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Predicting Adverse Childhood Experiences: The Importance of Neighborhood Context in Youth Trauma Among Delinquent Youth

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Abstract

Few studies have examined multilevel effects of neighborhood context on childhood maltreatment. Less work has analyzed these effects with juvenile offenders, and no prior work has examined context effects of childhood maltreatment through the Adverse Childhood Experiences (ACEs) framework. ACEs include 10 indictors: emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, domestic violence toward the youth's mother, household substance abuse, household mental illness, parental separation/divorce, and household member with a history of jail/imprisonment. Effects of concentrated disadvantage and affluence on ACE scores are examined in a statewide sample of more than 59,000 juvenile offenders, controlling for salient individual (including family and parenting) measures and demographics. Both disadvantage and affluence affect ACE exposure. Implications for research and policy are discussed.

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In celebration of the 40th anniversary of the Juvenile Justice and Delinquency Prevention Act, Office of Juvenile Justice and Delinquency Prevention (OJJDP; 2014) Administrator Robert Listenbee Jr. critiqued that while there was cause for celebration with declines in offending and residential placement of youth, there were several challenges and opportunities to further improve outcomes for youth while maintaining public safety. Toward the top of Administrator Listenbee's list of reforms was recognizing the extensive trauma, abuse, and exposure to violence histories of justice-involved youth. Prior work has found higher prevalence of adversity and trauma for justice system-involved youth in comparison with the general population (Dierkhising et al., 2013). Justice-involved youth are more likely to have experienced multiple forms of trauma (Abram et al., 2004), with one third reporting exposure to multiple types of trauma each year (Dierkhising et al., 2013), and 50% reporting exposure to four or more types of trauma by age 18 (Baglivio et al., 2014). In the 2013 Sutherland Address, Widom (2014) stated "violence prevention policies and programs that target abused and neglected children are warranted, given the prominent role of [Child Abuse and Neglect] in the backgrounds of these violent offenders" (p. 313). While prior work has examined a limited number of individual types of abuse or neglect, few have analyzed the multilevel effects of neighborhoods on abuse and less have studied neighborhood effects on a comprehensive individual-level measure of multiple types of abuse and neglect. The present study aims to fill that void.

Abuse and Delinquent Youth

Among offenders, even after controlling for prior delinquency, experiencing childhood physical abuse and other maltreatment leads to higher self-reported total, violent, and property offending (Teague, Mazerolle, Legosz, & Sanderson, 2008). Experiencing child abuse/neglect has been shown to double the risk of arrest for violent offenses for girls (Maxfield & Widom, 1996). Controlling for socioeconomic status, physically abused youth had more violent offenses then nonabused youth (Lasford et al., 2007). Within disadvantaged families, childhood maltreatment predicts arrest (Mersky & Topitzes, 2010). Herrera and McCloskey (2001) found witnessing marital violence in childhood uniquely contributes to later behavioral problems and/or delinquency, and predicted referral to juvenile court. These findings support

additional research, including meta-analytic work, indicating that exposure to domestic violence leads to internalizing and externalizing behavior problems (Evans, Davies, & DiLillo, 2008; Moylan et al., 2010). Parental divorce exhibits a strong association with delinquency (Amato, 2001) which has not decreased despite increased social acceptability and prevalence in recent decades (Amato, 2001; D'Onofrio et al., 2005), and which is not mediated by common genes when examining adoptive and biological families (Burt, Barnes, McGue, & Iacono, 2008). Exposure to parental incarceration is associated with delinquency and maladaptive behaviors (Geller, Garfinkel, Cooper, & Mincy, 2009; Murray & Farrington, 2008; Parke & Clarke-Stewart, 2002), even after controlling for other childhood risk factors (Murray & Farrington, 2005).

Adverse Childhood Experiences (ACEs)

A limitation of prior work has been examining only one, or a few, abuses at a time in a given study. One answer to this drawback has been the concept of the ACE score first described in 1998 in the seminal "Adverse Childhood Experiences (ACE) Study" (Felitti et al., 1998). The ACE concept acknowledges the complex and cumulative nature of risk factors through the process of summing risk factors and associating the composite score with relevant outcomes developed by Rutter (1983). ACEs refer to 10 childhood experiences, which include emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, domestic violence toward the youth's mother, household substance abuse, household mental illness, parental separation/divorce, and household member with a history of jail/imprisonment. The ACE score is expressed as the sum of the 10 exposures, measured dichotomously (yes/no), and therefore ranges from 0 to 10. An exposure (e.g., sexual abuse) is counted as 1 point regardless of the number of incidents of the exposure (whether sexually abused 1 or 100 times). The implications of high ACE scores have been well documented in the medical literature (Anda, Butchart, Felitti, & Brown, 2010). Higher ACE scores have been shown to increase the odds of smoking, heavy drinking, incarceration, and morbid obesity, along with increased risk for poor educational and employment outcomes, and recent involvement in violence (Bellis, Lowey, Leckenby, Hughes, & Harrison, 2014). Higher ACE scores have also been shown to significantly increase the odds of developing some of the leading causes of death in adulthood, such as heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease.

