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Early Childhood Predictors of Low-Income Boys' Pathways to Antisocial Behavior in Childhood, Adolescence, and Early Adulthood

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Abstract

Guided by a bridging model of pathways leading to low-income boys' early-starting and persistent trajectories of antisocial behavior, the current paper reviews evidence supporting the model from early childhood through early adulthood. Using primarily a cohort of 310 low-income boys of families recruited from WIC centers in a large metropolitan area followed from infancy to early adulthood, and smaller cohorts of boys and girls followed through early childhood, we provide evidence supporting the critical role of parenting, maternal depression, and other proximal family risk factors in early childhood that are prospectively linked to trajectories of parent-reported conduct problems in early and middle childhood, youth-reported antisocial behavior during adolescence and early adulthood, as well as court-reported violent offending in adolescence. The findings are discussed in terms of the need to identify at-risk boys in early childhood and methods and platforms for engaging families in health care settings not previously used to implement preventive mental health services.

Keywords

parenting; maternal depression; child conduct problems; antisocial behavior; gender; boys; early childhood

Introduction

Consistent with the Special Issue's focus on indicators for boys' risk in early childhood, the current paper reviews findings from primarily one long-term, longitudinal study, the Pitt Mother & Child Project (PMCP), and a second smaller and shorter-term longitudinal study including boys and girls, the Pitt Mother & Baby Project. The PMCP includes a cohort of urban, low-income boys followed from infancy to early adulthood with the aim of examining developmental precursors of conduct problems (CP) in childhood and more serious types of antisocial behavior (AB) during adolescence. Although during early childhood the current data bases allow the examination of sex differences, the long-term primary focus on boys precludes examining sex differences in vulnerability for serious forms of AB in the current cohorts. However, several other studies previously have demonstrated that boys show higher

rates of aggression and serious forms of AB reliably beginning by age 4 (see Brennan & Shaw, 2013; Keenan & Shaw, 1997 for reviews of this literature). Thus, the primary aim of the current paper review risk factors assessed during early childhood that have reliably predicted CP and AB in middle childhood, adolescence, and early adulthood for boys rather than examine sex differences in such prediction. Much of the research reviewed has been published previously (Shaw et al., 1998; Shaw, Gilliom, Ingoldsby, & Nagin, 2003; Shaw, Hyde, & Brennan, 2012; Sitnick et al., in press); however, the current paper extends the review of findings from the PMCP published more than 15 years ago (Shaw, Bell, & Gilliom, 2000) and thus updates longitudinal follow-ups extending through adolescence and early adulthood, including links to violent behavior during adolescence. We begin by reviewing and extending a previously discussed theoretical model for conceptualizing early childhood risk factors for CP and later AB in low-income families and particularly for boys (Shaw & Bell, 1993; Shaw, Bell, & Gilliom., 2000).

Impetus for Focusing on Conduct Problems and Antisocial Behavior

The study of CP and AB in childhood and adolescence is important because of the direct cost of such behavior to society not only in terms of damaged property and disruption of normal patterns of living, but also because of the difficulty of treating delinquent youth, and the potential emergence of later adult criminality and other serious disorders such as substance abuse (Loeber & Stouthamer-Loeber, 1998; Shaw et al., 2000). Despite the plethora of research on the treatment of antisocial behavior in childhood, efforts to prevent its development have proven to be difficult (Conduct Problems Prevention Research Group, 1999; Reid, 1993). The limited success to effectively treat conduct problems among school-age children and adolescents may be because of the inability to fully understand either the developmental trajectories leading to the disorder or the most appropriate content and timing of the intervention. As an example, past research on treatment of CP has shown that interventions implemented prior to school-age have a higher probability of success (Dishion & Patterson, 1992), with recent evidence suggesting this is possible using family-centered models initiated during early childhood (Shaw, Dishion, Supplee, Gardner, & Arnds, 2006; Dishion et al., 2008, 2014). In response to the need to more fully understand the origins of CP (Moffitt, Caspi, Dickson, Silva, & Stanton 1996; Patterson, Capaldi, & Bank, 1991), Shaw and Bell (1993) proposed a bridging model of early conduct problems beginning in early childhood that is summarized and expanded below.

Bridging Model of Antisocial Behavior

The goal of the original bridging model was to integrate theory and normative empirical work on young children's development with studies of correlates of older children's CP and AB (Shaw et al., 2000). At a broad level, Hirschi's (1969) social control theory provided a mechanism from which to understand parental influence, as the antisocial child's lack of self-control was postulated to emerge from the inability to form an attachment to parents in early development. Sroufe's (1983) conceptualization and application of attachment theory to early CP was also instrumental, describing how avoidant and/or disorganized working models are formed during infancy and demonstrating how they predisposed children to show later noncompliant and hostile acting out behavior (Erickson, Sroufe, & Egeland, 1985; Lyons-Ruth, Alpern, & Repacholi, 1993). Greenberg's and Speltz' (1988) cognitive-

affective model, also conceptualized from an attachment perspective, provided specific examples of how parent-child interchanges from ages 2 to 4 would lead to early disruptive behavior based on the dyad's inability to form a goal-corrected partnership. Finally, Patterson's (1982) model of coercion applied principles from social learning theory to explain how patterns of family interaction might produce conduct problems in school-age children, a model adapted and validated in early childhood by Martin (1981). Martin's work provided the critical empirical link for the model by demonstrating longitudinal associations between unresponsive caregiving during infancy and coercive parent-child interaction during the toddler and preschool periods, thereby establishing a bridge between attachment and social learning models.

Methodologically, we adopted the reciprocal effects model of Bell (1968) and the transactional perspective of Sameroff (1990). We also considered it critical to incorporate the normal cognitive and emotional changes that children undergo from infancy to school entry. Thus, our framework considered (1) ongoing influences that parents and children have on each other (Bell, 1968), and (2) the previous behavior of both parents and children in accounting for their later behavior (Sameroff, 1990) within the context of children's rapidly evolving development. As is evident from our use of several other earlier theoretical frameworks, the model combines and integrates previous perspectives on developmental psychopathology. Its novelty rests primarily on its ability to synthesize perspectives from disparate theoretical frameworks and different developmental periods to provide a cohesive framework for understanding processes leading to the antecedents of CP in early childhood.

