

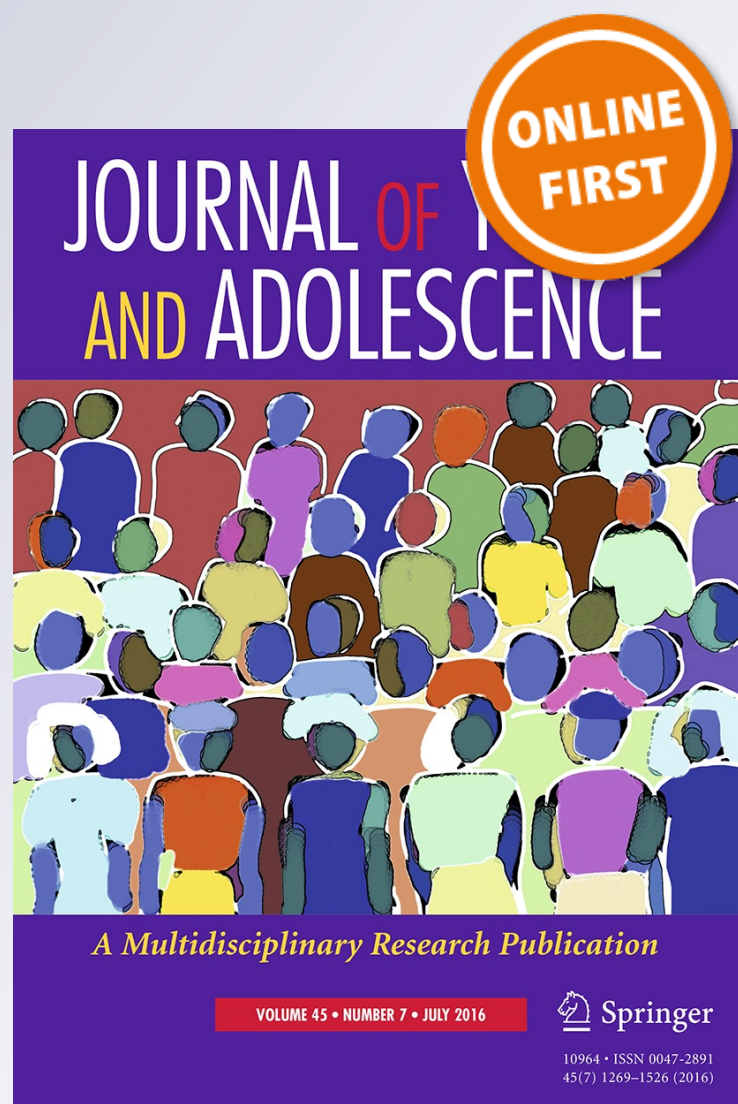
Adverse Childhood Experiences and Suicide Attempts: The Mediating Influence of Personality Development and Problem Behaviors

**Nicholas M. Perez, Wesley G. Jennings,
Alex R. Piquero & Michael T. Baglivio**

Journal of Youth and Adolescence
A Multidisciplinary Research Publication

ISSN 0047-2891

J Youth Adolescence
DOI 10.1007/s10964-016-0519-x



Your article is protected by copyright and all rights are held exclusively by Springer Science +Business Media New York. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your article, please use the accepted manuscript version for posting on your own website. You may further deposit the accepted manuscript version in any repository, provided it is only made publicly available 12 months after official publication or later and provided acknowledgement is given to the original source of publication and a link is inserted to the published article on Springer's website. The link must be accompanied by the following text: "The final publication is available at link.springer.com".

Adverse Childhood Experiences and Suicide Attempts: The Mediating Influence of Personality Development and Problem Behaviors

Nicholas M. Perez¹ · Wesley G. Jennings^{2,3} · Alex R. Piquero⁴ · Michael T. Baglivio⁵

Received: 11 April 2016 / Accepted: 3 June 2016
© Springer Science+Business Media New York 2016

Abstract Adverse childhood experiences, comprised of forms of maltreatment and certain dysfunctional household environments, can affect the development of a child in a variety of different ways. This multitude of developmental changes may subsequently produce compounding harmful effects on the child's life and increase acutely maladaptive outcomes, including adolescent suicidal behavior. This study uses data collected from 2007 to 2012 for 64,329 Florida Department of Juvenile Justice youth (21.67 % female, 42.88 % African American, and 15.37 % Hispanic)

to examine the direct and indirect effects of adverse childhood experiences on suicide attempts. Using a generalized structural equation model, the effects of adverse childhood experience scores are estimated on suicidal behavior through pathways of certain aspects of a child's personality development (aggression and impulsivity), as well as adolescent problem behaviors (school difficulties and substance abuse). The results show that a large proportion of the relationship between childhood adversity and suicide is mediated by the aforementioned individual characteristics, specifically through the youth's maladaptive personality development. These results suggest that, if identified early enough, the developmental issues for these youth could potentially be addressed in order to thwart potential suicidal behavior.

✉ Wesley G. Jennings
jenningswgj@usf.edu

Nicholas M. Perez
nperez87@gmail.com

Alex R. Piquero
apiquero@utdallas.edu

Michael T. Baglivio
Michael.Baglivio@us.g4s.com

Keywords Juveniles · Suicide · ACE assessment · Maltreatment · Aggression · Impulsivity · Substance abuse · School difficulties

¹ School of Criminology, Criminal Justice, and Emergency Management, College of Health and Human Services, California State University, Long Beach, 1250 Bellflower Blvd., ET-232, Long Beach, CA 90840, USA

² Department of Criminology, University of South Florida, Tampa, FL 33620, USA

³ Department of Mental Health Law and Policy, Faculty Affiliate, Florida Mental Health Institute, College of Behavioral and Community Sciences, University of South Florida, 4202 E. Fowler Ave., SOC 309, Tampa, FL 33620, USA

⁴ Program in Criminology, EPPS University of Texas at Dallas, EPPS 800 W. Campbell Road, GR31, Richardson, TX 75080-3021, USA

⁵ G4S Youth Services, LLC, 6302 Benjamin Rd., Suite 400, Tampa, FL 33643, USA

Introduction

Childhood adversity is a common experience for youth worldwide. Recent studies have estimated that more than half of children suffer from at least one adverse or traumatic experience (Anda et al. 2006; Copeland et al. 2007; Felitti et al. 1998). These experiences can range from different types of maltreatment, such as abuse or neglect (cf. Widom 1989), to traumatically dysfunctional household environments, as a result of family violence, parental separation, household member incarceration, household mental illness, and household substance abuse. Contemporary developmental psychology research has begun to consider the effects of these adverse childhood experiences

on the likelihood of a number of harmful adolescent and adult outcomes. These empirical analyses have continuously shown that early adverse experiences are associated with a multitude of developmental problems for the individual throughout subsequent life stages (Cicchetti and Toth 1995; Lamphear 1985; Trickett and McBride-Chang 1995).

One theoretical perspective used by researchers in this area of research emerges from developmental psychopathology. This framework has been defined as “the study of the origins and course of patterns of behavioral maladaptation, whatever the age of onset, whatever the causes, whatever the transformations in behavioral manifestation, and however complex the course of the developmental pattern may be” (Sroufe and Rutter 1984, p. 18). This field of research examines the growth of both adaptive and maladaptive behavior throughout a child’s maturation, considering different challenges at each age throughout a child’s growth to determine the predictors of normal and abnormal developmental processes (Causadias 2013). One of the important dimensions of this perspective examines the consequences of childhood adversity and maltreatment. The developmental psychopathology perspective on child maltreatment was largely shaped by the work of developmental and clinical psychologist Cicchetti in the 1980s and early 1990s (Cicchetti 1984; Cicchetti and Toth 1995).

In this line of research, since child abuse is such an unfavorable experience, it can have vast and devastating consequences for this young and vulnerable population (Cicchetti and Toth 2005). According to this notion, maltreated children experience major risks for insufficient maturation and inappropriate adaptation as a result of their unhealthy upbringing, and may instead show numerous symptoms of maladaptive functioning throughout their development (Cicchetti and Toth 1995, 2008; Manly et al. 1994). Accordingly, children who experience abuse, neglect, or some other type of adverse experience are predicted to be more likely to experience developmental difficulties in emotion regulation, personal and peer relationships, self-concept, school adaptation, and a variety of psychopathological traits throughout life (Cicchetti and Toth 1995).

Adverse Childhood Experiences (ACE) Assessment

In light of studies that have shown the damaging effects of childhood adversity, researchers have developed certain ways to measure it empirically. One such tool developed in the medical field is the Adverse Childhood Experiences (ACE) assessment. Felitti et al.’s (1998) original assessment included measures of emotional abuse, physical abuse, sexual abuse, witnessing household violence, household substance abuse, household mental illness, and

having an incarcerated member of the family. Subsequent research, though, has since included physical neglect, emotional neglect, and parental separation/divorce. Cumulatively, these experiences of childhood adversity comprise a ten-item assessment used to calculate an individual’s ACE score.

Felitti et al. (1998) found that over half of their sample (52.1 %) reported exposure to at least one adverse childhood experience during childhood. Their results also indicated that individuals with higher levels of adverse childhood experiences experienced increased health risks and numerous diseases and health problems such as heart disease, high blood pressure, chronic lung disease, skeletal fractures, liver disease, cancer, and early death. Adverse childhood experiences also predicted the presence of alcoholism, drug abuse, depression, obesity, and suicide (Felitti et al. 1998). In fact, the ACE score demonstrated a graded relationship with these outcomes, where the exposure to multiple adverse childhood experiences demonstrated an exponentially more severe effect. This finding suggested that biological, as well as psychological and physical health problems later in life may be associated with adversity that occurred during childhood.

The emergence of this area of empirical inquiry has provided an important step for the consideration of adverse childhood experiences as a correlate for negative outcomes beyond those assessed in the original Felitti study. Not surprisingly, many researchers have examined the life-course effects of childhood adversity using the ACE assessment. These studies have demonstrated that higher ACE scores have been linked to a variety of dangerous or deviant behaviors, such as smoking (Anda et al. 1999), alcoholism (Dong et al. 2005), obesity (Burke et al. 2011), mental illness (Chapman et al. 2007; Felitti and Anda 2010), depression (Dube et al. 2003), risky sexual behavior (Hillis et al. 2001), offending (Baglivio et al. 2014; Baglivio et al. 2015), adolescent pregnancy (Hillis et al. 2004), and homelessness (Herman et al. 1997). In addition, higher ACE scores have also been shown to directly predict an individual’s likelihood of suicidal behavior (Dube et al. 2001).

Adverse Childhood Experiences and Suicidal Behavior

For American adolescents, suicide is the third leading cause of death and averages over 4000 deaths per year (Center for Disease Control 2014). This figure accounts for about 20 % of all deaths of individuals aged 10–24 each year (Kaslow 2014). According to Kaslow (2014), in a nationally-representative sample of high school students, approximately 16 % of adolescents had considered suicide

at some point and about 8 % had attempted suicide at least once. In her sample, certain risk factors emerged from all realms of the adolescent's life (intrapersonal, social, environmental, and cultural). The presence of these risk factors suggests that suicide is not a random or arbitrary choice, but is instead precipitated by specific processes and life events that may propel the juvenile toward self-destructive behavior.

Accordingly, within the developmental psychopathology framework, a number of maladaptive changes throughout childhood and adolescence may impact a juvenile's risk for suicidal ideation or attempts (see Mazza and Reynolds 1998; Windle 2004). For example, developmental problems in childhood related to early life adversity, major adjustment difficulties, and psychopathology have been found to be important predictors of suicidal behavior (Fergusson and Lynskey 1995). The empirical research has also indicated that traumatic or stressful events can lead to a lower self-concept and increase the likelihood of suicidal ideation (Wilbum and Smith 2005). According to Wagner (1997), family dynamics during childhood, such as abuse, maltreatment, and household dysfunction are considered key risk factors for both suicidal ideation and suicide attempts during adolescence.

