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Modeling the Interplay of Multilevel Risk Factors for Future Academic and Behavior Problems: A Person-Centered Approach

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Abstract

This study identified profiles of 13 risk factors across child, family, school, and neighborhood domains in a diverse sample of children in kindergarten from 4 US locations (n = 750; 45% minority). It then examined the relation of those early risk profiles to externalizing problems, school failure, and low academic achievement in Grade 5. A person-centered approach, latent class analysis, revealed four unique risk profiles, which varied considerably across urban African American, urban white, and rural white children. Profiles characterized by several risks that cut across multiple domains conferred the highest risk for negative outcomes. Compared to a variable-centered approach, such as a cumulative risk index, these findings provide a more nuanced understanding of the early precursors to negative outcomes. For example, results suggested that urban children in single-parent homes that have few other risk factors (i.e., show at least average parenting warmth and consistency and report relatively low stress and high social support) are at quite low risk for externalizing problems, but at relatively high risk for poor grades and low academic achievement. These findings provide important information for refining and targeting preventive interventions to groups of children who share particular constellations of risk factors.

Keywords

Multiple risks; risk profiles; person-centered; latent class analysis; child behavior problems

Children live within multiple contexts, including the family, the school, and the neighborhood, and characteristics of those contexts contribute to the development of competence or adjustment problems (Bronfrenbrenner, 1979; Cicchetti, 1993). Although it can be useful to examine the role of individual risk factors, they seldom operate in isolation (Cicchetti, 1993). In fact, they often are highly related both within and across ecological levels (e.g., child, family, school, and neighborhood). Findings from numerous longitudinal studies support the value of a holistic/ecological approach to examining the multiple risk factors associated with children's future adjustment problems (Gorman-Smith, Tolan, & Henry, 2000; Greenberg, et al., 1999; Greenberg, Speltz, DeKlyen, & Jones, 2001; Keller, Spieker, & Gilchrist, 2005; Rutter, 1979; Sameroff & Seifer, 1990).

This study assumed such a multivariate approach, in which children's characteristics and outcomes are influenced by factors including the social context of their family, the nature of

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interactions they have with their parents, the quality of their neighborhoods, their experiences with their teachers and classmates, and the climate of their schools. Although we know that each of those factors is contributory, it is less clear how all of those factors interact to lead toward or deflect children from specific outcomes. The beginning of elementary school and the beginning of middle school represent two critical developmental time periods during which the transition in context, along with developmental changes in the child, may place him or her at greater risk for behavior and academic problems (Conduct Problems Prevention Research Group, 1992; Kellam et al., 1991). For these reasons, the purpose of this study was to identify in a large and diverse sample of children how known risk factors at different ecological levels co-occurred in kindergarten and led to problematic outcomes by the end of fifth grade.

Individual Risk Factors for Problematic Outcomes

Substantial research has shown that children's own characteristics affect their outcomes. For example, when children have trouble processing information in school – due to specific learning challenges or difficulties paying attention – they are less successful academically, and they often feel frustrated and act out (Hinshaw, 1992). Not surprisingly, children with lower intellectual or cognitive abilities are at increased risk for a host of future negative outcomes, including poor academic achievement (Montague, Enders, & Castro, 2005) and serious conduct problems (Burchinal, Roberts, Zeisel, Hennon, & Hooper, 2006; Burt, Hay, Pawlby, Harold, & Sharp, 2004; Leech, Day, Richardson, & Goldschmidt, 2003). Children's cognitive skills appear to be particularly important in the prediction of later academic and behavioral outcomes for children who are exposed to high-risk social and environmental contexts (Burchinal, et al., 2006; Easterbrook, Davidson, & Chazan, 1993; Garmezy, Masten, & Tellegen, 1984; Gudonis, Giancola, & Tarter, 2007).

When children are hypervigilant to perceived threat in social situations and tend to interpret ambiguous behaviors of peers as hostile, they are more likely to respond aggressively and to have social difficulties (Dodge, 1986). As such, deficits in early social-cognitive skills, like emotion recognition capabilities and problem solving strategies, also have been related to a number of negative outcomes, including poor academic achievement, peer rejection, aggression, delinquency, and internalizing problems (Denham, 1998; Dodge, Bates & Petit, 1990; Gumora & Arsenio, 2002; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003; Izard et al., 2001; Leech et al., 2003; Mostow, Izard, Fine, & Trentacosta, 2002; Shields et al., 2001; Sullivan, 2006).

Once children become oppositional and aggressive, they are more likely to be rejected by children without behavior problems (Patterson, Reid, & Dishion, 1992); this makes it more likely that aggressive children associate with other aggressive children, a situation that can result in reinforcement and further escalation of maladaptive behaviors (Patterson et al., 1992). Indeed, early behavior problems are one of the strongest predictors of later antisocial behavior, serious delinquency, school failure, later mental health problems, and eventual unemployment (Burt et al., 2004; Caspi, Moffitt, Wright, & Silva, 1998; Hanlon, Bateman, Simon, O'Grady, & Garswell, 2004; Hill, Coie, Greenberg, & CPPRG, 2004; Moffitt, 1993; Montague et al., 2005; Robins & Price, 1991).

In addition to child characteristics, family demographic factors are among the most important predictors of a wide range of negative child outcomes (Costello, Compton, Keeler, & Angold, 2003; Evans, 2004). Family structure is among the most predictive demographic factor for children's outcomes; children from households with single (unmarried) parents have access to fewer economic and psychological resources (Carlson & Corcoran, 2001; McLanahan & Sandefur, 1994). On average, single parents give less time and attention to their children, have weaker control, make fewer demands and exhibit lower levels of warmth

toward their children compared to two-parent (married) families (Amato, 1987; Astone & McLanahan, 1991). Living with a single parent, living in poverty, having parents with low levels of education and/or few job skills places children at increased risk for academic problems (Duncan, Brooks-Gunn, & Klebanov, 1994; Gutman, Sameroff, & Cole, 2003; Gutman, Sameroff, & Eccles, 2002; NICHD Early Child Care Research Network, 2005; Prelow & Loukas, 2003; Rauh, Parker, & Garfinkel, 2003; Yeung, Linver, & Brooks-Gunn, 2002). These family demographic risks also are positively related to children's conduct problems (Cote, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Dodge, Pettit, & Bates, 1994; Duncan et al., 1994; Harland, Reijneveld, Brugman, Verloove-Vanhorick, & Verhulst, 2002; NICHD Early Child Care Research Network, 2005; Sampson & Laub, 1994; Schultz & Shaw, 2003; Yeung et al., 2002).

To some degree, those family demographic factors affect children's outcomes because those factors tend to be associated with problems in adult functioning and more stressful life events (Klebanov, Brooks-Gunn, & Duncan, 1994). Both parent mental health, especially depression, and stressful life events are related to poor cognitive and behavior outcomes in children (Burt et al., 2004; Dodge et al., 1994; Gutman et al., 2002; Gutman et al., 2003; Hair, McGroder, Zaslow, Ahluwalia, & Moore, 2002; Harland et al., 2002; Martin, Linfoot, & Stephenson, 2005; Prelow & Loukas, 2003). Marital conflict, which is often closely tied to parent mental health and stressful life events, further increases children's risk for later conduct problems (Conger & Ge, 1994).

One means by which family demographic characteristics, parent mental health, stressful life events, and marital conflict affect children's outcomes might be by undermining more optimal parenting (Belsky, 1984). Poor parenting practices including child maltreatment, overly harsh discipline, lack of warmth and sensitivity, and inconsistency in implementing routines or enforcing rules have been linked to children's adjustment problems in multiple areas (Cote et al., 2006; Dodge et al., 1994; McCabe, Lucchini, Hough, Yeh, & Hazen, 2005; McMahon & Forehand, 1988).

Child and family functioning also are affected by broader ecological environments. For example, concentrated poverty in a community is related to children's lower academic achievement (Gutman et al., 2002; Prelow & Loukas, 2003; Rauh et al., 2003). In addition, when children live in poor and disorganized neighborhoods, they are more likely to display conduct problems and engage in criminal behavior (Sampson & Groves, 1989; see Leventhal & Brooks-Gunn, 2000, for a review). Similarly, when children attend schools that have a greater proportion of poor and/or aggressive students, they are more likely to display externalizing problems themselves (Ingoldsby & Shaw, 2002; Kroneman, Loeber, & Hipwell, 2004; McCabe et al., 2005; Rutter, Maughan, Mortimore, Ouston, & Smith, 1979).

Other important factors to consider when examining the association between individual risks and children's outcomes include race or ethnicity and the urban or rural contexts in which children live. Regardless of socioeconomic differences, children's exposure to various risks, including parenting practices and contextual experiences, vary by race (Bradley, Corwyn, McAdoo, & Garcia Coll, 2001; Kilmer, Cowen, Wyman, Work, & Magnus, 1998). Some risk factors are more prevalent in urban contexts whereas others are more prevalent in rural contexts (Atav & Spencer, 2002; Pedersen & Mortensen, 2001). Also, the meaning, salience, and impact of risk factors vary by the context in which children live (Armistead, Forehand, Brody, & Maguen, 2002; Ackerman, Schoff, Levinson, Youngstrom, & Izard, 1999; Deater-Deckard, Dodge, Bates, & Pettit, 1998; Garcia Coll & Magnusson, 1999).