Prior studies have shown that for adults who have experienced four or more ACEs in childhood, the odds of having one of the above-mentioned

negative health outcomes are up to 12 times greater than those of adults who have not had such exposure (Felitti et al., 1998). While first identified as risk factors for chronic disease, ACEs have more recently been identified with immediate negative consequences, such as chromosome damage (Shalev et al., 2013) and functional changes to the developing brain (Anda et al., 2010; Cicchetti, 2013; Danese & McEwen, 2012; Teicher et al., 2003). Furthermore, high ACE scores have been linked to sexually risky behaviors, such as having 50 or more sexual partners, intercourse before age 15 (Hillis, Anda, Felitti, & Marchbanks, 2001), and teenage pregnancy (Hillis et al., 2004). ACE studies of juvenile offenders have found prevalence rates 3 times higher than those reported in the original ACE study sample (Grevstad, 2010). In addition, juvenile offenders were found 13 times less likely to report zero ACEs and 4 times more likely to report ACE scores of 4 or more compared with the ACE Study's private-insured population of mostly college-educated adults (Baglivio et al., 2014).

The ACE research has shown that types of childhood abuse and neglect are common, highly interrelated, and exert a powerful cumulative effect on human development (Anda et al., 2010). This "cumulative stressor approach," based on the co-occurrence and cumulative effect of these experiences, necessitates their examination as a collective composite, as opposed to the traditional approach of examining one or only a few adverse exposures, which misses the broader context in which they occur. The use of the ACE score as a measure of the cumulative effect of traumatic stress exposure during childhood is consistent with the latest understanding of the effects of traumatic stress on neurodevelopment (Anda et al., 2010; Anda et al., 2006).

Neighborhood Context and Abuse

Widom (2014) cautioned that any relationship between child abuse or neglect and later outcomes, such as delinquency, offending, or violence, is confounded by socioeconomic status. The concentration of child maltreatment in particular neighborhoods, predominately disadvantaged ones, is well established (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007). In a review of the literature, Coulton and colleagues (2007) indicated neighborhood structural factors, and economic markers in particular, are most consistently linked to child abuse and neglect. One serious limitation of the studies reviewed, however, is their use of neighborhood characteristics and neighborhood maltreatment *rates*. Only 3 of the 25 studies reviewed used multilevel modeling, examining neighborhood-level measure associations with *individual*-level measures of childhood maltreatment (see Coulton, Korbin, & Su, 1999; Kim, 2004; Molnar, Buka, Brennan, Holton, & Earls, 2003). These multilevel

designs have found smaller neighborhood effects than those aggregated to child maltreatment rates, with most of the variance being explained at the individual or family level (Coulton et al., 2007). Between 2% and 5% of the variance in abuse/neglect was found among neighborhoods in multilevel studies. An additional limitation in prior work has been the widespread use of official report data of child maltreatment from institutional sources (such as Child Protective Services) or a handful of studies that used self-report data from parents (Coulton et al., 2007). The danger in using official data for child maltreatment is of course in differences in how maltreatment is defined, recognized, and reported such that differences found are potentially variations in maltreatment reports, not necessarily in maltreatment behaviors. This has been termed the "definition, recognition, and reporting" path to accounting for the correlation between childhood maltreatment and neighborhood characteristics by Coulton and colleagues (2007). We are unaware of any published multilevel study using self-report of child maltreatment from the youth.

In addition, prior studies have found differences in the associations between neighborhoods and maltreatment by the type of abuse/neglect. Different neighborhood measures (such as poverty, low socioeconomic status [SES], high violent crime rates, residential stability, etc.) are differently associated with different measures of abuse and neglect (Coulton et al., 2007). However, these differences may miss the point as types of abuse/neglect are extremely interrelated such that exposure to one type increases the odds of exposure to additional types. Differences among prior studies may be differences of convenience or researcher choices (in what abuse measures were available) rather than true differences in effects. As the ACE literature argues against examining individual types, the current multilevel study examines neighborhood measure effects on the ACE composite score, a score empirically linked to a host of negative later life and health outcomes.

Prior multilevel work has strongly suggested the need to include examining the potential protective effects of affluent neighborhoods and not just the role of concentrated disadvantage (Morenoff, Sampson, & Raudenbush, 2001). The exiting of more wealthy families from middle-class areas, increased access to social and institution resources, and increased social control based on enhanced ability to mobilize resources afforded to affluent neighborhoods have been espoused as justification to include measures of the upper-end income distributions (Brooks-Gunn, Duncan, Kato, & Sealand, 1993; Morenoff et al., 2001; Sampson, Morenoff, & Earls, 1999). The current study includes concentrated disadvantage and the degree of concentrated affluence relative to the concentration of poverty in a given census tract (using the Index of Concentration at the Extremes [ICE] measure explained below).