Dube et al. (2001) examined the effects of adverse childhood experiences and suicide attempts, and their results suggested that each individual ACE assessment item (ranging from abuse and neglect to other household dysfunction) increased the odds of attempted suicide by two- to five-times. In addition, the cumulative ACE score exerted a graded effect on suicidal behavior, increasing exponentially for each additional adverse childhood experience. Specifically, their analysis showed that adolescents who experienced seven or more adverse experiences had a suicide rate of 31.1 % (compared to only 3.8 % in the full sample).

In another study by Brown et al. (1999), adolescents who experienced some form of adversity or maltreatment were three-times more likely to be suicidal. The largest effect on suicide attempts was found for children who were sexually abused. For these youth, the risk of multiple suicide attempts was *eight-times* higher than those who had not been sexually abused. Similarly, Plunkett and colleagues (2001) found that the rate of suicide for victims of child sexual abuse may actually be 10.7- to 13-times larger than the national rate. Further, Greer (1964) showed that parental loss for over a year (potentially the result of separation/divorce or imprisonment) was significantly more prevalent for adolescents who had attempted suicide than for those who had not. While these studies have supported a relationship between adverse childhood experiences and suicide, few studies have considered this relationship while

including intervening variables that research has also found to be risk factors for suicidal behavior. The uncovering of potential mediator variables between childhood adversity and suicide may better contextualize this relationship and point to more focused and concerted interventions.

Adverse Childhood Experiences and Suicidal Behavior Mediation

Aggression

Research has found that certain maladaptive personality traits that are more prevalent in suicide attempters may also be higher in those who have experienced childhood adversity. One such area of inquiry has focused on the influence of trauma and adversity on childhood aggression. Many studies have shown that children who are physically abused (Dodge et al. 1990; Farrington 1978; Klika et al. 2012; Swogger et al. 2011; Widom 1989), emotionally abused (Allen 2011), neglected (Kotch et al. 2008), witness domestic violence (Sousa et al. 2010), or have an incarcerated family member (Murray et al. 2012; Wildeman, 2010) are much more likely to display aggressive tendencies later in life.

Additionally, aggression during childhood has been empirically coupled with the self-destructive nature of suicide (Brown and Goodwin 1986; Garrison et al. 1993; Giegling et al., 2009). This association was explained by Conner et al. (2003) as the result of a specialized subtype, called *reactive aggression*. The individuals who are *reactively aggressive* (compared to proactively aggressive) are more susceptible to impulsive and angry outbursts to external events. As such, they experience emotional dysregulation (inappropriate emotive responses or mood swings) and are exceptionally vulnerable to psychologically distressing situations that place them at a higher risk of attempting suicide. Accordingly, aggression may play an important role in mediating the relationship found between adverse childhood experiences and suicidal behavior.

Impulsivity

A child's level of impulsivity is also considered an important determinant for subsequent behavior. Gottfredson and Hirschi's (1990) general theory of crime, with its focus on the link between effective parental socialization and the development of self-control among offspring, would anticipate that parents who are abusive, neglectful, incarcerated, or altogether absent may be less likely to utilize positive childrearing practices and less likely to succeed in sculpting their child's self-control during their formative years (Bornstein 2002). Further research has since found significant relationships between childhood

adversity and higher levels of impulsivity in clinical samples (Rosenberg et al. 2007; Roy 2005).

As with aggression, impulsivity has also been linked to a higher risk for suicidal behavior (Maser et al. 2002). In fact, some studies have actually considered impulsivity as a mediating influence between adverse childhood experiences and subsequent suicide. For example, in addition to finding that childhood adversity was related to impulsivity, Roy (2005) found that impulsivity was then predictive of future suicidal behavior. This finding represents an important step in understanding the relationship between adverse childhood experiences and suicidal behavior, but research has not yet considered both aggression and impulsivity together as potential mediators for this association. In addition, beyond these two maladaptive personality traits, certain adolescent problem behaviors must also be taken into account as contributors for adolescent suicide.

School Difficulties

In addition to individual differences in personality, childhood adversity may also affect a youth's potentially maladaptive behaviors in adolescence. Jessor's problem behavior theory is a common social-psychological framework used to explain such maladaptation (see: Jessor 1987, 1991; Jessor and Jessor 1977). Through this perspective, the interrelationships of multiple problem behaviors are seen as indicative of a larger root problem behavior "syndrome." Jessor (1987) defined a problem behavior as any "behavior that is socially disapproved by the institutions of authority and that tends to elicit some form of social control response whether mild reproof, social rejection, or even incarceration" (p. 332). Under this definition, a variety of adolescent problem behaviors that meet this definition have been examined over the past few decades (Ary et al. 1999; Bensley et al. 1999a; b; Jessor, 1987). Some research suggests that these problem behaviors may be best predicted by the presence of adverse childhood experiences.

For example, adverse childhood experiences have been shown to negatively influence a child's intellectual abilities or their enthusiasm for their educational pursuits, resulting in substantially weakened school comprehension and performance (Erickson et al. 1989). For example, Eckenrode et al. (1993) utilized a matched sample of maltreated children and non-maltreated children and found that the maltreated group performed lower on standardized tests and received lower overall grades (see also: Kurtz et al. 1993; Kendall-Tackett and Eckenrode 1996; Shonk and Cicchetti 2001; Zolotor et al. 1999). In addition, witnessing family violence has been found to be related to lower performance and more school absences (Bowen and Bowen

1999; Hurt et al. 2001). Finally, household environments characterized by parental substance abuse, have also been associated with weakened school performance (Moss et al. 1995). Accordingly, childhood adversity is also considered a serious risk factor for school failure and dropout (Kurtz et al. 1993).

School difficulties have also been cited as an important risk factor in suicidal behavior. Studies have shown that suicide attempters have lower levels of academic success (Lewis et al. 1988). This relationship was reinforced by the work of Richardson et al. (2005), indicating that a group of adolescents who perceived their academic performance as "failing" had a likelihood of suicide attempts five-times greater than those who considered their performance "above average." School dropout or expulsion may also negatively affect the self-image of the adolescent, and thus, increase their propensity for internalized violent behavior. Daniel et al. (2006) found that children who struggled in school and eventually dropped out were more likely to report suicidal attempts (Daniel et al. 2006). As such, high school dropouts are often considered an "at-risk group" for suicidal behavior (Silverman and Felner 1995).

Substance Abuse

Children who experience childhood adversity may be at an increased risk for abusing substances to cope with their emotions. In fact, many of the ten ACE assessment items were related to general lifetime alcohol use, heavier use, and earlier alcohol onset (Dube et al. 2006; Rothman et al. 2008; Waldrop et al. 2007). Beyond an earlier onset and heavier use, experiences of childhood adversity have been connected to alcohol use disorders (AUDs) as well (Dube et al. 2002; Makhija and Sher 2007; Simpson and Miller 2002). In fact, adolescents experiencing AUDs were 6 to 12 times more likely to have a history of physical abuse and 18 to 21 times more likely to have a history of sexual abuse (Clark et al. 1997).

In addition to alcohol abuse, childhood adversity has been associated with the use of a variety of other mood-altering substances. Dube et al. (2003) found that each adverse childhood experience was related to an earlier initiation of illicit drugs, with each adverse childhood experience increasing the likelihood of early initiation by two- to four-times. Their study showed that the prevalence of adverse childhood experiences strongly predicted drug use problems and drug addiction as well. Ireland et al. (2002) found that persistent maltreatment throughout childhood and adolescence was related to higher levels of adolescent drug use. The experience of physical and sexual abuse during childhood has been related to intravenous drug use and an earlier initiation of intravenous drug use (Kerr et al. 2009; Ompad et al. 2005). Growing up in a non-

intact family (possibly as a result of separation, divorce, or incarceration) was also predictive of higher levels of substance abuse (Flewelling and Bauman 1990). Finally, higher levels of abuse and other adverse experiences are predictive of the abuse of multiple substances simultaneously as well (Harrison et al. 1997).

As with individuals who experience school difficulties, the use and abuse of substances is also considered a serious risk factor for suicidality. Many youth use substances to escape or cope with the negative emotions that may eventually lead to self-destructive behaviors, such as suicide. Not surprisingly, early alcohol initiation (before the age of 13) has been shown to predict a significantly higher incidence of suicidal ideation and attempts (Swahn and Bossarte 2007; Swahn et al. 2010). In addition, “distressed” drinking, heavy drinking, and alcohol dependence were each associated with attempting suicide (Murphy 2000; Schilling et al. 2009). Adolescent drug abuse has also been closely related to suicidal behavior (Brent 1995; King et al. 2001; McKenry et al. 1983). In fact, Dube et al. (2001) found that adolescent substance abuse mediated the relationship between adverse childhood experiences and suicidal behavior.

The Current Study

A review of the empirical literature clearly shows that a vast amount of research has examined many of the relationships relevant to the current study. While past studies have shown that higher levels of childhood adversity can predict suicidal behavior, the intervening mechanisms between the experience and subsequent suicide attempts have not been fully examined *simultaneously*. Consequently, the present study investigates the mediating processes between a child's experiences of adverse childhood experiences and suicidal behavior relying on data from 64,239 Florida Department of Juvenile Justice youth. This line of research then aims to recommend more meaningful and effective interventions to prevent the progression toward this type of self-destructive behavior.

This project attempts to answer a variety of questions regarding the associations of variables present in the lives of adolescents. Specifically, three main research questions are tested. (1) Does the ACE score predict the development of higher levels of aggression as well as higher levels of impulsivity? (2) Does the ACE score predict the presence of two adolescent problem behaviors, school difficulties and substance abuse, and is this relationship mediated by the development of higher levels of aggression and impulsivity? (3) Does the ACE score predict suicidal behavior and is this relationship mediated by the youth's personality development or adolescent problem behaviors?

In light of the empirical research that has discussed many of the aforementioned developmental variables, certain hypotheses were generated. First, ACE scores were hypothesized to significantly impact a child's personality development in each of the two domains: aggression (see Aber et al. 1989) and impulsivity (see Haapasalo and Pokela 1999; Roy 2005). Relatedly, the experiences of childhood adversity were expected to partially mediate relationships between the demographic background variables and the two maladaptive personality traits.

In addition to the predicted impacts on the maladaptive personality measures, ACE scores were hypothesized to significantly increase the likelihood of each of the adolescent problem behaviors. As found in past research, children who experience adversity are predicted to be at increased risk of encountering difficulties in school (Erickson et al. 1989; Kendall-Tackett and Eckenrode 1996) and develop a problem with substance abuse (Dube et al. 2002, 2003; Ireland et al. 2002). These relationships were anticipated to be partially mediated by the personality measures of aggression and impulsivity, but the ACE score was still expected to exert a direct significant effect and increase the odds of each of the maladaptive adolescent outcomes.

Finally, in accordance with the current literature, higher levels of childhood adversity were predicted to increase the likelihood of suicidal behavior (Brown et al. 1999; Dube et al. 2001). This relationship was anticipated to be partially mediated by each of the maladaptive personality factors and adolescent problem behaviors, but the ACE score was still predicted to exert a direct and significant effect on suicidal behavior.

Methods

The data used for this project was collected by the Florida Department of Juvenile Justice (FDJJ). This sample consists of all de-identified individual juveniles who received a delinquency referral in the state of Florida and aged out of the juvenile justice system between 1 Jan 2007 and 31 Dec 2012. At the time of their FDJJ referral, each youth was administered a Positive Achievement and Change Tool (PACT) assessment. The PACT is a risk/needs assessment consisting of a semi-structured interview with a juvenile probation officer, a case file examination, and an appraisal of the child's official child abuse records. Specifically, the PACT assessment, through its automation process, creates paperwork efficiencies that allow for more time for the probation officer to interact with the youth. The criminal history domain of the PACT is fully automated from the information system, eliminating the need for self-report or recall of charges, adjudications, or system placements by the youth. Additionally, the PACT automates the

individualized youth case management plan, reducing the amount of time the probation officer has to take to create a plan. Instead, the officer selects goals, and interventions to reach those goals from drop-down menus (which are editable to increase individuality). Standardized three-day PACT training teaches officers to focus on higher risk youth, youth who receive the PACT full screen (the sample of the current study), and to increase contact frequency with those higher risk youth, while minimizing contact with low risk youth. Caseloads can range from 15 to up to 90 for caseloads of exclusively low risk “on demand status” (completed all court requirements and only owe court fees and/or restitution) or administrative cases. A full PACT assessment (those used in the current study) takes between 45 and 60 min to conduct, but may be longer, depending on the youth’s history and unique circumstances (personal communication with FDJJ Statewide Risk Assessment Coordinator on 31 May 2016). Ultimately, the aim of the PACT is to determine a juvenile’s likelihood to re-offend and review the presence of certain risk and protective factors. Based on the PACT assessment, a specialized case plan was created to appropriately assist the juvenile.

