# RISK FACTORS FOR BOY'S CONDUCT PROBLEMS WITHIN AND ACROSS NEIGHBORHOODS

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B.A., University of Michigan, 1998

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Submitted to the Graduate Faculty of

Arts and Sciences in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

University of Pittsburgh

2005

UNIVERSITY OF PITTSBURGH

FACULTY OF ARTS AND SCIENCES

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Risk Factors for Boys' Conduct Problems Within and Across Neighborhoods

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University of Pittsburgh, 2005

This study had three aims. The first was to examine whether there is a relationship between children's developmental histories of conduct problems (CP) and neighborhood risk. A second aim was to examine whether children from poorer neighborhoods are exposed to more environmentally-based CP risk factors (e.g., peer deviance, rejecting parenting) than children from more prosperous neighborhoods. Finally, a third aim was to compare the developmental histories of CP youth across communities that varied in SES (e.g., lower-middle-class and more deprived neighborhoods) and within such communities (e.g., high-CP vs. low-CP boys from lower-middle-class communities). Raine's (Raine & Venables, 1984) social push hypothesis proposes that CP youth from more prosperous communities are more likely to demonstrate biologically-based risk factors for CP (e.g., ADHD) and less likely to be exposed to environmentally-based risk factors. These issues were investigated in two samples of ethnically diverse boys, one that included younger children and another that included adolescents. Children were assigned to groups based on their trajectories of CP and neighborhood SES using Nagin's (1999, 2005) semiparametric group based approach to modeling trajectories. Results revealed weak support for a relationship between children's trajectories of CP and neighborhood SES. Also, children from poorer neighborhoods were consistently found to have greater exposure to environmentally-based CP risk factors than children from more prosperous communities. However, contrary to the social push hypothesis, the results did not generally support the notion

that CP youth from more prosperous communities had less exposure to environmentally-based CP risk factors or demonstrate more biologically-based risk factors for CP.

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## PREFACE

This dissertation project would not have been feasible without the help of many others. I would like to acknowledge these individuals in this preface section. First, the staff of the Pitt-Mother & Child Project (PMCP) and the Pittsburgh Youth Study (PYS) deserve special recognition as they were responsible for collecting the data on which this study was based. Without their hardwork and dedication, studying the longitudinal effects of neighborhood conditions on children's antisocial behavior would not have been an option to me.

Also, I would like to recognize the members of my dissertation committee who made themselves available to me for individual meetings, and always had sage advice for me when needed. I am greatly appreciative of Rolf Loeber in particular for allowing me to use data from the PYS study for my dissertation analyses. Also, I am greatly appreciative of Danny Shaw for granting me permission to use data from the PMCP study for my dissertation and for serving as a highly dedicated and competent mentor during my tenure in graduate school.

Finally, I would like to thank my friends and family for their support over the last couple of years. It is nice to know that I have people who I can count on and turn to when needed. In particular, I would like to give special recognition to my fiancé, Liz, who gave me the strength to carry on during tough times and who helped take care of me when I was too busy to do so on my own.

# INTRODUCTION

During childhood, conduct problems (CP) account for nearly 50% of all clinic referrals (Kazdin, 1995). Children who engage in CP burden society by taxing mental health services and by causing distress for their victims (Kazdin, 1995). Because CP is more common among children reared in communities characterized by high rates of crime and poverty (Beyers, Loeber, Wikström, & Stouthamer-Loeber, 2001), many theories about how CP develop focus on the influence of contextual factors (Bursik, 1988; Sampson, Raudenbush, & Earls, 1997). However, not all children who engage in antisocial behaviors come from disadvantaged environments. CP is also common for children reared in safe and prosperous communities (Beyers et al., 2001).

Unfortunately, relatively little is known about whether the processes that predict CP differ for children reared in high- and low-risk environments. The principal of equifinality suggests that more than one pathway exists for CP, and that the pathways leading to CP may vary by environmental risk status. For instance, several researchers have found that parental supervision is more closely related to CP in low- versus higher-income neighborhoods (Beyers et al., 2001; Ingoldsby, Shaw, Flanagan, Yaggi, & Hartman, 2001; Pettit, Bates, Dodge, & Meece, 1999; Rankin & Quane, 2002), as greater parental supervision is thought to be needed in high-risk communities to protect children from exposure to deviant peer and adult influences.

Interestingly, community risk status has been found to interact with several other risk factors for CP by amplifying their impact on CP in high-risk neighborhoods. These include the quality of parent-child and parent-parent relationships (Kupersmidt, Griesler, DeRosier,

Patterson, & Davis, 1995; Lindstrom. 1996; McCord, 2000), children's ADHD symptomatology (Lynam et al., 2000), and the level of deviance displayed by children's peers (Beyers et al., 2001; Ingoldsby, Shaw, Schonberg, & Flannagan, 2003). Together, these findings suggest that the influence of family, child, and peer risk factors may be moderated by community-risk status, and that separate theoretical models may be needed to explain the origins of CP in high- and low-risk communities.

However, there may be an alternative explanation for the interactive effects described above. Some risk factors that moderate neighborhood risk are unequally distributed across high- and low-risk communities (e.g., peer deviance, family disruption; Brooks-Gunn, Duncan, & Aber, 1997; Elliott et al., 1996; Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999; Ingoldsby et al., 2001). This complication makes it difficult to determine whether these risk factors interact with neighborhood risk because they are less influential in one type of community or because of range restriction. Range restriction is a potential concern because it attenuates the size of correlations between variables. Fortunately, person-oriented analytic approaches are impacted less by range restriction than variable-oriented approaches. Whereas variable-oriented approaches assess the strength of relationships between variables, person-oriented approaches assess how groups of individuals compare to other groups of individuals. The present study seeks to improve upon past studies of neighborhood risk by using a person-oriented approach to investigate how neighborhood risk and other CP risk factors interact over time. Although person-oriented approaches have been used for similar purposes in the past (Beyers et al., 2001; Kupersmidt et al., 1995), previous studies have relied on measures of CP and/or neighborhood risk that were collected at only one time point. As a consequence, little is known about how children's developmental trajectories of CP are affected by long- versus short-term exposure to

neighborhood risk, and how, in the context of prolonged neighborhood risk or safety, other risk factors for CP alter children's trajectories of antisocial behavior. A study on this topic has the potential to improve our understanding of how CP develops in different environments and help researchers tailor prevention and intervention efforts to the diverse needs of children growing up in high- and low-risk communities.

## Literature Review

This literature review will summarize theory and research about how CP develops, discuss how a specific risk factor, neighborhood disadvantage, affects CP, and review how neighborhood disadvantage and other risk factors for CP (e.g., child, family, and peer risk factors) interact to influence children's trajectories of antisocial behavior.

### *Risk Factors for Children's CP: The Influence of Genetics and Environment*

It has long been known that CP runs in families. For instance, CP children are more likely to have siblings who demonstrate antisocial behaviors than are their non-CP peers (DiLalla, 2002; Miles & Carey, 1997). This may imply that genetic factors influence the course of CP because siblings share approximately 50% of the same genes. Alternatively, this may suggest that environmental conditions contribute to CP because siblings who are reared together are typically exposed to the same environmental risk factors. A third possibility is that CP is affected by both genetic and environmental influences. Unfortunately, it is difficult to untangle how these sources of influence affect CP without genetically-informed research designs because genetic and environmental risk factors tend to be correlated. For instance, many children who have criminal parents, an indicator of genetic risk, are reared in poor homes, an environmental risk factor (DiLalla, 2002). Also, individuals who inherit genetic predispositions for CP often seek out environmental conditions that support their deviant tendencies (e.g., antisocial peers), and

elicit environmental conditions that exacerbate their genetic risk (e.g., harsh parenting; DiLalla, 2002). This is why genetically-informed research designs, which control for the degree of genetic similarities between participants, are needed. Examples of such studies include twin and adoption studies.

The twin and adoption studies that have been conducted on CP suggest that both genetic and environmental factors (particularly shared environment) contribute to CP, but the extent to which each matters varies depending on a number of methodological issues (DiLalla, 2002; Miles & Carey, 1997). First, one must consider the type of CP that is measured. Generally speaking, overt forms of CP have been found to demonstrate higher levels of heritability and lower levels of shared and non-shared environment than covert forms of CP (DiLalla, 2002). Second, the age of the participants must be acknowledged. Whereas genetic and environmental factors contribute equally to aggression during childhood, genetic factors become more important during adulthood (Miles & Carey, 1997). Finally, the manner in which CP is measured is of consequence. In a meta-analysis of twin and adoption studies, Miles and Carey (1997) found greater support for genetic influences if parental reports were used to measure CP as opposed to observations. However, only two observational studies were included in their meta-analysis, and they were limited to small sample sizes that grouped together children from multiple developmental stages (DiLalla, 2002).

To complicate matters, for individual children, the importance of genetic and environmental risk factors may also depend on whether or not they are both present. Several adoption studies have uncovered interactive effects in which the presence of one risk factor (history of antisocial behavior in biological family or rearing in crimonergic environment) only increased risk for CP to a small degree, but the presence of both genetic and environmental risk

factors increased CP risk substantially (Cadoret, Leve, & Devor, 1997; Cloninger et al., 1982; Hutchings & Mednick, 1977). For instance, in a study of male Swedish adoptees, Cloninger and colleagues found that among adoptees who had a history of criminality in both their biological and adoptive families, 40% evidenced petty criminality as adults compared to just 12.1% of adoptees who only had a history of genetic risk, and 6.7% of adoptees who only had a history of environmental risk. Further proof of gene by environment interactions comes from a molecular genetic study in which child maltreatment was found to interact with a gene that encodes monoamine oxidase A (MAOA), an enzyme that metabolizes neurotransmitters, and that has been linked to aggressive behavior in humans and mice (Caspi et al., 2002). Maltreated individuals who conferred high levels of MAOA expression were more likely to demonstrate CP than their counterparts who conferred lower levels of MAOA expression. This molecular genetic study, like the adoption studies described above, suggests that genetic risk factors may influence the degree to which children are susceptible to environmental insults, and highlights the need for theories that consider how genetic and environmental risk factors interact.

***Theories about How CP Develops***

In recent years, several theories have been proposed that account for both genetic and environmental influences on CP (Cloninger, Sigvardsson, Bohman, & von Knorring, 1982; Quay, 1988). However, most are adevelopmental, and as such, fail to distinguish between those who initiate CP during childhood versus adolescence. This distinction is important because according to research based on boys, individuals who initiate CP during childhood are at much greater risk for criminality as adults compared to those individuals who initiate CP later on (Farrington, 1986; Loeber, 1982; Patterson, 1982). One exception is Moffitt's (1993) theory about Life-Course-Persistent and Adolescent-Limited antisocial behavior, which provides

explanations for what prompts CP among male child- and adolescent-onset populations. Moffitt refers to these respective populations as Life-Course-Persisters (LCP) and Adolescent-Limited (AL) boys.

According to Moffitt (1993), for LCP boys, factors present before or soon after birth are probably of great importance, particularly those that contribute to neuropsychological deficits (e.g., nutrition, abuse). Moffitt's definition of neuropsychological deficits is broad and is meant to include, in addition to low Verbal IQ and ADHD (Attention-Deficit-Hyperactivity-Disorder), all anatomical structures and physiological processes within the nervous system that affect behavior, cognition, and psychological characteristics such as temperament. These deficits, which are highly heritable, are likely to increase children's susceptibility to environmental stressors because they interfere with the ability of children to solve problems, manage their impulses, and regulate their emotions (Campbell, 2000; Caspi & Moffitt, 1995). Thus, one would expect that children who suffer from such deficits would be more difficult to rear, and that because of the genes they share with their parents, their parents would be poorly suited to deal with the challenges these children present. For instance, an impulsive and irritable child is likely to have parents with similar characteristics as a result of common genes. Thus, irritable and hyperactive children who are in need of firm discipline and parental warmth would be more likely to experience parental hostility and inconsistent discipline. Moffitt contends that this combination of child and family impairment represents the starting point from which CP develops. Once initiated, risk is maintained by transactional processes in which the challenge of dealing with a difficult child evokes negative responses from others that exacerbate the difficult child's tendencies (Sameroff & Chandler, 1975).

In contrast, Moffitt (1993) contends that adolescent-onset CP can best be explained by exposure to deviant peers who serve as role models who provide training in how to perform various antisocial behaviors. According to Moffitt, adolescence is a period of developmental transition during which adolescents have achieved biological maturity, but lack opportunities for demonstrating their social maturity. This discrepancy results in a maturity gap, which AL boys try to close by engaging in behaviors that antagonize adults. More specifically, AL boys view LCP boys as being free of parental constraints and conclude that by mimicking their behavior, they too can be free of such constraints.

Moffitt's (1993) theory about LCP and AL boys has generally been supported in studies conducted by Moffitt and colleagues (Moffitt, Caspi, Harrington, & Milne, 2002; Moffitt & Silva, 1988), and in studies conducted by other investigators (Fergusson & Horwood, 2002; Nagin &Tremblay, 2001; NICHD Early Child Care Research Network, 2004; Schaeffer et al., 2003). However, the model is not immune to criticism. For instance, Moffitt only considers a small range of environmental influences that could potentially exacerbate children's genetic proclivities for CP. According to Bronfenbrenner (1979), children's environments can be separated into four nested structures that vary in their proximity to the child. The most proximal structures include the microsystem and mesosytem, which collectively represent the immediate settings of children, including the physical location (e.g., home, school), the people present, and their interrelations. The more distal structures include the exosystem and macrosystem. These structures respectively represent settings that affect children, but do not necessarily include them (e.g., the parent's work environment), and the beliefs and practices of the cultures to which children belong. Moffitt's conceptualization of environment was limited to the proximal structures defined by Bronfenbrenner. This oversight is significant because Bronfenbrenner's

distal structures sometimes define and delimit the potential developmental outcomes available to children. For instance, for many poor children from lower-income communities, a college education may be out of reach regardless of their cognitive abilities. Thus, it is important to consider how distal environmental structures impact children's CP above and beyond the more proximal structures, especially for children who demonstrate high levels of genetic/biological risk. The next two sections of this dissertation will review research and theory about how one distal environment type, neighborhood context, influences CP and interacts with other risk factors for CP to affect children's trajectories of antisocial behavior. Although neighborhood context is just one of many relevant distal environments types, it will be the only one focused on in this dissertation because it has received prominence in a number of CP theories, and because as described below, the relationship between CP and neighborhood disadvantage has been well-established (Brooks et al., 1997; Cleveland, 2003; Lochman, 2004; Sampson, Morenoff, & Gannon-Rowley, 2002).