Variable-Centered Approaches to Multiple Risks

Broadly speaking, researchers have taken two general approaches to understand how the presence of multiple risk factors at multiple ecological levels relates to child development: variable-centered approaches and person-centered approaches (Magnusson & Bergman, 1988). Variable-centered approaches allow for the quantification of individual risk factors or cumulative indices of risk that, on average, relate to poor outcomes (Sameroff & Seifer, 1990). Burchinal et al. (2000) and Deater-Deckard et al. (1998) provide good overviews of the advantages and limitations of variable-centered approaches, including multiple regression analysis and the cumulative risk index.

Early work by Rutter (1979) using the cumulative risk index emphasized the importance of examining multiple risks that exist in conjunction with each other. This represented an important step forward both conceptually and statistically in modeling multiple risks, and was used widely to demonstrate that more risk factors are associated with less adaptive outcomes, but often in a non-linear manner (e.g., Appleyard, Egeland, van Dulmen, Manfred, & Stroufe, 2005; Gerard & Buehler, 2004; Luthar, 1993; Sameroff, Seifer, Baldwin, & Baldwin, 1993; Seifer, Sameroff, Dickstein, Keitner, & Miller, 1996). One disadvantage of this approach is that all risk factors are weighted equally and, perhaps more importantly, are assumed to be interchangeable. The exposure to two risk factors also is considered to be equal regardless of how highly related they are. For example, the presence of two highly related risk factors, such as parent education and occupational prestige, would provide more redundant information in predicting children's outcomes than the presence of two unrelated or mildly related risk factors, such as parent education and depression. Moreover, such risk indices do not provide insight into how particular risk factors may interact with each other, or how their effects might vary across different subpopulations.

Person-Centered Approaches to Multiple Risks

Although variable-centered approaches have been invaluable in understanding how multiple risks are associated with children's development, a person-centered approach can provide unique insight regarding how an individual's entire spectrum of risk factors interact to predict negative outcomes (Cicchetti & Rogosch, 1993). Person-centered approaches to multiple risks intuitively map on to the real-life experiences of individual children and are more closely aligned with a holistic view of development (von Eye & Bergman, 2003). In such a view, the significance of any one aspect of individual development gains meaning mostly in terms of its relations to other parts of the person-environment system (Lovden, Bergman, Adolfsson, Lindenberger, & Nilsson, 2005). In other words, the whole *is* greater than the sum of the individual parts (Bergman & Magnusson, 1997). Previous studies have demonstrated that specific combinations of risk factors that cut across multiple domains better explain the association between early risk and later academic and behavioral outcomes than any single risk factor (e.g., Ackerman et al., 1999; Burchinal, Roberts, Hooper, & Zeisel, 2000; Corapci, 2008).

One person-centered approach is the classification of individuals into groups based on the presence or absence of a small number of risk factors (e.g., Greenberg et al., 2001). As the number of individual risk factors increases, however, the number of risk profiles increases exponentially and can become unwieldy. Other studies have used cluster analysis to identify a small number of subgroups of individuals with different risk profiles (e.g., Murdock & Bolch, 2005; Roberts et al., 2000; Sameroff et al., 1993; Seidman et al., 1999; Yoshikawa & Seidman, 2001).

Latent class analysis (LCA) is conceptually similar to cluster analysis but is based on a measurement model much like factor analysis. This person-centered approach posits that

there are underlying subgroups, or latent classes, of individuals who share similar characteristics, but that true subgroup membership is unknown and can be inferred only through the measurement of a set of observed characteristics, which in the case of LCA are categorical indicators. LCA is a model-based procedure in which models with different numbers of latent classes (e.g., one versus two, two versus three, three versus four) can be compared by using parameter estimates, fit statistics, and model information criteria to determine the most parsimonious summary of all observed patterns of responses to the individual items. The optimal number of latent classes is identified, and each individual child has a (typically nonzero) probability of being a member of each of those classes. A comprehensive overview of LCA can be found in Collins and Lanza (in press).

Although LCA has been applied to many multidimensional constructs, including temperament (Stern, Arcus, Kagan, Rubin, & Snidman, 1995), depression (Lanza, Flaherty, & Collins, 2003), teaching style (Dewilde, 2004), and alcohol use behavior (Lanza, Collins, Lemmon, & Schafer, 2007), it has not been well demonstrated in the literature, as applied to the study of multiple risks. Only very recently has this type of approach been proposed for modeling multiple risks. For example, Parra, DuBois, and Sher (2006) used a related technique, latent profile analysis, to identify four underlying groups of adolescents based on continuous indicators from five ecological levels (i.e., individual, family, peer, school, and neighborhood) and related group membership to depression and conduct problems.

The Current Study

In the current study, we investigated how combinations of diverse risk factors interact to predict outcomes in children living in diverse but disadvantaged communities. We relied on multiple methods and multiple informants, including direct child assessments, parent interviews, teacher questionnaires, interviewer ratings, direct observations, and public records to assess risk factors in 13 domains related to the child, family, parenting, and community that were present at the end of kindergarten. As part of our analyses, we compared the cumulative risk index to the innovative person-oriented method, LCA, in predicting children's functioning at the end of elementary school in Grade 5 and summarized prevention implications that could be drawn based on the different approaches to modeling multiple risks.

Hypotheses

We expected there would be a relation between the cumulative risk index, computed in kindergarten, and each of the indicators of academic and behavior problems in Grade 5. We hypothesized, however, that those relations would be less informative than the results from our LCA analyses in terms of specific implications for prevention.

The purpose of LCA and related analytic techniques is primarily descriptive. It distills vast amounts of information and identifies patterns that are difficult to detect a priori. We hypothesized that we could identify a relatively small number of risk profiles that would capture parsimoniously the variability in the intersection of risks in our large sample. We did not anticipate that the structure of the latent classes of risk factors would differ by race and locality (i.e., urban versus rural), but we did expect prevalence rates to differ substantially across those dimensions (Rowe, 1994). Despite the fact that all participants lived in relatively disadvantaged communities, we expected to identify a substantial portion of our sample that was experiencing relatively few risk factors (Werner & Smith, 1992; Wyman et al., 1999). Because the LCA approach can be used effectively to identify sample heterogeneity even within a single risk factor, we also expected to be able to differentiate distinct classes of single-parent families and distinct classes of two-parent families that were and were not characterized by other risk factors. For instance, we expected that some single-

parent families would experience relatively few risk factors and that some two-parent families would experience multiple risk factors (Foster & Kalil, 2007). Because of the cascading effects of some problems, we also expected that many children in our sample would experience risk factors at most ecological levels.

With regard to the association between risk profile membership and Grade 5 academic and behavioral problems, we had two hypotheses. First, we expected that profiles characterized by risks that cut across multiple domains would be associated with increased academic and behavioral difficulties, compared to profiles characterized by risks in any single domain. Second, given evidence that children's skills are particularly important within the context of risky environments (e.g., Garmezy et al., 1984), we expected that profiles that are characterized by low levels of risk in the child domain would be at lower risk for later academic and behavior problems relative to those profiles characterized by high levels of risk in the child domain.

Methods

This study relied on data from Fast Track, a multi-site, multi-cohort research project designed to study and change the development of serious conduct problems among aggressive children (CPPRG, 1992). This study included children and their families from the schools assigned to the control condition in Fast Track. It did not include those children from the schools assigned to the intervention condition; none of the children in this study received prevention services from Fast Track.

Fast Track recruited children and families from four distinct communities in the United States. These communities were: (1) Durham, NC, a small city with many low- to middle-socioeconomic status (SES) African-American families; (2) Nashville, TN, a moderate-sized city with many low- to middle-SES African American and European American families; (3) Seattle, WA, a moderate-sized city with many low- to middle-SES, ethnically diverse families, including European Americans, African Americans, Asian and Pacific Islanders, Latinos, and Native Americans; and (4) central Pennsylvania, a rural area with mostly low- to middle-SES, two-parent, European American families.

Screening and Recruitment

Schools within each of the four sites were selected because they served neighborhoods with high rates of poverty and crime. Teachers completed the 10-item Authority Acceptance scale of the Teacher Observation of Child Adjustment-Revised (TOCA-R; Werthamer-Larsson, Kellam & Wheeler, 1991) for all children attending kindergarten in those schools during three successive academic years. When children received scores in the top 40% for their schools, their parents completed similar ratings about behavior problems at home.

A "normative" sample of 387 children was selected to represent the full range of behavior problems (or lack thereof) in these high-risk schools, based on teacher ratings alone. A high risk sample of 446 children were selected to represent the 10–20% most extreme cases of aggressive and oppositional behavior problems, based on a standardized sum of the teacher and parent ratings. Starting with the highest total score and moving downward, we successfully recruited about 90% of all eligible children and families until desired sample sizes were reached within schools and cohorts.

Although we did not use the Teacher's Report Form (TRF; Achenbach, 1991b) to screen children, we did use it to assess the relative severity of our sample. The children in our normative sample received an average externalizing scale t-score of 55.93 (SD = 11.80), which was about one-half standard deviation above the average for a large nationally

representative sample of children and consistent with the fact that the “normative” children in Fast Track were from schools serving relatively poor and dangerous neighborhoods. The children in our high risk sample received an average externalizing scale t-score of 66.35 (SD = 10.59), indicating that average behavior problems were in the clinical range and comparable to those of children receiving treatment services in mental health settings.

Sample

This study included the children and families from both the normative and high-risk control samples. By design, the severity of behavior problems in the highest quintile of the normative sample were comparable to the severity of behavior problems in the high risk sample; thus, 79 children were considered part of both samples. There were 185 European American families living in one of the three urban sites, 373 African American (including 30 biracial or ethnic minority) families living in one of the three urban sites, 192 European American families living in rural Pennsylvania, and 4 African American families living in rural Pennsylvania. Because of the small size of this last locality-race group, those four families were excluded from all analyses, resulting in a final sample of 750 children and their families (i.e., 387 children in the normative sample + 446 children in the high risk sample −79 children who were part of both samples −4 rural African American children in our rural site).