The PACT consists of two versions: a Pre-Screen Assessment (46 items) and a Full Assessment (126 items). At this time, FDJJ assesses every juvenile with the Pre-Screen when they enter the system. Individuals who score as moderate-high or high risk to re-offend are then assessed using the Full Assessment, which contains the following 12 domains: criminal history, gender, school, use of free time, employment, relationships, family and living arrangements, alcohol and drugs, mental health, attitudes/behaviors, aggression, and skills (Baird et al. 2013). This assessment has been widely validated as a tool for predicting risk and recidivism (Baglivio 2009, 2014; Baglivio and Jackowski 2013). The final sample in this study is comprised of each unique juvenile who had been administered the PACT Full Assessment ($n = 64,329$ youth) with a mean age of 17 years old (at the time of the last assessment). Each of the following measures was compiled by the juvenile case worker based on the semi-structured interview and review of the youth’s official records.

Measures

Adverse Childhood Experiences (ACE) Score

Based on information collected in the PACT, each ACE item was coded dichotomously based on the presence (1) or absence (0) of each experience in the child’s life. In this study, the items used to calculate the ACE score consist of: (1) emotional abuse; (2) physical abuse; (3) sexual abuse; (4) emotional neglect; (5) physical neglect; (6) witnessing

household violence; (7) household substance abuse; (8) household mental illness; and (9) household member incarceration. As such, an overall ACE score, ranging from zero to nine, was created by summing the number of ACE assessment items present in the history of each juvenile in the sample. This method of ACE assessment coding matches the technique used in other recent research (Fox et al. 2015).

Aggression

The first maladaptive personality variable, “aggression,” was ascertained using a latent construct, comprised of seven ordinal-level indicator variables representing different facets of aggressive behavior assessed in the PACT. The factor was created using the youth’s (1) level of belief in yelling and verbal aggression to resolve a conflict; (2) level of belief in fighting and physical aggression to resolve a conflict; (3) tolerance for frustration; (4) empathy, remorse, sympathy, or feelings for the victim; (5) hostile interpretation of actions and intentions of others in non-confrontational settings; and (6) evidence of prior violent or aggressive behavior not included in the juvenile’s criminal record ($\alpha = 0.79$). These items were coded by the PACT worker based on the juvenile’s semi-structured interview and correspond to the measures found in the PACT’s “Aggression” domain.

Impulsivity

The second maladaptive personality variable, “impulsivity,” was ascertained based on the juvenile caseworker’s determination of the juvenile’s impulsive behavior. Based on the PACT assessment, the juvenile was coded as one of four levels of impulsivity: “usually thinks before acting;” “sometimes thinks before acting;” “impulsive; often acts before thinking;” or “highly impulsive; usually acts before thinking.”

School Difficulties

The first adolescent problem behavior, “school difficulties,” was assessed using a latent construct comprised of seven ordinal-level indicator variables derived from the PACT data. The factor was created using (1) the level of belief in the value of an education; (2) school involvement; (3) amount of school suspensions; (4) seriousness of school conduct; (5) school attendance; (6) academic performance; and (7) school dropout or expulsion ($\alpha = 0.71$).

Substance Abuse

The second adolescent problem behavior, “substance abuse,” was assessed by the caseworker to determine if

there are any signs of substance abuse problems. These signals can include past or current use of a substance in a manner that may disrupt the youth's education, cause family conflict, interfere with friends, cause any physical health problems, or contribute to criminal behavior. The case worker also looked for signs of tolerance (needing increasing amounts of the drug to achieve the same level of intoxication) or withdrawal. These criteria mimic much of the language used to diagnose substance abuse in the DSM-V (American Psychiatric Association 2013). If the youth has experienced any of these symptoms indicating abuse of alcohol or drugs, they were coded as "1," while all others were coded as "0."

Suicidal Behavior

The "suicidal behavior" outcome variable was coded in a binary fashion. All juveniles who were determined by their case worker to have attempted suicide at some point in their past were coded as "1," while all individuals with no prior suicide attempts were coded as "0."

Demographics

The gender of the youth was coded as "0" for females and "1" for males. The race/ethnicity of the juvenile was coded based on the evaluation of the juvenile caseworker during the PACT assessment and consists of four categories: "White," "African American," "Hispanic," or "other." In the analysis, each of the minority groups, (African American, Hispanic, and other) were coded dichotomously to compare their effects to the "White" reference group. Lastly, the socioeconomic status of the juvenile's family was coded based on the PACT and contains four interval categories of household income: "Under \$15,000," "From \$15,000 to \$34,999," "From \$35,000 to \$49,999," and "\$50,000 and Over." These demographic variables were considered as control variables at each stage of estimation.

Analytic Method

In order to estimate a multi-stage model, a statistical technique capable of including mediating relationships was necessary. Structural equation modeling (SEM) is regarded as a powerful method of multivariate regression, often used when testing mediation since an outcome variable of one equation can become the predictor variable in the next (Cole and Maxwell 2003; Hayes 2009; Holmbeck 1997; Iacobucci 2008; James et al. 2006). To accommodate the unique features of the PACT data (many measures are dichotomous or ordinal-level), we used a generalized structural equation model (GSEM), which allows for variables that do not fit the necessary conditions of a

normal distribution for traditional SEM (Skrondal and Rabe-Hesketh 2004). These GSEM models can accommodate both continuous and categorical outcome variables within the measurement and structural models (Muthén 1984; Skrondal and Rabe-Hesketh 2004; StataCorp. 2013a). In order to design the current GSEM model, this analysis utilized Stata 13's *Model Builder* (StataCorp. 2013b).

The structural model for the GSEM is found in Fig. 1. This model consisted of the control demographic characteristics, the ACE score, the two maladaptive personality traits, the two adolescent problem behaviors, and the ultimate outcome of suicidal behavior. Again, each stage of the model allows for the mediation of the effects of the previous stage and the estimation of both the direct and indirect effects on the outcome measure at the succeeding stage of analysis.

Results

Descriptive Statistics

Table 1 presents the demographic information for the sample. The sample is predominantly male (78.33 %) and widely divided across the four racial/ethnic categories. The juveniles are 42.88 % African American (non-Hispanic), 38.23 % White (non-Hispanic), 15.37 % Hispanic, and 3.52 % of the other racial/ethnic category. As is true in other official delinquency samples, this represents a much larger proportion of African American juveniles and much smaller proportions of White juveniles than found in the general U.S. population (U.S. Census Bureau 2015). Finally, the vast majority of household incomes of the youths' families falls below \$35,000 per year. Although 53.87 % of families earn between \$15,000 and \$34,999, 19.46 % fell below \$15,000 per year. Only 18.03 % of families earned between \$35,000 and \$49,999 per year and less than one-tenth lived with families that earned above \$50,000 per year (8.64 %).

The key predictor variable in the current study was adverse childhood experiences, measured using the ACE assessment. Table 2 presents the prevalence of each individual ACE item in the sample. The data indicated that each ACE item is experienced by between approximately 9 and 66 % of the juveniles. The most common experience was having an incarcerated household member (65.92 %). About one-third of the juveniles also witnessed household violence (33.25 %) or experienced emotional abuse (32.53 %), while over one-fourth experienced physical abuse (26.53 %). Additionally, 24.37 % of youth grew up with a family member who abused substances, 13.28 % experienced physical neglect, 13.16 % experienced

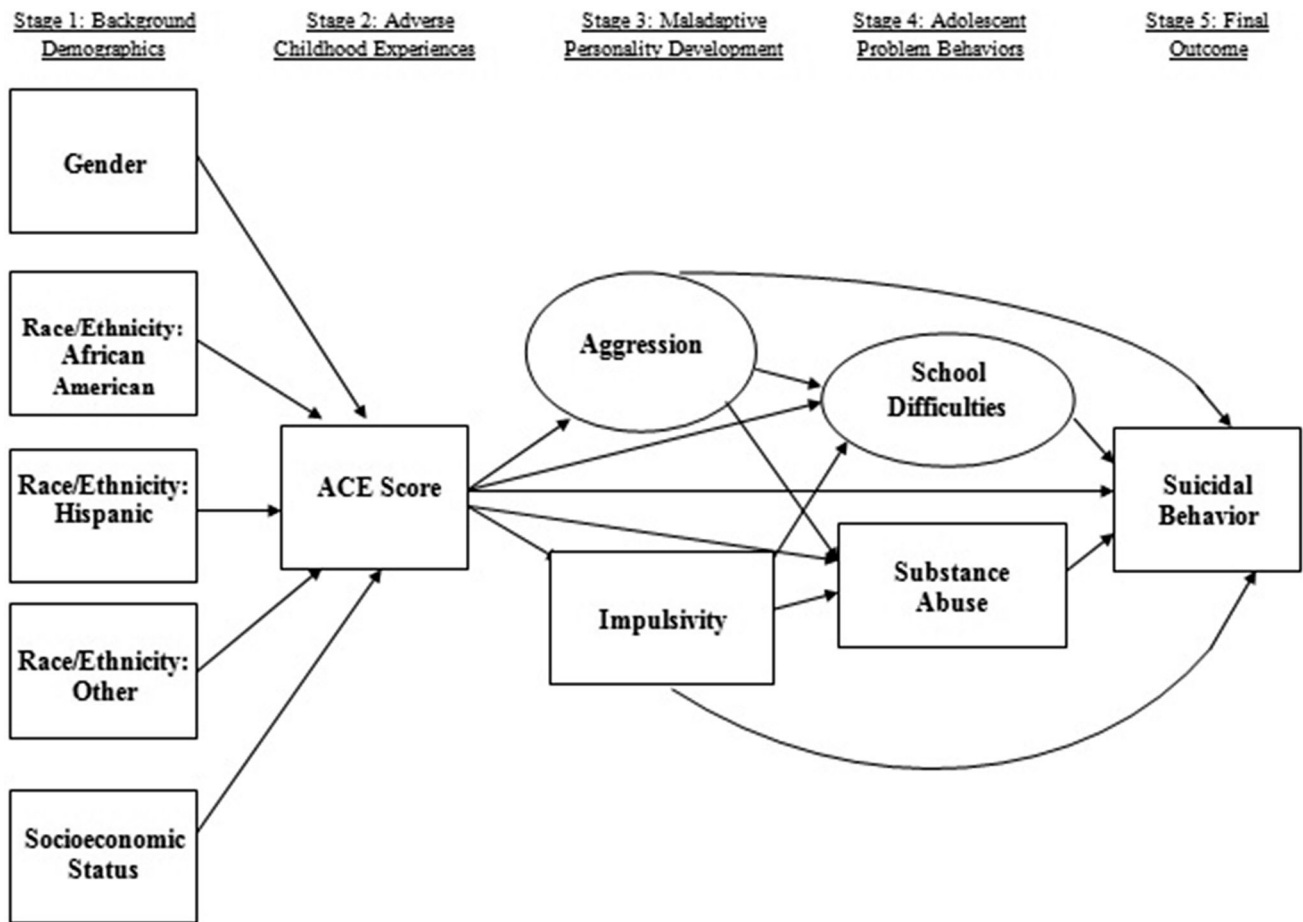


Fig. 1 Full GSEM structural model

Table 1 Descriptive statistics for demographic characteristics

Variable	%
Gender	
Male	78.33
Female	21.67
Race/ethnicity	
White, non-hispanic	38.23
African American, Non-Hispanic	42.88
Hispanic	15.37
Other	3.52
Socioeconomic status	
Under \$15,000	19.46
\$15,000–\$34,999	53.87
\$35,000–\$49,999	18.03
\$50,000 or over	8.64

Table 2 Individual adverse childhood experience prevalence

Individual ACE	%
Emotional abuse	32.53
Physical abuse	26.53
Sexual abuse	9.22
Emotional neglect	13.16
Physical neglect	13.28
Household violence	33.25
Household substance abuse	24.37
Household mental illness	12.28
Incarcerated household member	65.92

emotional neglect, and 12.28 % grew up with a mentally ill family member. Finally, sexual abuse was the most infrequent adverse childhood experience (9.22 %).