***Neighborhood Disadvantage and CP***

Several review papers have documented a modest, but consistent, relationship between neighborhood risk and CP (Brooks-Gunn et al., 1997; Ingoldsby & Shaw, 2002; Leventhal & Brooks-Gunn, 2000). Interestingly, the association between neighborhood risk and CP grows stronger as children mature (Halpern-Fisher et al., 1993; Elliott et al., 1996), presumably because older children spend more unsupervised time in their neighborhoods (Herman, Heins, & Cohen, 1987). However, the effects of neighborhood conditions on CP have been detected on children as young as age five (Chase-Landsdale & Gordon, 1996; Winslow & Shaw, 2003).

Why would neighborhood conditions increase risk for CP? Several theories have been proposed, some of which offer direct explanations, and others that suggest indirect explanations

(Ingoldsby, 2002; Jencks & Mayer, 1990; Leventhal & Brooks-Gunn, 2000). The direct explanations typically focus on the quality of institutional resources available to children and the high prevalence of violence in lower-income communities (Gorman-Smith & Tolan, 1998; Jencks & Mayer, 1990). For instance, in lower-income communities families have limited access to high-quality schools and child care, stimulating after-school programs, and educational resources such as libraries, family resource centers, and literacy programs (Leventhal & Brooks-Gunn, 2000). These resources may influence how children spend their free time and their motivation for academic achievement. In poor communities, children may more often become involved in deviant peer groups because they have fewer prosocial options for entertainment. Relatedly, children in these communities may drop out of school because they perceive their academic opportunities as being limited. In regard to community violence, it has been suggested that exposure to such violence can desensitize children to the consequences of CP on others (Garbarino, Kostenly, & Dubrow, 1991; Gorman-Smith & Tolan, 1998) and teach children to use aggression as a strategy for solving problems (Bandura, 1986). This is consistent with research by Colder, Mott, Levy, and Flay (2000), who found a link between neighborhood risk and children's positive attitudes about antisocial behavior.

Indirect explanations for the association between CP and neighborhood disadvantage typically focus on how neighborhood conditions influence family relations. Parents who live in disadvantaged neighborhoods are often poor and highly stressed. These factors are thought to contribute to harsh and restrictive discipline strategies (Furstenberg, 1993; Garbarino & Kostenly, 1993) that promote coercive behavior among children (Patterson, 1982). This may explain why, in some cases, parenting behaviors have been found to mediate the relationship between SES (a correlate of neighborhood risk) and CP (McLoyd, 1998).

Finally, a third group of theories, which have both direct and indirect effects on children's outcomes, focus on how communities are socially organized. According to such theories, neighborhoods have behavior norms that directly influence how children behave, but also affect youth indirectly by influencing how adults respond to child deviant behavior (Sampson, 1997; Sampson et al., 1997; Tolan, Gorman-Smith, & Henry, 2003). For instance, neighborhoods vary in the extent to which residents trust one another and are willing to intervene on the behalf of other residents. Sampson and colleagues (1997) refer to this linkage of traits as collective efficacy, which has been found to be less pervasive in communities characterized by high levels of residential instability, ethnic heterogeneity, and family disruption. These structural characteristics are believed to promote mistrust among neighbors and interfere with the ability of community members to organize around the goals of monitoring children and maintaining public order (Sampson, 1997; Sampson et al., 2002). Accordingly, collective efficacy facilitates the spread of deviant peer influences in such communities because deviant peer groups are able to congregate with minimal adult intervention. Consistent with Sampson's theory, collective efficacy has been found to mediate the association between neighborhood disadvantage and rates of community crime (Sampson et al., 1997).

Although much of the research on neighborhoods has been conducted on children from poor urban environments, there is reason to believe that children from poor rural communities are at risk too, but perhaps slightly less risk than their urban counterparts. Children from poor rural communities typically demonstrate fewer behavior problems than their urban peers (Elgar, Arlett, & Groves, 2003; Nøvik, 1999), but more behavior problems than children from upper-income urban and suburban communities (Brooks-Gunn et al., 1997; Ingoldsby & Shaw, 2002; Leventhal & Brooks-Gunn, 2000). This may be because risk factors that promote CP are the

most prevalent in poor urban communities. For instance, children in poor urban communities are more likely than children from poor rural and more prosperous urban and suburban communities to have single parents (Furstenberg et al., 1999; Thompson, 1992) and be exposed to deviant peers (Brody et al., 2001; Forehand et al., 2000; Ingoldsby et al., 2001). These findings collectively suggest that community type (urban vs. rural) may matter less than the prevalence of risk factors in the community.

Incidentally, critics of the theories described above contend that neighborhood disadvantage and CP correlate simply because families with antisocial tendencies tend to live in lower-income neighborhoods (Plotnick & Hoffman, 1999; Rowe & Rodgers, 1997). This confound is referred to as selection effect and is supported by research demonstrating that individuals base their decisions about where to live on factors such as housing affordability, crime prevalence, shared values, and being of similar ethnic or racial background as their neighbors (Coulton, 1997; Tienda, 1991). Thus, it is possible that deviant families prefer to live in poor communities because they feel more accepted in such communities and/or because they have difficulty acquiring or maintaining the jobs needed to pay for more expensive housing. However, it is unlikely that such selection factors fully account for the effect of neighborhood disadvantage on CP. In a study of twins, Caspi, Taylor, Moffitt, and Plomin (2000) found that neighborhood conditions account for a small, but significant portion of shared environmental influence (2%) on early manifestations of CP. This effect was evident even after accounting for genetic and other shared-environmental influences. Furthermore, neighborhood disadvantage has been found to predict CP after controlling for factors that relate to family movement in and out of low-income neighborhoods among school-age children (e.g., parental psychopathology, being of minority status; Winslow, 2001). Finally, in a quasi-experimental study of poor families, half

of whom were randomly assigned to move to safer communities, children were less likely to engage in CP after moving (Ludwig, Duncan, & Hirschfield, 2001). These studies suggest that neighborhood conditions influence CP over and above the effects of selection factors and underscore the need to investigate how CP develops across diverse communities.

### *The Social Push Theory*

According to the social push theory proposed by Raine and Venables (1984), genetic/biological risk factors for CP should be of greater importance in low-risk neighborhoods, and familial and peer risk factors should be more influential in high-risk neighborhoods. Although not explicitly stated, the social push theory implies that there is a lower genetic threshold for CP for children from high-risk communities. The assumption that underlies this theory is that in high-risk neighborhoods, children's genetic potentials for CP are more likely to be activated due to the presence of other CP risk factors commonly found in such communities (e.g., poverty, exposure to deviant peers). This is consistent with theories about vulnerability factors and provoking agents, which suggest that genetic/biological vulnerabilities are more likely to affect CP when combined with provoking agents (Lynam et al., 2000). Raine and Venables refer to the provoking agents found in disadvantaged communities as "push factors" because they have the potential to push children towards CP even if they are only at mild genetic/biological risk. Although push factors can be found in both high- and low-risk neighborhoods (e.g., family conflict), they are far less common in low-risk neighborhoods. Thus, one would expect that for children at mild genetic/biological risk, the likelihood of developing CP would be less in low-risk neighborhoods, and that in high-risk neighborhoods, a smaller proportion of CP variance would be accounted for by biological risk factors.

Unfortunately, the empirical literature on how neighborhood risk and other CP risk factors interact is too small to validate the social push theory. Only two studies could be located that investigated how biological and neighborhood risk factors interact and both involved boys from the Pittsburgh Youth Study (PYS; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998). The first study was limited to boys from the middle cohort of the PYS and examined how ADHD symptomatology and neighborhood risk interact using hierarchical linear modeling (HLM), a variable-oriented data analytic strategy (Lynam et al., 2000). As mentioned previously, variable-oriented approaches assess the strength of relationships between variables. The second study included boys from the youngest cohort of the PYS, one of the two samples that will be used to test hypotheses in the present study. This study also investigated how ADHD symptomatology and neighborhood risk interact, but employed a person-oriented data analytic strategy (comparison of odds ratios for repeated CP given ADHD in high- or low-SES neighborhoods; Beyers et al., 2001). Person-oriented strategies examine how groups of individuals compare. Interestingly, contrasting results were obtained across studies. The study that employed a variable-oriented approach found that ADHD symptomatology was more closely associated with CP in high-risk neighborhoods as would be predicted by the theories about vulnerability factors and provoking agents. The study that employed the person-oriented approach found the reverse, lending credence to the social push hypothesis. Together, these findings imply that ADHD symptoms have a greater impact on CP in low-SES neighborhoods, but that ADHD symptoms are more common among CP adolescents in high-SES neighborhoods. Unfortunately, both studies relied on measures of neighborhood risk that were collected at one time point only and were limited to adolescents. Consequently, these studies reveal little about how, in the context of *prolonged* neighborhood risk, other risk factors for CP alter children's

trajectories for antisocial behavior. In addition, in the study that employed HLM, it was difficult to determine whether the results were affected by range restriction. Clearly, the findings from these studies need to be replicated with younger samples, tested using designs that measure neighborhood risk over time, and employ a wide variety of analytic strategies.

## Risk domains, Neighborhood Risk and CP

Several studies have assessed how risk factors besides ADHD relate to CP across high- and low-risk communities. These studies tap risk factors from several domains (child, peer, and familial risk factors) and will be reviewed below. Community risk status was generally defined at the neighborhood level in these studies.

### *Child Risk Factors*

Unfortunately, studies investigating how child attributes interact with neighborhood risk are rare. Only five studies could be located on this topic. These studies examined how children's self-esteem, coping skills, attitudes about CP, school motivation/connectedness, academic achievement, or pubertal timing relate to CP across high- and low-risk neighborhoods (Beale-Spencer, Cole, Jones, & Swanson 1997a; Beyers et al., 2001; Dornbusch, Erickson, Laird, & Wong, 2001; Dubow, Edwards, & Ippolito, 1997; Gonzales, Tein, Sandler, & Friedman, 2001). The only risk factor that was consistently found to interact with neighborhood risk status was children's school motivation/connectednedness. This risk factor was more strongly related to CP in high-risk neighborhoods.

Clearly more studies are needed on how child attributes interact with neighborhood risk. There may be a number of other child attributes that vary in their importance across communities, but that have not been tested in interactive models. For instance, it would be important to examine whether children's temperamental characteristics interact with

neighborhood quality. Children who exhibit high levels of sensation seeking in low-risk neighborhoods may be at reduced risk for CP because of the greater availability of prosocial options for entertainment in such communities (e.g., a community run sports league; Dabbs & Morris, 1990). Likewise, the importance of children's empathy skills may vary by neighborhood risk status. Children in high-risk neighborhoods commonly witness violence (Attar, Guerra, & Tolan, 1994; Duncan, 1996; Garbarino, et al., 1991), an experience which is believed to interfere with the development of empathy and desensitize children to the consequences of CP on others (Farrell & Bruce, 1997; Gorman-Smith & Tolan, 1998). Thus, one might expect that children's lack of empathy would be more closely related to CP in high- versus low-risk neighborhoods. Unfortunately, these issues remain to be tested.

***Family Risk Factors***

The studies on family influences have been marked by inconsistency. Although risk factors such as family cohesion/involvement, family conflict, parental supervision, and marital status have been found to have a greater impact on CP in high-risk communities in several studies (Beyers et al., 2001; Lindstrom, 1996; Kupersmidt et al., 1995; McCord, 2000; Pettit et al., 1999; Plybon & Kliewer, 2001; Rankin & Quane, 2002), the reverse has been evident in many others (Furstenberg et al., 1999; Gorman-Smith, Tolan, & Henry, 1999; Gorman-Smith & Tolan, 1998; Miller, Wasserman, Neugebauer, Gorman-Smith, & Kamboukos, 1999; Simons, Lin, Gordon, Brody, & Conger, 2002). This pattern of inconsistency can at least be partially explained by the characteristics of the samples studied. Some studies were limited to children from primarily middle-class backgrounds (Pettit et al., 1999); others only included children from high-risk neighborhoods (Gorman-Smith & Tolan, 1998). Interestingly, the studies that found stronger relations between CP and familial risk factors in high-risk environments generally

demonstrated more variability in neighborhood quality. The studies that found the reverse were primarily restricted to lower-income children from deprived communities. This suggests that there may be different patterns of interaction for children from low-, high- and extremely high-risk neighborhoods, and potentially could explain why in some studies, family cohesion was found to have a greater effect on CP in high-risk environments, and in other studies, the reverse was found. For instance, in a study of lower and middle-class children, family cohesion was more closely related to CP in high-risk neighborhoods (Plybon & Kliewer, 2001). However, in a second study conducted by Gorman-Smith and colleagues (1999), family cohesion was found to be more closely related to delinquency among older children and young adolescents in poor-urban versus poor inner-city communities. Although both community types in the Gorman-Smith et al. study were marked by disadvantage, the poor inner-city communities were marked by extreme disadvantage. This implies that in severely impoverished environments, the influences that families have on their children may become overwhelmed by the social push factors that promote CP.