Fifty-eight percent of the children in this sample were male, and 42% were female. At the beginning of the study, children were, on average, 6 years and five months old (SD = 5 months). At the end of this study, they were five years older.

Forty-four percent of the families in this study included a single parent only (more than 95% of whom were mothers or female relatives). Approximately 64% of the families were in the lowest two categories of socioeconomic status (Hollingshead, 1975). Twenty percent of the families did not include a parent who had graduated from high school, and 31% of families did not include a parent who had a job requiring specialized skills.

Procedure

Data were collected from teachers, school records, and government records, as well as from parents and children during summer home interviews. Research staff members completed extensive training in conducting home interviews and were required to make reliable ratings before collecting data on their own. During home interviews, one research staff member met with the parent, and another research staff member met with the child in a separate room. All questionnaire items were read to both parents and children.

Measures

We assessed the presence or absence of risk present at the end of kindergarten in 13 domains related to the child, family, parenting, and community. Within certain domains, we chose to combine two or more indicators of risk in order to assess whether any risk was present in the broader conceptual domains. For example, an indicator reflecting ‘no parent with a high school degree’ was combined with an indicator reflecting ‘no parent with a job requiring specialized skills’ in order to create a single risk indicator within the family demographic risk domain (see below for more details). In theory, each specific risk indicator could be included in a latent class model, although the number of possible response patterns can become unwieldy, causing issues with model identification. Although indicators of risk that were combined within domains were not equivalent, the composites we created were supported by the literature or based on very high correlations among the indicators, and were formed in a way to represent the *presence of any risk in the domain*.

Although many risk factors in this study were dichotomous by nature, several continuous measures of risk were transformed to dichotomous risk factors to facilitate our examination of the relation between exposure to multiple risks and adverse outcomes. This was also necessary to make a direct comparison between the cumulative risk index and LCA. Modeled on previous research (e.g., Burchinal et al., 2000; Deater-Deckard et al., 1998; Gerard & Buehler, 2004), dichotomous indicators for risk factors were created according to commonly accepted criteria, such as parents' graduation from high school, or using previously established clinical range thresholds. In the absence of such cut points, we used one standard deviation from the national mean, or, if unavoidable, one standard deviation from the Fast Track normative sample mean, as our demarcation of the presence or absence of risk. Outcomes were based on children's academic and social-emotional functioning and were assessed at the end of Grade 5. For some of our outcomes, we included continuously-distributed measures of functioning as well as dichotomous indicators of problems. Information on the many measures included in this study is summarized in Table 1. Additional information on any measure included in this study is available at www.fasttrackproject.org.

Child risk

Three risk factors were created at the child level. The **child cognitive risk** factor represented those aspects of functioning most likely to interfere with children's academic success (Duncan et al., 2007; Freberg, Vandiver, Watkins, & Canivez, 2008, McCall, 1977) and was based on children's intellectual ability, early reading skills, and attention problems. Intellectual ability was assessed with the Block Design and Vocabulary subtests of the *Wechsler Intelligence Scale for Children – Third Edition* (Wechsler, 1991). Age-normed standard scores on these subtests were used to estimate total IQ (Satler, 1992). Early reading skills were assessed with the Letter-Word Identification subtest from the *Woodcock-Johnson Psycho-Educational Battery -Revised* (Woodcock & Johnson, 1989). The Letter-Word Identification subtest (standard score mean = 100, SD = 15) assesses early literacy skills, such as knowledge of letters and the ability to read short words. Attention problems were assessed with the TRF attention problems syndrome (Achenbach, 1991b); teachers were asked to rate 20 items, such as "Can't concentrate, can't pay attention for long," on a 3-point Likert scale (0 = not true to 2 = very true or often true; $\alpha = .94$). All pair-wise associations among intellectual ability, early reading skills, and attention problems were significant ($p < .0001$ for all pairs). Children received a score of one (signifying risk) for the overall child cognitive risk factor if they received an estimated IQ score below 80, were one standard deviation below the national mean on the Letter-Word Identification subtest, or received a T-score in the clinical range (70 or above) on the TRF attention problems syndrome.

The **child social-cognitive risk** factor represented aspects of emotional intelligence (Mayer, Salovey, & Caruso, 2008) and social information processing (Dodge, 1986) that predict social competence and the absence of behavior problems; it was based on children's emotion understanding, hostile attributions, and social problem solving skills. Emotion understanding was assessed with the *Emotion Recognition Questionnaire* (ERQ; Ribordy, Camras, Stafani, & Spaccarelli, 1988), in which children were asked to correctly identify how a child would feel (happy, sad, mad or scared) in each of 16 vignettes ($\alpha = .66$). Hostile attributions were assessed in the *Home Interview with Child* (HIWC; based on Dodge, 1980). After looking at each of eight drawings depicting a failed attempt at peer entry or minor harm under conditions of ambiguous intent (i.e., being bumped), children were asked to state why the undesired event might have occurred. Interviewers then rated each explanation as hostile or non-hostile (inter-rater reliability kappa = .94; $\alpha = .76$). Social problem solving skills were assessed using the *Social Problem Solving Scale* (SPSS; based on Dodge et al., 1990, and Rubin & Krasnor, 1986). Children were presented with drawings of eight challenging peer

situations and asked to generate possible solutions. Interviewers then rated each solution as competent or not (inter-rater reliability kappa = .91; α = .77). All pair-wise associations among emotion understanding, hostile attributions, and social problem solving skills were significant (*p* ranged from.04 to .0001). Children received a score of one (signifying risk) for the overall child social-cognitive risk factor if the number of feelings they identified correctly on the ERQ was one standard deviation below the normative sample mean, if their percentage of hostile attributions on the HIWC was one standard deviation above the normative sample mean, or if their percentage of competent solutions on the SPSS was one standard deviation below the normative sample mean.

The **child behavioral risk** factor was based on the externalizing scale of the Child Behavior Checklist (CBCL; Achenbach, 1991a). Parents were asked to rate 33 items, such as "Disobedient at home" and "Gets in many fights," on a 3-point Likert scale (0 = not true to 2 = very true or often true; α = .90). Children received a score of one (signifying risk) for the child behavioral risk factor if they received a nationally-normed t-score in the clinical range (64 or above).

Family risk

Six risk factors were created within the family level. Children received a score of one for the **single parent risk** factor if their primary caregiver was unmarried or had not been living with a partner for more than a year. Children received a score of one for the **family demographic risk** factor if their families did not include a parent with a high school degree or a job requiring specialized skills. Having no high school degree and having a low-skilled job were significantly related ($p < .0001$).

Because of the relation between stress, social support, and children's adjustment (Crnic & Greenberg, 1990, Pianta & Ball, 1993), we created a **stress/support risk** factor, based on the number of stressful life events parents experienced and the amount of social support they received. In the *Life Changes* interview (developed for Fast Track), parents were asked whether each of 16 different events, such as a serious illness or the loss of a job, had occurred within the last year and how stressful each of those events had been (0 = did not occur, 1 = minor stress, 2 = major stress). In the *Inventory of Parent Experiences* (Crnic & Greenberg, 1990), parents were asked six questions about how satisfied (0 = very dissatisfied to 3 = very satisfied) they had been with the amount of instrumental and emotional support they received from family members and friends (α = .74). The association between stressful life events and social support was significant ($p < .01$). Children received a score of one on the stress/support risk factor if the frequency and severity of stressful life events was one standard deviation above the normative sample mean or if the amount of social support their primary caregiver received was one standard deviation below the normative sample mean.

The **parent history of problems** factor assessed characteristics of parents that might confer genetic and/or environmental risks for children (Jaffee, Moffitt, Caspi, & Taylor, 2003; Sonuga-Barke, Daley, & Thompson, 2002). Children received a score of one on this risk factor if either of the child's biological parents had ever been arrested, had ever had alcohol or drug problems, had ever been diagnosed with attention problems, or was placed in special education classes as a child. All pair-wise associations among parents' history of arrests, alcohol/drug problems, and attention problems were significant ($p < .0001$ for all pairs).

The **maternal depression risk** factor sought to quantify some of the biological and social challenges children face when their mothers are impaired (Goodman, 2007). It was assessed with the *Center for Epidemiological Studies Depression Scale* (Radloff, 1977). Children received a score of one on this risk factor if their mothers' responses to 20 questions about

the frequency of symptoms associated with depression (0 = rarely to 3 = almost all the time) were in the measure's established clinical range (16 or higher; α = .88).

The **marital risk** factor reflected problems in the parents' relationship. Children received a score of one for this risk factor if their parents reported any physical violence during the prior year on a revised version of the *Conflict Tactics Scales* (Straus, 1979). Based on research suggesting that many forms of marital conflict – not just physical aggression – can affect children's adjustment (Grych & Fincham, 1990), children also received a score of one on this risk factor if their parents reported so much conflict and so few positive interactions on the 28 items of the *Dyadic Adjustment Scale* (Spanier, 1976) that their scores fell into the measure's established clinical range (88 or higher; α = .93). Because they could not be exposed to marital conflict, children from single-parent families received a score of zero for this risk factor.

