to prevent the start of the cycle of violence. Unfortunately, for many it is too late and young men often slip through the cracks. A doctor working in an urban community found that many of the young, male victims of street violence that came to him after gang-related injuries had been traumatized from early life challenges. They were simply continuing the cycle of violence that they learned from their childhoods (Rich, 2009). In order to make an impact on preventing violence, helping these individuals before they hurt others is important for stopping the cycle of violence.

Conclusion

Gang involvement has a number of negative life outcomes for those involved with the gangs, including increased odds of victimization or death (Pyrooz & Sweeten, 2015), and impacts on the communities the gangs exist in. There are structural and systemic reasons why gangs have formed around the world (Klein, 1995), but by recognizing the individual members' risk factors for joining is important for lessening the damages done in communities around the world. Despite the limitations, the findings of this dissertation

indicate that adversity with family members, in the home, and in the community are associated with higher odds of gang membership. By recognizing these risk factors and the importance of cumulative risk, system actors, such as teachers, administrators, counselors, and social workers, can help reverse the impact of the trauma and intervene early to prevent the negative outcomes of gang membership. This study moves forward our understanding of risk factors and more broadly how to recognize the adversity leading to gang membership.

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APPENDIX A. ACE OPERATIONALIZATION

ACE	PYS Question	Phases	Youngest	Oldest
Physical Abuse	How many times has an adult in your family, responsible for you, hit you with something like a belt, hairbrush, a stick, or some other hard object?	Single	19	25
	How many times has an adult in your family, responsible for you, hit you with a fist or kicked you hard?	Single		
	How many times has an adult in your family responsible for you, beaten you severely?	Single		
	How many times has an adult in your family, responsible for you, hurt you so badly that you were cut, had bruises on your body, or had a broken bone or something like that?	Single		
	Has an adult in your family, responsible for you, severely punished you in some other way that I have not mentioned?	Single		
Sexual Abuse	During your childhood or adolescence, did anyone, including people outside of your family, ever try to do something sexual that you did not want?	Single	19	25
Emotional Abuse	How many times did an adult in your family react to you by swearing or cursing at you?	Single	19	25
Physical Neglect	How many times did an adult in your family react to you by leaving you alone, even when an adult should have looked after you?	Single	19	25
	How many times did an adult in your family react to you by leaving you without the food you needed?	Single		
	How many times did an adult in your family react to you by not	Single		

	taking you to a doctor or hospital when you needed it?			
	How many times has an adult in your family, responsible for you, been so drunk or high that you could not be taken care of?	Single		
Emotional Neglect	You feel that no one loves you	Multiple	10-16	12-17
Substance misuse within household	In the past year, have you or your partner sought help for emotional problems, drugs, alcohol, or relationships?	Multiple	6-16	N/A
Household mental illness	Have you been upset because of something that happened unexpectedly?	Single	6	13
	Have you felt that you were unable to control the important things in your life?	Single		
	Have you felt nervous and stressed?	Single		
	Have you successfully dealt with irritating life hassles	Single		
	Have you felt that you were coping well?	Single		
	Have you felt confident about your ability to handle personal problems?	Single		
	Have you felt things were going your way?	Single		
	Have you found that you could not cope with all the things that you had to do?	Single		
	Have you been able to keep the irritations in your life under control?	Single		
	Have you felt that you were on top of things?	Single		
	Have you been angry about things that happened to you?	Single		
	Were you behind with things you needed to do?	Single		
	Have you been able to control the way that you spend your time?	Single		

	Have you felt that difficulties were piling up so high that you could not overcome them?	Single		
Parental separation or divorce	Marital status	Multiple	6-16	12-16
Incarcerated household member	What was the result/outcome of biological mother's police contact?	Single	14	17
	What was the result/outcome of biological father's police contact?	Single		
Witnessing community violence	Muggings and violence are a problem in the neighborhood	Multiple	6-16	12-17
School bullying	In the past year, have other kids bullied you in school?	Multiple	11-17	16-17
	In the past year, have other kids bullied you going to and from school?	Multiple		

APPENDIX B. IRB EXEMPTION

TEMPLE UNIVERSITY
Office of the Vice President for Research

Research Integrity & Compliance
Student Faculty Center
3340 N. Broad Street, Suite 304
Philadelphia PA 19140