Gorman-Smith et al.'s (1998) finding of weaker familial influences in extremely deprived communities is consistent with Tolan et al.'s (2003) finding that gang membership fully mediates the effects of parenting on CP among adolescents in comparable communities. Although the participants in these studies were restricted to older children and adolescents, similar findings have been reported by researchers studying younger children. For instance, in a study of 6-10 year old boys from dangerous communities, Miller et al. (1999) found that family conflict was less closely related to CP among boys exposed to the highest levels of community violence. Similarly, in a study of 10- to 11-year old low-income boys, Shaw, Criss, Schonberg, and Beck (2004) found that the protective effects of strong family hierarchy (represented by observations

of clear family boundaries and maternal reports of disciple effectiveness) were greater for European-American boys from *high*-risk neighborhoods than for African-American boys from *extremely* high-risk neighborhoods. These findings, in conjunction with the results reported by Gorman-Smith et al., indicate a need to separate high-risk and extremely high-risk neighborhoods when evaluating how familial and neighborhood risk factors interact to predict CP.

***Peer Risk Factors***

The studies on *peer* risk factors generally suggest that children's peer experiences have a greater impact on CP in high-risk neighborhoods. In particular, children from high-risk neighborhoods who have deviant friends demonstrate higher levels of overt and covert CP than their counterparts from low-risk neighborhoods (Beyers et al., 2001; Ingoldsby et al., 2001). This is consistent with research conducted by Tolan and colleagues (2003), who found that gang membership, a marker for peer deviance, mediates the effects of parenting on CP in highly disadvantaged neighborhoods. Studies involving children from more prosperous communities typically report partial mediation (Dishion, Capaldi, Spracklen, & Li, 1995; Lansford, Criss, Pettit, Dodge, & Bates, 2003). Tolan and colleagues attribute these findings to the different social processes found in high- and low-risk communities. Community members in high-risk neighborhoods demonstrate less willingness to intervene when they see neighborhood children behaving inappropriately (Sampson, Raudenbush, & Earls, 1997; Sampson et al., 2002). This enables children who more typically engage in antisocial activities to congregate in groups and engage in deviant acts without having to worry about adult intervention.

Peer support, defined as the degree to which children feel they can count on friends for help and advice in dealing with problems, has also been found to predict CP more strongly in

disadvantaged neighborhoods (Dubow et al., 1997). This is surprising because social support generally provides protection from stress and correlates positively with adjustment (Dubow & Tisak, 1989; Hill, Levermore, Twaite, & Jones, 1996; Pianta & Ball, 1993). Dubow and colleagues (1997) had been expecting peer support to deter CP by promoting self-esteem. Contrary to expectations, their results suggest that a moderate degree of peer rejection may be advantageous in high-risk environments where peer deviance is common. Unfortunately, because a cross-sectional design was employed, it was difficult to determine whether peer support preceded or followed the onset of CP. In the future, it will be important to assess how peer support and rejection interact with neighborhood risk over time.

To review, community-level adversity has been found to moderate the impact of risk factors from several domains. However, the studies on this topic have many limitations and their pattern of results have been marked by inconsistency. For instance, some risk factors have only been studied in relation to older children or in cross-sectional studies. Other risk factors that one might theoretically expect to interact with neighborhood risk have not been studied at all (e.g., temperament). Moreover, none of the studies that have investigated how neighborhood risk and other CP risk factors interact have assessed how children are affected by prolonged exposure to neighborhood risk. In the future, it will be important to address these concerns and to evaluate why inconsistent results have been obtained across studies. Most likely some of the inconsistent findings can be explained by the various quantitative methods used to analyze data and variability in the range of neighborhoods sampled across studies.

### *Defining Neighborhood Risk*

The possibility that different interactive patterns may apply to children from high-risk and extremely high-risk samples raises many questions about how to define and partition

neighborhood risk. Unfortunately, it is unclear whether the dichotomy applied by Gorman-Smith and colleagues (1999) described above yielded qualitatively different environment types. Other researchers have recommended alternative classification schemes (Kupersmidt et al., 1995; Lindstrom, 1996; Pettit et al., 1999; Wikström & Loeber, 2000). Clearly, objective guidelines need to be developed on how to classify children's neighborhood risk status concurrently and over time. Several researchers have recommended cluster analyses for this purpose (Gorman-Smith, Tolan, & Henry, 2000; Beale-Spencer, McDermott, et al., 1997). However, because lower-income families move frequently (Winslow & Shaw, 2003), it may be difficult to classify children's life-time neighborhood risk in this manner. One potential solution is to assign children to groups based on their developmental trajectories of neighborhood risk using Nagin's (1999) semiparametric, group based approach for modeling trajectories (SPGM). SPGM provides objective criteria for deciding how many types of trajectories exist within a population and for estimating the proportion of individuals who follow each trajectory. Assuming that multiple trajectory groups exist, the SPGM technique should separate children who are exposed to prolonged neighborhood risk from those who are exposed to intermittent risk. This distinction seems important given developmental differences in how children respond to neighborhood risk (Halpern-Fisher et al., 1993; Elliott et al., 1996), and research suggesting that chronic stressors have a greater impact on children's adjustment than acute stressors (Duncan, 1996; Garbarino et al., 1991; Korenman, Miller, & Sjaastad, 1995).

Although SPGM is typically used for classifying children on one developmental trajectory at a time, recent developments have made it possible to classify children on multiple trajectories simultaneously and then estimate relations between trajectories (Nagin & Tremblay, 2001). In the current study, this new application of SPGM will be used to assign children to

groups based on their joint trajectories of CP and neighborhood risk. Subsequent analyses will compare the developmental histories of the CP groups within and across neighborhood trajectory types and examine the conditional probability of being in specific CP trajectory groups (e.g., chronic high CP) given specific histories of neighborhood risk (e.g., persistent impoverished neighborhood). In addition, because the social push hypothesis rests on the assumption that children reared in poorer neighborhoods are exposed to more environmental risk factors for CP, the developmental histories of children from the SPGM-identified neighborhood trajectories will be compared irrespective of their CP trajectories.

It is difficult to conjecture how many types of neighborhoods SPGM will identify because most researchers have defined neighborhood as a static variable, and have employed subjective criteria for classifying neighborhood types. However, because individuals often move into neighborhoods with similar socio-demographic characteristics over time (i.e., people frequently move laterally rather than upward or downward, particularly poor, single-parent, minority families; Massey, Gross, & Shibuya, 1994; Nelson & Edwards, 1993; South & Crowder, 1998), one might expect SPGM to yield large groups that demonstrate stability at the upper, middle, and lower-ends of the sample distribution. Also, one might expect smaller groups that change over time for families that experience life events that result in opportunities to move up (e.g., remarriage, graduation from college, inheritance) or that cause economic hardships (e.g., job loss, divorce).

Fortunately, more is known about the number of groups needed to describe children's trajectories of CP. Several studies have been conducted on the topic since the advent of SPGM (Nagin, 1999) and general growth mixture modeling (GGMM; Muthén & Muthén, 2000), an analgous analytic tool that uses objective criteria for classifying growth trajectories.

Unfortunately, these studies have been marked by inconsistency. According to prior studies, the number of trajectories needed to capture inter-individual variation in how CP develops ranges from three to six (Broidy et al., 2003; Chung, Hawkins, Gilchrist, Hill, & Nagin, 2002; Fergusson & Horwood, 2002; Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003; Shaw, Gilliom, Ingoldsby, & Nagin, 2003; White, Bates, & Buyske, 2001). Most of these studies include small chronic and large abstainer groups that respectively demonstrate CP at every or none of the trajectory time points. However, only inconsistent support can be found for other common groups (e.g., a late-starters group, a desisting group). Furthermore, even among studies that find comparable group numbers, the groups often demonstrate contrasting patterns of change over time, and the proportion of children assigned to the most and least deviant groups frequently differ.

Interestingly, sample heterogeneity and contrasting measures of CP may account for some of the inconsistency described above. For instance, after comparing physical aggression trajectories for six samples of males and four samples of females, Broidy and colleagues (2003) suggested that fewer trajectories may be needed to describe aggression among females than males. Furthermore, they concluded that a higher proportion of females than males follow never or rarely aggressive trajectories, a finding that has been corroborated by Fergusson and Horwood (2002) for overt and covert forms of CP.

Sample age may also influence how many trajectory types are found. Samples that include adolescents are more likely to identity late-starting or adolescent-limited groups (Chung et al., 2002; Fergusson & Horwood, 2002; White et al., 2001) than are samples that are restricted to pre-adolescents (NICHD Early Child Care Research Network, 2004; Shaw et al., 2003). However, this may only be true for studies that employ broad measures of CP that tap overt and

covert antisocial behaviors. Studies that specifically focus on physical aggression rarely identify late-starters (Brame, Nagin, & Tremblay, 2001; Broidy et al., 2003; Nagin & Tremblay, 2001), presumably because these children primarily engage in covert acts. Late-starters in these studies are probably grouped together with children who rarely engage in CP because despite large group differences in how often these groups display covert CP, both groups are rarely aggressive.

Thus, to fully capture how CP develops among children, the present study will employ a broad measure of CP that includes overt and covert acts. Different groups are anticipated for analyses involving adolescents versus those limited to younger boys. More specifically, for both age groups, it is expected that the CP groups will include a small chronic group that demonstrates CP from the beginning of the trajectory to the end, and a large abstainer group, which rarely demonstrates CP. A third group, which is only expected among the younger boys is a desister group, which demonstrates high levels of CP initially, but exhibits a reduction in CP over time. For the older boys, a fourth group is expected, which initially exhibits low levels of CP, but demonstrates growth in this behavior over time.

Should these groups be found, prior research conducted with SPGM suggests that chronic children will have developmental histories characterized by higher levels of neuropsychological impairment and family adversity than children from less deviant trajectory groups (Chung et al., 2002; Fergusson & Horwood, 2002; Nagin &Tremblay, 2001; NICHD Early Child Care Research Network, 2004; Schaeffer et al., 2003; White et al., 2001), just as Moffitt (1993) proposed. However, none of the previous SPGM studies investigated how neuropsychological impairments and family adversity associate with CP across diverse communities. Thus, many questions remain about the generalizability of Moffitt's (1993) theory, and the validity of the social push hypothesis in relation to neighborhood context.

## Statement of Purpose

The primary aim of this study is to identify environmental and biologically based child predictors of CP within and across trajectories of neighborhood risk. Secondary goals include comparing the degree to which children from disadvantaged and more-prosperous neighborhoods are exposed to CP risk factors, and examining the relationship between children's developmental histories of CP and neighborhood risk. This study has the potential to improve upon previous studies in several ways. Whereas most studies represent neighborhood risk as a static variable that does not change over time, the present study investigated how long-term exposure to neighborhood risk affects children's CP trajectories. Moreover, a person-oriented approach to data analysis was employed. Person-oriented approaches are considered advantageous because they are affected less by range-restriction. When variable-oriented analyses are conducted, if an interactive effect is detected, it is difficult to determine whether the interaction is due to range restriction or the variable involved in the interaction actually having a different effect across communities. Finally, data from two large longitudinal samples were studied in three sets of analyses. This allowed for an assessment of the generalizability and replicability of findings across diverse samples. The first analysis set was conducted on children from the Pitt Mother and Child Project (PMCP), a study of 310 low-income boys followed longitudinally from ages 1.5 to 12. The remaining two sets of analyses were conducted on boys from the youngest cohort of the Pittsburgh Youth Study (PYS), a study of 503 boys followed longitudinally from age 7 to 20. The first of the two sets of analyses involving PYS data was limited to data collected from ages 7 to 12 to facilitate comparisons with results from the PMCP data set. The second set of PYS analyses included data from ages 7 to 18 to assess the degree to which the analyses conducted on younger children generalize to children followed from middle childhood to late adolescence. When differences were found across analyses, the results were examined with respect to the

characteristics of the sample on which the analyses were conducted. Whereas the PMCP sample was restricted to lower-income preadolescent boys, the PYS sample included preadolescent and adolescent boys from upper- and lower-income backgrounds. This study should advance our understanding of how, in the context of prolonged neighborhood risk or safety, risk factors from different domains (e.g., biological, familial) affect children's trajectories of CP. In addition, it has the potential to advance our understanding of prevention and intervention for children living in high- and low-risk neighborhoods.

## Hypotheses

The hypotheses described below were based on three assumptions. First, researchers commonly identify between three and six groups when using the SPGM technique to classify children based on their CP trajectories. Most of the prior studies that have used SPGM for this purpose have identified a small chronic CP group that demonstrates high-levels of CP from early childhood to late childhood, and an abstainer group that rarely demonstrates any CP. Inconsistent support has been found for a later starter group that is characterized by growth in CP during late childhood, though this group is more commonly found among samples that include adolescents. Inconsistent support has also been found for a desister group that exhibits high-levels of CP during early childhood followed by declines in this behavior during middle childhood (Aber, Brown, & Jones, 2003; Nagin & Tremblay, 1999; Shaw et al., 2003). Given the research described above, when developing the hypotheses described below, it was assumed that the SPGM analyses conducted on the PMCP sample and the preadolescent data of the PYS sample would yield at least three CP groups, including an abstainer group, a chronic CP group, and a desister group. It was also expected that SPGM analyses conducted on the middle childhood to late adolescence PYS data would identify at least three CP groups, but for this data, the three

groups that would be identified would be an abstainer group, a chronic CP group, and a late-starter group. In regard to neighborhood trajectories, it was assumed that three or more types of neighborhood histories would be identified, including: a persistently impoverished type, a variable-improving type, and a persistently advantaged type. The latter assumption was based upon the high degree of variability in neighborhood quality found among the participants in the PMCP and PYS studies, and research demonstrating that when upper- and lower-income families move, they often move into neighborhoods with similar demographics as their old neighborhoods (Massey, Gross, & Shibuya, 1994; Winslow, 2001). Hypothesis 1 examines the relationship between children's trajectories of CP and neighborhood risk. Hypothesis 2 tests the assumption that children from poorer neighborhoods are exposed to higher-levels of environmentally based risk factors that push them towards CP than are children from more prosperous communities, as is implied by Raine's (Raine & Venables, 1984) social push hypothesis. Finally, Hypotheses 3 and 4 compare the developmental histories of CP groups within and across neighborhood trajectories.