The total ACE score for each juvenile was generated by adding these nine measures for each juvenile, producing a score ranging from 0 to 9. The average ACE score was 2.31 (SD = 1.85). Only 16.74 % of youth in the sample did not experience any of the adverse childhood experiences, indicating that 83.26 % exhibited at least one adverse

childhood experience. Nearly 60 % of the sample experienced two or more adverse childhood experiences. The overall prevalence of adverse childhood experiences progressively decreased for each additional experience. Less than 2.5 % of the sample experienced seven or more adverse childhood experiences during childhood. The individual and cumulative breakdowns of the prevalence for each ACE score can be found in Table 3.

The final descriptive statistic integral to this study related to the number of youth who reported engaging in suicidal behavior. The results indicated that 1.97 % of those in the sample had reported attempting suicide at some point in their life, which is slightly smaller than the general population (4 %; see Nock et al. 2013). This difference may be due, in part, to the unique demographic and behavioral nature of the youth found in this FDJJ sample. In this sample, a lower percentage of youth who attempted suicide was found in those with lower ACE scores (nearly 0 %). On the other hand, those youth with higher ACE scores displayed larger percentages of suicidal behavior and 24 % of youth with a 9 ACE score had engaged in suicidal behavior (see Fig. 2).

The Effect of ACE Scores on Suicidal Behavior without Mediators

In order to first estimate the initial effect of the ACE score on a juvenile's likelihood of suicide, a logistic regression model was estimated. This model simply included the ACE score and the demographic characteristics of the juvenile. This analysis was conducted to test the relationship between adverse childhood experiences and suicidal behavior without any mediator variables included. The results of this regression can be found in Table 4. As can be seen, a higher ACE score significantly increased the odds of a youth attempting suicide ($OR = 1.49, p < 0.001$,

Table 3 Percentage of sample with each total ACE score

ACE score	%	Cumulative %
0	16.74	16.74
1	24.06	83.26
2	19.53	59.21
3	14.97	39.68
4	10.70	24.71
5	7.30	14.01
6	4.29	6.71
7	1.92	2.42
8	0.45	0.50
9	0.05	0.05

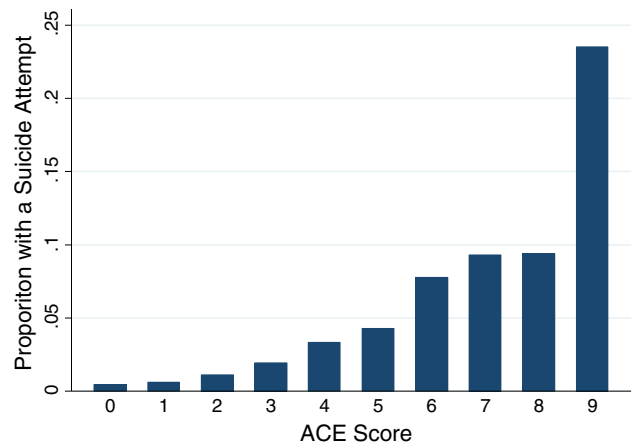


Fig. 2 Proportion of sample with suicide attempt by ACE score

95 % CI [1.45, 1.53]). The estimates for the demographic variables also indicated that females ($OR = 0.48, p < 0.001, 95 % CI [0.43, 0.54]$) and Whites compared to African Americans ($OR = 0.48, p < 0.001, 95 % CI [0.42, 0.55]$), Hispanics ($OR = 0.77, p = 0.004, 95 % CI [0.64, 0.92]$), and the "other" racial/ethnic category ($OR = 0.61, p = 0.012, 95 % CI [0.42, 0.90]$) demonstrated an increased odds of a suicide attempt. Socioeconomic status, conversely, did not exert a significant effect on the likelihood of having attempted suicide.

The Mediation Model of ACE Scores and Suicidal Behavior

The initial logistic regression results presented above documented a relationship between the ACE score and likelihood of suicidal behavior. As such, additional analyses were conducted to better understand the potential mediating effects of this relationship. To begin the estimation of the complete GSEM, the model (as seen in Fig. 1) was estimated with all effects calculated

Table 4 Logistic regression predicting suicidal behavior

Predictor	b	SE	OR	95 % CI
ACE Score	.40	.01	1.49***	1.44, 1.53
Gender	-.73	.06	0.48***	0.43, 0.54
Race/ethnicity: African American	-.74	.07	0.48***	0.42, 0.55
Race/ethnicity: Hispanic	-.27	.09	0.77**	0.64, 0.92
Race/ethnicity: other	-.49	.20	0.61*	0.42, 0.90
Socioeconomic status	.06	.03	1.06	0.99, 1.13

OR Odds ratio, CI confidence interval, Nagelkerke R2 .111, $p < 0.001$

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

simultaneously. The complete results of this model can be found in Table 5. For ease of presentation, the results will be described in successive stages, beginning with the control demographic variables on the left of the model/table and progressing, ultimately, to the full estimation of all predictors on the likelihood of suicidal behavior at the right side of the model/table.

The Effects of Background Demographics on the ACE Score

The data was first analyzed to determine if any key differences emerged in the adverse childhood experiences as a result of the juvenile's demographic characteristics. Each of the demographic variables were significant predictors of the ACE score. Being male significantly reduced the juvenile's ACE score ($b = -0.77, p < 0.001, 95\% \text{ CI}$

$[-0.80, -0.73]$). Additionally, the three racial/ethnic categories, African American ($b = -0.52, p < 0.001, 95\% \text{ CI}$ $[-0.55, -0.49]$), Hispanic ($b = -0.78, p < 0.001, 95\% \text{ CI}$ $[-0.83, -0.74]$), and "other" race/ethnicity ($b = -0.85, p < 0.001, 95\% \text{ CI}$ $[-0.93, -0.77]$) also predicted a reduced level of ACE scores when compared to White juveniles. Finally, juveniles from families with higher annual incomes experienced fewer adverse childhood experiences and had lower ACE scores ($b = -0.29, p < 0.001, 95\% \text{ CI}$ $[-0.30, -0.27]$).

The Effects of the ACE Score on Maladaptive Personality Traits

In the second section of the GSEM model, the two maladaptive personality traits (aggression and impulsivity) were regressed on the ACE score while controlling for the

Table 5 GSEM coefficient estimates

Predictor	Direct effect											
	1: ACE		2: Maladaptive personality development				3: Adolescent problem behaviors				4: Suicidal behavior	
	ACE score		Aggression		Impulsivity		School difficulties		Substance abuse		Suicidal behavior	
	<i>b</i>	95 % CI	<i>b</i>	95 % CI	<i>b</i>	95 % CI	<i>b</i>	95 % CI	<i>Exp(b)</i>	95 % CI	<i>Exp(b)</i>	95 % CI
Gender	-0.77*** (0.02)	-0.80, -0.73	0.03*** (0.00)	0.02, 0.03	0.21*** (0.02)	0.19, 0.23	0.08*** (0.00)	0.08, 0.09	1.78*** (0.04)	1.70, 1.85	0.45*** (0.03)	0.40, 0.51
Race/ethnicity: African American	-0.52*** (0.02)	-0.55, -0.49	0.11*** (0.00)	0.11, 0.12	0.11*** (0.02)	0.09, 0.13	0.05*** (0.00)	0.05, 0.06	0.57*** (0.01)	0.55, 0.60	0.42*** (0.03)	0.37, 0.49
Race/ethnicity: hispanic	-0.78*** (0.02)	-0.83, -0.74	0.05*** (0.01)	0.05, 0.06	-0.01 (0.02)	-0.04, 0.01	0.04*** (0.00)	0.04, 0.05	0.90*** (0.02)	0.87, 0.96	0.73** (0.07)	0.61, 0.88
Race/ethnicity: other	-0.85*** (0.04)	-0.93, -0.77	0.11*** (0.10)	0.09, 0.12	0.08** (0.02)	0.03, 0.12	0.05*** (0.00)	0.04, 0.07	0.57*** (0.03)	0.53, 0.63	0.56** (0.11)	0.38, 0.83
Socioeconomic status	-0.29*** (0.01)	-0.30, -0.27	0.003 (0.002)	-0.01, 0.01	0.01* (0.02)	0.00, 0.02	-0.03*** (0.00)	-0.03, -0.02	1.20*** (0.01)	1.19, 1.23	1.03 (0.04)	0.98, 1.05
ACE score	-	-	0.12*** (0.001)	0.12, 0.12	0.23*** (0.02)	0.22, 0.23	0.02*** (0.00)	0.02, 0.03	1.14*** (0.01)	1.15, 1.17	1.29*** (0.02)	1.25, 1.33
Aggression	-	-	-	-	-	-	0.26*** (0.01)	0.27, 0.28	2.03*** (0.05)	1.93, 2.14	3.36*** (0.29)	2.80, 4.03
Impulsivity	-	-	-	-	-	-	0.07** (0.00)	0.07, 0.07	1.25** (0.02)	1.21, 1.28	1.44*** (0.07)	1.32, 1.58
School difficulties	-	-	-	-	-	-	-	-	-	-	0.79* (0.09)	0.64, 0.98
Substance abuse	-	-	-	-	-	-	-	-	-	-	1.06 (0.02)	0.98, 1.10

Standard errors in parentheses

CI Confidence interval, $n = 63,400, AIC 562,106.00, BIC 562,595.10, df 54$

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

demographic characteristics. These estimates are found in the second major column of Table 5. Even when controlling for demographic characteristics, higher ACE scores were found to significantly increase the juvenile's level of aggression ($b = 0.12$, $p < 0.001$, 95 % CI [0.12, 0.12]). The demographic characteristics, however, were not fully mediated by the introduction of the ACE score. The respondent's level of aggression was also significantly increased by being male ($b = 0.03$, $p < 0.001$, 95 % CI [0.02, 0.03]) or by being a member of each of the three minority racial/ethnic groups (African American ($b = 0.11$, $p < 0.001$, 95 % CI [0.11, 0.12]), Hispanic ($b = 0.05$, $p < 0.001$, 95 % CI [0.05, 0.06]), and "other" race/ethnicity ($b = 0.11$, $p < 0.001$, 95 % CI [0.09, 0.12])). The youth's socioeconomic status was not found to be a significant predictor of their level of aggression.

Impulsivity was also significantly associated with a number of predictors. Again, a higher ACE score was predictive of a higher level of impulsivity, while controlling for the youth's demographics ($b = 0.23$, $p < 0.001$, 95 % CI [0.22, 0.23]). The youth being male ($b = 0.21$, $p < 0.001$, 95 % CI [0.19, 0.23]), being African American ($b = 0.11$, $p < 0.001$, 95 % CI [0.09, 0.13]), and being a member of the "other" racial/ethnic category ($b = 0.08$, $p < 0.01$, 95 % CI [0.03, 0.12]) were each predictive of a higher level of impulsivity. Socioeconomic status also exerted a small, but significant effect, where those of higher SES had higher levels of impulsivity ($b = 0.01$, $p = 0.04$, 95 % CI [0.00, 0.02]).

The Effects of the ACE Score on Adolescent Problem Behaviors

The third section of the GSEM model predicted the effects of the ACE score and the two maladaptive personality traits on the two adolescent problem behaviors while controlling for the demographic variables. These estimates are located in the third major column of Table 5.