Parenting risk

Our **parenting risk** factor included the most important domains of the caregiving relationship identified over several decades of empirical research (Baumrind, 1966; Maccoby & Martin, 1983; Steinberg, Mounts, Lamborn, & Dornbusch, 1991) and the focus of most parent management training (McMahon & Forehand, 2003; Webster-Stratton, 1992). Parent-child warmth was based on a 20-minute semi-structured play session. While observing this play session, child interviewers used six items from the *Interaction Ratings Scales* (Crnic & Greenberg, 1990) to assess how sensitive and responsive parents were to their child (inter-rater intraclass correlation coefficient = .73; α = .87). Parental consistency was based on a revised version of the *Parenting Practices Scale* (Strayhorn & Weidman, 1988). As part of this measure, parents were asked seven questions such as "How often is your child able to get out of a punishment when she or he really sets her or his mind to it?" (0 = never to 4 = all the time; α = .70). Extremely harsh discipline and potential child maltreatment was based on an interviewer rating (Dodge et al., 1990). After asking numerous questions about the child's life and how parents had addressed various child-rearing challenges, interviewers rated the likelihood that the child had been severely harmed (1 = extremely unlikely, 3 = suspected/possible, 5 = authorities involved) in the time before kindergarten or during kindergarten. Children received a score of one on the parenting risk factor if observed parent-child warmth was one standard deviation below the normative sample mean, if parental consistency was one standard deviation below the normative sample mean, or if interviewers rated the likelihood of extremely harsh discipline and child maltreatment as "suspected/possible" or higher. Although warmth and maltreatment were not significantly related ($p = .17$), low consistency was significantly related to warmth ($p = .01$) and maltreatment ($p = .01$).

Community risk

Three risk factors were included within the community level: neighborhood, school, and classroom risk. Analyses were initially conducted with these risk factors standardized within the entire sample, just as all of the other risk factors were. Although reasonable, that decision meant that almost all urban African American children experienced the community risk factors, and virtually no rural white children experienced them. This provided little information about the relation of community risk and Grade 5 outcomes within each locality-race group, and we did not want neighborhood, classroom, and school factors to function as simple proxies for locality and race. That decision also neglected to account for the relative risk within children's more immediate reference group: Children might be more attuned to and affected by the way in which their circumstances compare to those of children like themselves whom they are most likely to encounter on a daily basis. Thus, we determined that it would be most meaningful for the three community-level risk factors to be

standardized within the three locality-race groupings. For each of these factors, individuals were coded as being at-risk relative to others within their locality-race group.

A **neighborhood risk** factor was created because poor and disorganized communities can affect child outcomes, even after controlling for characteristics of the children and families living within them (Leventhal & Brooks-Gunn, 2000); this risk factor was based on information from the United States Census Bureau, parent ratings, and interviewer ratings. A measure of concentrated disadvantage (Sampson, Raudenbush, & Earls, 1997) reflected five characteristics of the Census tract, such as the percentage of families living in poverty and the percentage of families who do not own their homes ($\alpha = .89$). A measure of safety was based on parent ratings of five items from the *Neighborhood Questionnaire* (developed for Fast Track), such as "How often are there problems with muggings, burglaries, assaults, or anything else like that around here?" ($\alpha = .80$). A measure of neighborhood quality was based on interviewers' reports of four factors such as noise level (inter-rater reliability = .70; $\alpha = .72$). Children received a score of one on the neighborhood risk factor if their mean standardized score on those three measures was one standard deviation below the normative sample mean within the child's locality-race group.

A **classroom risk** factor was included because of the long-term impact of early school experiences on children's development (Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Thomas, Bierman, & CPPRG, 2006). For this risk factor, teachers rated 10 items regarding the aggressive and oppositional behavior of every child in their classroom (Werthamer-Larsson et. al, 1991), and observers rated 10 characteristics of the classroom atmosphere, such as the quality of teaching practices (inter-rater reliability kappa = .62 - .81; $\alpha = .92$). These two aspects of classroom risk were significantly related ($p = .03$). Children received a score of one on the classroom risk factor if the average level of aggressive and oppositional behavior of their classmates was one standard deviation above the normative sample mean in their locality-race group or if the quality of the classroom atmosphere was one standard deviation below the mean in their locality-race group. Finally, because attending schools serving low-SES students adversely affects academic performance even controlling for individual student and institutional characteristics (Palardy, 2008), we created a **school risk** factor, based on public records indicating the percentage of students who received free or reduced-price meals. Children received a score of one on this risk factor if they attended a school in which that percentage was more than one standard deviation above the normative sample mean in their locality-race group.

Grade 5 outcomes

Two Grade 5 outcomes measured behavior problems in late childhood. **Externalizing problems at home** were assessed with the 33 items of the externalizing scale of the parent-reported CBCL (Achenbach, 1991a; $\alpha = .92$). **Externalizing problems at school** were assessed with the 34 items of the externalizing scale of the TRF (Achenbach, 1991b; $\alpha = .97$). For these two outcomes, we retained the raw scores for analysis, and we created dichotomous variables, on which children received a score of 1 if their parents' or teachers' ratings placed them in the nationally-normed clinical range (64 or higher).

The final two Grade 5 outcomes assessed failing grades and academic achievement. To assess **failing grades**, research staff members reviewed children's Grade 5 school records. Children received a score of one if they were making D's or F's in any academic subject (e.g., math, language arts, science, or social studies). **Academic achievement** was based on the average standard scores of the Calculation, Passage Comprehension, and Letter-Word Identification subtests of the *Woodcock-Johnson Psycho-Educational Battery - Revised* (Woodcock & Johnson, 1989). In addition to the continuous version of this scale, a

categorical versions was created, on which children received a score of one if their average standard score was one standard deviation below the normative sample mean.

Analysis

Logistic regression models for examining the effects of the cumulative risk index on Grade 5 outcomes were estimated using SAS PROC LOGISTIC. Latent class models were estimated using SAS PROC LCA (Lanza, et al., 2007)[1]. Maximum-likelihood parameter estimates were obtained using an EM-type procedure. Missing data on the latent class indicators are accounted for using a full-information maximum-likelihood procedure, and are assumed to be missing at random. This means that missingness can be accounted for by the set of variables included in the LCA model. Although this assumption cannot be tested empirically, it is reasonable in the current study given the broad range of risk indicators included in the model. The software to conduct LCA is available for download free of charge at http://methodology.psu.edu. Details on PROC LCA can be found in the user's guide (Lanza, Lemmon, Schafer, & Collins, 2008).

Results

Descriptive Statistics

Table 2 shows the percent of children who were classified as at risk on each risk factor within each locality-race group. There were statistically significant locality-race differences in the prevalence of all risk factors except for child behavioral risk, stress/support risk, classroom risk, and school risk. The proportion of children exposed to single parent risk shows the largest group differences, with 66.1% for urban African American children, 27.6% for urban white children, and 17.2% for rural white children. Urban African American children had the highest rates of exposure to most risk factors and rural white children usually had the lowest risk. The one exception was marital risk. Because rural white families were most likely to include two parents, they were most likely to experience domestic violence or high levels of conflict. These proportions suggest that there will be large locality-race differences in the prevalence of different risk profiles.

For each locality-race group, the proportion of children exhibiting each negative outcome at Grade 5 appears in Table 3. Just as there were group differences in the prevalence of risk factors, there were statistically significant locality-race differences in the proportion of children who displayed each negative outcome, with the exception of parent report of externalizing problems. White children, in particular those living in rural areas, were less likely to have clinically-significant externalizing behavior problems, to be failing a class in school, and to have low academic achievement.

Significant univariate relations between each of the 13 risk factors and the dichotomous indicators of adverse outcomes are marked in Table 4. For each locality-race group, p-values are based on chi-square tests of differences in the proportion of individuals with the adverse Grade 5 outcome for children who were or were not exposed to the corresponding risk factor. All effects were in the expected direction, with a higher rate of the adverse outcome among individuals exposed to the risk factor. Not surprisingly, the early child cognitive risk factor is strongly predictive of poor academic outcomes, and the early child behavioral risk factor is strongly predictive of adverse behavioral outcomes for all locality-race groups. Risk factors in the child and family domains have wide-spread relations to Grade 5 outcomes.

[1]For several of the models with covariates, a data-derived prior was applied to stabilize the logistic regression model. This approach addresses estimation problems that arise in the multinomial logistic regression model due to extreme sparseness. See Clogg, Rubin, Schenker, Schultz, and Weidman (1991) for technical details on the prior.

Risk factors in the parenting, neighborhood, classroom, and school domains were less consistently related to the Grade 5 outcomes across locality-race groups.

Cumulative Risk Index

A cumulative risk index ranging from 0 to 13 was created by summing the number of risk factors each child displayed or experienced.[2] The mean index among urban African Americans (*M*=5.1, *SD*=2.4) was significantly higher than that among urban whites (*M*=4.0, *SD*=2.5; *p*<.0001) or rural whites (*M*=3.6, *SD*=2.4; *p*<.0001), although the mean index did not differ between the two white groups.

As expected, the risk index was a significant predictor of all four dichotomous outcomes. Each additional risk factor was associated with significantly higher odds of all Grade 5 outcomes: CBCL externalizing problems (*OR*=1.3, *p*<.0001), TRF externalizing problems (*OR*=1.3, *p*<.0001), failing grades (*OR*=1.3, *p*<.0001), and low academic achievement (*OR*=1.4, *p*<.0001). In other words, with each additional risk factor a child was exposed to, she or he was 1.3 to 1.4 times more likely to exhibit the problematic outcome. None of these effects varied significantly across locality-race groups.