Institutional Review Board
Phone: (215) 707-3390
Fax: (215) 707-9100
e-mail: irb@temple.edu

Not Human Subject Research Determination

Protocol Number: 25653

PI: ROMAN, CATERINA G. Sponsor: NO EXTERNAL SPONSOR

Project Title: Adverse Childhood Experiences and Adolescent Gang Membership: Utilizing Latent Class Analysis to Understand the Relationship

Date: 14-Jan-2019

On 14-Jan-2019, the IRB reviewed the protocol 25653: Adverse Childhood Experiences and Adolescent Gang Membership: Utilizing Latent Class Analysis to Understand the Relationship.

The proposed activity is not research involving human subjects as defined by DHHS or FDA regulations. Consequently, Temple IRB review and approval is not applicable. You are welcome to pursue the activity, obtaining any applicable administrative or departmental (non-IRB) approvals.

This determination applies only to the activities described in this IRB submission and does not apply should any changes be made. Changes could affect this determination, therefore please contact the IRB for guidance.

DHHS Definitions:

Research - a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.
Human subject - a living individual about whom an investigator (whether professional or student) conducting research obtains:

1. Data through intervention or interaction with the individual; or
2. Identifiable private information

FDA Definitions:

Research - any experiment that involves a test article and one or more human subjects, and that either must meet the requirements for prior submission to the Food and Drug Administration
Human subject - an individual who is or becomes a participant in research, either as a recipient of the test article or as a control. A subject may be either a healthy individual or a patient.

Please contact the IRB at (215) 707-3390 if you have any questions

APPENDIX C. DATA SHARING AGREEMENT

Restricted Data Use Agreement
for the use of Confidential Data through the ICPSR Virtual Data Enclave (VDE)
from the
National Archive of Criminal Justice Data (NACJD

I. DEFINITIONS

A. “Investigator” is the person primarily responsible for analysis and other use of Confidential Data obtained through this Agreement.
B. “Research Staff” are persons authorized by the Investigator's institution, excluding the Investigator, who will have access to Confidential Data obtained through this Agreement. Research Staff include project staff or students conducting dissertation or thesis research, where applicable.
C. “Participants” are persons, other than Investigator and Research Staff, who will be provided access to Confidential Data by the Investigator.
D. “Institution” is the university or research institution at which the Investigator will conduct research using Confidential Data obtained through this Agreement.
E. “Representative of the Institution” is a person authorized to enter into contractual agreements on behalf of Investigator's Institution.
F. “Confidential Data” consist of data derived from identifiable private information linkable to a specific individual either directly or indirectly, and for which the individual (whether a person or organization) has the expectation that the information will not be released in a manner allowing public identification of the individual or causing some harm to the individual.
G. “Private Person” means any individual (including an individual acting in his official capacity) and any private (i.e., non-government) partnership, corporation, association, organization, or entity (or any combination thereof), including family, household, school, neighborhood, health service, or institution.
H. “ICPSR” is the Inter-university Consortium of Political and Social Research.
I. “ICPSR Data Access Request System” (“IDARS”) is the web-based system for data contracts at ICPSR. It is hereafter referred to as IDARS.
J. “Data Security Plan” is a component of this Agreement, found as Attachment A, which specifies permissible computer configurations for use of Confidential Data through Investigator responses to a series of questions, and records what the Investigator commits to do in order to keep Confidential Data secure.
K. “Deductive Disclosure” is the discerning of an individual's identity or confidential information through the use of known characteristics of that individual. Disclosure risk is present if an unacceptably narrow estimation of an individual’s confidential information is possible or if determining the exact attributes of the individual is possible with a high level of confidence.
L. “Derivative” is a file or statistic derived from the Confidential Data that poses disclosure risk to any Private Person in the Confidential Data obtained through this Agreement. Derivatives include copies of the Confidential Data received from ICPSR, subsets of the Confidential Data, and analysis results that do not conform to the guidelines in Section VI.H.
M. The “Virtual Data Enclave” permits monitored access to data that are not available to the general public because of respondent confidentiality concerns. The virtual machine is isolated from the user's physical desktop computer, restricting the user from downloading files or parts of files to their physical computer. The virtual machine is also restricted in its external access, preventing users from emailing, copying, or otherwise moving files outside of the secure environment, either accidentally or intentionally.