As can be seen, higher ACE scores directly increased the juvenile's level school difficulties ($b = 0.02$, $p < 0.001$, 95 % CI [0.02, 0.03]). In addition, higher levels of each of the two maladaptive personality traits of aggression ($b = 0.26$, $p < 0.001$, 95 % CI [0.27, 0.28]) and impulsivity ($b = 0.07$, $p < 0.01$, 95 % CI [0.07, 0.07]) also increased the juveniles' level of school difficulties. The indirect effect of the ACE score on school difficulties was also predicted through the presence of aggression and impulsivity (see Table 6). Specifically, the results indicated that there was a significant and indirect effect through aggression ($b = 0.03$, $p < 0.001$), as well as impulsivity ($b = 0.02$, $p < 0.001$). This increased the total cumulative effect of adverse childhood experiences

on school difficulties from 0.02 to 0.07 ($p < 0.001$; see Table 6).¹

All demographic control variables also significantly affected the juvenile's level of difficulties or misconduct in school. Being male ($b = 0.08$, $p < 0.001$, 95 % CI [0.08, 0.09]), being African American, ($b = 0.05$, $p < 0.001$, 95 % CI [0.05, 0.06]), being Hispanic ($b = 0.04$, $p < 0.001$, 95 % CI [0.04, 0.05]), being of the "other" racial/ethnic category ($b = 0.05$, $p < 0.001$, 95 % CI [0.04, 0.07]), and being of a lower socioeconomic status ($b = -0.03$, $p < 0.001$, 95 % CI [-0.03, 0.02]) each directly and significantly increased the juvenile's level of school difficulties.

The second adolescent problem behavior of interest was substance abuse. Since this was a dichotomous outcome, these effects were reported as odds ratios (OR). A higher ACE score directly and significantly increased the juvenile's odds of displaying problems with substance abuse ($OR = 1.14$, $p < 0.001$, 95 % CI [1.15, 1.17]). Additionally, higher levels of each of the two maladaptive personality traits of aggression ($OR = 2.03$, $p < 0.001$, 95 % CI [1.93, 2.14]) and impulsivity ($OR = 1.25$, $p < 0.01$, 95 % CI [1.21, 1.28]) directly increased the juveniles' likelihood of substance abuse. The indirect effect of the ACE score on substance abuse was again predicted through the presence of aggression and impulsivity. The results indicated that there was a significant and indirect effect through aggression ($OR = 1.09$, $p < 0.001$), as well as impulsivity ($OR = 1.05$, $p < 0.001$). This increased the total cumulative effect of adverse childhood experiences on substance abuse from 1.14 to 1.31 ($p < 0.001$; see Table 6).

Finally, each of the demographic characteristics significantly affected the juvenile's odds of substance abuse. Being male ($OR = 1.78$, $p < 0.001$, 95 % CI [1.70, 1.85]), being White as opposed to African American, ($OR = 0.57$, $p < 0.001$, 95 % CI [0.55, 0.60]), Hispanic ($OR = 0.90$, $p < 0.001$, 95 % CI [0.87, 0.96]), or the "other" racial/ethnic category ($OR = 0.57$, $p < 0.001$, 95 % CI [0.53, 0.63]), and being of higher socioeconomic status ($OR = 1.20$, $p < 0.001$, 95 % CI [1.19, 1.23]) each directly increased the youth's likelihood of reporting substance abuse.

The Effects of the ACE Score on Suicidal Behavior

In the final stage of the GSEM model, the ACE score, the two maladaptive personality traits, and the two adolescent problem behaviors were entered as predictors of suicidal behavior, while controlling for the demographic variables. A majority of the predictors significantly increased the odds of a juvenile attempting suicide. Specifically, the

¹ Significance calculated using Sobel test (Sobel 1982, 1986).

Table 6 Direct, indirect, and total effects

Model path	Effects		
	Direct	Indirect	Total
ACE score → Aggression	0.12***	–	0.12***
ACE score → Impulsivity	0.23***	–	0.23***
ACE score → School difficulties	0.02***	0.03***(Aggression) 0.02***(Impulsivity)	0.07***
ACE score → Substance abuse	1.14***	1.09***(Aggression) 1.05***(Impulsivity)	1.31***
ACE score → Suicidal behavior	1.29***	1.14***(Aggression) 1.07***(Impulsivity) 0.99 (School diff.) 1.01 (Sub. abuse)	1.49***

Unstandardized effect estimates
*** $p < 0.001$

ACE score still directly and significantly increased the odds of a youth attempting suicide ($OR = 1.29$, $p < 0.001$, 95 % CI [1.25, 1.33]). There was, however, evidence of partial mediation of the effect of the ACE score in this full model, as the total effect was significantly reduced from the original logistic regression without the mediator variables included (original total effect: $OR = 1.49$, $p < 0.001$, 95 % CI [1.45, 1.53]; see Table 6).

The likelihood of attempting suicide was also directly increased by both maladaptive personality traits, aggression ($OR = 3.36$, $p < 0.001$, 95 % CI [2.80, 4.03]) and impulsivity ($OR = 1.44$, $p < 0.001$, 95 % CI [1.32, 1.58]). Interestingly, school difficulties ($OR = 0.79$, $p = 0.03$, 95 % CI [0.64, 0.98]) significantly *decreased* the odds of a juvenile attempting suicide, while substance abuse was not found to be a significant predictor of suicidal behavior. Finally, the estimates for the demographic variables indicated that being female ($OR = 0.45$, $p < 0.001$, 95 % CI [0.40, 0.51]) and White, compared to African Americans ($OR = 0.42$, $p < 0.001$, 95 % CI [0.37, 0.49]), Hispanics ($OR = 0.73$, $p = 0.001$, 95 % CI [0.61, 0.88]), and the “other” racial/ethnic category ($OR = 0.56$, $p = 0.004$, 95 % CI [0.38, 0.83]), significantly increased the juveniles’ odds of a suicide attempt. Socioeconomic status did not exert any significant direct effect on suicidal behavior.

Sensitivity Analyses

Due to the very large sample size, nearly all effects that were estimated in the models were found to be significant. In order to address this, a post hoc sensitivity analysis was conducted using a random selection of 10 % of the original sample. This produced a model using a randomly-generated sample of juveniles. These results indicated that many of the effects remained close to the original models, only

increasing or decreasing slightly. The most pronounced change was found in the significance of the estimates. Some effects were reduced in significance in the smaller random sample model but maintained their statistical significance ($p < .05$), and a few variable estimates were found to become nonsignificant altogether. It should be noted, however, that the ACE score remained a significant predictor of all maladaptive outcomes in the model including suicidal behavior ($OR = 1.21$, $p < 0.001$, 95 % CI [1.09, 1.34]) even using the random sample of only 10 % of all cases. Additionally, aggression ($OR = 4.66$, $p < 0.001$, 95 % CI [2.63, 8.24]) and impulsivity ($OR = 1.38$, $p = 0.021$, 95 % CI [1.05, 1.82]), both also remained significant predictors of suicidal behavior in this smaller sample. Neither school difficulties nor substance abuse were significant predictors of suicidal behavior in the reduced sample model.

Discussion

At the outset of this article, we highlighted that prior research has linked adverse childhood experiences to attempted suicide (Brown et al. 1999; Plunkett et al. 2001), but this line of research has been slow to examine the potential intervening mechanisms linking this relationship. In fact, only a few of these studies have considered any mediator variables (Dube et al. 2001; Roy 2005) and, to the best of our knowledge, none have examined the mediating effects of multiple maladaptive personality traits and adolescent problem behaviors in the context of this association. The consideration of these mediator variables could help clarify the associations often found between adverse childhood experiences and suicidal behavior. As a result, the estimation of these effects simultaneously in a model

could assist researchers and practitioners in better assessing the etiology of suicidal behavior. As such, the current study aimed to fill this gap in the empirical literature and provide a better understanding of the multiple mediating mechanisms between childhood adversity and suicidal behavior.

The results of our investigation led to several important findings for research and policy in the area of childhood adversity and suicidal behavior. First, a majority of youth in this sample experienced some type of abuse, neglect, or dysfunctional household environment, with the vast majority (over 83 %) experiencing at least one adverse childhood experiences during their childhood. This prevalence of childhood adversity was found to be much higher than that of the original Felitti et al. (1998) study, which reported that about one-half of respondents reported one adverse childhood experiences. These differences are likely due to the increased prevalence of childhood adversity in individuals who are processed by the juvenile justice system, as is the case among the Florida sample used in our study.

Second, the structural models revealed that the ACE score was significantly predictive of higher levels of two maladaptive personality traits, aggression and impulsivity. This finding supported past studies that suggested that children who experience higher levels of childhood adversity will be more aggressive (Aber et al. 1989) and impulsive (Haapasalo and Pokela 1999; Roy 2005). In addition, the ACE score significantly predicted higher levels of both adolescent problem behaviors, school difficulties, and substance abuse. This finding supported prior empirical research regarding the effect of adverse childhood experiences on these problem behaviors (Dube et al. 2002, 2003; Erickson et al. 1989; Ireland et al. 2002; Kendall-Tackett and Eckenrode 1996). Finally, the ACE score was also significantly associated with a higher likelihood of suicidal behavior. This result supports previous findings regarding the association found between childhood adversity and suicide (Brown et al. 1999; Dube et al. 2001).

Additionally, the positive predictive effects of school difficulties and substance abuse were no longer found upon inclusion of aggression and impulsivity in the model. Although an initial regression model revealed that school difficulties and substance abuse were significant predictors of suicide, the full GSEM estimates indicated that substance abuse became non-significant and school difficulties actually exerted a negative effect. This finding is relevant to the understanding of the path between childhood adversity and suicidal behavior. In this sense, the behavior of these children, while important, may be predominantly predicated on the early personality changes that may be provoked by experiences of trauma.

Policy and Practical Interventions

In light of these findings, a number of practical interventions can be proposed. For example, the primary goal of interventions should be the prevention of the onset of any form of childhood trauma or adversity. Since the adverse childhood experiences (ACE) assessment was found to be a significant and direct predictor of every one of the model's adverse outcomes (maladaptive personality development, adolescent problem behaviors, and suicidal behavior), the ability to prevent childhood adversity from occurring should be a high priority. In theory, by preventing the variety of traumatic experiences early in life, children should be able to develop in more positive and prosocial ways, while being better equipped to avoid the more maladaptive personality and problematic behavioral outcomes.

The findings of this study most principally endorse the use of programs to prevent children from experiencing adversity during the formative years. Early life interventions that provide improved prenatal care and parental assistance have been found to be especially cost-effective practices that can improve the family life of those at-risk of adversity and ensuing unfavorable outcomes (Cohen et al. 2010; Zigler and Hall 1989). In fact, a recent meta-analysis of parental and family training programs found that such programs can have substantive benefits on the lives of the children with little risk for adverse effects (Piquero et al. 2009; see also Piquero et al. 2016). As such, they may be valuable in reducing the level of adverse experiences and affecting the associations with maladaptive outcomes throughout development.

Another practice, designed to prevent child maltreatment and family conflict, involves home visitations for high-risk families (for review, see Piquero et al. 2009, 2016). These interventions are designed to enhance at-risk parents' caregiving abilities, educate them on the effects of child maltreatment, and impart positive problem-solving behaviors (Zigler and Hall 1989). Some interventions even include nurse home visits during pregnancy and through the formative first years of development. For example, Olds and colleagues tested such a program and found that nurse visits for unmarried low SES women reduced child maltreatment and reduced subsequent adverse behavior, including delinquency, arrests, convictions, and running away (Olds et al. 1986, 1997, 1998). These assessments show that these programs affect the prevalence of childhood adversity and also reduce the subsequent problems associated with them (see also: Poole et al. 2014). We recommend that these programs be implemented to reduce the number of children who are maltreated or other adverse childhood experiences in the home.

Based on the prior literature and the results of the current study, in order to reduce suicidal behavior, a number of mediating factors should also receive attention in empirically-based interventions (Wasserman and Miller 1998). For example, higher levels of aggression and impulsivity were both directly and significantly associated with increases in the prevalence or likelihood of the two adolescent problem behaviors, as well as suicidal behavior. As such, the reduction of these maladaptive traits in youth who experience adversity could play a pivotal role in inhibiting these maladaptive and even dangerous behaviors. These efforts to reduce aggression and impulsivity in children who experience adversity should aim to address both the cognitive and social aspects of the individual, often implementing a problem-solving model emphasizing self-evaluation exercises and teaching the youth become more sensitive to the feelings of others (Kendall et al. 1991).