Consistent with the focus of the Special Issue, the model was originally focused on young boys, especially those from low-income families, capitalizing on the greater risk of serious AB among males from impoverished settings and the more developed research base on the emergence of boys' externalizing disorders. We maintain a focus on boys from high-risk environments in the current paper; however, because a small number of girls were included and followed up for a shorter duration in the PMCP and a prior, shorter-term longitudinal study (Pitt Mother & Baby Project; Shaw, Keenan & Vondra, 1994), we provide input about sex differences in children's vulnerability to family risk when possible during early childhood (Shaw et al., 1994, 1998).

Following the tenets of the bridging model, empirically we emphasized identifying aspects of caregiving that have been highlighted as central causal factors in the development of early-starting CP and AB, as postulated by social learning and attachment theorists (Greenberg & Speltz, 1988; Patterson, Reid, & Dishion, 1992; Shaw et al., 2012). From a social learning perspective, parenting management practices that model and reinforce disruptive behavior are hypothesized to be associated with increasingly frequent and severe CP that begin during the 'terrible twos' and escalate during the preschool and school-age years through a coercive cycle (Shaw & Gross, 2008). With respect to attachment theory, parenting characterized by insensitivity and low responsiveness has been linked with avoidant and disorganized infant attachments and subsequent CP (Aguilar, Sroufe, Egeland, & Carlson, 2000; Erickson et al., 1985; Lyons-Ruth et al., 1993; Shaw, Owens, Vondra, Keenan, & Winslow, 1996). In addition, direct measures of maternal unresponsivity and low positivity during infancy and the toddler period have been linked to emerging CP (Martin,

1981; Shaw et al., 1994, 1998; Wakschlag & Hans, 1999). However, the follow-up for most of these studies typically has been limited to the preschool or early school-age period, with only a few studies on parenting and antisocial outcomes that have spanned from early childhood to adolescence (Aguilar et al., 2000; Caspi et al., 2002; Fergusson & Woodward, 1999; Moffitt & Caspi, 2001). Two studies have shown that aspects of parenting tend to differentiate early-starting children from other groups through adolescence. Moffitt and Caspi (2001) found a nonsignificant trend for greater deviant mother-child interaction at age 3 for early-starters versus adolescent-limited youth in the Dunedin, New Zealand cohort. Aguilar and colleagues (2000) found that low-income, early-starting youth were more likely to be maltreated between the ages of birth and 2 than nonoffending youth and tended to have parents who were more psychologically unavailable and more hostile at age three.

In addition to unresponsive and hostile, rejecting parenting in early childhood predicting later CP and AB, there is also some evidence to suggest that high levels of positive parenting in early childhood may serve a protective function for children living in high-risk urban neighborhoods (Forehand & Jones, 2003; McKelvey, Conners-Burrow, Mesman, Pemberton, & Casey, 2015; Supplee, Unikel, & Shaw, 2007). Although both of these longitudinal studies did not measure parent-child conflict or family cohesion until middle childhood, they demonstrated the potential protective role the quality of family relationships could play in attenuating risk of early-starting AB. More recently, Shaw and colleagues (in press) found indirect effects of the Family Check-Up intervention were found to reduce risk of teacher-reported CP at age 9.5 among those low-income, urban families living in the highest-risk neighborhoods when positive parenting was improved between child ages 2 and 3. Thus, there is some evidence that early aspects of parenting may be important across childhood and adolescence in terms of both actualizing or preventing early-starting and persistent patterns of AB.

In addition to parenting, several other proximal family risk factors have been implicated in the development of children's AB, by virtue of direct effects on child behavior and indirect effects through compromising caregiving quality (Shaw & Shelleby, 2014; Yoshikawa, Aber, & Beardslee, 2012). Such family risk factors include daily parenting hassles and satisfaction with social support (McEachern et al., in press), parental psychopathology (Goodman & Gotlib, 1999; Goodman et al., 2011; Shaw et al., 2009; Zahn-Waxler, Iannotti, Cummings, & Denham, 1990), and parental conflict, especially in the form of exposure to interparental aggression (Emery, 1988). For example, direct and interactive effects have been found for parental history of psychiatric illness on AB (Cadoret, Yates, Ed, Woodworth, & Steward, 1995; Kandel & Mednick, 1991), focusing primarily on parental antisociality and depression. In our work, we have emphasized how, in particular, maternal depression may be a key factor for compromising young boys' ability to regulate their emotions through compromising caregiving, by depressed mothers' being more passive in obtaining appropriate and much-needed resources for the family, and by transmitting genetic risk to offspring for difficulties in regulating emotions (Shaw & Shelleby, 2014). These processes might be especially heightened in the context of urban poverty where both compromised parenting and maternal depression have been found to be elevated (Yoshikawa et al., 2012).

Additionally, we have tested potential mechanisms by which proximal family risk factors such as maternal depression could “get under the skin” of at-risk boys during early childhood, compromise their ability to regulate emotions, and ultimately increase their risk of early-starting and persistent CP and AB. Based on overlapping sensitive periods for fundamental processes of dyadic emotion regulation (e.g., attachment; Martins & Gaffan, 2000) and neurodevelopment (Schoore, 1994) in the first years of life, exposure to early maternal depression could predict alterations in children’s emerging neuroendocrine predispositions and/or regulatory capacities that place them at increased risk for early-starting patterns of CP and AB (Davidson, Putnam, & Larson, 2000; Hyde, Shaw, & Hariri, 2013; Lorber, 2004; Propper, & Moore, 2006). For example, hyper-reactivity of the hypothalamic–pituitary–adrenal axis has been linked to emotionally ‘reactive’ types of aggressive behavior in children (Lopez-Duran, Olson, Hajal, Felt, & Vazquez, 2009). Morphological alterations in related brain structures such as the amygdala-hippocampal complex could be altered by children’s neurodevelopmental adaptations to chronic exposure to maternal depression, and possibly lead to heightened and persistent levels of AB.