To examine possible non-linear associations between the cumulative risk index and the log-odds of Grade 5 outcomes, the cumulative risk index score for each child was squared and included in the logistic regression equations. This term was not significant for TRF externalizing problems, failing grades and low academic achievement, although for CBCL externalizing problems the term was significant ($p = .02$), with a smaller positive effect corresponding to a higher number of risk factors.

Latent Class Analysis

Modeling risk profiles—With 13 dichotomous risk factors, there would be 2^{13} or 8,192 possible combinations of those risk factors. If we were to classify children based on their observed risk profiles, it would be difficult to make any meaningful conclusions about them. Thus, LCA was used to identify a set of risk profiles that can represent sufficient heterogeneity in risk among the 750 children, and still be a parsimonious description of multiple risks. Indices like the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are useful tools for selecting the number of latent classes that optimizes the balance between model fit and parsimony. We relied on these information criteria as well as substantive meaning of the parameters to determine the optimal number of risk profiles.

Preliminary analyses were conducted within locality-race groups to gain a clear understanding of the constellations of risk factors within the different ecological contexts. However, because a primary goal was to make direct comparisons of the prevalence of the risk profiles across locality-race groups, we ultimately chose to model all children together and include a grouping variable indicating children's locality and race.

Models with one through six latent classes were compared, although the six-class model could not be identified sufficiently well. Results were as follows (note that for both the AIC and BIC, lower values are preferable): for one latent class BIC = 4151.4 and AIC = 4091.4; for two latent classes BIC = 3661.2 and AIC = 3527.2; for three latent classes BIC = 3526.8 and AIC = 3318.9; for four latent classes BIC = 3546.3 and AIC = 3264.5; for five latent classes BIC = 3602.2 and AIC = 3246.4. These results suggest that a model with three to

[2]Missing data on the 13 risk factors did not contribute to the total number of risk factors accounted for in the cumulative risk index; thus, the mean index scores represent a lower limit of the actual number of risk factors to which individuals were exposed.

five classes should be considered further. Based on a careful interpretation of the latent classes (including interpretability of the solution, clean structure in the measurement model, and correspondence with the resultant latent classes with those identified in preliminary group-specific analyses) – and the fact that the five-class model was not well identified – we selected the four-class model.

Measurement of the four latent classes was constrained to be equal across the locality-race groups for several reasons. First, the BIC strongly favored the model with measurement invariance (and the AIC was nearly equal). Second, we wanted to be able to interpret the risk profiles in the same way across groups. And, third, the four-class model with no constraints on the measurement model was highly unstable due to the large number of parameters being estimated.

In a latent class model, two sets of parameters are estimated. Latent class membership probabilities describe the underlying distribution of the latent class variable; in this study, these quantities reflect the prevalence of each risk profile. Item-response probabilities express the correspondence between each observed item and each latent class (i.e., these are the measurement parameters); in this study, this is the relation between each of the 13 risk factors and each risk profile. The top panel of Table 5 shows the item-response probabilities for the final model with four risk profiles. Each column represents the probability of individuals in a particular latent class reporting each risk factor. Higher probabilities signify defining characteristics of risk profile membership. Latent classes were given descriptive labels based on the risk factors that had high item-response probabilities for that class.

The **Two Parent Low Risk** latent class comprised individuals with a low probability of reporting any risk factor. A **Single Parent/History of Problems** latent class was characterized by a high probability of being in a single-parent household and by a high probability of having a biological parent with a history of problems such as arrests, substance use, or learning difficulties. Note that children with this risk profile also had a somewhat higher probability of reporting child cognitive or social-cognitive risk and demographic risk than children in the Two Parent Low Risk class. A **Single-Parent Multilevel Risk** class was characterized by children in a single-parent household with a high probability of child cognitive risk, child social-cognitive risk, family demographic risk, parental history of problems, maternal depression, and parenting risk. Finally, the **Two-Parent Multilevel Risk** profile consisted of children who were very likely to live in a two-parent household. Like children in the Single-Parent Multilevel Risk class, these children were exposed to a host of risk factors at many ecological levels, including child cognitive risk, family demographic risk, parental history of problems, maternal depression, marital risk, and parenting risk.[3]

Locality-race differences in the prevalence of risk profiles—In multiple-groups LCA, both the class membership probabilities and item-response probabilities can be conditioned on group membership. When the same measurement model is imposed across groups (i.e., all item-response probabilities are constrained to be equal across groups), an examination of group differences in the prevalence of the different latent classes is meaningful. In the current study, applying the same measurement model across locality-race groups allowed for a comparison of the proportion of children with each risk profile, with risk profiles having the same meaning across groups.

[3]It is worth noting that the three-class model revealed a nearly identical Two-Parent Multilevel Risk profile. The remaining two classes could be interpreted as Two-Parent Low Risk and Single-Parent Multilevel Risk, with individuals from the Single Parent/History of Problems distributed between these two latent classes. However, because of the increased heterogeneity within these classes, item-response probabilities showed a poorer correspondence between the items and the latent variable. See Collins and Lanza (in press) for a complete discussion of interpreting overall patterns of item-response probabilities in LCA.

The bottom panel of Table 5 shows the prevalence of each risk profile within each locality-race group. Group differences are apparent for all risk profiles. Most notably, urban African American children were least likely to belong to the Two-Parent Low Risk class (11% versus 38% for urban white and 55% for rural white) and more likely to have a Single-Parent Multilevel Risk profile (38% versus 5% urban white and 4% rural white). Children in urban environments were more likely to have a Single Parent/History of Problems profile (33% urban African American and 25% urban white versus 11% rural white). White children were more likely to have a Two-Parent Multilevel Risk profile (32% urban white and 30% rural white versus 18% urban African American).

Relation between risk profiles and dichotomous Grade 5 outcomes—After identifying the four risk profiles, we examined how membership in the profiles was related to the Grade 5 outcomes. In the current study, we did this by including the measures of the Grade 5 outcomes in the LCA models. Although technically 'covariates' in the statistical models, we will refer to them as outcomes because they were assessed six years after the risk factors. Such variables can be incorporated in a latent class model as predictors of latent class membership. A multinomial logistic regression model is used to predict latent class membership probabilities from these variables (Bandeen-Roche, Miglioretti, Zeger, & Rathouz, 1997; Chung, Flaherty, & Schafer, 2006; Dayton & Macready, 1988). This approach allows us to describe the associations between risk profile membership and the outcomes of interest while taking into account classification uncertainty in latent class membership. In addition, this model allowed us to include locality-race as a moderator of these associations. A set of logistic regression coefficients, which can be transformed into odds ratios, expresses the relation between each covariate and latent class membership.[4] In the case of categorical covariates, Bayes theorem can be used to reverse the direction of the interpretation of effects.[5] By doing this, we can report the proportion of children in each locality-race group expected to experience each (categorical) adverse outcome given risk profile membership in kindergarten, taking into account classification uncertainty. More details about LCA with covariates appear in Lanza et al. (2007).

Table 6 shows the odds ratios reflecting the relation between risk profile membership and outcomes at Grade 5 for each locality-race group. Specifically, the odds ratios reflect the change in odds of membership in a particular risk profile, relative to membership in the Two-Parent Low Risk profile, for children who exhibit the negative outcome at Grade 5. An odds ratio of 1.0 indicates that children are no more likely to belong in a particular risk profile, relative to the Two-Parent Low Risk profile, given that they exhibit a poor outcome at Grade 5. Odds ratios greater than 1.0 suggest that children with a poor outcome are more likely to have been in a particular risk profile, relative to the Two-Parent Low Risk profile. For example, among those children displaying clinically significant externalizing problems in Grade 5 according to their parents, the odds of membership in the Two-Parent Multilevel Risk profile, relative to the Two-Parent Low Risk profile, were between 2.9 and 6.2 times higher (top-right entries in Table 6) depending on locality-race group. Conversely, odds ratios less than 1.0 suggest that children with a poor outcome are less likely to have been in a particular risk profile relative to the Two-Parent Low Risk profile. P-values in this table

[4]One of the latent classes must be specified as the reference class, thus the number of logistic regression coefficients required to express the effect of a covariate equals the number of latent classes minus one.

[5]Transforming the parameter estimates in order to reverse the interpretation of the effect is possible when the covariates are categorical because all of the marginals of the table crossing the categorical outcome and latent class membership can be calculated. For example, this allows us to transform the direction of the interpretation of an effect within the African American group from "individuals who experience academic failure in Grade 5 are 5.9 times more likely than individuals who do not experience academic failure to belong in the Two-Parent Multilevel Risk class relative to the Two-Parent Low Risk class" to "0.5% of individuals in the Two-Parent Low Risk class are expected to experience academic failure in Grade 5, compared to 47.6% of individuals in the Two-Parent Multilevel Risk class."

are based on a log-likelihood difference test with nine degrees of freedom, indicating the significance of the overall relation between class membership and the outcome. Note that the inclusion of covariates did not result in any substantial changes to the structure of the latent classes, indicating that our models did not violate the important underlying assumption of marginal homogeneity.[6]

Not surprisingly, findings from these analyses revealed that children who were having problems in Grade 5 were much more likely to have had a Single Parent/History of Problems, Single-Parent Multilevel Risk, or Two-Parent Multilevel Risk profile than a Two-Parent Low Risk profile in kindergarten. The relations between risk profilemembership and all outcomes were statistically significant ($p < .001$ for all outcomes).