Additional concerns in multilevel research involve the definition/identification of neighborhood dimensions, the range of neighborhoods available by measures examined, and the number of individuals within each neighborhood (Leventhal & Brooks-Gunn, 2000). The current study organizes neighborhoods by census tracts across a large and diverse state, ensuring a wide range of neighborhoods across contextual measures, and includes almost 60,000 youth. Census tract boundaries are composed around prominent physical features, as well as important social and ethnic divisions, that define neighborhoods (Duncan & Aber, 1997; Leventhal & Brooks-Gunn, 2000). For that reason, we utilize the data readily available at the census tract level to construct our neighborhood measures of concentrated disadvantage and affluence, described in detail below, to assess their impact on the youth outcome of interest (ACE scores).

Current Study

The current multilevel study is a statewide examination of neighborhood effects on the ACE score of juvenile offenders. While the literature on ACE scores and negative later life and health outcomes has been growing, and is well documented, the current study is the first to examine the effects of neighborhood context in a multilevel model on ACE scores. Furthermore, the vast majority of studies examining the neighborhood context and child maltreatment in general have not been multilevel in nature (Coulton et al., 2007). The current study aims to fill those gaps and move the ACE research forward by including consideration of the effects of both the disadvantage and affluence of neighborhoods, across an entire state, in addition to individual-level measures (including family characteristics) on the cumulative stressor quantitative ACE score.

Data and Method

Data were drawn from the Florida Department of Juvenile Justice (FDJJ) archival data records and the U.S. Census Bureau. The FDJJ maintains a centralized database, the Juvenile Justice Information System (JJIS), that contains complete social, offense, placement, and risk assessment history data for all youth referred (equivalent to an adult arrest). The individual-level measures of interest were taken from the Positive Achievement Change Tool (PACT) risk/needs assessment panel used by the FDJJ. Data for this study included all the juvenile offenders under the care of FDJJ who turned 18 between January 1, 2007, and December 31, 2012, and who were assessed using the Full Positive Achievement Change Tool (C-PACT) risk/needs

assessment (N = 64,329). Due to incomplete address data (a result of data entry error, or wards of the state incorrectly having state office addresses entered as home addresses), a total of 4,977 youth were excluded from the sample as a usable address could not be ascertained.[1] We used MapMarker software available from Pitney Bowes to match the home address information with 2010 census tract data to determine the Florida census tract in which each youth resided. There are a total of 4,245 census tracts in the state of Florida, but 1,397 had no youth contained in the current sample or were not residential tracts (e.g., parks or airports) and thus were excluded from the analyses presented here. Our final sample size includes 59,342 youth living in 3,948 neighborhoods. The average number of youth in each tract in the analyses presented was 15; however, this number ranged from 7 to 156.

Dependent Variable

ACE Scores

Although the purpose of the PACT assessment is to classify youth on risk to reoffend at their time of intake, certain PACT items relate to ACEs. These PACT items were used to derive ACE scores (see Baglivio et al., 2014, for specific items and responses). Ten individual ACEs were studied: parental separation or divorce; psychological abuse; physical abuse; sexual abuse; emotional neglect; physical neglect; household violence; living with household members who were substance abusers; household mentall illness; and household member jail/prison history. These are the same 10 ACEs used in the comprehensive Wave 2 of the original ACE Study (Dong et al., 2004). The outcome variable examined in the current study represents the sum (0-10) of all ACEs endured by youth at the time of their last contact with Department of Juvenile Justice (DJJ).

Independent Variables

Individual Level

Independent variables at both the individual level and neighborhood level were selected based on the relevant literature surrounding ACEs. At the individual level, the association between the total number of ACEs a youth has experienced by the time of their last contact with DJJ and a number of demographic, parental, and family variables is explored. Family support is measured as a dichotomous variable where the reference group is youth who reported they have little or no support outside their immediate family. Parental

employment problem history is dichotomous where the reference group is youth who report no parental employment issues.

We also control for gender, race-ethnicity, and age because these demographic factors may also be associated with ACEs. Gender was measured using a dichotomous variable (0 = female, 1 = male). Race–ethnicity is measured using a set of dichotomous variables with 1 = Black, 1 = Hispanic, and 1 = Other (Haitian, Jamaican, Native American; in each category, non-Hispanic White is the reference group). Age is measured in years for each youth in the sample and reflects the age at which youth were last in contact with DJJ.