II. DESCRIPTION OF DISCLOSURE

Deductive disclosure of an individual's identity from research material is a major concern of federal agencies, researchers, and Institutional Review Boards. If a person is known to have participated in ANY study or if information is known to be included in files or a database from which the Confidential Data were obtained, then a combination of his or her personal characteristics may allow someone to determine which record corresponds to that individual. Investigators and Institutions who receive any portion of Confidential Data are obligated to protect the individual's confidential information from deductive disclosure risk by strictly adhering to the obligations set forth in this Agreement and otherwise taking precautions to protect the
Confidential Data from non-authorized use.

III. REQUIREMENTS OF INVESTIGATORS

A. Investigators must meet the following criteria:
1. Have a PhD or other terminal degree; and
2. Hold a faculty appointment or research position at Institution.
B. The Investigator assumes the responsibility of completing the IDARS online application and required documents, reports, and amendments. The Investigator agrees to responsibly manage and use Confidential Data and implement all Confidentiality Data security procedures per the Data Security Plan.
C. The Investigator will provide ICPSR any publications or public presentations derived from the Confidential Data.

IV. REQUIREMENTS OF INSTITUTION

The Institution must meet the following criteria:
A. Be an institution of higher education, a research organization, a research arm of a government agency, or a nongovernmental, not for profit, agency.
B. Have a demonstrated record of using Confidential Data according to commonly accepted standards of research ethics and applicable statutory requirements.

V. OBLIGATIONS OF ICPSR

In consideration of the promises made in Section VI of this Agreement, ICPSR agrees to:
A. Provide access to the Confidential Data requested by the Investigator in the Confidential Data Order within a reasonable time of execution of this Agreement by appropriate ICPSR officials. Quantitative Confidential Data will be made available via the Virtual Data Enclave, a secure remote-access work space. Access requires proper authentication. NACJD will provide instructions on establishing user accounts within a reasonable amount of time after the execution of the agreement.
B. Provide electronic documentation of the origins, form, and general content of the Confidential Data, in the same time period and manner as the Confidential Data.
ICPSR MAKES NO REPRESENTATIONS NOR EXTENDS ANY WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR THAT THE USE OF THE CONFIDENTIAL DATA WILL NOT INFRINGE ANY PATENT, COPYRIGHT, TRADEMARK, OR OTHER PROPRIETARY RIGHTS. Unless prohibited by law, Investigator and Institution assume all liability for claims for damages against them by third parties that may arise from the use or disclosure of the Confidential Data.

VI. OBLIGATIONS OF INVESTIGATOR, RESEARCH STAFF, AND INSTITUTION

Confidential Data provided under this Agreement shall be accessed by the Investigator, Research Staff, Participants, and Institution in strictest confidence and can be disclosed only in compliance with the terms of this Agreement. In consideration of the promises in Section V of this Agreement, and for use of Confidential Data from ICPSR, the Investigator, Research Staff,
Participants, and Institution agree:

A. That the Confidential Data will be used solely for research or statistical purposes relative to the research project identified on the Application for Obtaining Confidential Data accompanying this Agreement, and for no other purpose whatsoever without the prior consent of ICPSR.

Further, no attempt will be made to identify private persons, no Confidential Data of private person(s) will be published or otherwise distributed, and Confidential Data will be protected against deductive disclosure risk by strictly adhering to the obligations set forth in this Agreement and otherwise taking precautions to protect the Confidential Data from nonauthorized use.