Relative to the Two-Parent Low Risk Profile, membership in the Single Parent/History of Problems profile conferred substantial risk. For example, among the children receiving failing grades at the end of elementary school, the odds of membership in the Single Parent/History of Problems profile relative to the Two-Parent Low Risk profile in kindergarten were 3.6 (urban African American), 1.8 (urban white) or 2.3 (rural white) times higher. Overall, poor outcomes tended to be more strongly associated with an increased likelihood of membership in the Two-Parent Multilevel Risk profile, which is characterized by exposure to risk factors in numerous ecological levels, and they were most strongly associated with an increased likelihood of membership in the Single-Parent Multilevel Risk profile. For many of the negative outcomes, the magnitude of the effect is quite striking.[7]

Although the relation between risk profile membership and Grade 5 outcomes is fairly consistent across locality-race groups, one effect stands out among all others: Urban African American children who scored one standard deviation below the normative mean on the tests of academic achievement were between 44.7 and 181.0 times more likely to belong in any of the three higher-risk profiles relative to the Two-Parent Low Risk profile. Such large odds ratios suggest that virtually none of the 29.4% of urban African American children with low academic achievement in Grade 5 (see Table 3) were likely to have had a Two-Parent Low Risk profile in kindergarten.

Many effects are stronger in the rural white group than the urban white group. For example, rural white children with scores in the clinical range on parent- and teacher-reported externalizing problems at Grade 5 were 6.2 and 6.7 times more likely to have been in the Two-Parent Multilevel Risk profile, respectively, than to have been in the Two-Parent Low Risk profile in kindergarten. In contrast, the increased risk was only 2.9 and 2.7, respectively, among urban white children.

As shown in Table 7, results based on reversing the direction of the effects better quantify the differential risk associated with early-childhood profiles. For low academic achievement, it is the higher-order interactions of risk factors (i.e., membership in the Single-Parent Multilevel Risk group or Two-Parent Multilevel Risk group) that confer the greatest risk. Indeed, for this outcome, less than 20% of children with Two-Parent Low Risk and Single Parent/History of Problems profiles are expected to have adverse outcomes regardless of locality-race group, compared to as much as 98.5% of children in the multilevel risk groups. For failing grades, however, a Single Parent/History of Problems risk profile also confers high risk among children in urban settings. One interesting finding in the two urban groups

[6]The assumption of marginal homogeneity in LCA refers to an assumption that the structure of the latent classes, i.e., the item-response probabilities, are the same across all levels of the covariates.

[7]For the rural white group, the extreme large and small odds ratios corresponding to membership in the Single-Parent Multilevel Risk latent class are based on a very small number of children.

is that teachers are more likely than parents to report externalizing problems regardless of risk profile membership.

Relation between risk profiles and continuous Grade 5 outcomes—The logistic regression coefficients from the LCA models with continuous outcomes can be used to plot the prevalence of membership in each risk profile across the range of values on the outcome (see Figures 1–3). For example, the top panel of Figure 1 shows the prevalence of risk profile membership among urban African American children corresponding to values from two standard deviations below the mean to two standard deviations above the mean on parent reports of externalizing behavior. The slope of the lines corresponds to the strength of the relation between externalizing behavior problems and membership in the risk profiles for this locality-race group.

These plots reveal risk profiles that are most prevalent among children who exhibit worse outcomes at Grade 5. For urban African American children, membership in the Single-Parent Multilevel risk group corresponds strongly to high levels of externalizing behavior problems (particularly when reported by parents) in Grade 5 and low academic achievement. The prevalence of both the Two-Parent Low Risk and the Single Parent/History of Problems risk profiles increase substantially with better outcomes, suggesting that both environments may be protective for African American children in urban environments. Both urban and rural white childrenwith very low scores on externalizing behavior at Grade 5 almost exclusively had a Two-Parent Low Risk profile in kindergarten. Children with very high scores on externalizing behavior most likely had a Two-Parent Multilevel Risk profile. These effects were stronger among rural white children than urban white children. Membership in the Single-Parent Multilevel Risk profile was not related to parent-reported externalizing behavior for white children. Also for both urban and rural white children, membership in the Two-Parent Low Risk orthe Single Parent/History of Problems profiles was related to higher academic achievement, whereas membership in both Multilevel Risk profiles was related to lower academic achievement. Interestingly, these effects were again stronger among rural children.

Discussion

This study demonstrated the utility of a person-centered approach to modeling multilevel risk factors in a diverse population of high-risk children and families. LCA maps well onto a holistic/ecological framework for childhood development. Thirteen risk factors from six ecological levels (child, family, parenting, classroom, school, and neighborhood) were modeled. Out of the thousands of possible constellations of risk factors, however, a set of four risk profiles provided a concise and interpretable description of risk exposure during kindergarten at multiple ecological levels. Developmental and clinical researchers often can be overwhelmed by the sheer number and combination of risk factors present in community-based samples. This study demonstrates that a person-centered approach can provide an insightful and parsimonious depiction of the interplay between many risk factors.

Results from a Cumulative Risk Index and Latent Class Analysis

A more traditional approach to modeling multiple risks, the cumulative risk index, demonstrated that urban African American children were, on average, exposed to more risk factors than urban white or rural white children. Urban African American children were exposed to approximately five of the 13 risk factors considered in this study. For all children, exposure to each additional risk factor corresponded to a 20% to 40% increase in odds of a poor Grade 5 outcome. This type of analysis confirms many previous findings that more risk factors are associated with less adaptive outcomes (e.g., Appleyard et al., 2005;

Luthar, 1993; Sameroff, Seifer, Baldwin, & Baldwin, 1993). Although interesting, these findings provide little information regarding how we should design future preventive interventioins and whom we should target. Rather, these findings simply imply that the most effective intervention approach would be to try to reduce the number of risk factors for all children, regardless of their level of risk exposure or, importantly, which risk factors are present in their lives.

In contrast, LCA provided a somewhat more nuanced description of the intersection of risk in these populations – both in terms of the *amount* of risk exposure in each risk profile subgroup and, importantly, in terms of *which* risk factors dominated the profiles. As hypothesized, the risk profiles that emerged in the present analyses illustrated the diversity of experiences within single- and two-parent families (Foster & Kalil, 2007). One two-parent class with no risks (i.e., Two-Parent Low Risk) and one two-parent class with multiple risks (i.e., Two-Parent Multilevel Risk) emerged. Similarly, one single-parent class with only one other risk (i.e., Single-Parent/History of Problems) and one single-parent class with multiple risks (i.e., Single-Parent Multilevel) emerged. The characteristics of these risk profiles, along with their differential expected rates of poor outcomes, provide information on which future intervention programs can be based.

Embedded within the four risk profiles are two important features. First, the profiles characterize subgroups of children that exist in the sample. Although the true latent class membership of a particular child is unknown, key features of an individual child's exposure to the 13 risk factors suggest his or her most likely risk profile. Indeed, in LCA each individual's posterior probability of latent class membership can be obtained. Rather than identifying each individual's likely class membership, however, these latent class models are more useful in summarizing key combinations of risk that children are exposed to, and determining which of those combinations or risk profiles are most strongly predictive of specific negative outcomes.

A second important feature of these four risk profiles is the implicit higher-order interactions by which they are characterized. Although the latent class model does not include interaction terms as they are typically conceptualized in a regression framework, an examination of Table 5 provides an immediate picture of which of the 13 risk factors tend to coexist within each risk profile. For example, the Single-Parent Multilevel Risk profile encompasses the intersection of risk factors both within and across several ecological levels. Although a multiple regression approach could be used to target specific risk factors that are most strongly predictive of a poor outcome, even two- or three-way interaction terms are often difficult to model (Aiken and West, 1991). Because of this, the differential effect of one particular risk factor often cannot be ascertained for children who differ in their exposure to other risks either within or across ecological levels.

A practical example of these features of the LCA model is found in the Single Parent/ History of Problems Group. Although single parenthood, especially in urban, high-risk neighborhoods, has been shown to predict poor outcomes for youth (e.g., McLanahan & Sandefur, 1994), this LCA derived group, which accounted for about one-third of white and African American youth, showed very low rates of behavior problem outcomes. In fact, one could characterize this family configuration as providing reasonably strong protective effects compared to other risk profiles. That is, urban children in single-parent homes that have few other risk factors (i.e., show at least average parenting warmth and consistency and report relatively low stress and high social support) are at quite low risk for externalizing problems. As a result, given an effective screening process, this family/child configuration might not be targeted for preventive interventions directed at this outcome which might save needed resources that could be allocated to children and families at greater risk. In contrast

to low behavioral risk, this group is still at relatively high risk for poor grades and academic achievement. Thus, while in low need of interventions focused on parent management and externalizing problems, such children and families may need more support for academic outcomes, such as tutoring and afterschool homework support.

Group Differences in Risk

Many of the group differences in prevalence of the risk profiles were driven by the fact that single-parent households were much more common among urban African American families. This important difference required the inclusion of both the Single-Parent Multilevel Risk and the Two-Parent Multilevel Risk profiles, even though the former was rare among both urban and rural white children.

Careful consideration was given to the coding of risk exposure within the neighborhood, classroom, and school levels. So that neighborhood, classroom, and school factors did not function as proxies for locality and race and, to account for the relative risk within children's most salient reference group these three risk factors were standardized within each locality-race group. Because of this, any conclusions made about community risks must be interpreted in terms of risk levels within this more circumscribed context. This approach may be necessary in communities that show high rates of ethnic segregation. This approach also might need to be expanded to include other locality-race groups, such as rural Latino or urban Asian American, in studies that include substantial numbers of these potential subgroups (Coll & Garrido, 2000; Quintana et al., 2006).