Neighborhood Level

Data used to construct the neighborhood-level measures were taken from the 2008-2012 American Community 5-year estimates for census tracts in the State of Florida (U.S. Census Bureau, 2014). Whether or not census tracts constitute neighborhoods is a long-standing issue within social science research (Coulton, Korbin, Chan, & Su, 2001). Tracts generally have stable boundaries, are designed to be relatively homogeneous with respect to population characteristics, and are a geographic unit for which data are readily available from the U.S. Census Bureau. Although imperfect, the use of census tracts as proxies for neighborhoods is common within most research which examines neighborhood effects (Morland, Wing, Diez Roux, & Poole, 2002; Mujahid, Diez Roux, Morenoff, & Raghunathan, 2007; Sampson, Morenoff, & Gannon-Rowley, 2002).

Six census tract variables were used to form the measure of neighborhood disadvantage used in the current study: the proportion of families living below the poverty line, median family income (logged and reverse coded), the proportion of female-headed households, the unemployment rate, the proportion of the population with a high school degree (reverse coded), and the proportion of households receiving public assistance. Previous studies have used some combination of these variables to assess the impact of community socioeconomic status on a variety of outcomes (Baumer et al., 1998; Kubrin & Stewart, 2006; Sampson, Radenbush, & Earls, 1997). These variables are strongly correlated to one another at the neighborhood level, and alpha factor analyses indicated that these variables loaded on a single factor in our sample ($\alpha = .920$). The items were standardized and combined to form an additive index of neighborhood disadvantage.

In addition to assessing the impact of concentrated disadvantage on ACEs, we examine the effect of concentrated affluence on the prevalence of ACEs. Prior work has pointed out that researchers spend too much time exploring

the consequences of disadvantage and little time focusing on affluence, which may generate a separate set of protective mechanisms, thereby reducing negative outcomes (Brooks-Gunn et al., 1993; Massey, 2001; Morenoff et al., 2001). To measure concentrated affluence, we use Massey's (2001) ICE measure. ICE captures the degree to which affluence is concentrated, relative to the concentration of poverty in a neighborhood. Accordingly, it reflects the relative socioeconomic inequality in a community, rather than the absolute level of disadvantage. Consistent with prior research, the ICE index was calculated using the following formula: [(Number of affluent families − Number of poor families) / Total number of families] (Kubrin & Stewart, 2006). In the current analysis "affluent" is defined as families with incomes two standard deviations above the mean (M = US$60,362 σ = US$26,283, which equates to US$112,928), and "poor" is defined as families below the poverty line. This measure ranges from +1 to −1. A value of +1 indicates that all families in a given neighborhood are affluent; a value of −1 indicates all families are poor; and a value of 0 indicates an equal balance between affluent and poor families (Kubrin & Stewart, 2006; Massey, 2001; Morenoff et al., 2001).

Analytic Strategy

To assess the impact of neighborhood-level conditions on childhood experiences, multilevel linear regression analyses are fitted using maximum likelihood estimation in Stata 13. The hierarchical regression models used here are extensions of traditional regression models that account for the structuring of data across aggregate groupings, that is, they explicitly account for the nested nature of data across multiple levels of analysis (i.e., youth nested in neighborhoods; Raudenbush & Byrk, 2002). Because one of the assumptions of ordinary regression models is that the error terms are independent, such clustering would violate this core model assumption. Consequently, failure to account for nonindependence of observations can result in standard errors that are biased downward, increasing the chances of drawing incorrect conclusions (Raudenbush & Byrk, 2002).

A related problem is that statistical significance tests in ordinary regression models overestimate the influence of the neighborhood-level predictors as the degrees of freedom are not adjusted for the hierarchical nature of the data. Accordingly, in the models presented here, the degrees of freedom used in the statistical significance tests have been adjusted for the number of aggregate units in the data. This type of multilevel modeling provides insight into the extent that individual differences in ACEs are due to either individual-level characteristics or characteristics of the neighborhood in which the youth live (contextual effects).

A three-step strategy is used to assess the impact of both individual- and neighborhood-level factors on youth's ACE scores. First, a null model (Model 1) is fitted, without any Level 1 or Level 2 predictors included. This model serves as a benchmark to which the more complex models are to be compared. The second model includes only the individual-level measures to determine to what extent youth-specific attributes explain variation in ACEs. Models 3 and 4 explore the contextual effects of neighborhood disadvantage and affluence separately, and Model 5 includes both predictors in a single model to assess their joint effects.

Results

Table 1 presents the descriptive statistics for the variables included in our analysis. Table 1 indicates that the mean number of ACEs in our sample of youth was 3.61, although this number ranged from 0 to a maximum of 10. Seventy-nine percent of the sample is male, with an average age of 17.67 at the time of their last PACT assessment. Blacks make up the largest proportion of our sample (43%), followed by Whites (38%), Hispanics (15%) and Other races (a total of 4%).