B. To supply NACJD/ICPSR with a completed IDARS online Application for Obtaining Confidential Data that will include the following:

1. Completed Investigator information and detailed research description
2. A signed Restricted Data Use Agreement which includes signature of Investigator and also the signature from a Representative of your Institution. **This signature must be obtained from an individual who has the authority to represent your organization in agreements of this sort, such as a vice president, provost, or similar official.** (Note: Department Chair or Office of Grants and Contracts are not acceptable unless specific written delegation of authority exists).
3. Data Security Plan
4. Confidential Data Order Summary specifying which files and documentation are requested
5. Pledges of Confidentiality for the Investigator and each Research Staff member
6. A copy of the Institution's Institutional Review Board (IRB) application including a document signed by the IRB approving or exempting the research project
7. Curriculum vitae for Investigator and Research Staff

C. To comply fully with the approved Data Security Plan at all times relevant to this Agreement.

D. That no persons other than those identified in this Agreement or in subsequent amendments to this Agreement, as Investigator, Research Staff or Participant and who have executed this Agreement, be permitted access to the contents of Confidential Data files or any files derived from Confidential Data files.

E. That no persons other than those identified in this Agreement or in subsequent amendments to this Agreement, as Investigator or Research Staff and who have executed this Agreement, be given the login name and/or password for access to the contents of Confidential Data files or any files derived from Confidential Data files.

F. That within one (1) business day of becoming aware of any unauthorized access, use, or disclosure of Confidential Data, or access, use, or disclosure of Confidential Data that is inconsistent with the terms and conditions of this Agreement, the unauthorized or inconsistent access, use, or disclosure of Confidential Data will be reported in writing to NACJD/ICPSR.

G. That, unless prior specific approval is received from ICPSR, no attempt under any circumstances will be made to link the Confidential Data to any individual, whether living or deceased, or with any other dataset, including other datasets provided by NACJD/ICPSR.

H. To avoid inadvertent disclosure of private persons by being knowledgeable about what factors constitute disclosure risk and by using disclosure risk guidelines, such as but not limited to, the following guidelines in the release of statistics or other content derived from the Confidential Data.[1]

1. No release of a sample unique for which only one record in the Confidential Data obtained through sampling (e.g., not a census) provides a certain combination of values from key variables. For example, in no table should all cases in any row or column be found in a single cell.
2. No release of a sample rare for which only a small number of records (e.g., 3, 5, or 10 depending on sample characteristics) in the Confidential Data provide a certain combination of values from key variables. For example, in no instance should the cell frequency of a cross-tabulation, a total for a row or column of a cross-tabulation, or a quantity figure be fewer than the appropriate threshold as determined from the sample characteristics. In general, assess empty cells and full cells for disclosure risk stemming from sampled records of a defined group reporting the same characteristics.
3. No release of a population unique for which only one record in the Confidential Data that represents the entire population (e.g., from a census) provides a certain combination of values from key variables. For example, in no table should all cases in any row or column be found in a single cell.
4. No release of the statistic if the total, mean, or average is based on fewer cases than the appropriate threshold as determined from the sample characteristics.
5. No release of the statistic if the contribution of a few observations dominates the estimate of a particular cell. For example, in no instance should the quantity figures be released if one case contributes more than 60 percent of the quantity amount.
6. No release of data that permits disclosure when used in combination with other known data. For example, unique values or counts below the appropriate threshold for key variables in the Confidential Data that are continuous and link to other data from ICPSR or elsewhere.
7. No release of minimum and maximum values of identifiable characteristics (e.g., income, age, household size, etc.) or reporting of values in the "tails," e.g., the 5th or 95th percentile, from a variable(s) representing highly skewed populations.
8. Release only weighted results if specified in the data documentation.
9. No release of ANOVAs and regression equations when the analytic model that includes categorical covariates is saturated or nearly saturated. In general, variables in analytic models should conform to disclosure rules for descriptive statistics (e.g., see #7 above) and appropriate weights should be applied.
10. In no instance should data on an identifiable case, or any of the kinds of data listed in preceding items 1-9, be derivable through subtraction or other calculation from the combination of tables released.

[1] For more information, see the U.S. Bureau of the Census checklist. *Supporting Document Checklist on Disclosure Potential of Data, at www.**census**.gov/srd/sdc/S14-1_v1.3_**Checklist**.doc; NCHS Disclosure Potential Checklist* at http://www.cdc.gov/nchs/data/NCHS%20Micro-Data%20Release%20Policy%204-02A.pdf; and *FCSM Statistical Policy Working Paper 22 (Second Version, 2005)* at http://www.fcsm.gov/working-papers/SPWP22_rev.pdf.