Empirical Validation of the Model

Data from the PMCP have permitted us to test several of the model’s primary tenets from infancy and the toddler period to children’s CP and AB during the school-age period, adolescence and early adulthood. We have been able to test the contribution of parenting and other proximal family risk factors (e.g., maternal depression, social support satisfaction) on emerging and persisting child disruptive behavior, including direct and interactional effects.

Participants

Participants in the PMCP include 310 infant boys and 55 girls and their mothers that were recruited from Women, Infants, and Children (WIC) Nutrition Supplement Clinics in Allegheny County, PA when the boys were between 6 and 17 months old (Shaw et al., 2003, 2012). WIC provides monetary support for the purchase of nutritionally sound foods for low-income families with children ages 0 to 5. Of the 310 boys, 245 were first assessed at 18 months in our campus laboratory. In addition, 65 of the 310 boys and 55 girls were first seen in the laboratory at 12 months, with the girls followed up only at ages 18, 24, and 42 months and the 65 boys joining the larger cohort followed through early adulthood. At the time of recruitment, 53% of the target children in the sample were European-American, 36% were African-American, 5% were biracial, and 6% were of other races (e.g., Hispanic-American or Asian-American). Two-thirds of mothers in the sample had 12 years of education or less. The mean per capita income was \$241 per month (\$2,892 per year), and the mean Hollingshead SES score was 24.5, indicative of a working class sample. Thus, many boys in this study were considered at elevated risk for antisocial outcomes because of their socioeconomic standing.

Retention rates have generally been high at each time point from age 1.5 through age 22, with 90–94% of the initial male 310 participants completing assessments at ages 5 and 6, 89% at ages 10, 11, or 12, 89% at age 15 (Trentacosta, Hyde, Shaw, & Cheong, 2009), and 83% at age 22. Selective attrition effects typically have not been found based on early

sociodemographic or family risk, including maternal education or depression, family income, or early child problem behavior. Regarding the subsample of male infants first assessed at 12 versus 18 months of age (i.e., $n_s = 65$ and 245, respectively), no differences were evident on sociodemographic characteristics between these two groups.

Procedure

Beginning at 12 months, 65 of the 310 target boys and 55 girls (followed through only to 42 months) and their mothers were seen for two- to three-hour assessments at ages 1.5, 2, 3.5, 5, 5.5, 6, 8, 10, 11, 12, 15, 17, 20, and 22 years old. Data were collected in the laboratory (ages 1.5, 2, 3.5, 6, 11, 20, 22) and/or at home (ages 2, 5, 5.5, 8, 10, 12, 15, 17). In addition phone/internet assessments were conducted with boys when they were ages 16, 18, 21, and 23. Home and lab assessments included various structured observational tasks tailored to the child's developmental status (e.g., teaching, free play and clean-up tasks in early childhood versus discussion of hot topics in adolescence). In addition, parents and, beginning with the assessment at age 8 years, target children completed questionnaires regarding family issues (e.g., parenting, family member's relationship quality, neighborhood conditions) and child problem behavior. At all points, children were assessed with their "primary caregiver," who in most cases were their mothers (at age 15, 90% of visits were with mothers), but could also be another adult who was responsible for the majority of the parenting (4% fathers, 2% step-mothers, and 2% were grandmothers at age 15). Participants were reimbursed for their time at the end of each assessment.

Testing the Primary Tenets of the Bridging Model

Below we provide an overview of some of our findings generated from the Bridging Model described above, examining associations between the quality of children's early family environment and CP and AB from early childhood through early adulthood, with a focus on how parenting, factors within and outside the family compromise caregiving quality (e.g., maternal depression, neighborhood deprivation), and child behavior in the first three years lead to early-starting and persistent trajectories of serious AB during childhood and adolescence.

Maternal Responsivity and Conduct Problems

With regard to parental influences, the model's focus during the first year has been on maternal unresponsiveness (Shaw et al., 2000). In accord with attachment theory (Bowlby, 1969) and coercion theory (Patterson, 1982), we postulated that a lack of sensitivity to the infant during the end of the first year would be related to later coercive exchanges between parents and children and ultimately to higher rates of children's conduct problems. Our strategy was to measure the mother's contingent level of responsiveness in relation to infant bids for attention. Using Martin's (1981) high-chair procedure, in which one-year olds were placed in a high-chair with nothing to do while mothers were instructed to complete a questionnaire *and* attend to the infant, maternal unresponsiveness to the infant's bids for attention was related to observed noncompliant and/or aggressive behavior at age 2 and maternal report of CP at ages 3.5 (Shaw et al., 1998), a result we had also found in working with the smaller Pitt Mother & Baby Project (Shaw et al., 1994). Relations between responsiveness and maternal reports of CBCL Externalizing problems at 24 and 42 months

are displayed in Figure I below. These results also replicate the work of Martin (1981), who found maternal unresponsiveness associated with observed noncompliance at age 22 months and coercive child behavior at 42 months. It is also consistent with the findings of Wakschlag and Hans (1999), who found an association between maternal unresponsiveness during infancy and later CP. Interestingly and of special relevance to the current Special Issue, in both of our studies and Martin's, these relations were evident only for boys. While both of our cohorts involve low-income boys, Martin's used a middle-class sample, suggesting generalizability of the findings to lower risk populations of boys.