Table 2 presents the bivariate correlations between the variables used in the current study. The correlations presented in Table 2 lend support to several hypotheses. In particular, the measures of neighborhood disadvantage, neighborhood affluence, and the individual-, parental- and familial-level variables are significantly associated with the sum of ACE scores. Females and Blacks are more likely to have endured a larger number of ACEs. Youth who have parents with substance abuse problems, mental health problems, or employment issues are also more likely to have higher ACE scores. To investigate these relationships more closely, we now turn to the multivariate results.

Unconditional Model

We began by assessing the degree to which ACEs vary across neighborhoods. To do this, we estimated an unconditional, random intercept model of variance (i.e., a model with no predictor variables). The results of this analysis are presented in Model 1 of Table 2. The significance of the grand mean intercept (3.571) corresponds to the mean level of ACE scores across neighborhoods. Also important is the finding of a significant random effects variance component .279 ($\chi^2 = 1{,}695.93$, $p < .01$), which indicates that the sum of ACEs varies significantly across neighborhoods and therefore can be modeled. Figure 1 provides a graphical depiction of the degree of variation in the

Table 1. Summary Statistics for the Analysis of ACEs in Florida Youth.

	Description	*M*	Median	Minimum	Maximum	*SD*
Dependent variable (*n* = 59,342)						
ACEs	Sum of ACEs	3.61	3	0	10	1.87
Youth-level independent variables						
Age at assessment	Youth's age when PACT assessment was completed	17.67	17.85	11.37	22.5	1.02
Male	Coded 0 for females, 1 for males	0.79	1	0	1	0.41
Black	Coded 1 for Black youth, 0 for all others	0.43	0	0	1	0.5
Hispanic	Coded 1 for Hispanic youth, 0 for all others	0.15	0	0	1	0.36
Other race	Coded 1 for Haitian, Jamaican, or native American; 0 for all others	0.04	0	0	1	0.19
Family support	Coded 0 for no support network, 1 for some support network, 2 for strong support network	1.35	1	0	2	0.61
Parental employment issues	Coded 0 for no parental employment problem history, 1 for parental employment problem history	0.14	0	0	1	0.35
Neighborhood-level independent variables (*n* = 3,958)						
Concentrated disadvantage	Six-item index composed of % family poverty, logged median family income (reversed), % female-headed households, unemployment rate, % population with high school degree (reversed), and % households receiving public assistance (α = .920)	0.00	−0.08	−2.71	4.03	0.85
Concentrated affluence	ICE concentrated affluence index	−0.06	−0.06	−0.97	0.74	0.20

Note. ACEs = Adverse Childhood Experiences; PACT = Positive Achievement Change Tool; ICE = Index of Concentration at the Extremes.

Table 2. Bivariate Correlations for the Analysis of ACEs in Florida Youth (n = 59,342).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ACEs	1.000									
(2) Age at assessment	.088**	1.000								
(3) Male	−.169**	.114**	1.000							
(4) Black	.019**	.059**	.005	1.000						
(5) Hispanic	−.112**	−.010*	.056**	−.374**	1.000					
(6) Other race	−.051**	.012**	.010*	−.169**	−.082**	1.000				
(7) Family support	−.196**	.039**	.056**	−.020**	.020**	−.010*	1.000			
(8) Parental employment issues	.254**	.052**	−.022**	.020**	−.021**	−.014**	−.049**	1.000		
(9) Concentrated disadvantage	.040**	.044**	.004	.392**	.005	.040**	−.059**	.073**	1.000	
(10) Concentrated affluence (ICE)	−.064**	−.037**	.004	−.349**	.001	−.029**	.068**	−.075**	−.824**	1.000

Note. ACEs = Adverse Childhood Experiences; ICE = Index of Concentration at the Extremes.
*p < .05. **p < .01.

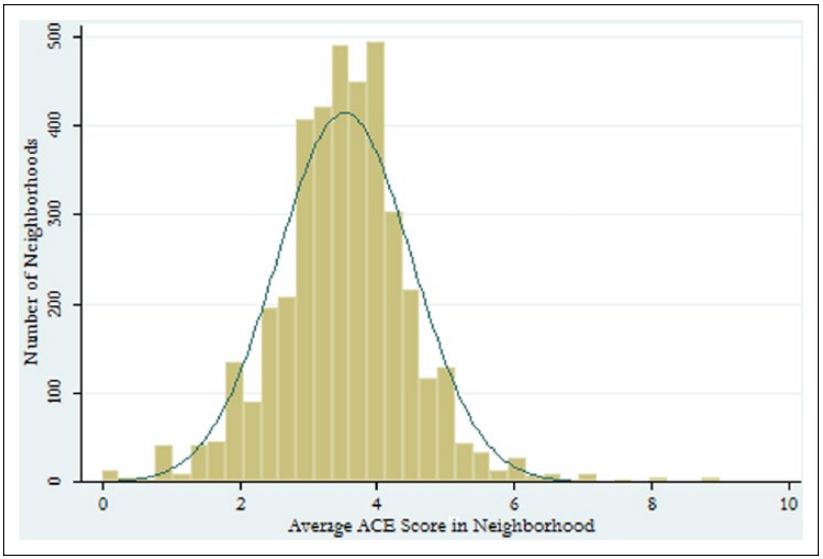

Figure 1. Distribution of ACE scores across neighborhoods.
Note. ACE = Adverse Childhood Experience.