11. No release of sample population information or characteristics in greater detail than released or published by the researchers who collected the Confidential Data. This includes but is not limited to publication of maps.
12. No release of anecdotal information about a specific private person(s) or case study without prior approval.
13. The above guidelines also apply to charts as they are graphical representations of crosstabulations.
In addition, graphical outputs (e.g., scatterplots, box plots, plots of residuals) should adhere to the above guidelines.
I. To abide by federal law and regulations that require that research data collected by the U.S. Department of Justice or by its grantees and contractors may only be used for research or statistical purposes. The applicable laws and regulations may be found in the United States Code, 42 USC Section 3789g(a), the Code of Federal Regulations, 28 CFR 22, and 62 F.R. 35044 (June 27, 1997) (The Federal Confidentiality Order). Accordingly, any intentional identification or disclosure of a person or establishment may violate federal law as well as the assurances of confidentiality given to the providers of the information. Therefore, users of data collected by or with the support from the U.S. Department of Justice and distributed by NACJD or other ICPSR archives must agree to abide by these regulations and understand that NACJD/ICPSR may report any potential violation to the U.S. Department of Justice. Any person violating the provisions of 42 USC 3789(g), or of any rule, regulation, or order issued thereunder, shall be fined not to exceed $10,000, in addition to any other penalty imposed by law.
J. That if the identity of any private person should be discovered, then:
1. No use will be made of this knowledge;
2. NACJD/ICPSR will be advised of the incident within five (5) business days of discovery of the incident;
3. The information that would identify the private person will be safeguarded or destroyed as requested by NACJD/ICPSR; and
4. No one else will be informed of the discovered identity.
K. Unless other provisions have been made with NACJD/ICPSR, all access to the Confidential Data will be terminated on or before completion of this Agreement or within five (5) days of written notice from ICPSR. Investigators requiring access to the Confidential Data beyond completion of this Agreement should submit a request for continuation three months prior to the end date of the Agreement.
L. To ensure that the Confidential Data are managed and used in compliance with the terms and conditions of this Agreement and with all applicable statutes and regulations. Noncompliance with this Agreement by any Research Staff or Participant hereto shall be deemed noncompliance and a breach by Investigator and Institution for purposes of section VII below.
M. To notify NACJD/ICPSR of a change in institutional affiliation of the Investigator. Notification must be in writing and must be received by NACJD/ICPSR at least six (6) weeks prior to Investigator's last day of employment with Institution. Investigator's separation from Institution terminates this Agreement. Investigator may reapply for access to Confidential Data as an employee of the new institution. Re-application requires:
1. Execution of a new Agreement for the Use of Confidential Data by both the Investigator and the proposed new institution;
2. Execution of any Pledges of Confidentiality by Research Staff at the proposed new institution;
3. Preparation and approval of a new Data Security Plan; and

3. Evidence of approval or exemption by the proposed new institution's IRB.
These materials must be approved by NACJD/ICPSR before Confidential Data or any derivatives or analyses may be accessed at the new institution.
N. That if the Investigator who is changing institutions does not have the new agreement executed by the time they leave their institution, NACJD/ICPSR will temporarily deactivate the Investigator's account but will maintain the Investigator's profile to save their work during the transition. Upon approval of the new IDARS online application, NACJD/ICPSR will reactivate the Investigator's account. If a new agreement is not executed within three (3) month, the Investigator's account will be deleted.
O. That any books, articles, conference papers, theses, dissertations, reports, or other publications that employed the Confidential Data or other resources provided by ICPSR reference the bibliographic citation provided by NACJD/ICPSR in the study description.
P. That use of the Confidential Data will be consistent with the Institution's policies regarding scientific integrity and human subjects research.
Q. To respond fully and in writing within ten (10) working days after receipt of any written inquiry from NACJD/ICPSR regarding compliance with this Agreement.