Some schools have implemented programs to reduce the presence of aggression and impulsivity in youth. Two interventions to address maladaptive personality traits include the “Classroom-Centered” (CC) intervention and the “Family School Partnership” (FSP) intervention, both of which are administered in early elementary school and aim to reduce the presence of aggression and impulsivity throughout the youth’s development (Musci et al. 2014). Musci et al. (2014) evaluated these programs while also considering the effect of genetic traits as moderators. Their results showed that, while certain genetic traits may alter the magnitude of the effects, the CC and FSP interventions are each effective at reducing both aggression and impulsivity. Despite the potential importance of genetic influences, these results still suggest that programs that aim to address aggression and impulsivity in children could potentially be effective in reducing the expression of these traits. Since these two traits were the predominant mediators in the relationship between adverse childhood experiences and suicide, their prevention is imperative in children who experience adversity.

In addition to the various interventions targeted toward the prevention of adverse childhood experiences and reduction of aggression and impulsivity, the results of this study can also recommend interventions to address those who are already at a heightened risk for suicidal behavior. Enhanced mental health professional services and crisis-service interventions may improve the effectiveness of treatment/psychotherapy and prevent the likelihood of suicide attempts in those children who have already reached adolescence (Gould et al. 2003). Beyond inpatient treatments, Motto and Bostrom (2014) showed that patients who received consistent follow-up contact (approximately every 30 days to determine whether the patient was adhering to their post-hospital plan) after a hospitalization,

had a significantly lower suicide rate than the group that received no follow-up contact. Finally, specialized screening, education of parents, physicians, and the media, school-based skills training, and more focused treatment using antidepressants have all been cited as promising and worthwhile suicide prevention strategies that could be implemented (Gould et al. 2003).

Limitations and Future Research

The present study does have some limitations. Since the data were collected as part of a FDJJ risk assessment, and not for the explicit purpose of this study, the measures used did not perfectly match all hypothesized constructs. For example, one of the ACE assessment items (parental separation/divorce) was not able to be accurately measured using the PACT data. Furthermore, the data only contained juvenile offenders who were given the PACT Full Assessment. This only represented a sub-sample (approximately 32 %) of the population of juvenile offenders who were processed by FDJJ during the study timeframe. This specialized group may have been markedly different than other youth, and as such, the results may not be fully generalizable.

In addition, there were also no true “control” subjects in the sample, which may have produced some unknown degree of selection bias within the sample. All those who were assessed with the PACT must have engaged in some level of delinquent or deviant behavior to be referred to the FDJJ. Whether this was the result of a referral from the youth’s school, law enforcement, or parents, some delinquent event had to occur for the youth to be included in the sample. Accordingly, there are no “normative” juveniles from the general population present in the sample. This may have resulted in over-inflated estimates as these children are at the highest risk for maladaptive behavior. These aforementioned limitations could be addressed in subsequent research with the use of a nationally-representative sample to estimate the effects in a broader juvenile population.

Additionally, the present study used gender and race/ethnicity only as control variables in the analysis. This decision was made to establish the general baseline for the mediating effects estimated in the model in the empirical literature. Space constraints precluded our investigation of potential race differences in the current study, but such a consideration is no less important. Given the over-representation of minority youth in the justice system (Piquero 2008) and the extent to which minority youth tend to be highly exposed to disadvantaged neighborhood and familial environments (Sampson and Wilson 1995), it would be important to examine how race may moderate the relationships assessed in the current study. For example, future

studies could utilize these demographic measures as moderator variables in multi-group models to assess the effects that may be different for each gender or different race/ethnicities. This line of empirical inquiry could support more directed interventions for each specialized demographic group and could provide a wealth of essential information for practitioners.

Furthermore, while the model does propose some semblance of a sequential path, the data cannot truly reveal the causal or temporal ordering of these events. Since the data is gathered at the time of the juvenile's last adjudicated offense, there is no specific indication regarding which adverse or maladaptive behaviors occurred during childhood and which occurred during later adolescence. As a result, no definitive statements of causality can be made with these results. This study only indicates the presence of a predictive association between adverse childhood experiences and suicidal behavior. Subsequent research using prospective longitudinal designs would go a long way in addressing this limitation and further examining the time-order of the associations found in the current analysis.

Finally, the present study also estimated the general effect of childhood adversity using the ACE assessment. By including each adverse childhood experience at identical weights, there is no accounting for the size of each experience's respective effect. This study only estimated the aggregated effect of multiple experiences. As such, it is quite possible that the effect of adverse childhood experiences is likely more nuanced than simply counting the presence or absence of a certain form of adversity. Again, this limitation should be addressed in future research using different tests or assessments to better understand the relationship. Finally, subsequent work should attempt to uncover other ways that childhood adversity is associated with suicidal behavior. In this vein, future research should consider including additional personality traits and perhaps other problem behaviors that are hypothesized to influence this relationship where data permits.

Conclusion

This article used data from a large sample of juvenile offenders in the Florida Department of Juvenile Justice in order to assess several mediating mechanisms between adverse childhood experiences scores (ACE scores) and subsequent suicidal behavior. This study highlights the importance of adverse childhood experiences as persistently damaging experiences for children. Its prevalence was found to be greater for those who enter the custody of the juvenile justice system. Children with more adverse childhood experiences were also found to be more aggressive, impulsive, have more difficulties in school, and

were more likely to abuse substances. Perhaps, even worse, they were more likely to engage in suicidal behavior.

In light of these empirical findings, this study directly coincides with the considerable amount of developmental literature on suicide and suicide prevention and intervention. For example, prior research has indicated that nearly half of identifiable risk factors for suicide occur prior to age 14. Relatedly, adolescence is the period of development where the highest rates of suicide attempts are reported, and prior suicide attempts are significantly associated with future attempts and suicide-related death (Wynam 2014). Steinberg (2010) has proposed a dual systems model of adolescent risk-taking behaviors from a developmental perspective, and preliminary research has suggested that age differences in impulsivity are unrelated to puberty (Steinberg et al. 2008). This model has implications for suicidal behavior as adolescence can be a particularly vulnerable period for youth who have an immature capacity to regulate their own self-control in general and who also evince co-occurring risk factors as they may view attempting suicide as a coping mechanism. In addition, developmental probabilistic models have also been put forth to encourage researchers and prevention scientists to consider a number of salient risk factor domains such as family processes and social variables that can have both direct and indirect effects as well as buffering effects (King and Merchant 2008), the latter of which has been referred to in the developmental literature as the "stress-buffer" hypothesis (Cohen and Wills 1985). In the end, this results from the current study in combination with the important existing research in the developmental literature and in the disciplines of public health, medicine, psychiatry, and criminology all point toward the utility of multi-faceted prevention and intervention approaches to address the factors that are either directly or indirectly related to suicide attempts. More importantly, these prevention and intervention efforts should be implemented early on in the life-course as the saliency of some of these risk factors are only heightened when considered alongside other developmental factors and developmental periods of the life-course that present their own unique issues and concerns.

Acknowledgments We wish to acknowledge and thank Director Mark Greenwald and Nathan Epps from the Office of Research and Data Integrity at the Florida Department of Juvenile Justice for allowing access to the sensitive data provided for this study. Opinions or points of view expressed are those of the authors' alone and do not necessarily reflect the official position or policies of the Florida Department of Juvenile Justice or the members of the FDJJ Office of Research and Data Integrity.

Author contributions Nicholas Perez conceived of the study, participated in its design and coordination and drafted the manuscript; Wesley Jennings participated in the design of the study and aided with the interpretation of the data; Alex R. Piquero aided with the

interpretations of the data and reviewed the manuscript; Michael Baglivio assisted with data collection, aided with the design of the study, and aided with the interpretations of the data. All authors read and approved the final manuscript.

Conflicts of interest The authors report no conflict of interests.

Ethical Approval The study detailed in this manuscript was approved by both the University of South Florida's IRB (CR1_Pro00015635) and the Florida Department of Juvenile Justice's (FDJJ) IRB.

Informed Consent Informed consent was waived/did not apply as the data relied on in this study represented a secondary analysis of de-identified, pre-existing agency data.

References

- Aber, J. L., Allen, J. P., Carlson, V., & Cicchetti, D. (1989). The effects of maltreatment on development during early childhood: Recent studies and their theoretical, clinical, and policy implications. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 579–619). New York: Cambridge University Press.
- Allen, B. (2011). Childhood psychological abuse and adult aggression: The mediating role of self-capacities. *Journal of Interpersonal Violence, 26*(10), 2093–2110.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Anda, R. F., Croft, J. B., Felitti, V. J., Nordenberg, D., Giles, W. H., Williamson, D. F., et al. (1999). Adverse childhood experiences and smoking during adolescence and adulthood. *JAMA, 282*(17), 1652–1658.
- Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C., Perry, B. D., et al. (2006). The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience, 256*(3), 174–186.
- Ary, D. V., Duncan, T. E., Biglan, A., Metzler, C. W., Noell, J. W., & Smolkowski, K. (1999). Development of adolescent problem behavior. *Journal of Abnormal Child Psychology, 27*(2), 141–150.
- Baglivio, M. T. (2009). The assessment of risk to recidivate among a juvenile offending population. *Journal of Criminal Justice, 37*, 596–607.
- Baglivio, M. T., Epps, N., Swartz, K., Sayedul, M., Sheer, A., & Hardt, N. S. (2014). The prevalence of adverse childhood experiences (ACE) in the lives of juvenile offenders. *Journal of Juvenile Justice, 3*(2), 1–23.
- Baglivio, M. T., & Jackowski, K. (2013). Examining the validity of a juvenile offending risk assessment instrument across gender and race/ethnicity. *Youth Violence and Juvenile Justice, 11*(1), 26–43.
- Baglivio, M. T., Wolff, K. T., Piquero, A. R., & Epps, N. (2015). The relationship between adverse childhood experiences (ACE) and juvenile offending trajectories in a juvenile offender sample. *Journal of Criminal Justice, 43*(3), 229–241.
- Baird, C., Healy, T., Johnson, K., Bogie, A., Dankert, E. W., & Scharenbroch, C. (2013). *A comparison of risk assessment instruments in juvenile justice*. Madison, WI: National Council on Crime and Delinquency.
- Bensley, L. S., Spieker, S. J., Van Eenwyk, J., & Schoder, J. (1999a). Self-reported abuse history and adolescent problem behaviors. II. Alcohol and drug use. *Journal of Adolescent Health, 24*(3), 173–180.
- Bensley, L. S., Van Eenwyk, J., Spieker, S. J., & Schoder, J. (1999b). Self-reported abuse history and adolescent problem behaviors. I. Antisocial and suicidal behaviors. *Journal of Adolescent Health, 24*(3), 163–172.
- Bornstein, M. H. (Ed.). (2002). *Handbook of parenting: Volume 4: Social conditions and applied parenting*. Mahwah, NJ: Psychology Press.
- Bowen, N. K., & Bowen, G. L. (1999). Effects of crime and violence in neighborhoods and schools on the school behavior and performance of adolescents. *Journal of Adolescent Research, 14*(3), 319–342.
- Brown, J., Cohen, P., Johnson, J. G., & Smailes, E. M. (1999). Childhood abuse and neglect: Specificity of effects on adolescent and young adult depression and suicidality. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*(12), 1490–1496.
- Brent, D. A. (1995). Risk factors for adolescent suicide and suicidal behavior: Mental and substance abuse disorders, family environmental factors, and life stress. *Suicide and Life-Threatening Behavior, 25*(1), 52–63.
- Brown, G. L., & Goodwin, F. K. (1986). Human aggression and suicide. *Suicide and Life-Threatening Behavior, 16*(2), 223–243.
- Burke, N. J., Hellman, J. L., Scott, B. G., Weems, C. F., & Carrion, V. G. (2011). The impact of adverse childhood experiences on an urban pediatric population. *Child Abuse and Neglect, 35*(6), 408–413.
- Causadias, J. M. (2013). A roadmap for the integration of culture into developmental psychopathology. *Development and Psychopathology, 25*(4), 1375–1398.
- Center for Disease Control. (2014). Suicide prevention: Youth suicide. http://www.cdc.gov/violenceprevention/pub/youth_suicide.html. Accessed 6 Jan 2015.
- Chapman, D. P., Dube, S. R., & Anda, R. F. (2007). Adverse childhood events as risk factors for negative mental health outcomes. *Psychiatric Annals, 37*(5), 359–364.
- Cicchetti, D. (1984). The emergence of developmental psychopathology. *Child Development, 55*(1), 1–7.
- Cicchetti, D., & Toth, S. L. (1995). A developmental psychopathology perspective on child abuse and neglect. *Journal of the American Academy of Child and Adolescent Psychiatry, 34*(5), 541–565.
- Cicchetti, D., & Toth, S. L. (2005). Child maltreatment. *Annual Review of Clinical Psychology, 1*(1), 409–438.
- Cicchetti, D., & Toth, S. L. (2008). The past achievements and future promises of developmental psychopathology: The coming of age of a discipline. *Journal of Child Psychology and Psychiatry, 50*(1–2), 16–25.
- Clark, D. B., Lesnick, L., & Hegedus, A. M. (1997). Traumas and other adverse life events in adolescents with alcohol abuse and dependence. *Journal of the American Academy of Child and Adolescent Psychiatry, 36*(12), 1744–1751.
- Cohen, M. A., Piquero, A. R., & Jennings, W. G. (2010). Estimating the costs of bad outcomes for at-risk youth and the benefits of early childhood interventions to reduce them. *Criminal Justice Policy Review, 21*(4), 391–434.
- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310–357.
- Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Question and tips in the use of structural equation modeling. *Journal of Abnormal Psychology, 112*(4), 558–577.