mean ACE score across neighborhoods in the current study. The figure shows that the average ACE score in a given neighborhood varies from 0 to greater than 8 and also important, the scores are fairly normally distributed.

Figure 1 raises the question of what predictors account for the differences in ACE scores across neighborhoods. One potential explanation is that these differences reflect individual-level characteristics of the youth in these neighborhoods. Alternatively, the prevalence of ACEs may be greater in some neighborhoods because youth living there are exposed to higher levels of concentrated disadvantage or inequality. In Models 2 to 5 of Table 3, we assess these possibilities in more detail.

Level 1 (Youth Level)

A comparison of the variance components from Models 1 and 2 indicates that individual-level characteristics account for roughly 45% of the variance in ACE scores within neighborhoods (.448 = .279 − .154 / .279). Thus, part of the explanation for why in some neighborhoods youth exhibit a larger number of ACEs is that some of the respondents have individual-level risk factors that increase ACEs. Specifically, youth who were older at the time of their release from DJJ supervision and those whose parents had employment issues reported

Table 3. Multilevel Multivariate Regression Results for the Analysis of Adverse Childhood Experiences in Florida Youth.

Youth level	(1)	(2)	(3)	(4)	(5)
Intercept	3.571**	3.586**	3.604**	3.609**	3.601**
	(.012)	(.010)	(.010)	(.010)	(.010)
Age at assessment	—	0.188**	0.188**	0.188**	0.188**
	—	(.007)	(.007)	(.007)	(.007)
Male	—	−0 716**	−0.715**	−0.714**	−0.714**
	—	(.017)	(.017)	(.017)	(.017)
Black	—	−0.181**	−0.225**	−0.240**	−0.218**
	—	(.018)	(.019)	(.019)	(.019)
Hispanic	—	0−.512**	−0.542**	−0.552**	−0.537**
	—	(.023)	(.023)	(.023)	(.023)
Other race	—	−0.537**	−0.576**	−0.588**	−0.569**
	—	(.040)	(.041)	(.040)	(.041)
Family support	—	−0.524**	−0.521**	−0.519**	−0.519**
	—	(.012)	(.012)	(.012)	(.012)
Parental employment	—	1.217**	1.210**	1.206**	1.208**
issues	—	(.020)	(.020)	(.020)	(.020)
Neighborhood level					
Concentrated	—	—	0.100**	—	0.225**
disadvantage	—	—	(.013)	—	(.032)
Concentrated affluence	—	—	—	−0.595**	−1.395**
(ICE)	—	—	—	(.052)	(.123)
Random effects					
σ^2	0.279	0.154	0.149	0.143	0.138
χ^2	1,695.93	903.01	880.32	832.19	792.39

Note. n = 59,342 youth within 3,948 neighborhoods. ICE = Index of Concentration at the Extremes.
*p < .05. **p < .01.

higher ACE scores. Support from members outside of the youth's immediate family was also associated with lower ACE scores. Despite the impact of the individual-level characteristics, the variance component in Model 2 indicates that a significant amount of variation in ACE scores still exists across neighborhoods, suggesting that additional factors contribute to ACE scores.

Level 2 (Neighborhood Level)

The vast literature on the importance of neighborhood effects described above suggests that living in a community characterized by poverty, inequality, and

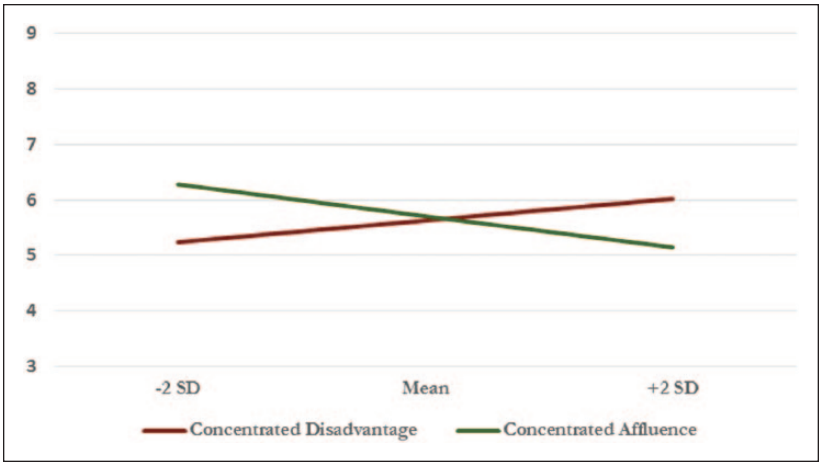

Figure 2. Predicted ACE score given varying neighborhood socioeconomic contexts.
Note. ACE = Adverse Childhood Experience.