*Hypothesis 1.* Across analyses, a higher proportion of children from *persistently impoverished* neighborhoods will be classified into the chronic CP and late-starting trajectory groups compared to children from *persistently advantaged* neighborhoods. The proportion of chronic CP children and late-starters from *variable-improving* neighborhoods will be greater than the proportion of such children from *persistently advantaged* neighborhoods, but significantly smaller than the proportion of such children from *persistently impoverished* neighborhoods.

*Hypothesis 2.* Children from *persistently impoverished* neighborhoods will be exposed to higher levels of environmentally-based risk factors than children from *variable-improving* and *persistently advantaged* neighborhoods.

*Hypothesis 3.* Children from high-CP groups (i.e., chronic CP youth, late-starters, desisters) in *persistently impoverished* neighborhoods will be characterized by more cognitive, familial, and peer risk factors than their counterparts from *persistently advantaged* neighborhoods, but fewer biological risk factors than high-CP youth from *persistently advantaged* neighborhoods. High-CP children from *variable-improving* neighborhoods will be characterized by intermediate levels of risk (i.e., significantly more biological risk factors than their counterparts from *persistently impoverished* neighborhoods, but significantly fewer cognitive, familial, and peer risk factors).

*Hypothesis 4.* Within each neighborhood trajectory, high-CP youth will be characterized by more biological (i.e., risk factors that are highly heritable and/or affected by biological processes such as ADHD, irritable temperament, and Verbal IQ), cognitive, familial, and peer risk factors for CP than non-CP children.

## METHOD

Methods for the PMCP sample are presented first, and followed by a review of the methods for the PYS sample. Methods for the preadolescent PYS analyses and the middle childhood to late adolescence PYS analyses are presented together because they are similar. However, before turning to the sample-specific methodologies, an overview of some of the strategies that were used to guide the selection of measures is presented below.

For the PMCP sample, SPGM was used to assign children to groups based on their joint trajectories from 5 to 12 of neighborhood SES as defined by U.S. Census data, and CP as rated by the participants' mothers. The same procedures were used to model the trajectories of CP and

neighborhood SES among the preadolescent PYS participants, except their trajectories were only modeled from 8 to 12. For the middle childhood to late adolescence PYS analyses, which modeled neighborhood SES and CP from 10.5 to 18, neighborhood SES scores were again based on data from the U.S. Census Bureau. However, CP was measured via youth self-reports. Different informants were employed across analyses, because child reports of CP tend to be unreliable during early childhood (Hinshaw & Zupan, 1997), and maternal reports of CP tend to be unreliable during adolescence (Loeber & Schmaling, 1985). Furthermore, adolescents demonstrate growth in covert forms of antisocial behavior (e.g., stealing, vandalism; Stanger, Achenbach, & Verhulst, 1997), and their mothers are often unaware of these behaviors (Loeber & Schmaling, 1985).

The importance of risk factors from three domains were assessed in this study: child, family, and peer risk factors. A decision was made to measure the risk factors for CP before the trajectories of CP and neighborhood SES began or during the first-year of those trajectories. If the risk factors were measured later, it would be difficult to determine whether they precede or follow the onset of CP.

To facilitate comparisons between findings from the PMCP and PYS analyses, efforts were made to employ similar measures across samples when possible. However, specific risk factors were only measured in one sample when their relation to CP was of greater developmental salience (e.g., peer relations during adolescence, negative emotionality during infancy).

## PMCP Method

### *PMCP Subjects*

The 310 participants in the PMCP were followed longitudinally from ages 1.5 to 12. Recruitment was conducted over the course of two years at Women, Infants, and Children (WIC) Nutritional Supplement Program Clinics in Allegheny County, PA. WIC provides nutritional aid for income-eligible families in the United States. The sample that was recruited was ethnically diverse and of low-SES. Fifty-four percent of the target children were Caucasian, 40% were African-American, and 6% were from other races (e.g., Hispanic American, Asian American, or biracial). The mean per capita income of their families was $242 per month ($2,892 per year, and $11,616 for a family of four), and their mean Hollingshead SES score was 24.5, indicative of a working class sample. Retention rates have been consistently high across the 10.5-year span of the study. An average of 85% or 264 participants were seen for assessments from ages 10 to 12. Participants who continued to participate in the study between ages 10 to 12 did not significantly differ from those who did not on their mean levels of SES at the time of recruitment or on maternal reports of externalizing problems at ages 2 and 3.5 as measured with the 2 to 3 version of the CBCL (Achenbach, 1992), a well-validated measure that assesses behavioral and emotional problems among children.

### *PMCP Procedures*

PMCP participants and their mothers were seen for two- to three-hour visits when the boys were 1.5-, 2-, 3.5-, 5-, 6-, 8-, 10-, 11-, and 12-years old. During these visits, mothers and sons participated in a number of parent-child interaction tasks, and mothers completed a series of questionnaires about their child's behavior, their own adjustment, and their family functioning. Beginning at the age-8 assessment, children were interviewed about similar topics. The visits at ages 1.5, 3.5, 6, and 11 were conducted at the PMCP laboratory. The remaining visits were

conducted solely at the homes of the participants, except for the age 2 assessment, which was a combined home-laboratory visit. Participants were reimbursed for their time after each assessment.

### *PMCP Measures*

The measures used to assess the study variables for the PMCP sample are presented in Table 1.

#### *Child Conduct Problems*

Mothers' reports of CP were assessed at ages 5, 6, 8, 10, 11, and 12 using select items from the Child Behavior Checklist for ages 4-16 (CBCL, Achenbach, 1991). The items that were selected and averaged for this composite are listed in Appendix A. These items reflect a broad range of serious overt and covert antisocial acts, many of which are symptoms of Conduct Disorder on the DSM, and less-serious items that are common among young CP children (e.g., oppositionality, Shaw et al., 1994). The mean internal consistency of the selected CBCL items across ages was .81.

#### *Neighborhood SES*

The neighborhood SES variable that was created for this study was developed following the procedures employed by Wikström and Loeber (2000). First, participants addresses were geocoded at ages 5, 6, 8, 10, 11, and 12 using U.S. census data at the census tract level from the 2000 census. It seemed more appropriate to extract data from the 2000 U.S. Census than the 1990 U.S. Census because although the first age 5 assessment in the PMCP sample took place in 1994, more of the PMCP assessments occurred near 2000. Second, a list of census tracts that occurred in the sample from ages 5 to 12 was generated. Third, data associated with the various census tracts found in the sample were entered into a factor analysis. It should be noted that

Table 1. **Study Constructs and Measures for the PMCP Sample**

| Construct | Ages | Informant | Measures | Scale development |
|---|---|---|---|---|
| Conduct Problems | 5-12 | Mother | CBCL | Sum of selected items |
| Neighborhood SES | 5-12 | US Census Tract, year 2000 | Median family income<br>Percent of families below poverty line<br>Percent of households on public assistance<br>Percent unemployed<br>Percent of single-mother households<br>Percent of African-American<br>Median household size<br>Percent living in the area for more than 5 yrs.<br>Percent of residents between 11 and 19 yrs. | Factor analysis score |
| Early Childhood Risk Factors | | | | |
| Difficult Temperament | 1.5 | Observational | Assessment of Negative Emotionality | Sum of interval and global scores of negative affect |
| Behavioral Inhibition | 2 | Observational | Molecular Codes<br>Latency to approach cabinet<br>Time in proximity to mother<br>Global Codes<br>Distress, Approach/avoidance | Sum and average of behavioral molecular and global scores |
| ADHD Symptoms | 2 & 3.5 | Mother | CBCL, TCB | Sum of selected items |

Table 1. Continued

| Construct | Ages | Informant | Measures | Scale development |
|---|---|---|---|---|
| Verbal IQ | 5.5 | Child | WPPSI-R | Averaged scores on the Vocabulary and Information subsets |
| Familial Risk Factors | | | | |
| Marital Satisfaction | 1.5, 2, 3.5 | Mother | Maternal Adjustment Test | The inverse sum of MAT scores standardized and averaged for 1.5 and 3 year assessments |
| Maternal Depression | 1.5, 2, 3.5 | Mother | Beck Depression Inventory | Sum of scores, standardized and averaged across assessments for one score |
| Physical Punishment | 2 | Mother | Adolescent Parenting Interview | Sum of selected items |
| Rejecting Parenting | 2 | Observational | Home Observation for Measurement of the Environment, Acceptance Scale | Sum of selected items |
| | 1.5, 2 | Observational | Early Parenting Coding System | Standardized sum of selected scores |

tracks from the same neighborhood within the city of Pittsburgh were combined to prevent certain communities within the PMCP sample from unduly influencing the factor structure of the factor analysis. The variables that were included in the factor analysis were: median family income, % families below poverty level, % households on public assistance, % unemployed, % single-mother households, % African-American, median household size, % of householders living in the census tract for more than five years, and % of residents in the census tract between the ages of 11 and 19. Following this procedure, the participants were assigned neighborhood poverty scores across ages by linking the factor scores from the factor analysis to the various census tracts in which the participants lived over time. This measure of neighborhood poverty has been linked to maternal reports of neighborhood quality in prior investigations involving the PYS sample (Loeber et al., 1998).

Regarding the factor analysis described above, two factors were identified. The factor with the larger eigenvalue (4.72) had the highest factor loadings for % of families living below the poverty line (.94), % of single mother households (.92), and % unemployment (.85). The census tract variables that had lowest factor loading were median household size (-.01) and % of householders living in the community more than five years (-.23). They were the only census tract variable found to have had small influences (i.e., a factor loading below .40) on the factor described above.

*Early Childhood Risk Factors*

*Temperament.* Two measures of temperament were administered to the PMCP sample. The first was an observational assessment of negative emotionality during infancy. Observations were coded from 70-minute-long video recordings during the age 1.5 lab visit when boys participated in activities designed to elicit varying amounts of stress (Owens, Shaw, & Vondra,

1998). Coders made ratings on a five-point scale of the amount and intensity of an infant's fussing and crying and a global rating of each child's overall difficulty. Weighted kappas for these codes ranged from .77 to .96, with a mean of .87. Scores for these codes were standardized and averaged to create one observed negative emotionality score.

The second measure administered to the PMCP sample was an observational assessment of nonsocial Behavioral Inhibition (adapted from the work of Kagan, 1977) administered at the age 2 assessment. Coders rated boys' behavior on two molecular and two global codes in response to an audio recording of loud and threatening noises made by gorillas in the movie, "Gorillas in the Mist." The molecular codes included *latency to approach the cabinet* and *time in close proximity to mother*. The global ratings included *distress* and *approach/avoidance.* Distress was defined as facial or vocal expressions of fear and anxiety. Approach/avoidance ratings were based on the extent to which boys approached and investigated the cabinet. Inter-rater reliability was .9 or greater for all four scales. Correlations between the codes range from .26 to .70, with an average of .38. Children's scores on these codes were standardized and averaged to create one behavioral inhibition score.

*ADHD Symptoms.* Mothers reported on ADHD symptomatology at ages 2 and 3.5 using items from the 2 to 3 Child Behavior Checklist (CBCL; Achenbach, 1992) and the Larzelere Toddler Behavior Checklist (TBC, Larzelere, Martin, & Amberson, 1989). Like the CBCL, the TBC was designed to assess behavioral and emotional problems in young children. Four items relating to restlessness and inattentiveness were selected from these measures for the ADHD composite. These items are listed in Appendix B. The internal consistency of these items was .66 and .68 at the age 2 and 3.5 assessments, respectively. For analyses, the age 2- and 3.5-year

ADHD symptomatology scores were standardized and averaged to create one score ($r = .47$, $p < .001$).

*Verbal IQ.* Verbal IQ was assessed at age 5.5 using the Vocabulary and Information subtests of the WPPSI-R (Wechsler, 1989). The WPPSI-R is used for assessing the cognitive ability of young children and was standardized on a large representative sample (Wechsler, 1989). The Vocabulary and Information subtests correlate .68 and .75 respectively with the full Verbal Scale score (Sattler, 1992). For both subtests, the split-half reliability coefficients are .84 (Sattler, 1992). For analyses, scores for the Vocabulary and Information subtests were averaged to create one score ($r = .60$, $p < .001$).

*Familial Risk Factors*

*Marital Satisfaction.* The Marital Adjustment Test (MAT, Locke & Wallace, 1959) was administered to mothers in the PMCP sample at the 1.5- , 2-, and 3.5-year assessments to measure maternal satisfaction with her partner. The MAT has proven successful in discriminating harmonious and disturbed marriages (Locke & Wallace, 1959). The split-half reliability for the MAT is .90 (Locke & Wallace, 1959). For analyses, the inverse of the age 1.5-3.5 MAT scores were standardized and averaged to create one score. The mean correlation between the MAT scores over time was .67 ($p < .001$). Mothers who did not have partners were asked to report on their closest adult relationships. Mothers who had separated recently were asked to report on times when they had been living with their partners in the past year.

*Maternal Depression.* Mothers completed the Beck Depression Inventory (BDI; Beck, Ward, Mandelon, Mock, & Erbaugh, 1961) at ages 1.5, 2, and 3.5. The BDI is a well-established and widely used measure of depressive states. The instructions ask respondents to provide ratings over the last two weeks. However, in the present investigation, to provide a more stable indicator

of maternal mood, mothers were asked to rate their depressive symptomatology during the previous six months. For analyses, maternal BDI scores were standardized and averaged to create one score. Across assessments, mother's ratings on the BDI ranged between .65 and .67 (in each case, $p < .001$).