- Conner, K. R., Duberstein, P. R., Conwell, Y., & Caine, E. D. (2003). Reactive aggression and suicide: Theory and evidence. *Aggression and Violent Behavior, 8*(4), 413–432.
- Copeland, W. E., Keeler, G., Angold, A., & Costello, E. J. (2007). Traumatic events and posttraumatic stress in childhood. *Archives of General Psychiatry, 64*(5), 577–584.
- Daniel, S. S., Walsh, A. K., Goldston, D. B., Arnold, E. M., Reboussin, B. A., & Wood, F. B. (2006). Suicidality, school dropout, and reading problems among adolescents. *Journal of Learning Disabilities, 39*(6), 507–514.
- Dodge, K. A., Bates, J. E., & Pettit, G. S. (1990). Mechanisms in the cycle of violence. *Science, 250*(4988), 1678–1683.
- Dong, M., Anda, R. F., Felitti, V. J., Williamson, D. F., Dube, S. R., Brown, D. W., et al. (2005). Childhood residential mobility and multiple health risks during adolescence and adulthood: The hidden role of adverse childhood experiences. *Archives of Pediatrics and Adolescent Medicine, 159*(12), 1104–1110.
- Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001). Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: Findings from the adverse childhood experiences study. *JAMA, 286*(24), 3089–3096.
- Dube, S. R., Anda, R. F., Felitti, V. J., Edwards, V. J., & Croft, J. B. (2002). Adverse childhood experiences and personal alcohol abuse as an adult. *Addictive Behaviors, 27*(5), 713–725.
- Dube, S. R., Felitti, V. J., Dong, M., Chapman, D. P., Giles, W. H., & Anda, R. F. (2003). Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: The adverse childhood experiences study. *Pediatrics, 111*(3), 564–572.
- Dube, S. R., Miller, J. W., Brown, D. W., Giles, W. H., Felitti, V. J., Dong, M., et al. (2006). Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. *Journal of Adolescent Health, 38*(4), 444.
- Eckenrode, J., Laird, M., & Doris, J. (1993). School performance and disciplinary problems among abused and neglected children. *Developmental Psychology, 29*(1), 53–62.
- Erickson, M. F., Egeland, B., & Pianta, R. (1989). The effects of maltreatment on the development of young children. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 647–684). New York: Cambridge University Press.
- Farrington, D. P. (1978). The family backgrounds of aggressive youths. In L. Hersov, M. Berger, & D. Shaffer (Eds.), *Aggression and antisocial behavior in childhood and adolescence* (pp. 73–93). Oxford: Pergamon.
- Felitti, V. J., & Anda, R. F. (2010). The relationship of adverse childhood experiences to adult medical disease, psychiatric disorders and sexual behavior: Implications for healthcare. In R. Lanius & E. Vermetten (Eds.), *The impact of early life trauma on health and disease: The hidden epidemic* (pp. 77–87). New York: Cambridge University Press.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., et al. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. *American Journal of Preventative Medicine, 14*(4), 245–258.
- Fergusson, D. M., & Lynskey, M. T. (1995). Suicide attempts and suicidal ideation in a birth cohort of 16-year-old New Zealanders. *Journal of the American Academy of Child and Adolescent Psychiatry, 34*(10), 1308–1317.
- Flewelling, R. L., & Bauman, K. E. (1990). Family structure as a predictor of initial substance use and sexual intercourse in early adolescence. *Journal of Marriage and the Family, 52*(1), 171–181.
- Fox, B. H., Perez, N. M., Cass, E., Baglivio, M. T., & Epps, N. (2015). Trauma changes everything: Examining the relationship between adverse childhood experiences and serious, violent and chronic juvenile offenders. *Child Abuse and Neglect, 46*(1), 163–173.
- Garrison, C. Z., McKeown, R. E., Valois, R. F., & Vincent, M. L. (1993). Aggression, substance use, and suicidal behaviors in high school students. *American Journal of Public Health, 83*(2), 179–184.
- Giegling, I., Olgiati, P., Hartmann, A. M., Calati, R., Möller, H. J., Rujescu, D., et al. (2009). Personality and attempted suicide. Analysis of anger, aggression and impulsivity. *Journal of Psychiatric Research, 43*(16), 1262–1271.
- Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.
- Gould, M. S., Greenberg, T. E. D., Velting, D. M., & Shaffer, D. (2003). Youth suicide risk and preventive interventions: a review of the past 10 years. *Journal of the American Academy of Child and Adolescent Psychiatry, 42*(4), 386–405.
- Greer, S. (1964). The relationship between parental loss and attempted suicide: A control study. *The British Journal of Psychiatry, 110*(468), 698–705.
- Haapasalo, J., & Pokela, E. (1999). Child-rearing and child abuse antecedents of criminality. *Aggression and Violent Behavior, 4*(1), 107–127.
- Harrison, P. A., Fulkerson, J. A., & Beebe, T. J. (1997). Multiple substance use among adolescent physical and sexual abuse victims. *Child Abuse and Neglect, 21*(6), 529–539.
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs, 76*(4), 408–420.
- Herman, D. B., Susser, E. S., Struening, E. L., & Link, B. L. (1997). Adverse childhood experiences: Are they risk factors for adult homelessness? *American Journal of Public Health, 87*(2), 249–255.
- Hillis, S. D., Anda, R. F., Dube, S. R., Felitti, V. J., Marchbanks, P. A., & Marks, J. S. (2004). The association between adverse childhood experiences and adolescent pregnancy, long-term psychosocial consequences, and fetal death. *Pediatrics, 113*(2), 320–327.
- Hillis, S. D., Anda, R. F., Felitti, V. J., & Marchbanks, P. A. (2001). Adverse childhood experiences and sexual risk behaviors in women: A retrospective cohort study. *Family Planning Perspectives, 33*(5), 206–211.
- Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples from the child-clinical and pediatric psychology literatures. *Journal of Counseling and Clinical Psychology, 65*(4), 599–610.
- Hurt, H., Malmud, E., Brodsky, N. L., & Giannetta, J. (2001). Exposure to violence: Psychological and academic correlates in child witnesses. *Archives of Pediatrics and Adolescent Medicine, 155*(12), 1351–1356.
- Iacobucci, D. (2008). *Mediation analysis*. Thousand Oaks, CA: Sage.
- Ireland, T. O., Smith, C. A., & Thornberry, T. P. (2002). Developmental issues in the impact of child maltreatment on later delinquency and drug use. *Criminology, 40*(2), 359–400.
- James, L. R., Mulaik, S. A., & Brett, J. M. (2006). A tale of two methods. *Organizational Research Methods, 9*(2), 233–244.
- Jessor, R. (1987). Problem-behavior theory, psychosocial development, and adolescent problem drinking. *British Journal of Addiction, 82*(1), 331–342.
- Jessor, R. (1991). Risk behavior in adolescence: A psychosocial framework for understanding and action. *Developmental Review, 12*(4), 374–390.
- Jessor, R., & Jessor, S. L. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth*. New York, NY: Academic Press.