Infant Characteristics, Parenting, and Conduct Problems

Another primary component of the model is infant characteristics, particularly behaviors that would be directly linked to later disruptive behavior or be viewed as aversive by parents, thereby evoking coercive interchanges and escalating levels of CP (Martin, 1981; Moffitt, 1993). Findings from both the PMCP and Pitt Mother & Baby Project revealed direct and interactive effects of observed infant characteristics on later conduct problems. Infant persistence, a measure of how often the infant makes initial bids for attention *and* continues to fuss in relation to the mother's unresponsiveness (i.e., thought to be influenced by biology and parental responsivity during the first year), was related to observed aggression at age 2 in the Pitt Mother & Baby Project and maternal report of CP at age 3.5 in the PMCP. In both cases, these relations were significant only for boys. Finally, in both samples, observed aggression and noncompliance at age 2 were significantly associated with maternal report of CP at ages 3 or 3.5 (Figure 1, Shaw et al., 1994, 1998).

The model also postulates that the interaction of parent and infant characteristics should add unique variance to the prediction of early CP after accounting for each factor's direct effects. Evidence also supports this supposition. In the PMCP, the interaction between high infant persistence and low maternal responsiveness on the high-chair task also contributed unique variance to maternal report of age 3.5 CP after accounting for each factor's direct effects (Shaw et al., 1998), a result that also was replicated in the Pitt Mother & Baby Project involving maternal responsiveness at age 1 and observed aggression at age 2 (Shaw et al., 1994). In both cases, more aversive child behavior coupled with unresponsive parenting appeared to heighten risk for later outcome, and in both cases the interaction was evident only for boys.

Moving from the first to second year, the model's emphasis shifts to how parents respond to the infant's increase in mobility and expression of anger (Shaw et al., 2000). Unfortunately for parents, toddling is accompanied by an increased desire to "own" most toys the toddler comes in contact with (i.e., 'mine'), evoking frustration and expression of anger when these desires are not met. In addition to responding appropriately to the infant's disruptive behavior, the parent must also set limits to protect the infant, other family members, pets, and valuable/dangerous objects from the infant's limited cognitive understanding of such concepts as gravity, electricity, and differentiation of living versus nonliving organisms (Shaw et al., 2000). Thus, a primary objective has been to assess parent's ability to maintain a positive and nonhostile approach to these shaping and 'coaching' tasks during this challenging period. For both boys *and* girls, children whose parents were observed to be

rejecting at age 2 during a laboratory-based clean-up task demonstrated a heightened risk for CP at age 3.5 (see Figure 1, Shaw et al., 1998). Furthermore, a composite score of observed rejecting parenting at ages 1.5 and 2 differentiated clinically-significant levels of boys' CP at ages 5.5–6 and 8 according to *both* parent and teacher reports (Shaw, Garcia, Winslow, & Owens, 1999). These findings are consistent with previous studies on the effects of rejecting or overcontrolling parenting conducted with preschool-age boys (Campbell, Pierce, Moore, Marakovitz, & Newby, 1996), school-age children and adolescents using primarily male samples (see Loeber & Dishion, 1983; McCord, McCord, & Zola, 1959), and the model's emphasis on the significance of parenting practices during the toddler period.

Early Childhood Predictors of School-Age Conduct Problems for Boys

A further test of the model's predictive validity was to examine if early caregiving and contextual factors that compromise the quality of caregiving differentiate clinically-meaningful conduct problems across contexts during the school-age period. For these analyses, we used different types of person-oriented approaches so that we could trace the differential pathways of *individuals* sharing common risk factors or a common outcome.

As an initial test, we identified clinically-meaningful cases at school-age and looked back at factors that discriminated group status in early childhood (Shaw et al., 1999; Shaw et al., 2000). The Kiddie-Schedule for Affective Disorders - Epidemiologic Version (K-SADS-E, Puig-Antich, et al., 1980) was administered to mothers about their 8 year-old sons, from which diagnoses of DSM-IV disruptive disorders were derived. Teachers completed the Teacher Report Form (Achenbach, 1991) at age 8, from which scores greater than or equal to the 90th percentile on the Aggression factor were used to establish clinical impairment. This cutoff score was chosen to ensure that children in the clinical group were qualitatively and clinically distinct from their peers, but permitted a sufficiently large sub-sample of impaired children to conduct comparative analyses. Children who met criterion for Oppositional Defiant Disorder (ODD), Conduct Disorder (CD), or ODD or CD and Attention Deficit Hyperactivity Disorder (ADHD) at age 8 according to K-SADS interviews were marked by early problem behavior and multiple family risk factors (e.g., maternal depression, low social support, rejecting parenting) that were evident in the second year of life. However, because many of the measures of early child and family functioning were derived from maternal report, the sole exception being observed rejecting parenting and quality of the home environment (i.e., the HOME Inventory), it was important to corroborate the results using teacher reports. Interestingly, maternal reports of infant negative emotionality and age 2 CP were not related to clinically-meaningful CP at school-age as rated by teachers. However, teacher-identified aggressive children at age 8 were more likely to live in families characterized by maternal depression, low maternal social support satisfaction, and higher levels of daily parenting hassles at ages 1.5 and 2, with effect sizes ranging from $d = .73$ (maternal depression) to $d = .80$ (social support satisfaction). This first type of person-oriented analysis suggested that for young boys' living in the context of urban poverty, pathways leading to serious CP *across* context were marked by issues in caregiving and factors that compromise caregiving quality.