VII. VIOLATIONS OF THIS AGREEMENT

A. The Institution will treat allegations by NACJD/ICPSR or other parties of violations of this Agreement as allegations of violations of its policies and procedures on scientific integrity and misconduct. If the allegations are confirmed, the Institution will treat the violations as it would violations of the explicit terms of its policies on scientific integrity and misconduct.
B. In the event Investigator or Institution breaches any provision of this Agreement, they shall be jointly and severally responsible to promptly cure the breach and mitigate any damages. Investigator and Institution hereby acknowledge that any breach of the confidentiality provisions herein may result in irreparable harm to NACJD/ICPSR not adequately compensable by money damages. Investigator and Institution hereby acknowledge the possibility of injunctive relief in the event of breach, in addition to money damages. In addition, NACJD/ICPSR may:
1. Terminate this Agreement upon notice and terminate access to the Confidential Data and any derivatives thereof;
2. Deny Investigator future access to Confidential Data; and/or
2. Report the inappropriate use or disclosure to the appropriate federal and private agencies or foundations that fund scientific and public policy research.
C. Institution agrees, to the extent permitted under the law, to indemnify, defend, and hold harmless The University of Michigan, NACJD/ICPSR, University of Pittsburgh and its present and past agents, Northwestern University and its present and past agents, and other sources of Confidential Data from any or all claims and losses accruing to any person, organization, or other legal entity as a result of Investigator's, Research Staff's, Participant's, and/or Institution's acts, omissions, or breaches of this Agreement.

VIII. CONFIDENTIALITY

This Agreement is consistent with the requirements of the United States Code -- 31 USC Section 3729 et seq. (The False Claims Act), and 42 USC Section 3789g(a), which authorizes the Department of Justice to collect confidential data while mandating strict protections – and the Code of Federal Regulations -- 28 CFR 22 (Confidentiality and Transfer of Confidential Data), 28 CFR 46 (Department of Justice version of the Common Rule), as well as 62 F.R. 35044 (June 27, 1997) (The Federal Confidentiality Order).

The Institution is considered to be a contractor or cooperating agency of NACJD/ICPSR; as such, the Institution, the Investigator, and Research Staff are authorized to protect the privacy of the individuals who are the subjects of the Confidential Data by withholding their identifying characteristics from all persons not connected with the conduct of the Investigator's research project. Identifying characteristics are considered to include those data defined as confidential under the terms of this Agreement.

IX. INCORPORATION BY REFERENCE

All parties agree that the following documents are incorporated into this Agreement by reference:

A. The Application for Obtaining Confidential Data (as entered in the online data access request system)

B. A copy of the Institution's IRB approval or exemption of the Research Project

C. The Data Security Plan proposed by the Investigator and approved by NACJD/ICPSR (Attachment A)

X. MISCELLANEOUS

A. All notices, contractual correspondence, and return of data under this Agreement on behalf of the Investigator shall be made in writing and delivered to the address below:
National Archive of Criminal Justice Data
ICPSR
P.O. Box 1248
Ann Arbor, MI 48106-1248
nacjd@icpsr.umich.edu

B. This agreement shall be effective for 24 months from execution.

C. The respective rights and obligations of NACJD/ICPSR and Investigator, Research Staff, and Institution pursuant to this Agreement shall survive termination of the Agreement.

D. This Agreement may be amended or modified only by the mutual written consent of the authorized representatives of NACJD/ICPSR and Investigator and Institution. Investigator's research project, Data Security Plan, Research Staff, or Participants may be amended or modified only by submitting such amendments or modifications to the IDARS and receiving approval from the authorized representatives of NACJD/ICPSR. This Agreement may be
extended only by submitting an extension request to the IDARS and receiving approval from the authorized representatives of NACJD/ICPSR. Investigator and Institution agree to amend this Agreement to the extent necessary for NACJD/ICPSR to comply with the requirements of any applicable regulatory authority.

E. The persons signing this Agreement have the right and authority to execute this Agreement, and no further approvals are necessary to create a binding agreement.

F. The obligations of Investigator, Research Staff, Participants, and Institution set forth within this Agreement may not be assigned or otherwise transferred without the express written consent of NACJD/ICPSR.

Attachment A: Virtual Data Enclave Data Security Plan

All of the following computer and data security requirements and procedures are required to be implemented as part of this Agreement:

- You must password protect the computer that is used to access the Confidential Data.
- Under no circumstances may you share or give your VDE username and password to anyone, and this includes not sharing them with other members of

your project team or your organization's IT staff. Passwords must not be stored on a computer in electronic or written form. Software password storage programs may not be used.