socioeconomic disadvantage can increase the risk of a number of negative life outcomes, including ACEs. Model 3 of Table 3 presents results that assess this possibility while accounting for the individual-level characteristics shown in Model 2 to have a significant effect on ACE scores. As shown, the relationship between neighborhood disadvantage and youth ACE scores is significant and positive. Consistent with our predictions, living in a disadvantaged neighborhood is a risk factor associated with a higher number of ACEs above and beyond youth-level attributes. Model 4 examines the effect of concentrated affluence on the sum of ACEs. This finding suggests that neighborhoods with large concentrations of affluent families (relative to poor families), or resource-rich neighborhoods, serve as a protective factor in reducing ACEs.

It is worth noting that neighborhood disadvantage accounted for roughly 3% of the variance in ACEs across neighborhoods, whereas the ICE measure accounted for roughly 7%. Combined, they accounted for a total of 10.4% of the variance in ACE scores across neighborhoods. Overall, Model 5 of Table 3 suggests that the individual- and neighborhood-level variables accounted just over half of the total variance in ACEs (.505 = .279 − .138 / .279) at the neighborhood level.

Although individual-level characteristics account for a large portion of the variance in ACEs observed, neighborhood disadvantage and the ICE measure of concentrated affluence are also significant predictors of ACE scores across neighborhoods. Figure 2 displays the predicted values for

youth who reside in neighborhoods that differ on levels of disadvantage and inequality. The predicted values were computed using the coefficients from Model 5 of Table 3 and assume mean values for all other variables in the model (Raudenbush & Byrk, 2002). The predicted values associated with the estimated disadvantage effect show that the predicted ACE score of the juvenile offenders ranges from about 5.25 in neighborhoods with lower levels of disadvantage (-2σ) to about 6.0 in those with higher levels of disadvantage ($+2\sigma$), assuming the mean for all other variables. The results for the ICE measure show a slightly larger difference, where extreme inequality (-2σ) is associated with a predicted ACE score of 6.27, whereas a low degree of inequality ($+2\sigma$) is associated with lower ACE scores (5.15). Collectively, the results for neighborhood disadvantage and the ICE measure indicate community context is an important predictor of higher ACE scores and that childhood experiences do vary depending on neighborhood characteristics.

Discussion and Conclusion

The current study examined the effects of concentrated disadvantage and affluence on the ACE scores of high-risk juvenile offenders. Both disadvantage and affluence were significantly associated with ACE scores, in the expected directions, after controlling for demographics and family support and parental employment. The relationship between the concentrated affluence ICE measure and ACE scores was found more robust than for the disadvantage index. Results show the economic reality of the neighborhood in which a juvenile lives has an effect on the number of childhood maltreatment types the youth experiences. Childhood maltreatment, explicitly operationalized as an ACE score, has been linked to myriad of negative outcomes, including immediate chromosomal and functional brain damage (Anda et al., 2010; Cicchetti, 2013; Danese & McEwen, 2012; Shalev et al., 2013; Teicher et al., 2003), proximal behavioral issues (Bellis et al., 2014), and more distal negative health outcomes, including leading causes of death (Felitti et al., 1998). Studying the predictors of ACEs is paramount to understanding the prevention of the host of negative outcomes indicated in prior research. An understanding of the neighborhood factors that lead to higher abuse/neglect exposure indicates the contextual issues required to be addressed.

This study is not without limitations. All youth had an offending history (at least one arrest). However, not all juvenile offenders were included, as only the PACT Full Assessment contained the required items to create the 10-item ACE score. While 64,329 youth who turned 18 during the study period were assessed with the PACT Full Assessment, an additional 136,691

youth who turned 18 during that time were only assessed with the PACT Pre-Screen, prohibiting the creation of ACE scores for those youth. While we captured ACE scores for all youth receiving a Full Assessment (approximately 32% of all juvenile offenders), caution should be used in generalizing the results to all Florida juvenile offenders. With this sample bias toward higher risk youth, however, it should be noted that 45% of the youth were classified as low or moderate risk to reoffend. Prior ACE work indicates that higher ACE scores are found in special populations (Baglivio et al., 2014; Dube et al., 2001). Accordingly, the results of this study are likely not typical of nonoffending juveniles.