Risk Profiles and Developmental Outcomes

As expected, all five negative outcomes in Grade 5 were significantly related to risk profile membership in kindergarten. These findings extend our knowledge, however, by highlighting the importance of specific multilevel ecological configurations of risk for maladaptive outcomes in school-age children. The profiles characterized by several risks that cut across multiple domains (Single-Parent and Two-Parent Multilevel Risk profiles) conferred the highest risk for negative outcomes. Also, this confirms our hypothesis that profiles characterized by lower levels of child-level risk, particularly in a context of risk (i.e., single-parent status), would fare relatively better than profiles with higher levels of child-level risk.

Interestingly, the effects of different risk profiles on negative outcomes appear to be stronger for urban African American children than urban white children and stronger for rural white children than urban white children. In both cases, this might be due to the relative distributions of risk profiles and negative outcomes. Urban African American children were least likely to have a Two-Parent Low Risk profile in kindergarten and were most likely to display a negative outcome in Grade 5. In contrast, rural white children were most likely to have a Two-Parent Low Risk profile in kindergarten and least likely to display a negative outcome in Grade 5. When so many of our urban African American children come from challenging circumstances and fare poorly, the ones who come from relatively benign circumstances and fare well might stand out. Likewise, when so many of our rural white children come from relatively benign circumstances and fare relatively well, the ones who come from challenging circumstances and fare poorly might stand out.

The relations between the four higher risk profiles in kindergarten and low academic achievement in Grade 5 were exceptionally strong for urban African American and rural white children. Low academic achievement was non-existent among Two-Parent Low Risk children in the urban African American group. This suggests that a low-risk developmental context might be especially protective for later academic success within this group.

Because of the ongoing debate between the dimensional or categorical nature of adverse outcomes in research on psychopathology (e.g., Beauchaine, 2003; Pickles & Angold, 2003), we examined externalizing problems and academic achievement as continuous variables based on their original metric as well as categorical variables. One finding that emerged when examining the full dimensional values of externalizing behavior is that risk profile membership is more strongly related to parent-reported than teacher-reported externalizing behavior. This finding may reflect the fact that parents are embedded in the same ecological environments as the children and, therefore, have different standards about what kinds of behaviors are typical or normative.

Because exposure to risk can change over time, an important future direction will be to build on LCA models like the one described here to accommodate measures of risk longitudinally (e.g., latent transition analysis; Lanza & Collins, 2008). Such models would be useful to establish whether earlier, more distal risk factors or recent, more proximal risk factors have stronger associations with externalizing behavior, school failure, and academic achievement. They may also help us elucidate whether stability or instability in risk factors across time is more strongly associated with children's developmental outcomes.

Limitations

Although this study advances our understanding of how multiple risk factors interact to influence child development, certain limitations affect the conclusions that can be drawn from it. First, this study was exploratory. It sought to identify latent classes that existed within our sample. We did not know a priori what risk factors would describe each risk profile. When studies are exploratory, their findings might be more dependent on specific sample characteristics. The fact that most of our risk profiles emerged in all three of our locality-race groups when examined in group-specific analyses gives us increased confidence in the robustness of our findings; even so, replication of these results will be important.

Second, confidence intervals for individual odds ratios presented in Table 6 are not available in the current version (Version 1.1.5) of PROC LCA, thus we were only able to rely on overall hypothesis tests of significance in the relations between risk profiles and Grade 5 outcomes. Despite the lack of confidence intervals, however, when the overall test is statistically significant the odds ratios provide a sense of the direction of the effects.

Third, the associations between the various risk profiles in kindergarten and negative outcomes in Grade 5 are not necessarily causal. Our only goal was to identify early risk profiles that were associated with later problems.

Fourth, although many of the risk factors considered in this study were categorical by nature, we had to choose cut-points for several risk factors. We found that the results were not especially sensitive to different cut-points based on the distribution of the risk factor in the normative sample, and chose to use 1 standard deviation from the mean in order to be consistent with previous studies that have used a similar approach. However, other researchers (e.g., Loeber et al., 2005) have used techniques such as receiver operating characteristic (ROC) curves that provide a statistically-based justification for the selection of cut-points for continuous variables.

Fifth, latent class models with many risk factors can become fairly complex. The addition of each binary risk factor expands the size of the contingency table of observed data exponentially, causing issues of sparseness common to all categorical methods. Such sparseness ultimately can result in estimation failure, particularly when relating latent class membership to other variables through logistic regression. To avoid that problem, we chose

to implement a data-derived prior to stabilize our logistic regression models when necessary (Clogg et al., 1991). Interestingly, the sparseness issues we confronted were mainly due to the presence of incredibly strong associations between risk profile membership and Grade 5 outcomes, most notably for low academic achievement among urban African American children. Such strong effects could not be estimated without a statistical approach such as this.

Sixth, because we did not sample a representative population of children or neighborhoods – Fast Track oversampled children living in disadvantaged neighborhoods – the percentage of children in particular risk groups, the rate of problematic outcomes, and perhaps even the relation between risk and outcomes is not likely representative of all urban or rural children. An important next step will be to utilize this method of analyses with a nationally-representative sample of children.

Prevention Implications

A major research, clinical, and policy concern in prevention science is how to target funds effectively so that families that will benefit from services in a cost-effective manner are targeted. To the extent that we can more effectively predict which children are at greatest risk, it is likely that resources can be rationed more successfully.

The findings of this study draw attention to the intriguing possibility that screenings across multiple ecological levels might capture particularly worrisome constellations of risk factors. For example, although poverty is clearly a risk factor that is related to later problems, many poor children do not develop problems. Further, as discussed above in regard to the Single Parent/History of Problems group, children may show risk in one outcome area (grades) and not in another area (behavioral problems). We assume that, despite the presence of poverty, there are other features of their ecological configurations that protect some children from adverse outcomes.

This information could be used to inform decisions about where intervention resources should be focused within a particular community. This may be especially important when multi-level (e.g., universal and indicated) or multi-component interventions are planned. The identification of latent classes can help to better identify persons who might benefit from different types or different dosages of treatment in adaptive designs (Collins, Murphy, & Bierman, 2004). Although a variable-centered approach, such as a cumulative risk index, may demonstrate that a specific number of risk factors places children at substantial risk for a negative outcome, such an approach is not very helpful in considering how to target prevention and intervention efforts, either to particular children and families or to particular ecological levels.

Another issue raised by this kind of person-oriented analysis regards multifinality (Cicchetti & Rogosch, 1997). It may be that poor behavioral or academic outcomes associated with certain combinations of risk factors are best treated with one kind of intervention, whereas other sets of etiologic factors are best treated in other ways (Greenberg, 1999). By using person-centered LCA profiles, it may be possible to rationally pick subgroups, all of whom have elevated risk, but for whom different kinds or levels of preventive services may be differentially effective. Clearly, there is a need for careful empirical testing of preventive interventions that more closely match service delivery mechanisms to particular risk combinations in children and their families.

Conclusions

A person-centered approach to multiple risks allows for the identification of meaningful groups of children who share particular constellations of risk factors and differential developmental outcomes. LCA, the approach used in the current study, takes into account higher-order interactions among risk factors that exist across multiple ecological levels. This holistic approach may serve prevention and treatment efforts by summarizing critical combinations of risk factors that children and families experience and are most strongly predictive of negative outcomes. In contrast to studies relying primarily on demographic and family history variables, using a multi-ecological approach demonstrated that families with different profiles varied dramatically in their child's outcomes five years later. Further, these outcomes also varied by locality and race. The understanding of multiple risks that is gained from a risk profiles approach could be used to modify future interventions by suggesting which treatment components should be paired together and by indicating where resources should be focused within a particular population.

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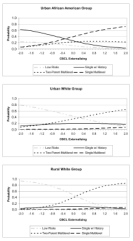

Figure 1.
Prevalence of risk profiles across levels of parent-reported externalizing behavior. For any given level on CBCL externalizing, the class membership probabilities sum to 1.0.

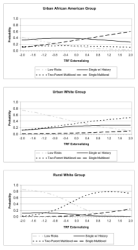

Figure 2.
Prevalence of risk profiles across levels of teacher-reported externalizing behavior. For any given level on TRF externalizing, the class membership probabilities sum to 1.0.

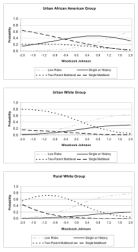

Figure 3.
Prevalence of risk profiles across levels of academic achievement. For any given level on intellectual achievement, the class membership probabilities sum to 1.0.

Table 1

Kindergarten Risk Factors by Ecological Level

Domain	Risk Factor	Rules for Creation of Risk Factor
Child	Cognitive	IQ below 80, 1 SD below national mean on WJ Letter Word ID, or clinical range on TRF attention problems (70 or above)
	Social-Cognitive	1 SD below normative mean on Emotion Recognition Questionnaire, 1 SD above normative mean on Hostile Attribution Bias, or 1 SD below normative mean on Social Problem Solving
	Behavioral	Clinical range on CBCL externalizing scale (64 or above)
Family	Single Parent	Child lives with a single parent
	Demographic	No parent with a high school diploma or no parent with a skilled job
	Stress/Support	1 SD above normative mean on Negative Life Changes Scale or 1 SD below normative mean on IPE Family and Friends Satisfaction scales
	Parent History of Problems[a]	Either parent with alcohol/drug problems, either parent with history of arrests, either parent with history of special education, or either parent with ADHD
	Maternal Depression	Clinical range on CES-D (16 or higher)
	Marital	Report of domestic violence on Conflict Tactics Scale or clinical range on Dyadic Adjustment Scale
Parenting	Parenting Behavior	History of child abuse, 1 SD below normative mean on parental warmth in parent-child interaction task, or 1 SD below normative mean on parental consistency from Parent Questionnaire
Community	Neighborhood[b]	1 SD above normative mean on sum of parent-reported neighborhood safety, interview-rated neighborhood quality, and census indicator of concentrated disadvantage
	Classroom[b]	1 SD above mean on classroom-level aggression ratings from Teacher Observation of Classroom Adaptation - Revised or 1 SD below mean on observer ratings of teaching quality
	School[b]	1 SD above mean on school-level poverty

[a] Overall prevalence of history of problems was 35% among mothers and 48% among fathers.