- Since the Confidential Data is administered by ICPSR, University of Michigan you should not contact the IT staff at your organization with questions about the Confidential Data.
- (You may contact your organization's IT staff if you need help installing the VM client software to access the Confidential Data. Your organization's IT staff should never be allowed to access the Confidential Data or any Confidential Data.)
- Under no circumstances can any unauthorized person be allowed to access or view Confidential Data within the VDE.
- The Confidential Data may only be accessed within the designated Project Office (as listed in the Application) using only the approved computer and assigned IP address.
- Unauthorized persons will not be allowed inside the designated Project Office when an authorized project team member is logged into the VDE. While logged into the VDE, the security protocol specified in the Application will be followed.
- You must not allow the computer monitor to display Confidential Data content to any unauthorized person. The computer monitor display screen must not be visible from open doors or through windows.
- You must set the computer to activate a password protected screen saver after three minutes of inactivity.
- If you are logged into the VDE and you leave your computer, you must "disconnect" or "logoff" from the VDE. (Disconnecting from the VDE will leave any open programs running but closes the connection to the VDE. Logging off of the VDE closes the connection and terminates all programs that are running.)
- All Confidential Data must be kept within the VDE:
    - You must not duplicate or copy the data (e.g., you must not retype and/or use non-technical ways of copying the data, such as handwritten notes).
    - You must not take screenshots, photographs, or videos of the displayed Confidential Data or statistical outputs.
    - You must not type or record the Confidential Data or results from the data onto your PC or onto some other device or media.
- You must protect all hardcopy documents related to the Confidential Data such as research notes. Such hardcopy documents must be kept in locked drawers or cabinets when not in use.
- Prior to a disclosure review and approval by ICPSR, neither you nor any project team member may talk about or discuss any Confidential Data or results from the Confidential Data in non-secure or public locations. These discussions cannot occur where an unauthorized person could eavesdrop.
- You must submit all statistical outputs/results from the Confidential Data to ICPSR for a disclosure review prior to sharing or giving such outputs to unauthorized persons. You also agree to revise or alter such outputs as required by ICPSR in order to minimize disclosure risk prior to ICPSR approving these outputs for dissemination to unauthorized persons.
- You may only disseminate aggregated information from the Confidential Data to unauthorized persons after you obtain clearance to do so through the ICPSR disclosure review process.

APPENDIX D. YOUNGEST AND OLDEST COHORT BEST MODEL FIT

Youngest Cohort Model Fit

Classes	df	AIC	BIC
1	9	4585.87	4623.85
2	19	4497.77	4577.64
3	28	4438.92	4557.10
4	37	4431.49	4587.66
5	43	4427.76	4609.25
6	54	4422.02	4649.93
7	55	4416.96	4649.09
8	68	4418.21	4705.22

Oldest Cohort Model Fit

Classes	df	AIC	BIC
1	9	4808.47	4846.51
2	19	4674.25	4754.55
3	28	4662.36	4780.70
4	39	4663.96	4828.80

APPENDIX E. MEAN POSTERIOR PROBABILITIES LATENT CLASS SOLUTIONS

Three-Class Solution for 9 Variable Model

Assigned Group	Low Adversity	Family/Community	Abuse/Neglect
Low Adversity	**.75**	.22	.03
Family/Community	.07	**.85**	.07
Abuse/Neglect	.05	.01	**.94**

Three-Class Solution Removing Bullying

Assigned Group	Low Adversity	Family/Community	Abuse/Neglect
Low Adversity	**.84**	.12	.03
Family/Community	.06	**.86**	.08
Abuse/Neglect	.05	.01	**.94**

Two-Class Solution Removing Expanded ACEs

	Family Stressors	Abuse/Neglect
Family Stressors	**.91**	.09
Abuse/Neglect	.08	**.92**

Five-Class Solution for Age-Specific ACEs

	1	2	3	4	5
1. Low Adversity	**.91**	.08	.00	.00	.01
2. Expanded	.07	**.90**	.01	.02	.00
3. Earlier	.00	.00	**.95**	.01	.03
4. Family/Community	.00	.00	.06	**.91**	.03
5. Abuse/Neglect	.00	.00	.00	.01	**.99**