In addition to relying on the use of ad hoc categorization to classify children into clinical groups, we have relied heavily on utilizing more recently-derived procedures for studying developmental trajectories of children over time (Bryk & Raudenbush, 1992; McArdle & Epstein, 1987), specifically semi-parametric, group-based (SPGB) modeling that identifies clusters of *individuals* who share common pathways (Nagin, 1999, 2005). The use of these types of mixture models has become very appealing to researchers desiring to model patterns of antisocial behavior, with many of these studies focusing on AB during middle childhood and/or adolescence (Broidy et al., 2003; Bushway, Thornberry, & Krohn, 2003; Chung, Hawkins, Gilchrist, Hill, & Nagin, 2002; Lacourse, Nagin, Tremblay, Vitaro, & Claes, 2003; Moffitt, 2006), and other recent studies examining aggressive behavior and more broadly-defined CP beginning in early childhood (NICHD, 2004; Tremblay et al., 2004). Using SPGB modeling, we identified four developmental trajectories of parent-reported aggressive and oppositional behavior from ages 2 to 8, including a persistent problem trajectory, a high-level desister trajectory, a moderate-level desister trajectory, and a persistent low trajectory (Shaw et al., 2003; see Figure 2). Follow-up analyses that accounted for other “third variable” predictors such as maternal education, family income, and child IQ, indicated that initially high and low groups were differentiated in early childhood by high levels of child fearlessness and elevated maternal depressive symptomatology assessed at or prior to age 2. To examine early childhood discriminators of children who continued to show higher levels of CP versus those who start high and desist, we also explored group differences between persistent problem and high desister trajectories. In addition to these groups being distinguished by high levels of observed child fearlessness, high persisters demonstrated higher levels of rejecting parenting at age 2. These results suggest that for boys living in poverty, those with initially high levels of CP are characterized by children who showed a tendency to approach stimuli most children would shy away from (i.e., the measure of fearlessness was based on child approach to sounds of male gorillas being chased by hunters) and high levels of maternal distress in the form of depressive symptoms. Furthermore, high levels of CP are likely to continue in the context of high levels of rejecting caregiving, which were more likely to occur within the context of a depressed parent coupled with a curious, unafraid, and mobile toddler.

Early Childhood Predictors of Adolescent Antisocial Behavior

We were fortunate in being able to continue follow up on our cohort of low-income toddlers through adolescence and early adulthood with minimal attrition (i.e., 83% retention at age 22). With the increased seriousness of AB and its legal consequences, it is not surprising that AB becomes more covert and youth become more reliable, albeit not always forthcoming reporters of AB, relative to parents, teachers, or other informants. In addition to moving to a greater reliance on youth reports for reporting about more serious forms of AB (e.g., vandalism, drug use and selling, theft, arson, and physical and sexual assaults), we also utilized official juvenile court records. Although court records severely underestimate the frequency of AB, they do provide corroboration of youth reports and in cases when youth may under-report AB, a validity check on their veracity.

In our first foray tracking early childhood predictors of adolescent trajectories of AB, we relied on youth reports of two age-specific versions of the Self-Report of Delinquency

(Elliott, Huizinga, & Ageton, 1985) at six assessment points from ages 10 through 17 to identify groups of adolescents showing similar patterns of AB. We then used early childhood risk factors to discriminate AB trajectory groups from one another (Shaw et al., 2012). We then used official records of juvenile court petitions to verify and validate trajectory group status based on youth reports of AB. Once again we employed Nagin's (2005) SBPG modeling to generate trajectory groups, and once again four trajectory groups were identified, including early- and late-starting groups, a low stable group, and a high decreasing group characterized by multiple risk factors during early childhood and early adolescence. The early-starting group showed the highest rate of juvenile court petitions (78%), with the late-starting group also having a moderately high rate (49%), and even the stable low rate showing a fairly high rate based on their stable and low frequency of reported AB (25%). Somewhat surprisingly, the high decreasing group also showed a high rate of juvenile court petitions (60%) even though their reported activity was reported to be modest and the third highest group after age 12 (see Figure 3). However, based on data from three assessments during early adolescence (ages 10 to 12), boys in the high decreasing group reported higher rates of callousness and lower rates of empathy and prosociality than other groups, which included items such as 'keeping promises' and 'not being concerned about right and wrong. These boys, thought to be high on callousness and unemotionality, also rated themselves as highest on "good at telling lies others believe" and "lie easily and skillfully." Hence, based on their high percentages of court involvement, we focused our comparisons of early childhood risk factors on distinguishing between those in the persistent high or high decreasing groups in reference to the low stable group. After accounting for socioeconomic (e.g., maternal education, family income), family, and neighborhood risk in early childhood, only one factor discriminated the high persistent group from the low stable group: maternal depression in early childhood. When a similar comparison was made between the high decreasing and low stable group, only rejecting parenting and maternal depression assessed 13 to 15 years earlier distinguished those boys with juvenile court petitions attaining rates of 60–78% with those demonstrating rates of 25%. Similar to the findings in tracing discriminators of parents' reports of boys' more overt CP from ages 2 to 8 (Shaw et al., 2003), these results also pointed to the importance of early caregiving and maternal well-being during early childhood in predicting trajectories of boys' serious AB during adolescence.

Our most recent attempt to further specify early childhood predictors of boys' AB has focused on discriminating different types of AB from one another, with special attention to boys' violent behavior (Sitnick, Shaw et al., in press). Relying once again on juvenile court records, we first divided boys into one of three groups: 1) those with no record of violent or nonviolent juvenile petitions; 2) those with a history of petitions involving only nonviolent behavior; and 3) those with a history of petitions for violent behavior. Note boys in the violent behavior group also had nonviolent petitions against them. Violent behavior was defined based on the presence of one or more of the following types of court petitions: homicide, forcible rape, sexual/physical assault, robbery, arson, or weapons possession. We then used several early childhood indicators, assessed from ages 1.5 to 3.5, to discriminate groups from one another, including such factors as family income, minority status, parent reports of early oppositional behavior, observations of child emotion regulation during a

waiting task (i.e., waiting for a cookie the child's mother had in her possession in a clear bag while child had nothing to do), parental conflict, neighborhood deprivation, maternal depression, and rejecting parenting. Interestingly, the only factor to discriminate nonoffenders from nonviolent offenders was family income (in the expected direction). However, the number of factors that discriminated violent offenders from nonoffenders included not only family income, but early child oppositional behavior, observed emotion regulation, and minority status – being African American. Finally, violent versus nonviolent offenders were distinguished by higher levels of early oppositional behavior, lower levels of emotion regulation, and higher levels of rejecting parenting in early childhood.