[b] Variables standardized within locality-race group

Table 2

Descriptive Statistics: Proportion of Each Locality-Race Group at Risk in Kindergarten

		% Yes (N missing)		
Risk Factor	***p-value*[a]**	**Urban African American (*N*=373)**	**Urban White (*N*=185)**	**Rural White (*N*=192)**
Child				
Cognitive	<.001	52.7 (41)	39.0 (21)	26.6 (15)
Social-Cognitive	<.001	50.0 (5)	30.1 (2)	25.7 (1)
Behavioral	.351	32.9 (5)	27.9 (2)	28.1 (0)
Family				
Single Parent	<.001	66.1 (4)	27.6 (0)	17.2 (0)
Demographic	<.001	50.1 (0)	28.1 (0)	28.1 (0)
Stress/Support	.384	31.8 (2)	32.1 (1)	26.5 (7)
Parent History of Problems	.004	61.0 (37)	67.5 (0)	36.8 (18)
Maternal Depression	<.001	47.5 (0)	36.8 (0)	34.4 (0)
Marital	<.001	16.8 (3)	26.6 (1)	34.9 (0)
Parenting				
Parenting Behavior	.002	45.7 (5)	34.8 (1)	31.9 (1)
Community				
Neighborhood	.019	22.0 (0)	14.1 (0)	14.1 (0)
Classroom	.307	30.7 (60)	38.0 (48)	34.1 (16)
School	.069	19.8 (9)	20.3 (8)	28.0 (3)

[a] Chi-square test of group differences in proportion reporting risk factor

Table 3

Descriptive Statistics: Grade 5 Outcomes by Locality-Race Group

		% Yes (N missing)		
Grade 5 Outcome	***p-value*[a]**	**Urban African American (*N*=373)**	**Urban White (*N*=185)**	**Rural White (*N*=192)**
CBCL externalizing scale in clinical range (parental report)	.994	19.1 (43)	19.5 (36)	19.4 (27)
TRF externalizing scale in clinical range (teacher report)	<.001	39.1 (58)	32.2 (39)	11.8 (31)
Failing Grades (D or F in any academic subject)	<.001	50.8 (52)	33.6 (30)	24.5 (29)
Low academic achievement (1 SD below normative mean)	<.001	29.4 (46)	10.8 (37)	6.5 (37)

[a] Chi-square test of group differences in proportion reporting adverse outcome

Table 4

Relations between Individual Risk Factors and Outcomes for Each Locality-Race Group

		Grade 5 Outcome			
Risk Factor	**Locality-Race Group**	**CBCL Externalizing Problems**	**TRF Externalizing Problems**	**Failing Grades**	**Low Academic Achievement**
Child					
Cognitive	Urban	*	***	***	***
	AA				
	Urban			*	**
	WT				
	Rural				***
	WT				
Social-Cognitive	Urban		*		***
	AA				
	Urban				
	WT				
	Rural	*	+	*	***
	WT				
Behavioral	Urban	***	**	**	**
	AA				
	Urban	***	*		
	WT				
	Rural	***	**	**	*
	WT				
Family					
Single Parent	Urban		**	**	*
	AA				
	Urban				
	WT				
	Rural		*		**
	WT				

		Grade 5 Outcome			
Risk Factor	**Locality-Race Group**	**CBCL Externalizing Problems**	**TRF Externalizing Problems**	**Failing Grades**	**Low Academic Achievement**
Demographic	Urban	*	**		**
	AA				
	Urban				
	WT				
	Rural	***			
	WT				
Stress/Support	Urban				
	AA				
	Urban				
	WT				
	Rural	*	+	*	
	WT				
Parent History of Problems	Urban	+	*		
	AA				
	Urban				
	WT				
	Rural		*	+	
	WT				
Maternal Depression	Urban	*		+	**
	AA				
	Urban		+	**	+
	WT				
	Rural	+	***	*	**
	WT				
Marital	Urban				
	AA				
	Urban				*
	WT				

Risk Factor	Locality-Race Group	Grade 5 Outcome			
		CBCL Externalizing Problems	TRF Externalizing Problems	Failing Grades	Low Academic Achievement
	Rural			+	
	WT				
Parenting					
Parenting Behavior	Urban				*
	AA				
	Urban			*	
	WT				
	Rural	***	+	*	
	WT				
Community					
Neighborhood	Urban		*		+
	AA				
	Urban				
	WT				
	Rural		***	**	
	WT				
Classroom	Urban		*		
	AA				
	Urban		*		
	WT				
	Rural				
	WT				
School	Urban				*
	AA				
	Urban				
	WT				
	Rural				
	WT				

Note: AA = African American, WT = white; +p<.10,

[*] p<.05,

[**] p<.01,

[***] p<.001.

Table 5

Item-Response Probabilities for Four-class Model (Probability of Reporting Risk Factor Given Latent Class) and Class Membership Probabilities for Each Locality-Race Group

	Latent Class			
Risk Factor	**Two-Parent Low Risk**	**Single Parent/ History of Problems**	**Single- Parent Multilevel Risk**	**Two-Parent Multilevel Risk**
Child				
Cognitive	0.160	0.378	0.647	0.584
Social-Cognitive	0.167	0.456	0.549	0.443
Behavioral	0.146	0.158	0.481	0.491
Family				
Single Parent	0.000	0.722	1.000	0.184
Demographic	0.075	0.334	0.756	0.511
Stress/Support	0.153	0.217	0.420	0.478
Parent History of Problems	0.254	0.688	0.719	0.677
Maternal Depression	0.149	0.181	0.733	0.700
Marital	0.234	0.000	0.027	0.683
Parenting				
Parenting Behavior	0.174	0.237	0.624	0.621
Community				
Neighborhood	0.036	0.106	0.403	0.235
Classroom	0.322	0.288	0.376	0.348
School	0.128	0.169	0.296	0.319
Class Membership Probabilities				
Urban AA (*N*=373)[a]	11%	33%	38%	18%
Urban WT (*N*=185)[a]	38%	25%	5%	32%
Rural WT (*N*=192)[a]	55%	11%	4%	30%

[a] Row sums to 100%

Note: AA = African American, WT = white.

Table 6

Odds Ratios for Grade 5 Outcomes by Locality-Race Group

	Latent Class			
Grade 5 Outcome	**Two- Parent Low Risk**	**Single Parent/History of Problems**	**Single- Parent Multilevel Risk**	**Two-Parent Multilevel Risk**
CBCL Externalizing Problems (N=644; p<.001)				
Urban African American	ref	0.1	4.8	3.0
Urban White	ref	1.4	0.2	2.9
Rural White	ref	0.3	>100	6.2
TRF Externalizing Problems (N=622; p<.001)				
Urban African American	ref	2.1	6.3	2.8
Urban White	ref	1.6	76.2	2.7
Rural White	ref	0.2	>100	6.7
Failing Grades (N=639; p<.001)				
Urban African American	ref	3.6	8.5	5.9
Urban White	ref	1.8	2.5	2.5
Rural White	ref	2.3	0.1	5.0
Low Academic Achievement (N=630; p<.001)				
Urban African American	ref	44.7	>100	>100
Urban White	ref	0.4	3.3	2.3
Rural White	ref	0.9	>100	10.3

Notes: For each row, ref indicates the reference class in the logistic regression model; p-values represent overall relation between risk profile membership and Grade 5 outcome based on log-likelihood difference test; for the white groups, odds ratios corresponding to membership in the Single-Parent Multilevel Risk latent class are based on a very small expected number of children.

Table 7

Percentage of Individuals in Each Locality-Race/Risk Profile Combination Expected to Report Each Adverse Outcome in Grade 5

	Grade 5 Outcome			
Locality-Race/Risk Profile Combination	**CBCL Externalizing Problems (%)**	**TRF Externalizing Problems (%)**	**Failing Grades (%)**	**Low Academic Achievement (%)**
Urban African American (N=373)				
Two-Parent Low Risk	9.7	17.5	17.6	0.5
Single Parent/History of Problems	1.3	30.7	43.7	17.7
Single-Parent Multilevel	33.7	57.1	64.6	47.6
Two-Parent Multilevel	24.5	37.2	55.9	37.1
Urban White (N=185)				
Two-Parent Low Risk	13.2	21.5	23.6	8.6
Single Parent/History of Problems	17.3	30.1	36.1	3.5
Single-Parent Multilevel	3.1	95.4	43.3	23.7
Two-Parent Multilevel	30.6	42.3	43.4	17.6
Rural White (N=192)				
Two-Parent Low Risk	8.6	4.3	13.8	1.1
Single Parent/History of Problems	3.0	0.8	26.6	1.0
Single-Parent Multilevel	96.7	97.6	1.6	98.5
Two-Parent Multilevel	37.0	23.3	44.4	10.4