*PhysicalPunishment.* As a proxy measure for how often parents employ physical discipline, maternal attitudes about physical discipline was measured at the age 2 assessment using the Adolescent Parenting Interview (API; Bavolek, Kline, McLaughlin, & Publicover, 1977). The API was developed with the aim of identifying parenting factors related to child maltreatment. The internal consistency of the items from the API that were used to measure maternal attitudes about physical discipline in the PMCP sample was .67.

*Rejecting Parenting*. For the PMCP study, a multi-method approach was employed to measure maternal rejecting parenting. First, reports from trained examiners were collected at the age 2 home assessments using the *Acceptance* scale of the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984). The *Acceptance* subscale taps parent's responses to child misbehavior or distress (e.g., "parent does not shout at the child"). The alpha coefficient for the factor computed with data from the present sample was .67. Second, rejecting parenting was observed at the 1.5- and 2-year assessments using the Early Parenting Coding System (EPCS). The EPCS consists of nine parenting strategies coded molecularly and six global ratings (Winslow et al., 1995). Two of the molecular ratings, *critical statemen*t and *verbal/physical approval*, and three of the global ratings, *hostility*, *warmth*, and *punitiveness*, were used to create a rejecting parenting factor. Cohen's Kappa coefficients for the molecular codes were .79 for critical statements, and .87 for approval. Weighted Kappa coefficients for the global ratings were .89, .84, and .93 for hostility, warmth, and punitiveness, respectively. Scores

for each of these codes were standardized and summed to create one observed rejecting parenting score for each age ($r = .37$, $p < .001$). For analyses, the inverse of the Acceptance scale from the HOME and the average of the observed EPCS scores were composited ($r = .33$, $p < .001$).

## PYS Method

### *PYS Subjects*

The 503 boys from the PYS study were recruited while in first grade (Loeber et al., 1998). They represent a subgroup of boys who participated in a screening sample of randomly selected males attending public school in Pittsburgh. Half of the boys were selected for follow-up because they scored in the top 30% of the screening sample on parent, teacher, and self-reports of CP. The other half was randomly selected from the remaining 70% of the screening sample. The follow-up sample was ethnically diverse and included boys from a wide range of economic backgrounds. Approximately 56% of the boys were African-American, 41% Caucasian, and 3% from other races. Their mean Hollingshead score was 34, with a standard deviation of 11. As was true for the PMCP sample, retention rates were generally high at each assessment period. Eighty-two percent of the participants were involved in the final assessment which took place thirteen years after the initial assessment. Prior investigations using data from the youngest sample of the PYS study found that attrition in the sample was unrelated to SES or diverse measures of CP (Raine et al., 2005).

### *PYS Procedures*

The participants in the PYS sample were seen twice a year for assessments from ages 7 to 10, and then once a year until age 20. All assessments took place in the homes of the participant and generally lasted two hours. Parent and children were separately interviewed about family

functioning and the behavior of various family members were conducted at each assessment. As was true for the PMCP sample, participants were paid for their time following each visit.

### *PYS Measures*

The measures used to assess the study variables for the preadolescent PYS analyses are presented in Table 2. The measures that were used to assess the study variables for the middle childhood to late adolescence PYS analyses are presented in Table 3. CP risk factors were assessed one time at age 7.5 for the preadolescent PYS analyses, and on several occasions from 7.5 to 9.5. to create more generalizable constructs for the older PYS analyses.

#### *Child Conduct Problems*

For the preadolescent PYS analyses, the same measure of CP was employed as was used to measure CP in the PMCP sample. As mentioned previously, CP was measured in this manner for the preadolescent PYS analyses to facilitate comparisons with the results from the PMCP sample. Once again, this measure was based on select items from the Child Behavior Checklist for ages 4-16 (CBCL, Achenbach, 1991), which are listed in Appendix C. Maternal reports on this measure were collected at ages 8, 8.5, 9, 9.5, 10, 10.5, 11, and 12. The mean internal consistency of the selected CBCL items from the eight assessment points was .78.

For the older PYS analyses, child reports of CP were assessed at ages 10.5 and 11 and then yearly after that time until age 18 using the Self-Report Delinquency Scale (SRD; Elliott, Huizinga, & Ageton, 1985). The SRD assesses children's involvement in overt and covert forms of CP ranging from minor transgressions (e.g., sneaking into movies, or on buses) to serious offenses (e.g., attack with a weapon, rape). For each item, boys were asked if they had ever participated in the delinquent behavior, and if so, how often in the past 6-months. To account for item severity, items were weighted using a severity scale developed by Loeber and colleagues

Table 2. Study Constructs and Measures for the Preadolescent PYS Analyses

| Construct | Ages | Informant | Measures | Scale development |
|---|---|---|---|---|
| Conduct Problems | 8, 8.5, 9, 9.5, 110, 10.5, 11, 12 | Mother | CBCL | Sum of selected items |
| Neighborhood SES | 8, 8.5, 9, 9.5, 10, 10.5, 11, 12 | US Census Tract, year 1990 | Median family income<br>Percent of families below poverty line<br>Percent of households on public assistance<br>Percent unemployed<br>Percent of single-mother households<br>Percent of African-American<br>Median household size<br>Percent living in the area for more than 5 yrs.<br>Percent of residents between 11 and 19 yrs. | Factor analysis score |
| Childhood Risk Factors | | | | |
| Hyperactivity-Impulsivity-Attention Problems | 7.5 | Mother, Teacher | CBCL, Teachers Report Form<br>Hyperactivity, impulsivity, attention problems | Sum of selected items from both measures averaged together |
| Academic Achievement | 7 | Child | California Achievement Test<br>Reading Subscale<br>Language Subscale | Percentile Score |
| Attitudes about Delinquency | 7.5 | Child | Attitude Toward Delinquent Behavior Scale | Sum of items |

Table 2. Continued

| Construct | Ages | Informant | Measures | Scale development |
|---|---|---|---|---|
| Familial Risk Factors | | | | |
| Marital Agreement | 7.5 | Mother | Dyadic Adjustment Scale, Marital agreement factor | Sum of selected items |
| Maternal Stress | 7.5 | Mother | Perceived Stress Scale | Sum of items |
| Parent-Child Relationship Quality | 7.5 | Mother, Child | Child Relationship with Parent Scale, Poor relationship with parent factor | Sum of selected items |
| Physical Punishment | 7.5 | Mother, Child | Discipline Scale | Composite score of maternal and child reports |
| Parental Supervision | 7.5 | Mother, Child | Supervision Involvement Scale | Composite score of maternal and child reports |
| Peer Risk Factors | | | | |
| Deviant Friends | 7.5 | Mother, Child | Parents and Peers Scale | Sum of items |

Table 3. Study Constructs and Measures for the Older PYS Analyses

| Construct | Ages | Informant | Measures | Scale development |
|---|---|---|---|---|
| Conduct Problems | 10.5, 11, 12, 13, 14, 15, 16, 17, 18 | Child | SRD | Sum of selected items weighted by severity |
| Neighborhood SES | 10.5, 11, 12, 13, 14, 15, 16, 17, 18, 19 | US Census Tract, year 1990 | Median family income<br>Percent of families below poverty line<br>Percent of households on public assistance<br>Percent unemployed<br>Percent of single-mother households<br>Percent of African-American<br>Median household size<br>Percent living in the area for more than 5 yrs.<br>Percent of residents between 11 and 19 yrs. | Factor analysis score |
| Childhood Risk Factors | | | | |
| Hyperactivity-Impulsivity-Attention Problems | 7.5, 8, 8.5, 9, 9.5 | Mother, Teacher | CBCL, Teachers Report Form<br>Hyperactivity, impulsivity, attention problems | Sum of selected items from both measures averaged together |
| Academic Achievement | 7 | Child | California Achievement Test<br>Reading Subscale<br>Language Subscale | Percentile Score |

Table 3. Continued

| Construct | Ages | Informant | Measures | Scale development |
|---|---|---|---|---|
| Familial Risk Factors | | | | |
| Marital Agreement | 7.5, 8.5, & 9.5 | Mother | Dyadic Adjustment Scale, Marital agreement factor | Sum of selected items for a factor score; standardized and averaged across assessments |
| Maternal Stress | 7.5, 8.5, & 9.5 | Mother | Perceived Stress Scale | Scores were standardized and averaged across assessments |
| Parent-Child Relationship Quality | 7.5, 8, 8.5, 9, 9.5 | Mother, Child | Child Relationship with Parent Scale, Poor relationship with parent factor | Sum of selected items for a score; averaged scores across assessments |
| Physical Punishment | 7.5, 8, 8.5, 9, 9.5 | Mother, Child | Discipline Scale | Composite score of maternal and child reports across assessments |
| Parental Supervision | 7.5, 8, 8.5, 9, 9.5 | Mother, Child | Supervision Involvement Scale | Composite score of maternal and child reports, averaged across assessments |

Table 3. Continued

| Construct | Ages | Informant | Measures | Scale development |
|---|---|---|---|---|
| Peer Risk Factors | | | | |
| Deviant Friends | 7.5, 8.5, 9.5 | Mother, Child | Parents and Peers Scale | Sum of items for composite score, averaged across assessments |

(1998), which differentiated between serious and minor delinquents. The specific items that were used to assess CP among the older PYS participants and the weights assigned to the items can be found in Appendix B. As mentioned earlier, this measure of CP was limited to youth reports because of previous research suggesting that adolescents engage in more covert than overt forms of CP (Stanger et al., 1997), and their mothers are less knowledgeable about their covert than their overt antisocial acts (Loeber & Schmaling, 1985).

*Neighborhood SES*

For both the preadolescent and middle childhood to late adolescence PYS analyses, the same procedures were used to create a neighborhood SES score as was employed with the PMCP sample. However, data were taken from the 1990 U.S. Census instead of the 2000 U.S. Census because data collection for the PYS sample began in 1987. Also, the majority of the assessments that the PYS participants were involved in occurred closer to 1990 than 2000. For the preadolescent PYS analyses, data from ages 8, 8.5, 9, 9.5, 10, 10.5, 11, and 12 were included in the factor analyses that would be used to link children's tract numbers to neighborhood SES values. For the older PYS analyses, data collected at ages 10.5, 11, 12, 13, 14, 15, 16, 17, and 18 were included in the factor analyses. The factor analyses for the preadolescent PYS analyses yielded three factors, of which the factor with the largest eigenvalue (4.79) had the highest loadings for % of families on public assistance (.95), % of families living below the poverty line (.92), and % unemployment (.91). Only median household size and % of members in the community longer than five years had small influences on this factor (i.e., a factor loading below .40); their respective factor loadings were on -.04 and -.07. For the older PYS analyses, the factor analysis yielded two factors. The factor with the larger eigenvalue (4.38) had the highest factor loadings for families on public assistance (.95), % unemployment (.90), % of single mother

households (.89). Median household size and % of members in the community longer than five years were the only census variables found to have small influences (i.e., a factor loading below .40) on this factor; their respective factor loadings were on -.09 and -.11.

*Childhood Risk Factors*

*Hyperactivity-Impulsivity-Attention Problems.* For the preadolecscent PYS analyses, maternal and teacher reports of hyperactivity, impulsivity, and attention problems (HIA problems) at age 7.5 were averaged together from the 4 to 16 version of the CBCL and the Teachers Report Form (Achenbach & Edelbrock, 1986). The specific items that were used to create the HIA composite are listed in Appendix D. The internal reliability of this scale, calculated with data from the youngest cohort of the PYS study, was .82. For the older PYS analyses, a longitudinal composite of HIA problems was created that involved the same measures as the 7.5 version, but included data collected biannually from 7.5 to 9.5. Across assessments, children's HIA problem scores had correlations ranging from .61 to .76 (in each case, $p < .01$).

*Academic Achievement*. For both the younger and older PYS analyses, boys' Academic Achievement was measured by their performance on the Reading and Language subtest of the California Achievement Test (CAT), which was administered to the participants at school as part of a state-wide assessment.

*Attitudes about Delinquency.* For the younger PYS analyses, children's feeling about whether or not it is right to engage in various antisocial behaviors (e.g., steal from a store, hit another child) were assessed at age 7.5 with the Attitude Toward Delinquent Behavior Scale developed by Loeber and colleagues (1998). The internal reliability of this scale, calculated with data from the youngest cohort of the PYS study, was .82. Regarding the older PYS analyses,

children's scores on the Attitude Toward Delinquent Behavior Scale at ages 7.5, 8.5, and 9.5 were averaged to create a longitudinal measure of this risk factor. Across assessments, children's scores on the Attitude Toward Delinquent Behavior Scale had correlations ranging from .13 to .16 (in each case, $p < .05$).

*Familial Risk Factors*

*Marital Agreement.* Marital agreement was assessed via maternal report at age 7.5 for the preadolescent PYS analyses with the marital agreement factor (Loeber et al., 1998) of the Dyadic Adjustment Scale (Spanier, 1976). The agreement factor assesses the extent to which partners agree on important relationship issues (e.g., life goals), the amount of time partners spend together, and how satisfying the mother finds her relationship. This internal reliability of the agreement factor, calculated with data from the youngest cohort of the PYS study, was .82. For older PYS analyses, mother's scores on this scale at ages 7.5, 8.5, and 9.5 were standardized and averaged over time (the correlations between measures ranged from .53 to .63, $p < .05$) to create a longitudinal measure of marital agreement. This scale was only administered to mothers who were in a relationship at the time of the assessment.