An additional limitation is that of the temporal order of our ACE score and the neighborhood context measures of disadvantage and affluence. Although we used the address at the time of arrest and the ACE score at the time of arrest, all neighborhood context measures were based on the 2008-2012 American Community 5-year estimates regardless of when the arrest was made. Importantly, 18.7% of the youth were arrested during 2007 (not covered by the period for which our neighborhood-level measures were drawn). Although we chose to not use different sets of 5-year estimates for those youth who were arrested in 2007, given the relative stability of neighborhood conditions over short time periods, we anticipate this decision to have very little impact on the results presented (Rohe & Stewart, 1996; Temkin & Rohe, 1996). In addition, we did not want to limit our sample to only youth arrested during 2008 to 2012 as we strived to ensure the broadest range of census tracts, with the greatest number of youth per tract.

A second concern regarding temporal order stems from the inability to track the mobility of youth during their entire childhood. In the current study, we assessed the impact of neighborhood condition based on the youth's neighborhood at the time of arrest. Accordingly, we are unable to say with certainty that the youth were living in a neighborhood characterized by these conditions during their entire childhood, the period during which many of the ACEs may have occurred. While it could be suggested that juvenile offenders may be a more transient population than nonoffending juveniles, and thus lived in different neighborhoods during their upbringing, the odds of a given youth moving substantially higher or lower in terms of disadvantage and/or affluence, we speculate, is quite rare. Future empirical efforts should test that speculation.

Future research should examine additional neighborhood context measures that may affect ACE exposure. Residential mobility, institutional resources, collective efficacy, and ethnic heterogeneity/immigration concentration are arguably theoretically linked to maltreatment. Couching ACE into a theoretical framework, such as the life-course perspective,

would further advance the field. Exposure to multiple abuse types during childhood and adolescence is arguably a significant transition that may alter one's life trajectory. Future endeavors should examine whether intervention programs can mitigate the effects of ACE on negative outcomes either by targeting individual factors (e.g., trauma-focused cognitive behavioral therapy [CBT]) or neighborhood context factors (such as vouchers to move to less disadvantaged areas). Examining interactions between individual and environmental characteristics, as well as the moderating effects of individual characteristics on the impact of affluence or disadvantage appears ripe for evaluation.

Neighborhood context clearly affects ACE exposure, as over 10% of the neighborhood-level variance in ACE was attributable to affluence and disadvantage. This is 2 to 5 times greater than the prior 2% to 5% variance explained found in prior context and childhood abuse work (see Coulton et al., 2007). Examining the components of our contextual measures leads to several policy implications through targeting those mechanisms. Our neighborhood disadvantage measure included unemployment rate, percent female-headed households, and percent with a high school diploma. Ripe policy targets include high school dropout prevention programs, teen pregnancy prevention programs, and job skills/life skills intervention and prevention both in schools and accessible community resources. Prevention services like the famed Nurse–Family Partnership may help curb the intergenerational transfer of childhood maltreatment. While the ACE score is a summation of abuse/trauma types, surely some communities are disproportionately plagued by some of those types over others. Targeted prevention to assessed community ACE scores, much like the process of individualizing case plans based on risk assessment results at the youth level, seems a productive avenue. A concerted and collaborative effort among youth and family services agencies to target existing family preservation, high school dropout and delinquency prevention, job readiness, and reentry services based on assessed community ACE scores should be considered. Specific areas may benefit from community revitalization projects, reentry assistance for members returning from prison, and domestic violence prevention.

Few studies have examined the effects of neighborhood characteristics on childhood maltreatment. No prior studies have examined those effects with juvenile offenders and maltreatment conceptualized using the ACE score. Marrying the literatures of multilevel neighborhood effects with the plethora of medical research on the negative effects of higher ACE scores advances discussion of how structural and contextual resources can be leveraged to improve health and justice system outcomes in truly disadvantaged and at-risk families and communities.

Authors' Note

The views and opinions expressed in this article are those of the authors and not necessarily those of the Florida Department of Juvenile Justice.

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Note

1. The total number of youth for which Adverse Childhood Experience (ACE) data were available was 64,329; however, 4,977 were dropped from the analyses for reasons related to the geocoding of their physical address at the time they were arrested. Specifically, 2,805 youth were dropped if they had a Post Office Box address listed in their contact information or if they were wards of the state and had a Department of Children and Families address which belonged to the state headquarters (those youth who were wards of the state at their time of arrest and were living in a foster home at the time were retained). In addition, we were unable to successfully geocode 3.5% of addresses contained in Juvenile Justice Information System (JJIS) due to data entry errors, resulting in the loss of 2,172 cases. Finally, neighborhoods with less than 3 youth residing in them were removed from the analysis. This resulted in a final sample of 59,342 youth living in 3,948 neighborhoods throughout the State of Florida.

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