- Kaslow, N. J. (2014). Suicidal behavior in children and adolescents. American Psychological Association, Presentation. <http://www.apa.org/about/governance/president/suicidal-behavior-adolescents.pdf> Accessed 13 Feb 2015.
- Kendall, P. C., Ronan, K. R., & Epps, J. (1991). Aggression in children/adolescents: Cognitive-behavioral treatment perspectives. In D. J. Pepler & K. H. Rubin (Eds.), *The development and treatment of childhood aggression* (pp. 341–360). New Jersey: Lawrence Erlbaum Associates.
- Kendall-Tackett, K. A., & Eckenrode, J. (1996). The effects of neglect on academic achievement and disciplinary problems: A developmental perspective. *Child Abuse and Neglect, 20*(3), 161–169.
- Kerr, T., Stoltz, J. A., Marshall, B. D., Lai, C., Strathdee, S. A., & Wood, E. (2009). Childhood trauma and injection drug use among high-risk youth. *Journal of Adolescent Health, 45*(3), 300–302.
- King, C. A., & Merchant, C. R. (2008). Social and interpersonal factors relating to adolescent suicidality: A review of the literature. *Archives of Suicide Research, 12*(3), 181–196.
- King, R. A., Schwab-Stone, M., Flisher, A. J., Greenwald, S., Kramer, R. A., Goodman, S. H., et al. (2001). Psychosocial and risk behavior correlates of youth suicide attempts and suicidal ideation. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*(7), 837–846.
- Klika, J. B., Herrenkohl, T. I., & Lee, J. O. (2012). School factors as moderators of the relationship between physical child abuse and pathways of antisocial behavior. *Journal of Interpersonal Violence, 28*(4), 852–867.
- Kotch, J. B., Lewis, T., Hussey, J. M., English, D., Thompson, R., Litrownik, A. J., et al. (2008). Importance of early neglect for childhood aggression. *Pediatrics, 121*(4), 725–731.
- Kurtz, P. D., Gaudin, J. M., Jr., Wodarski, J. S., & Howing, P. T. (1993). Maltreatment and the school-aged child: School performance consequences. *Child Abuse and Neglect, 17*(5), 581–589.
- Lamphear, V. S. (1985). The impact of maltreatment on children's psychosocial adjustment: A review of the research. *Child Abuse and Neglect, 9*(2), 251–263.
- Lewis, S. A., Johnson, J., Cohen, P., Garcia, M., & Velez, C. N. (1988). Attempted suicide in youth: its relationship to school achievement, educational goals, and socioeconomic status. *Journal of Abnormal Child Psychology, 16*(4), 459–471.
- Makhija, N., & Sher, L. (2007). Childhood abuse, adult alcohol use disorders and suicidal behavior. *Quarterly Journal of Medicine, 100*(5), 305–309.
- Manly, J. T., Cicchetti, D., & Barnett, D. (1994). The impact of maltreatment on child outcome: an exploration of dimensions within maltreatment. *Developmental Psychopathology, 6*(1), 121–143.
- Maser, J., Akiskal, H., Schettler, P., Scheftner, W., Mueller, T., Endicott, J., et al. (2002). Can temperament identify affectively ill patients who engage in lethal or near-lethal suicidal behavior? A 14-year prospective study. *Suicide and Life-Threatening Behavior, 32*(1), 10–32.
- Mazza, J. J., & Reynolds, W. M. (1998). A longitudinal investigation of depression, hopelessness, social support, and major and minor life events and their relation to suicidal ideation in adolescents. *Suicide and Life-Threatening Behavior, 28*(4), 358–374.
- McKenry, P. C., Tishler, C. L., & Kelley, C. (1983). The role of drugs in adolescent suicide attempts. *Suicide and Life-Threatening Behavior, 13*(3), 166–175.
- Murphy, G. E. (2000). Psychiatric aspects of suicidal behavior: Substance abuse. In K. Hawton & K. van Heeringen (Eds.), *The international handbook of suicide and attempted suicide* (pp. 135–146). New York: John Wiley & Sons.
- Moss, H. B., Vanyukov, M., Majumder, P. P., Kirisci, L., & Tarter, R. E. (1995). Prepubertal sons of substance abusers: Influences of parental and familial substance abuse on behavioral disposition, IQ, and school achievement. *Addictive Behaviors, 20*(3), 345–358.
- Motto, J. A., & Bostrom, A. G. (2014). A randomized controlled trial of postcrisis suicide prevention. *Psychiatric Services, 52*(6), 828–833.
- Murray, J., Farrington, D. P., & Sekol, I. (2012). Children's antisocial behavior, mental health, drug use, and educational performance after parental incarceration: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 175–210.
- Musci, R. J., Bradshaw, C. P., Maher, B., Uhl, G. R., Kellam, S. G., & Ialongo, N. S. (2014). Reducing aggression and impulsivity through school-based prevention programs: A gene by intervention interaction. *Prevention Science, 15*(6), 831–840.
- Muthén, B. (1984). A general structural equation model with dichotomous, ordered categorical, and continuous latent variable indicators. *Psychometrika, 49*(1), 115–132.
- Nock, M. K., Green, J. G., Hwang, I., McLaughlin, K. A., Sampson, N. A., Zaslavsky, A. M., et al. (2013). Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: results from the National Comorbidity Survey Replication Adolescent supplement. *JAMA Psychiatry, 70*(3), 300–310.
- Olds, D. L., Eckenrode, J., Henderson, C. R., Kitzman, H., Powers, J., Cole, R., et al. (1997). Long-term effects of home visitation on maternal life course and child abuse and neglect: Fifteen-year follow-up of a randomized trial. *JAMA, 278*(8), 637–643.
- Olds, D. L., Henderson, C. R., Chamberlin, R., & Tatelbaum, R. (1986). Preventing child abuse and neglect: A randomized trial of nurse home visitation. *Pediatrics, 78*(1), 65–78.
- Olds, D. L., Henderson, C. R., Cole, R., Eckenrode, J., Kitzman, H., Luckey, D., et al. (1998). Long-term effects of nurse home visitation on children's criminal and antisocial behavior: 15-year follow-up of a randomized controlled trial. *JAMA, 280*(14), 1238–1244.
- Ompad, D. C., Ikeda, R. M., Shah, N., Fuller, C. M., Bailey, S., Morse, E., et al. (2005). Childhood sexual abuse and age at initiation of injection drug use. *American Journal of Public Health, 95*(4), 703.
- Piquero, A. R. (2008). Disproportionate minority contact. *The Future of Children, 18*, 59–79.
- Piquero, A. R., Farrington, D. P., Welsh, B. C., Tremblay, R., & Jennings, W. G. (2009). Effects of early family/parent training programs on antisocial behavior and delinquency. *Journal of Experimental Criminology, 5*(2), 83–120.
- Piquero, A. R., Jennings, W. G., Diamond, B., Farrington, D. P., Tremblay, R. E., Welsh, B., et al. (2016). A meta-analysis update on the effects of early family/parent training programs on antisocial behavior and delinquency. *Journal of Experimental Criminology, 12*(2), 229–248.
- Plunkett, A., O'Toole, B., Swanston, H., Oates, R. K., Shrimpton, S., & Parkinson, P. (2001). Suicide risk following child sexual abuse. *Ambulatory Pediatrics, 1*(5), 262–266.
- Poole, M. K., Seal, D. W., & Taylor, C. A. (2014). A systematic review of universal campaigns targeting child physical abuse prevention. *Health Education Research, 29*(3), 388–432.
- Richardson, A. S., Bergen, H. A., Martin, G., Roeger, L., & Allison, S. (2005). Perceived academic performance as an indicator of risk of attempted suicide in young adolescents. *Archives of Suicide Research, 9*(2), 163–176.
- Rosenberg, S. D., Lu, W., Mueser, K. T., Jankowski, M. K., & Courmos, F. (2007). Correlates of adverse childhood events among adults with schizophrenia spectrum disorders. *Psychiatric Services, 58*(2), 245–253.

- Rothman, E. F., Edwards, E. M., Heeren, T., & Hingson, R. W. (2008). Adverse childhood experiences predict earlier age of drinking onset: Results from a representative US sample of current or former drinkers. *Pediatrics*, *122*(2), 298–304.
- Roy, A. (2005). Childhood trauma and impulsivity: Possible relevance to suicidal behavior. *Archives of Suicide Research*, *9*(2), 147–151.
- Sampson, R. J., & Wilson, W. J. (1995). Toward a theory of race, crime, and urban inequality. In J. Hagan & R. D. Peterson (Eds.), *Crime and inequality* (pp. 37–56). Stanford, CA: Stanford University Press.
- Schilling, E. A., Aseltine Jr., R. H., Glanovsky, J. L., James, A., & Jacobs, D. (2009). Adolescent alcohol use, suicidal ideation, and suicide attempts. *Journal of Adolescent Health*, *44*(4), 335–341.
- Shonk, S. M., & Cicchetti, D. (2001). Maltreatment, competency deficits, and risk for academic and behavioral maladjustment. *Developmental Psychology*, *37*(1), 3–17.
- Silverman, M. M., & Felner, R. D. (1995). The place of suicide prevention in the spectrum of intervention: Definition of critical terms and constructs. *Suicide and Life-Threatening Behavior*, *25*(1), 70–81.
- Simpson, T. L., & Miller, W. R. (2002). Concomitance between childhood sexual and physical abuse and substance use problems: A review. *Clinical Psychology Review*, *22*(1), 27–77.
- Skrondal, A., & Rabe-Hesketh, S. (2004). *Generalized latent variable modeling: Multilevel, longitudinal, and structural equation models*. New York: Chapman & Hall/CRC.
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological methodology 1982* (pp. 290–312). Washington, DC: American Sociological Association.
- Sobel, M. E. (1986). Some new results on indirect effects and their standard errors in covariance structure models. In N. Tuma (Ed.), *Sociological methodology 1986* (pp. 159–186). Washington, DC: American Sociological Association.
- Sousa, C., Herrenkohl, T. I., Moylan, C. A., Tajima, E. M., Klika, J. B., Herrenkohl, R. C., et al. (2010). Longitudinal study on the effects of child abuse and children's exposure to domestic violence, parent-child attachments, and antisocial behavior in adolescence. *Journal of Interpersonal Violence*, *26*(1), 111–136.
- Sroufe, L. A., & Rutter, M. (1984). The domain of developmental psychopathology. *Child Development*, *55*(1), 17–29.
- StataCorp. (2013a). *Stata 13 base reference manual*. College Station, TX: Stata Press.
- StataCorp. (2013b). *Stata statistical software: Release 13*. College Station, TX: StataCorp LP.
- Steinberg, L. (2010). A dual systems model of adolescent risk taking. *Development and Psychobiology*, *52*, 216–224.
- Steinberg, L., Albert, D., Cauffman, E., Banich, M., Graham, S., & Woolard, J. (2008). Age differences in sensation seeking and impulsivity as indexed by behavior and self report: Evidence for a dual systems model. *Developmental Psychology*, *44*, 1764–1778.
- Swahn, M. H., & Bossarte, R. M. (2007). Gender, early alcohol use, and suicide ideation and attempts: Findings from the 2005 youth risk behavior survey. *Journal of Adolescent Health*, *41*(2), 175–181.
- Swahn, M. H., Bossarte, R. M., Ashby, J. S., & Meyers, J. (2010). Pre-teen alcohol use initiation and suicide attempts among middle and high school students: Findings from the 2006 Georgia Student Health Survey. *Addictive Behaviors*, *35*(5), 452–458.
- Swogger, M. T., You, S., Cashman-Brown, S., & Conner, K. R. (2011). Childhood physical abuse, aggression, and suicide attempts among criminal offenders. *Psychiatry Research*, *185*(3), 363–367.
- Trickett, P. K., & McBride-Chang, C. (1995). The developmental impact of different forms of child abuse and neglect. *Developmental Review*, *15*(3), 311–337.
- U.S. Census Bureau. (2015). U.S.A. QuickFacts. Retrieved July 14, 2015 from <http://www.census.gov/en.html>.
- Wagner, E. F. (1997). Substance use and violent behavior in adolescence. *Aggression and Violent Behavior*, *1*(4), 375–387.
- Waldrop, A. E., Santa Ana, E. J., Saladin, M. E., McRae, A. L., & Brady, K. T. (2007). Differences in early onset alcohol use and heavy drinking among persons with childhood and adulthood trauma. *The American Journal on Addictions*, *16*(6), 439–442.
- Wasserman, G. A., & Miller, L. S. (1998). The prevention of serious and violent juvenile offending. In R. Loeber & D. P. Farrington (Eds.), *Serious and violent juvenile offenders: Risk factors and successful interventions* (pp. 197–247). Thousand Oaks, CA: Sage.
- Widom, C. S. (1989). Does violence beget violence? A critical examination of the literature. *Psychological Bulletin*, *106*(1), 3–28.
- Wilbum, V. R., & Smith, D. E. (2005). Stress, self-esteem, and suicidal ideation in late adolescents. *Adolescence*, *40*(157), 33–45.
- Wildeman, C. (2010). Paternal incarceration and children's physically aggressive behaviors: Evidence from the fragile families and child wellbeing study. *Social Forces*, *89*(1), 285–310.
- Windle, M. (2004). Suicidal behaviors and alcohol use among adolescents: a developmental psychopathology perspective. *Alcoholism, Clinical and Experimental Research*, *28*(1), 29–37.
- Wynam, P. A. (2014). Developmental approach to prevent adolescent suicides: Research Pathways to effective upstream preventive interventions. *American Journal of Preventive Medicine*, *47*(3), S251–S256.
- Zigler, E., & Hall, N. W. (1989). Physical child abuse in America: Past, present, and future. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 38–75). New York: Cambridge University Press.
- Zolotor, A., Kotch, J., Dufort, V., Winsor, J., Catellier, D., & Bou-Saada, I. (1999). School performance in a longitudinal cohort of children at risk of maltreatment. *Maternal and Child Health Journal*, *3*(1), 19–27.

Nicholas M. Perez, Ph.D. is an Assistant Professor in the School of Criminology, Criminal Justice, and Emergency Management in the College of Health and Human Services at California State University, Long Beach. His research interests are criminological theory and quantitative methods.

Wesley G. Jennings, Ph.D. is Associate Professor, Associate Chair, and Undergraduate Director in the Department of Criminology, has a Courtesy Appointment in the Department of Mental Health Law and Policy, and is a Faculty Affiliate of the Florida Mental Health Institute in the College of Behavioral and Community Sciences at the University of South Florida. In addition, he also has a Courtesy Appointment in the Department of Health Outcomes and Policy and is a Faculty Affiliate of the Institute for Child Health Policy in the College of Medicine at the University of Florida.

Alex R. Piquero, Ph.D. is Ashbel Smith Professor of Criminology and Associate Dean for Graduate Programs in the School of Economic, Political, and Policy Sciences at the University of Texas at Dallas, Adjunct Professor Key Centre for Ethics, Law, Justice, and Governance, Griffith University, Faculty Affiliate, Center for Violence and Injury Prevention George Warren Brown School of Social Work Washington University in St. Louis, and was Co-Editor of the *Journal of Quantitative Criminology* from 2008 to 2013.

Michael T. Baglivio, Ph.D. is the Director of Research and Program Development at G4S Youth Services, LLC in Tampa, Florida.