*Maternal Stress.* Maternal stress in the PYS study was assessed with Perceived Stress Scale (PSS; Loeber et al., 1998) at age 7.5 for the preadolescent PYS analyses. The PSS asks mothers about their stress levels and their ability to cope with stress. The internal reliability of this scale, calculated with data from the youngest cohort of the PYS study, was .83. Maternal ratings on this scale from ages 7.5, 8.5, and 9.5 were standardized and averaged over time to create a longitudinal measure of maternal stress for the older PYS analyses. Across assessments, maternal stress scores had correlations ranging from .52 to .60 ($p < .05$ in each case)

*Parent-Child Relationship Quality.* In the PYS study, maternal and child reports of relationship quality were assessed with the *Poor Relation with Parent* factor (Loeber et al., 1998) of the Child Relationship with Parent Scale (Stouthamer-Loeber, 1991). This scale was administered biannually from 7.5 to 9.5. Only the assessment at 7.5 was used to measure parent-child relationship quality for the preadolescent PYS analyses. The measure for the older PYS analyses was based on the mean of the age 7.5, 8.5, and 9.5 measures, which demonstrated correlations between .47 and .60 over time (in each case, $p < .05$). Sample items from this factor assess how often the child feels like his parents bother him and how often the mother wishes her child would just leave her alone. The internal reliability of this scale, calculated with data from the youngest cohort of the PYS study, was .73.

*Physical Punishment.* For the preadolescent PYS analyses, physical punishment was assessed at age 7.5 with the Discipline Scale developed by Loeber and colleagues (1998), which asked mothers' about the frequency of their physical discipline. The child-report version of this measure asked the participants about how often their mothers slapped or spanked them. Regarding the older PYS analyses, a longitudinal composite of this measure was created that represented maternal and child-reports on the Discipline Scale collected biannually between the ages of 7.5 and 9.5 ($r$ ranged between .22 and .43 over time, in each case, $p < .05$).

*Parental Supervision.* Mother and child reports of supervision were assessed biannually from 7.5 to 9.5 in the PYS study with the Supervision/Involvement Scale (Loeber et al., 1998) based on Moos' Family Environment Scale (Moos & Moos, 1975), and Skinner, Steinhauer, and Santa-Barbara's (1983) Family Assessment measure. Items on this scale assess the extent to which mothers are aware of their sons' activities and the amount of time that children are left unsupervised. The internal reliability of this scale, calculated with data from the youngest cohort

of the PYS study, was .63. Maternal and child reports on this scale will be averaged across informants and over time. Only the assessment at 7.5 was used to measure parental supervision for the preadolescent PYS analyses. The measure for the older PYS analyses was based on the mean of the ages 7.5 to 9.5 measures, which demonstrated significant correlations over time (*r* ranged between .22 and .42 across assessments, in each case, $p < .05$).

*Peer Risk Factors*

*Deviant Friends.* For the preadolescent PYS analyses, maternal and child reports of peer deviance were assessed at age 7.5 using the Parents and Peers Scale (Loeber et al., 1998), an 11-item scale measuring the extent to which mothers approve of their sons' friends, and the behaviors that cause them to disapprove. The internal reliability of this scale, calculated with data from the youngest cohort of the PYS study, was .61. For the older PYS analyses, maternal and child reports on this scale at ages 7.5, 8.5, and 9.5 were averaged across informants and over time (*r* over time ranged between .25 and .39 across assessments, in each case, $p < .05$).

## Data Analysis

The goal of the proposed research is to test the social push hypothesis (Raine & Venables, 1984) within the context of *prolonged* neighborhood risk. This necessitates a strategy for data analysis that fully captures children's developmental histories of CP and neighborhood risk. Nagin's (1999, 2005) semi-parametric group-based approach (SPGM) for analyzing developmental trajectories is well-suited for this study. SPGM provides objective criteria for deciding how many types of trajectories exist within a population and for estimating the proportion of individuals who follow each trajectory. When simultaneously applied to two distinct longitudinal variables, SPGM classifies children into groups based on their joint trajectories of the variables under investigation (Nagin & Tremblay, 2001). In the current study,

children will be assigned to groups based on their joint trajectories of CP and neighborhood risk. Follow-up analyses will: (1) examine the conditional probability of being in specific CP trajectory groups (e.g., chronic high CP) with the conditional probability of being in specific neighborhood groups (e.g., persistently impoverished neighborhood), (2) examine whether boys from lower-income neighborhood trajectories have greater exposure to risk factors for CP as is assumed by the social push hypothesis, and (3) compare the developmental histories of CP groups within and across neighborhood trajectory types to assess whether CP boys from upper- and lower-income communities differ in their developmental histories. A more detailed description of the analytic strategies that will be used to test the hypotheses described on pages 25-26 is provided below.

*Hypothesis 1*

It was predicted that children who were exposed to prolonged neighborhood disadvantage would be at greater risk for chronic and late-starting pathways of CP. In order to test this hypothesis, chi-square tests were conducted to examine whether there were more chronic CP children in persistently disadvantaged neighborhoods than would be found if these children were equally distributed across neighborhoods. The present hypothesis would be confirmed if the $X^2$ statistics associated with the tests described above were significant and it was found that a higher proportion of chronic CP children and late-starters came from persistently impoverished neighborhoods than other types of neighborhoods.

Because the chi-square test described above depends on the way in which children are assigned to groups by SPGM, a brief of description of the SPGM technique follows (see Nagin, 2005, for a more detailed description of the analytic tool).

SPGM is a latent class growth curve modeling technique designed to identify individuals within a sample who follow similar trajectories. It can be used to estimate how many distinct trajectory patterns exist within a population and to assign individuals into groups based on the match between their trajectories and the trajectories of the various groups created by SPGM.

The procedures for estimating univariate trajectory models in SPGM (i.e., models that only evaluate trajectories for one variable at a time) will be discussed initially. This is important because the first step in conducting a joint trajectory analysis using SPGM is to evaluate separate univariate trajectory models for the two variables that are to be included in the joint trajectory model.

When deciding upon how many distinct trajectory groups exist within a population, SPGM evaluates the shape of trajectories for all of the individuals included in the population of interest. Trajectories for individuals *i*'s on the variable of interest *y* at a specific time *t*, given membership in a specific group *j*, can be estimated by the following equation:

$$y_{it}^{j} = \beta_0^{j} + \beta_1^{j}\,\mathrm{Age}_{it} + \beta_2^{j}\,\mathrm{Age}^2_{it} + \varepsilon_{it}$$

where the parameters, $\beta_0^{j}$ (intercept, or level when Age = 0), $\beta_1^{j}$ (slope, or growth rate), and $\beta_2^{j}$ (slope$^2$, or quadratic change in growth rate), determine the shape of the trajectory. The *j* which is superscripted above the parameters indicates that they are free to vary across groups. The $\varepsilon_{it}$ at the end of the equation represents the residual error of each individual's score.

After specifying a model, SPGM offers several sources of output that are helpful for evaluating the fit of the model. First, it is important to examine the statistical significance of the trajectory parameter estimates for each group included in the model. A significant parameter for

a group indicates that the parameter in question is necessary for describing the trajectory of that group. A nonsignficant parameter indicates a parameter that is extraneous and should be removed to improve fit.

Second, SPGM yields a value, which is referred to as the Bayesian Information Criterion (BIC). The BIC helps identify among a series of models, which model fits the best (i.e., has the optimal number of groups, all of which demonstrate optimal shape, meaning that there a no nonsignificant parameters included). Better fit is indicated by higher BIC values. According to Nagin (2005), the BIC is comparable to a goodness of fit test for selecting between models that are not nested, as is the case for alternate SPGM models. The BIC value associated with a model is based on the model's maximized likelihood minus a penalty for each parameter included in the model, thereby encouraging more parsimonious solutions with fewer groups.

Finally, a third source of output that helps determine fit are the mean posterior assignment probabilities by group. When SPGM assigns individuals to groups, it does so probabilistically, meaning that in most SPGM models, there is a chance that at least a few individuals will be misclassified. This happens because it is rare for individuals to perfectly follow the modal trajectory pattern of the groups to which they are assigned. The more that individuals deviate from what is normative for their trajectory groups, the lower their mean posterior assignment probabilities. Low posterior assignment probabilities are problematic because if subsequent analyses are planned with the groups created by SPGM, having too many individuals who are misclassified could lead to faulty findings. Nagin (2005) recommends against selecting models that have groups with mean posterior assignment probabilities below .70, even if they have the highest BIC score.

Regarding joint trajectory models, the same procedures are employed for estimating such models as are employed for estimating univariate models, except in the case of the joint trajectory analysis, two measurement series are included and two sets of trajectories are estimated. The output SPGM produces for joint trajectory models resembles the output SPGM produces for univariate models. More specifically, parameter estimates and mean posterior assignment probabilities are provided by group for both sets of trajectory groups and a BIC score is provided for the overall model. In addition, the joint trajectory model estimates conditional probabilities for classification into the various groups it identifies on the first trajectory it estimates (e.g., CP) given classification into specific groups on the second trajectory it estimates (e.g., neighborhood poverty). For well-fitting joint trajectory models, the conditional probabilities that are yielded should be similar to those that would be obtained by cross-tabulating group membership counts from each of the univariate models, except the conditional probabilities produced by the joint trajectory analysis tend to be more consistent (Nagin & Tremblay, 2001).

The same criteria that were used to determine the best-fitting univariate models (e.g., significance of parameter estimates, BIC score, mean posterior assignment probabilities) can also be applied to determine fit of the joint trajectory model. However, using the BIC to determine the best-fitting joint trajectory model is more complicated when evaluating joint trajectory models. This is because the number of alternate models that could be explored in the joint trajectory format grows exponentially as the size of the univariate models increase. For example, when evaluating a joint model based on two variables with four groups each, to truly determine which joint model has the highest BIC, a full model search would entail estimating 16 distinct joint models (e.g., 4 groups by four groups, 4 groups by 3 groups, and so on). For this reason, Nagin

(2005) recommends instructing SPGM to estimate joint trajectory models with the number of groups and parameter estimates found to be optimal in each of the univariate models tested beforehand. Decisions about fit can then be made by considering the significance of the trajectory parameters in the joint model, and by evaluating the mean posterior probabilities for the joint model.

*Hypothesis 2*

It was predicted that children from *persistently impoverished* neighborhoods would be exposed to higher levels of environmentally-based risk factors than children from *variable-improving* and *persistently advantaged* neighborhoods. To test this hypothesis, a series of one-way ANOVAs was conducted comparing the developmental histories of children from diverse neighborhood trajectories. One-way ANOVAs were chosen as a means of comparing neighborhood trajectory groups instead of a MANOVA to prevent case loss due to some participants having missing data for specific risk factors (e.g., in the PMCP sample, 22 of the 310 PMCP had missing data on one of the environmental risk factors and would have been omitted from a MANOVA analysis). Decisions about how to classify children were based on the SPGM analyses discussed above. Risk factors that were considered to be environmentally-based in the PMCP sample were maternal depression, low marital satisfaction, maternal physical discipline, and rejecting parenting. In the PYS sample, maternal stress, low marital agreement, poor parent-child relationship quality, maternal physical discipline, low caretaker supervision, and peer deviance were considered to be environmentally-based risk factors.

*Hypothesis 3*

It was predicted that the developmental histories of high-CP groups (e.g., chronic CP youth, late-starters, desisters) from poorer neighborhood groups would be characterized by more

cognitive, familial, and peer risk factors than their counterparts from persistently advantaged neighborhoods, but fewer biological risk factors. To test this hypothesis, a series of one-way ANOVAs were conducted comparing the developmental histories of CP groups across neighborhood trajectories (persistently impoverished vs. persistently advantaged). Once again, one-way ANOVAs were chosen as a means of comparing CP youth across communities instead of a MANOVA to prevent case loss due to some participants having missing data for specific risk factors (e.g., only 98 of the 310 PMCP participants would have had enough data to be included in a MANOVA analysis). Once again, decisions about how to classify children were based on the SPGM analyses discussed above. Risk factors that were considered to be biologically-based in the PMCP sample were ADHD symptoms, difficult temperament, low behavioral inhibition, and low Verbal IQ. This was based on research documenting the heritability of these traits (Biederman & Farone, 2002; DiLalla, Kagan, & Reznick, 1994; Plomin, 1999; Wachs & Bates, 2001). In the PYS sample, hyperactive-impulsive-inattentive behavior was considered a biologically based risk factor and so was achievement, given well-established relations based children's IQ and their performance on achievement tests (Sattler, 1992). Attitudes about delinquency was the only cognitive risk factor assessed in this study and it was measured in the PYS sample. Risk factors that were considered to be environmentally based across studies were mentioned above under hypothesis 2.

*Hypothesis 4*

It was predicted that, regardless of neighborhood trajectory, children who demonstrate high-levels of CP will have developmental histories characterized by more biological, cognitive, familial, and peer risk factors for CP than non-CP children. Again, the same process that was

used for testing hypothesis 3 will be employed to test this hypothesis, except CP groups will be compared within neighborhood trajectories rather than across such trajectories.

## RESULTS

Results from analyses involving the PMCP sample are presented first and followed by a presentation of results from the preadolescent PYS analyses. Results from the middle childhood to late adolescence PYS analyses are presented last. Within this organizational framework, results are reported in the following sequence: (1) descriptive statistics and bivariate correlations for CP, neighborhood SES, and the predictor variables; (2) estimates of the number of trajectory groups needed to describe CP development and neighborhood SES history within each set of analyses; (3) conditional probabilities for membership in specific CP trajectory groups (e.g., chronic CP) given membership in specific neighborhood SES trajectory groups (e.g., persistently impoverished); (4) a comparison of mean risk scores across neighborhood trajectory groups for environmentally based CP risk factors; and (5) a comparison of the developmental histories of CP children within and across neighborhood trajectories.