The findings regarding the predictive validity of parent reports of early child CP on multiple types of AB are inconsistent with prior research in this area, including from the current cohort (Shaw et al., 2012), which indicate that parent reports of child behavior show emerging predictive validity only after age 3. However, in the current study that focused specifically on discriminating violent offenders from nonviolent offenders and nonoffenders, such parent reports assessed at ages 1.5 and 2 consistently predicted violent AB. In accord with findings from the Dunedin study examining multiple forms of AB (Moffitt, Poulton, & Caspi, 2013), observed emotion regulation assessed at age 3.5 also predicted later violent behavior. The finding regarding rejecting parenting also is in accord with other findings reported in the current cohort and other longitudinal research initiated in early childhood on multiple types of AB (Campbell et al., 1996). The implications of the current findings should be viewed as critical, as it appears that for boys living in urban poverty, those showing a very early history of oppositional behavior and difficulties in regulating emotions, coupled with rejecting caregiving are at heightened risk for engaging in very serious forms of AB. Identifying such boys as early as possible and implementing evidence-based preventive interventions (e.g., Dishion et al., 2008, 2014; Shaw et al., 2006, 2009) would be recommended to prevent these boys from showing this dangerous trajectory of crime and violence.

Early Childhood Predictors of Early Adult Antisocial Behavior and Mediating Role of Alterations in Brain Structure

As emphasized earlier in discussing how compromises in early caregiving and maternal well-being may “get under the skin” to influence children's long-term functioning, we have placed a special emphasis on the contribution of maternal depression, especially exposure during early childhood when rapid structural maturation is occurring in key limbic systems underlying neuroregulatory predispositions and threat-response tendencies. We were thus very interested in exploring the possibility that chronic exposure to maternal depression during early and middle childhood might be linked to aggressive behavior in early adulthood, particularly aggressive behavior that might be more reactive versus proactive in nature (e.g., reactive aggression including acts typically carried out without forethought versus aggressive acts planned based on instrumental reasons to get money). In addition, because we were able to collect MRI data on young adult brain structure at age 20, we could also test whether potential associations found between exposure to maternal depression and young adult aggression might be mediated by individual variation in structural properties (e.g., volume) of specific brain regions. For this reason, we focused our attention on

potential disruptions to the amygdala and hippocampus because of prior research demonstrating that early adverse caregiving experiences were associated with such structural alterations (Tottenham et al., 2010). For example, one recent study found that enlargements of the amygdala in 10 year-old children discriminated chronically depressed versus nondepressed mothers (Lupien et al., 2011). Although no differences in hippocampal volume were found in the Lupien study, there is some evidence to suggest that alterations in hippocampal structure would not appear until adolescence or young adulthood because of its protracted development (Andersen & Teicher, 2004). We chose to examine amygdala: hippocampal volume ratio based on recent findings suggesting that a larger ratio might more strongly predict problems in emotion regulation compared to alterations in either structure alone (Gerritsen et al., 2012; MacMillan et al., 2003). Using Nagin's (2005) SPGB to identify trajectories of maternal depressive symptoms from child's age 1.5 to 10 based on maternal reports from the Beck Depression Inventory (BDI, Beck, Ward, Mendelson, Mock, & Harbaugh, 1961), three trajectories were identified: a stable and persistently very high group, a moderately high group, and a persistently low group. Although we hypothesized that children exposed to mothers with persistently high trajectories of maternal depression would show both higher levels of aggressive behavior in young adulthood and the highest amygdala: hippocampus ratio, we found that such elevated trajectories of maternal depression were linked only to depressive symptoms in male young adults (Gilliam et al., in press). In contrast, moderately high trajectories of maternal depression during childhood predicted young adult aggression and higher levels of amygdala: hippocampal volume, with amygdala: hippocampal volume also mediating the association between maternal depression and young adult aggression. Male offspring of mothers with persistently moderate levels of depressive symptoms were more likely to report high levels of aggression on the Self-Report of Delinquency at age 20.

Why might moderate versus severely elevated levels of exposure to maternal depression be related to both aggression and structural differences in brain morphology? Although somewhat counterintuitive, this finding is consistent with some extant evidence (Gross, Shaw, Burwell, & Nagin, 2009; Hammen & Brennan, 2003). For example, an earlier study also using the PMCP sample found that moderately high (vs. low or severe) trajectories of maternal depression during childhood were most strongly related to earlier kinds of AB during adolescence (Gross et al., 2009). Consistent with the theoretical perspective of Rutter (1990), moderate maternal depressive symptoms may be strong enough to affect parenting practices, but not to result in someone else taking the role of primary caregiver. Thus, offspring of caregivers with moderate (versus extremely high) levels of depression might be more likely to be exposed to unresponsive or rejecting parenting. For the moderate trajectory group, mean levels of depressive symptoms were in the modest to moderate range, whereas scores for the persistently high group were well above the clinical cut point for clinical depression (> 20) in the persistent high group throughout child ages 1.5 to 10.

Discussion

The current pattern of findings suggests that for at boys living in low-income, urban communities, parenting and other proximal family risk factors assessed in early childhood are reliable predictors of CP during middle childhood and more serious forms of AB in

adolescence and early adulthood. Although consistent patterns were found between the quality of young boys' early family environment and clinically (and legally) meaningful levels of AB 8 to 20 years later, because only boys were followed through childhood and adolescence, we cannot rule out the possibility that similar associations would be found for girls. However, previous research suggests reliable differences in the frequencies and seriousness of CP and AB among boys beginning in early childhood (Keenan & Shaw, 1997; Brennan & Shaw, 2013), boys' heightened vulnerability to a plethora of neurodevelopmental disorders beginning before birth (e.g., miscarriages), at birth (e.g., stillbirths), and continuing in very early childhood (e.g., neonatal stillbirth, autism, ADHD, learning disabilities), and boys' greater vulnerability to early oppositional and aggressive behavior in the context of individual variations in the quality of early caregiving (Martin, 1981; Shaw et al., 1994, 1998). Hence, we believe it is reasonable to infer that boys are at heightened risk relative to girls for showing serious forms of AB during adolescence as a result of adverse family contexts in early childhood.

While we presented evidence from the current cohort and others (Martin, 1981) that boys might be particularly vulnerable to unresponsive caregiving during infancy, leading to more conflictual interactions with parents, poorer self-regulation skills, and subsequent greater risk for CP and AB, data also suggest that boys come into this world with greater vulnerabilities for problems in executive functioning and both CP and AB. Whereas findings are inconsistent about boys having a greater vulnerability to other contextual risk factors than girls (Moffitt et al., 2001; Lahey et al., 2006; Fergusson & Horwood, 2002), previous research and other papers in this volume suggest that boys have higher levels of child risk that make them more vulnerable to a host of problem behaviors related to issues in executive function, including such risk factors as inhibitory control and language delays (Moffitt, 1993; Messer et al., 2006).

Early Childhood Risk Factors: Parenting and Maternal Depression

Consistent with the tenets of our bridging model, both early parenting and factors linked to compromises in caregiving quality – maternal depression stood out as predicting CP in middle childhood and serious forms of AB during adolescence and early adulthood. Parenting practices assessed during the “terrible twos” discriminated stable persisting from high desisting reports of child CP in early and middle childhood, and both youth reports and court petitions of AB, including violent AB, during adolescence. These findings corroborate previous research that the early caregiving environment plays a critical role in the development and maintenance of CP and AB during childhood and adolescence (Aguilar et al., 2000; Caspi et al., 2002; Fergusson & Woodward, 1999; Moffitt & Caspi, 2001). Similar to the Aguilar et al. findings, parenting was assessed based on observational data during very early childhood, and was successful in discriminating patterns of AB up to 15 years later.

Perhaps somewhat more surprising was the similar predictive validity of maternal depression in relation to later CP and AB, also assessed during the toddler period. Maternal depression was a consistent predictor of trajectories of CP during early and middle childhood and serious AB during adolescence and young adulthood, and was the only early childhood factor to discriminate trajectories of high persisting AB (with a 78% rate of petitions) from a

low stable group (25% rate of petitions) during adolescence. In addition, exposure to moderate levels of maternal depression from child ages 1.5 to 10 were linked to both maladaptive development in brain structure and reactive aggression in young adulthood. Previous research linking maternal depression to AB has been more limited in terms of the length of time between assessments of maternal depression and later AB (Shaw et al., 2000), the severity of AB present in the sample being assessed, and the use of prospectively-collected data (Kandel & Mednick, 1991; Shaw et al., 2012). With these added methodological strengths, the current findings add more evidence to previous research linking early maternal depression to later maladaptive child outcomes (Kandel & Mednick, 1991; Shaw et al. 2000), which has been theorized to be transmitted by compromising caregiving quality, modeling of harsh and aggressive parental behavior, and both genetic (Goodman et al., 2011) and epigenetic risk. Emerging findings in the prevention area also suggest the centrality of maternal depression in leading to early-starting pathways of antisocial behavior. In a recent intervention study by Shaw and colleagues (2009) that utilized the Family Check-Up, improvements in maternal depressive symptoms (ages 2 to 3) were found to mediate improvements in child CP and internalizing symptoms from ages 2 to 4. This intervention finding and the current results suggest that targeting maternal depression may be particularly timely during the ‘terrible twos’ for preventing early-starting CP because of the frequency with which children demonstrate oppositional and aggressive behavior at this age (Gross et al., 2009).

Implications for Programs, Practices, and Policies

Findings from the current long-term longitudinal study suggest we have the ability to identify some of the boys living in urban, low-income contexts who will go to show persistent and serious forms of AB during adolescence and early adulthood from as young as ages 1.5 and 2. As noted above, these findings are consistent and extend research from similar longitudinal cohorts that have identified developmental antecedents of AB beginning in the toddler (Augilar et al., 2000) or preschool periods (Fergusson & Woodward, 1999; Moffitt & Caspi, 2001). However, it is one step to identify reliable risk factors for prevention and early intervention; it is an entirely different step to find ways to engage low-income parents with at-risk children into evidence-based prevention programs. One of the primary issues preventing engagement is accessibility. Although there are now several evidence-based program for young children designed to address either problem behavior in general by improving parental adjustment and/or parenting skills (Harding, Galano, Martin, Huntington, & Schellenbach, 2007; Lieberman, Van Horn, & Ippen, 2005; Love et al., 2005; Olds, 2002; Van Zeijl et al., 2006), or CP specifically by focusing on parent management strategies (Dishion et al., 2008; Eyberg, 1988; Webster-Stratton et al., 2008), accessibility to these programs is modest and nonexistent in most communities in the US. Thus, to actually reduce levels of early-starting CP at the *population* level, identifying new platforms and methods to reach and engage low-income families with toddlers and preschool children should be a priority (Shaw, 2013). Fortunately, there are existing examples of ‘outreach’ programs, including Webster-Stratton research in Head Start centers (Webster-Stratton et al., 2001), and Dishion, Shaw, and colleagues’ work at WIC centers (Dishion et al., 2008; Shaw et al., 2006). Following in the steps of Olds’ (2002) intervention program in engaging at-risk pregnant women in the Nurse-Family Partnership, Dodge and colleagues (Dodge, Goodman,

O'Donnell, Sato, & Guptill, 2014) initiated a home visiting program in very early childhood, recruiting parents in hospitals following the birth of their child. Carried out by nurses, random assignment of all children born in Durham, NC during one year resulted in fewer emergency room and overnight hospital visits, more community connections, more positive parenting, use of higher quality out-of-home care, and reduced rates of maternal anxiety when infants were 6 months old (Dodge, Goodman, Murphy, O'Donnell, & Sato, 2013). Although not yet formally linked to reduced rates of child CP because of the duration of the follow-up, based on established linkages between early parenting, social support, and parental psychopathology with child CP, the program shows promise for preventing rates of early-starting CP.