### PMCP Results

#### *Descriptive Statistics and Bivariate Correlations*

Descriptive statistics for CP, neighborhood SES, and the PMCP predictor variables are presented in Table 4. As the CP measure employed was created uniquely for this study, it is not possible to directly assess how participants in the PMCP compare to participants in other large longitudinal studies in regard to frequency and severity of antisocial behavior. However, because the CP measure used represents an average of maternal ratings on items tapping covert and overt antisocial behavior from the CBCL (i.e., scale ranging from ‘0’ to ’2’ for each item), it can be stated that on average, the mothers of the PMCP participants saw their children as

Table 4. Means and Standard Deviations for Study Variables for PMCP Sample

| | Child's Age | *M* | SD |
|---|---|---|---|
| *Maternal Reports of CP* | | | |
| CBCL | 5 | .26 | .21 |
| CBCL | 6 | .24 | .21 |
| CBCL | 8 | .20 | .21 |
| CBCL | 10 | .18 | .21 |
| CBCL | 11 | .19 | .23 |
| CBCL | 12 | .18 | .24 |
| *Neighborhood SES* | | | |
| 1990 U.S. Census | 5 | -.57 | 1.40 |
| 1990 U.S. Census | 6 | -.47 | 1.33 |
| 1990 U.S. Census | 8 | -.40 | 1.24 |
| 1990 U.S. Census | 10 | -.34 | 1.21 |
| 1990 U.S. Census | 11 | -.26 | 1.19 |
| 1990 U.S. Census | 12 | -.21 | 1.11 |
| *Census Tract Data at 5* | | | |
| Median Household Income | 5 | $29713.46 | $14420.54 |
| % of Families Living in Poverty | 5 | .19 | .17 |
| % of Families on Public Assistance | 5 | .07 | .07 |
| % Unemployed | 5 | .06 | .04 |
| % Single-Parent Families | 5 | .14 | .12 |
| % of Householders in Nbh. > 5 years | 5 | .61 | .11 |
| % African-American | 5 | .36 | .35 |
| % Percent Youth | 5 | .14 | .04 |
| Mean Household Size | 5 | 2.35 | .28 |
| *Census Tract Data at 12* | | | |
| Median Household Income | 12 | $31922.93 | $12610.41 |
| % of Families Living in Poverty | 12 | .15 | .14 |
| % of Families on Public Assistance | 12 | .06 | .06 |
| % Unemployed | 12 | .05 | .03 |
| % Single-Parent Families | 12 | .11 | .09 |
| % of Householders in Nbh. > 5 years | 12 | .61 | .13 |
| % African-American | 12 | .28 | .31 |
| Mean Household Size | 12 | 2.34 | .24 |

Table 4. Continued

| | Child's Age | *M* | SD |
|---|---|---|---|
| *Predictor Variables* | | | |
| ADHD Symptoms | 2-3.5 | .80 | .38 |
| Behavioral Inhibition | 1.5 | .00 | 1.00 |
| Difficult Temperament | 2 | 13.25 | 5.45 |
| Verbal IQ | 5 | 93.57 | 14.43 |
| Maternal Depression | 1.5-3.5 | 8.1 | 5.6 |
| Marital Satisfaction | 1.5-3.5 | 102.91 | 25.50 |
| Physical Discipline | 2 | -.38 | .29 |
| Rejecting Parenting | 1.5-3.5 | -.01 | .54 |

engaging in some deviant behaviors, but inconsistently, and with decreasing frequency over time.

In regard to the neighborhood data, mean values at ages 5 and 12 for the various census tract scores used to create the neighborhood poverty factors were included in Table 4 to provide greater detail about neighborhood conditions for participants in the PMCP sample throughout the study. The census tract variables that were used to define neighborhood SES suggest that on average, the participants from the PMCP sample were from high-risk communities characterized by low income and residential instability. However, the proportion of participants living in such communities declined over time.

Finally, the mean scores for the predictor variables suggest that the participants in the PMCP sample were at elevated risk for CP, based on maternal reports on the Beck Depression Inventory and the Marital Adjustment Scale, that were indicative of mild depression and marital distress, respectively. Furthermore, boys in the PMCP sample performed nearly a half standard-deviation below the mean on a test of Verbal IQ, further highlighting their at-risk status.

Bivariate correlation coefficients appear in Tables 5 through 7. Table 5 contains correlations coefficients for the six measures of CP and neighborhood SES collected between ages 5 and 12. Both CP and neighborhood SES demonstrated stability over time, but with decreasing stability as the length of time between assessments increased. More specifically, for CP, correlations ranged between .40 and .81 (in each case, $p < .05$). The weakest observed correlation was between children's CP scores at ages 5 and 12. For neighborhood SES, correlations ranged between .55 and .91 (in each case, $p < .05$). As was true for CP, the weakest observed correlation was for children's neighborhood SES scores at ages 5 and 12.

Table 5. Correlations Between Maternal-Reports of CP and Neighborhood SES for PMCP

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. CP, Age 5 | .64** | .56** | .40** | .46** | .40** | -.10 | -.07 | -.04 | .04 | -.01 | .02 |
| 2. CP, Age 6 | --- | .64** | .54** | .47** | .51** | -.15* | -.17* | -.18** | -.16* | -.16* | -.07 |
| 3. CP, Age 8 | | --- | .68** | .60** | .57** | -.06 | -.06 | -.08 | -.06 | -.07 | -.04 |
| 4. CP, Age 10 | | | --- | .70** | .63** | -.11+ | -.12+ | -.14* | -.21** | -.20** | -.11 |
| 5. CP, Age 11 | | | | --- | .81** | -.05 | -.06 | -.07 | -.08 | -.13+ | -.07 |
| 6. CP, Age 12 | | | | | --- | -.05 | -.07 | -.06 | -.04 | -.09 | -.07 |
| 7. Neighborhood SES, Age 5 | | | | | | --- | .89** | .76** | .69** | .55** | .55** |
| 8. Neighborhood SES, Age 6 | | | | | | | --- | .81** | .72** | .55** | .57** |
| 9. Neighborhood SES, Age 8 | | | | | | | | --- | .83** | .73** | .65** |
| 10. Neighborhood SES, Age 10 | | | | | | | | | --- | .87** | .79** |
| 11. Neighborhood SES, Age 11 | | | | | | | | | | --- | .91** |
| 12. Neighborhood SES, Age 12 | | | | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

Table 6. Correlations Between Maternal-Reports of CP and Predictor Variables for PMCP

| Variable | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|
| 1. CP, Age 5 | .32** | -.14* | .09 | -.07 | -.19** | .28** | .03 | .21** |
| 2. CP, Age 6 | .28** | -.18* | -.02 | -.17* | -.20** | .26** | .01 | .21** |
| 3. CP, Age 8 | .25** | -.20** | .01 | -.06 | -.15* | .22** | -.02 | .09 |
| 4. CP, Age 10 | .23** | -.07 | .01 | -.08 | -.16* | .20** | .00 | .09 |
| 5. CP, Age 11 | .20** | -.13+ | .09 | -.13+ | -.26** | .26** | -.02 | .18** |
| 6. CP, Age 12 | .16* | .01 | -.01 | -.12+ | -.20** | .22** | -.02 | .15* |
| 7. ADHD symptoms | --- | -.16* | .03 | -.03 | -.17** | .23** | .16** | .20** |
| 8. Behavioral Inhibition | | --- | .09 | .02 | .00 | .00 | -.06 | -.11 |
| 9. Difficult Temperament | | | --- | -.01 | -.12* | .06 | .00 | -.04 |
| 10. Verbal IQ | | | | --- | -.08 | -.07 | .00 | -.35** |
| 11. Marital Satisfaction | | | | | --- | -.43** | .02 | -.10 |
| 12. Maternal Depression | | | | | | --- | .00 | .14* |
| 13. Physical Discipline | | | | | | | --- | -.16** |
| 14. Rejecting Parenting | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

Table 7. Correlations Between Neighborhood SES Scores and Predictor Variables for PMCP

| Variable | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|
| 7. Neighborhood SES, Age 5 | -.10 | .00 | .06 | -.30** | .15* | -.17** | -.14* | -.27** |
| 8. Neighborhood SES, Age 6 | -.10 | -.01 | .04 | .24** | .15* | -.16* | -.21 | -.29** |
| 9. Neighborhood SES, Age 8 | -.09 | -.06 | .04 | .24** | .15* | -.18 | -.07 | -.29** |
| 10. Neighborhood SES, Age 10 | -.08 | -.08 | .09 | .18** | .14* | -.15* | -.08 | -.26** |
| 11. Neighborhood SES, Age 11 | -.05 | -.04 | .12 | .21** | .14* | -.15* | -.08 | -.23** |
| 12. Neighborhood SES, Age 12 | -.05 | -.12 | .11 | .19* | .12+ | -.17* | -.08 | -.18** |
| 7. ADHD symptoms | --- | -.16* | .03 | -.03 | -.17** | .23** | .16** | .20** |
| 8. Behavioral Inhibition | | --- | .09 | .02 | .00 | .00 | -.06 | -.11 |
| 9. Difficult Temperament | | | --- | -.01 | -.12* | .06 | .00 | -.04 |
| 10. Verbal IQ | | | | --- | -.08 | -.07 | .00 | -.35** |
| 11. Marital Satisfaction | | | | | --- | -.43** | .02 | -.10 |
| 12. Maternal Depression | | | | | | --- | .00 | .14* |
| 13. Physical Discipline | | | | | | | --- | -.16** |
| 14. Rejecting Parenting | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

Regarding associations between CP and neighborhood SES, with a few exceptions, measures of CP and neighborhood SES were generally unrelated. When significant relationships were detected (e.g., at age 6, $r = -.15$, $p < .05$, and at age 10, $r = -.21$, $p < .01$), neighborhood SES predicted CP in a negative manner each time, such that when neighborhood SES increased, risk for CP decreased.

Bivariate correlation coefficients between the six measures of CP collected between ages 5 and 12 and the predictor variables are presented in Table 6. CP generally demonstrated weak to modest associations with the predictor variables, though relations were generally stronger for predictor variables that were also measured via maternal report. For instance, correlations as high as .32 ($p < .01$) were observed between maternal reports of ADHD symptoms and CP at age 5, as low as -.26 ($p < .01$) for maternal reports of marital satisfaction and CP at age 11, and as high as .28 ($p < .01$) for maternal reports of depression and CP at age 5. Correlations between maternal reports of CP and predictor variables that were observed tended to be weaker (e.g., observations of difficult temperament were unrelated to maternal reports of CP). However, this does not mean that all predictor variables assessed via maternal reports were related to children's CP as reported by mothers (e.g., maternal beliefs about physical discipline were unrelated to maternal reports of CP). Nor does this mean that all of the predictor variables that were observed failed to predict maternal reports of CP. Correlations as low as -.21 ($p < .01$) were detected between observations of rejecting parenting during early childhood and maternal reports of CP at ages 5 and 6, and as low as -.20 ($p < .01$) between observations of behavioral inhibition at 18 months and maternal reports of CP at age 8.

In Table 7, correlation coefficients are presented for the six measures of neighborhood SES collected between ages 5 and 12 and the predictor variables. Boys from lower SES

neighborhoods were found to be at increased risk for parental rejection ($r$ as low as -.29 across ages, $p < .01$) and more likely to have low Verbal IQs ($r$ as high as .30 across ages, $p < .01$). In addition, their mothers were more likely to endorse symptoms of depression ($r$ as low as -.17 across ages, $p < .01$) and less likely to express satisfaction with their closest adult relationships ($r$ as high as .15 across ages, $p < .05$). The mothers of boys from low SES neighborhoods were also more likely to have favorable views of physical discipline, though this relationship between neighborhood SES and maternal views about physical discipline declined over time ($r = -.14$ for age 5 neighborhood SES, $p < .05$, but at later ages, was not significant).

***Individual and Joint Trajectories of CP & Neighborhood SES***

As mentioned previously, the first step in conducting a joint trajectory analysis using SPGM is to identify optimal univariate models for the variables that are to be included in the joint analysis. For this reason, univariate models for CP and neighborhood SES were evaluated first. Results from the univariate models are reported below.

Researchers who use SPGM and GGCM to study CP typically identify three to six CP groups (Broidy et al., 2003; Nagin & Tremblay, 2001, NICHD Early Child Care Research Network, 2004; Shaw et al., 2003). As a precaution, the first CP model that was tested was limited to two groups. One additional group was added to each subsequent CP model until the BIC score associated with each subsequent model ceased to increase. Model testing was conducted using the censored normal version of SPGM, which as mentioned previously, accounts for skewed data. Because TRAJ can model trajectories on individuals who have missing data points, in the present investigation, individuals who had at least two data points were included in the trajectory models. Following Nagin's (2005) recommendation, quadratic coefficients were assigned to each group for initial model testing. This allows for non-linear

growth in the trajectories being evaluated. Table 8 contains BIC scores for all of the univariate CP models that were tested. As is evident in the table, the five-group solution provided the best fit for CP growth among the PMCP participants between the ages of 5 and 12. However, because some of the trajectory coefficients for the initial best-fitting model failed to achieve significance, the initial best-fitting model had to be modified to ensure optimal model fit. More specifically, for three of the five groups, the quadratic term had to be removed from the model because the intercept and linear terms were sufficient for describing their growth (see Table 8).