In addition to using WIC and hospitals as platforms to provide intervention services, other promising alternatives include pediatric primary care, center-based care (e.g., Early Head Start in some communities) and preschool contexts (e.g., Head Start) serving predominantly low-income families (Shaw, 2013). Center-based care and preschools are particularly appealing because of research suggesting greater predictive validity associated with children demonstrating CP in multiple contexts (Campbell, Shaw, & Gilliom, 2000). For example, being able to engage parents based on the child's level of disruptive behavior at a Head Start center would provide an opportunity to assess similarities in child behavior across contexts and caregiving strategies that appear to be effective or ineffective at home and at preschool (Webster-Stratton et al., 2001). By enlisting the cooperation of both parents and teachers, an intervention package could be formulated that emphasized consistent ways of managing the child's behavior across contexts, with both parent and teacher input used to identify the most pressing concerns and optimize ways of addressing these issues in a consistent manner. Primary care centers serving young children are also attractive because of the trust parents typically bring to the pediatrician's office, adding credibility to the intervention program. Pediatricians themselves are typically overburdened with the number of patients they are required to see each day, and often have modest levels of expertise in behavioral health methods, much less the requisite time to deal with young children's oppositional and aggressive behavior.

Whereas providing the accessibility to services is one critical challenge for the field, generating ways of engaging families with children at elevated risk for early-starting CP in nontraditional settings represents another concern (Shaw, 2013). Although parents using WIC services are there primarily to obtain food vouchers, pregnant women are coming to hospitals to birth their children, and parents are typically bringing children to primary care centers to address a child physical malady, the opportunity to engage parents in their children's behavioral health is possible at these sites, in part because of parents' trust in these health settings (i.e., more so for pediatric care than WIC). Without a national health care system for identifying at-risk infants and toddlers used by well over 95% of the population, as is the case in such countries as Sweden and Australia, prevention scientists in the US have had to be creative in identifying ways to engage parents in nontraditional settings to promote mental health in young children. For example, Dodge and colleagues have used nurses to recruit families into the Durham Connects program in hospitals before parents leave home with their newborn infants. Beginning with the infant's first visit to the pediatrician (i.e., 2 weeks after birth), Mendelsohn and colleagues (Mendelsohn et al., 2005)

have capitalized on the popularity and credibility of the Reach Out and Read Program to initiate video feedback intervention for parents, emphasizing their contingent responsivity and sensitivity while reading to and playing with their children. The authors have taken advantage of time parents are waiting to see pediatricians at primary care centers to implement this intervention. Also noted above, WIC Centers have been used to successfully engage parents of at-risk 2-year olds in the Family Check-Up, with engagement rates between 73% and 92% in two trials of low-income children varying in urbanicity (Dishion et al., 2008; Shaw et al., 2006). In another ongoing study using the Family Check-Up in a primary care center serving primarily low-income, African American youth focused on identifying early adolescents at risk for substance use, engagement rates have ranged from 90 to 92% during the first two years of the project (Ridenour & Shaw, personal communication).

We believe an important component of the success of the Family Check-Up to engage families with toddlers at WIC sites is the embedding of motivational interviewing (MI) into the intervention, as previous research with adult drinkers (Miller & Rollnick, 1991) and parents with at-risk adolescents (Connell, Dishion, Yasui & Kavanagh, 2007) has demonstrated the effectiveness of the MI to promote change in multiple forms of behavior. MI stresses the importance of individual's taking ownership of their motivation to change by generating dissonance between their goals for themselves or family members and their own or their children's current level of functioning. Dishion incorporated the use of MI as a core feature of the Family Check-Up to promote changes in parenting in families of at-risk youth, an approach that has been found to be particularly useful to apply during developmental periods of biological and/or social transitions, most notably during adolescence and the 'terrible twos' (Shaw & Bell, 1993) when parents often find children's behavior challenging to manage. The use of MI is just one example of strategies that could be used to engage parents of at-risk toddlers and preschoolers into preventive interventions at nontraditional mental health settings. In the next decade, more innovative and creative methods will need to be developed to both identify *and* engage parents of young children (including expecting parents) who are at-risk for early-starting CP.

Conclusions

Although the generalizability of the current findings may be limited to samples of low-income boys living in urban environments and by possible cohort effects (i.e., born in the early 1990's), the results suggest boys' high vulnerability to family-level adversities in early childhood in relation to early-starting and persistent trajectories of CP and AB. In particular, the current findings suggest that boys who are exposed to harsh and rejecting parenting and/or elevated and chronic maternal depression are at heightened risk for serious and sometimes violent AB during adolescence and early adulthood. In addition, for boys living in urban poverty, those demonstrating high levels of oppositional behavior and poor self-regulation skills coupled with compromised caregiving and maternal well-being during toddlerhood are at elevated risk for demonstrating violent behavior during adolescence. Taken together, we believe these findings should be viewed as "a call to arms" for social policies that promote the quality of low-income children's home environments and boys' self-regulation skills. With a number of evidence-based interventions available for

preventing early-starting antisocial trajectories, we believe a primary challenge for the coming years is to find creative ways to implement such preventive interventions in existing medical and educational platforms serving the needs of low-income children. We also suggest that the field take advantage of innovative methods, such as motivational interviewing, to increase parents' engagement in interventions designed to promote children's early psychosocial development.

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Figure 1.

Child and parenting contributors to conduct problems in early childhood

Figure 1 was originally published in Shaw, D.S., Winslow, E.B., Owens, E. B., Vondra, J.I., Cohn, J.F., & Bell, R.Q. (1998). The development of early externalizing problems among children from low-income families: A transformational perspective. *Journal of Abnormal Child Psychology*, 26, 95–107.

Figure 2.

Trajectories of boys' overt conduct problems from ages 2 to 8

Figure 2 was originally published in Shaw, D.S., Gilliom, M., Ingoldsby, E.M., & Nagin, D (2003). Trajectories leading to school-age conduct problems. *Developmental Psychology*, 39, 189–200.

Figure 3.

Trajectories of self-reported delinquent behaviors across adolescence

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