In regard to the neighborhood SES model, the same procedures as those described above were employed to determine the best-fitting model. As was the case for CP, the first model that was tested for neighborhood SES was limited to two groups, because as discussed earlier, multiple neighborhood SES groups were expected (see page 20), yet it was unclear how many to expect. BIC scores for univariate neighborhood SES models with two through six groups are depicted in Table 8, for which the six-group solution provided the best fit for the neighborhood SES trajectories. However, when criteria other than the BIC score were considered (i.e., mean posterior assignment probabilities, parsimony), the four-group solution appeared to provide a more adequate fit. The six-group solution was faulty because one of the groups included in the model had a low mean posterior probability (.48), indicating that for some of the participants, there was a greater than 50% chance of being misclassified. The reason for choosing the four-group solution over the five-group solution, which had a higher BIC value, was because the fifth group in the five-group model split one of the groups from the four-group solution into two smaller groups. The fourth and fifth groups had similar slopes and were difficult to distinguish. The four-group solution was deemed the better fit because it was more parsimonious, yet had much in common with the five-group solution. Researchers who use SPGM commonly opt for

Table 8. BIC by Model Type for CP and Neighborhood SES from Ages 5 to 12 for PMCP

| Model | Order | BIC |
|---|---|---|
| *CP* | | |
| a. Two group | 2 2 | -186.02 |
| b. Three group | 2 2 2 | -100.10 |
| c. Four group | 2 2 2 2 | -84.04 |
| d. Five group | 2 2 2 2 2 | -60.78 |
| e. Six group | 2 2 2 2 2 2 | -65.37 |
| f. Five group | 1 1 2 1 2 | -54.00 |
| | | |
| *Neighborhood SES* | | |
| a. Two group | 2 2 | -2109.67 |
| b. Three group | 2 2 2 | -1931.71 |
| c. Four group | 2 2 2 2 | -1843.61 |
| d. Five group | 2 2 2 2 2 | -1799.24 |
| e. Six group | 2 2 2 2 2 2 | -1748.79 |
| f. Four group | 2 1 1 0 | -1834.48 |

*Note.* Entries in the second column denote the parameters used to define the shape of each group's trajectory. Groups represented by the number 0 were defined solely by their intercepts. Groups represented by the number 1 were defined by their intercepts and a linear growth term. Finally, groups represented by the number 2 were defined by their intercepts, a linear growth term, and a quadratic term.

the more parsimonious model when having to choose between two models that only vary in slight ways, even if this means opting for the model with the smaller BIC (Brame et al., 2001; Nagin, 2005). To enhance the fit of the four-group solution, nonsignificant trajectory coefficients from the four-group model were removed. This resulted in one group that could be defined solely by the intercept (i.e., the trajectory did not demonstrate change), two groups that were best defined by the intercept and a linear growth term, and a fourth group, that required an intercept, a linear growth term, and a quadratic term to explain neighborhood SES over time. The BIC score for this final model is listed in Table 8.

After deciding upon optimal univariate models, the joint trajectory model was specified using the number of groups and the shape of trajectories from the univariate models. According to Nagin (2005), this approach typically yields the best fitting joint trajectory model. However, in the present situation, this strategy caused one of the five CP groups identified in the univariate CP model to decline from 5% to 1.6% of the sample, or five out of the 310 subjects in the sample. As five subjects is too few to compare to the other four CP groups, the four-group univariate model for CP was re-estimated, but with nonsiginficant parameters removed to allow for the estimation of a joint trajectory model that only included four CP groups. This resulted in a univariate CP model that included four CP groups, all of which followed a linear trajectory. The BIC score associated with this model was -74.26.

Thus, the joint trajectory model for CP and neighborhood SES in the PMCP sample included four CP and four neighborhood SES groups. Parameter estimates for both sets of trajectories are presented in Table 9. In addition, estimated group sizes and posterior assignment probabilities for both sets of trajectory groups are reported on in Table 9. Figures 1 and 2 display these observed trajectories graphically and as would be predicted by the parameter estimates for

Table 9. Estimated Trajectory Parameters, Percentages, and Posterior Assignment Probabilities for CP and Neighborhood SES Groups for 5 to 12 PMCP Trajectories

| | Intercept | | Slope | | Quadratic | | Est. % of | Post. Assignment Prob. | |
|---|---|---|---|---|---|---|---|---|---|
| Trajectory Group | β | *SD* | β | *SD* | β | *SD* | Population | *M* | *SD* |
| *CP* | | | | | | | | | |
| Abstainers | -0.039* | 0.017 | -0.030*** | 0.004 | ---- | 0.0168 | 30.1% | .88 | .14 |
| Occasional Rule-Breakers | 0.185*** | 0.012 | -0.012*** | 0.003 | ---- | ---- | 49.8% | .89 | .14 |
| Desisters | 0.383*** | 0.021 | -0.054*** | 0.008 | ---- | ---- | 10.0% | .80 | .18 |
| Chronic CP | 0.563*** | 0.016 | 0.033*** | 0.006 | ---- | ---- | 10.0% | .94 | .12 |
| *Neighborhood SES* | | | | | | | | | |
| Poverty-Stricken-Stable | -3.376*** | 0.142 | -0.063 | 0.031 | 0.050** | 0.017 | 5.8% | .97 | .08 |
| Poverty-Stricken-Improve | -2.040*** | 0.109 | 0.522*** | 0.031 | ---- | ---- | 5.3% | .95 | .12 |
| Lower-Class | -0.873*** | 0.044 | 0.053*** | 0.012 | ---- | ---- | 34.8% | .96 | .10 |
| Lower-Middle-Class | 0.436*** | 0.033 | ---- | | ---- | ---- | 54.1% | .93 | .14 |

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

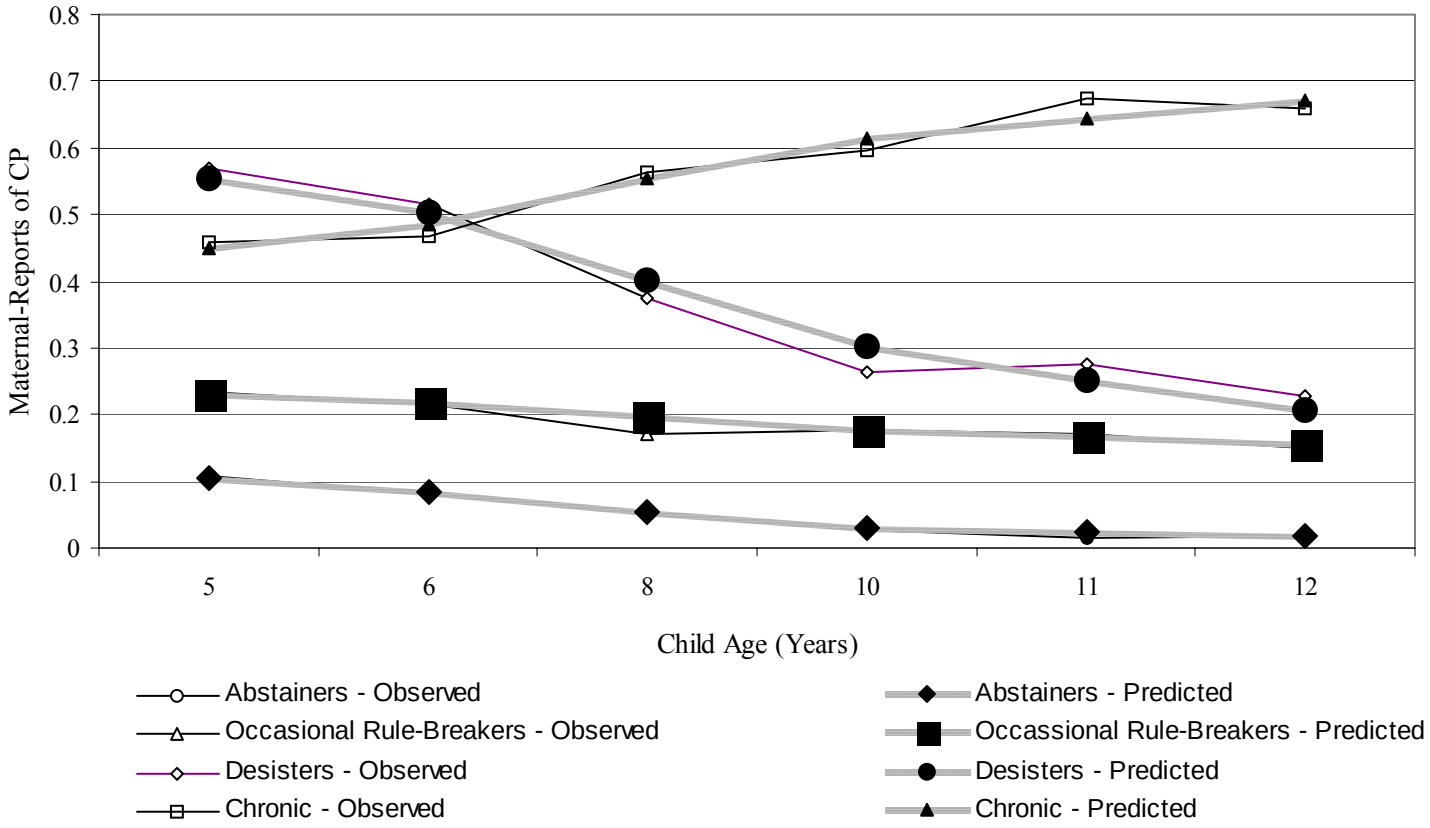


Figure 1. Maternal reports of CP by CP trajectory group for PMCP sample

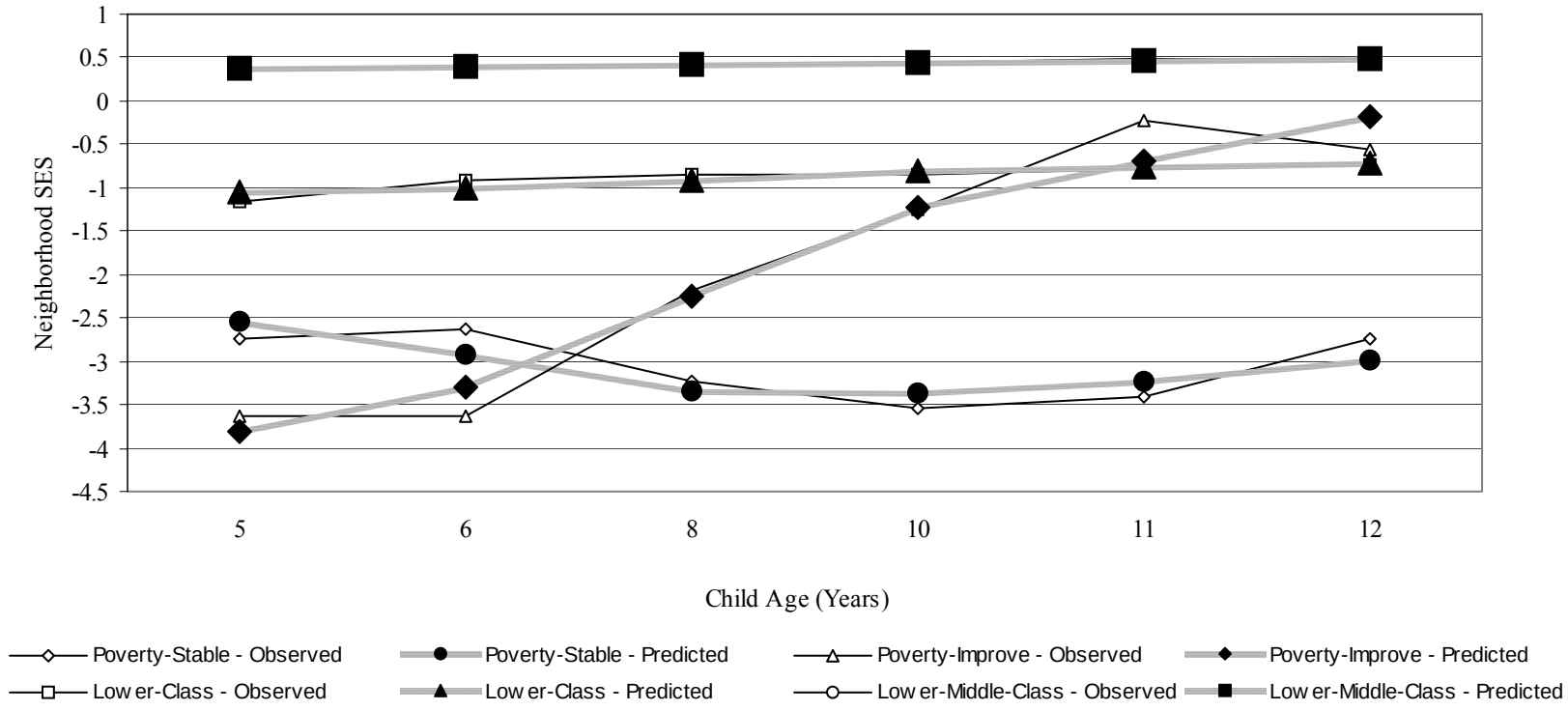


Figure 2. Neighborhood SES scores by neighborhood SES trajectory groups in PMCP Sample

the trajectories reported in Table 9. More specifically, the parameter estimates reported in Table 9 determine the shape of the predicted trajectories in the Figures. The observed trajectories in Figures 1 and 2 represent mean CP scores for the members of each CP group or mean neighborhood SES scores for the neighborhood SES groups, respectively at the various time points these variables were assessed.

Of the four CP groups included in the joint trajectory model, one group engaged in low levels of CP from ages 5 to 12. This group, which included 30.1% of the sample, will be referred to as Abstainers throughout the remainder of the paper. Another group, which will be referred to as Occasional Rule-Breakers, included 49.8% of the sample, and these boys were involved in a moderate level of CP from ages 5 to 12. A third group that included 10% of the sample will be labeled as Desisters. This group was involved in the highest level of CP at age 5, but demonstrated a significant decline over time. By age 12, the Desisters were involved in only slightly more CP than the Occasional Rule-Breakers. Finally, the fourth group was involved in almost as much CP as the Desisters at age 5, but demonstrated growth in CP over time so that by age 12, these boys were engaging in significantly more CP than any other group. This group, which included 10% of the PMCP sample, will be referred to as the Chronic CP group. Mean posterior assignment probabilities for the four CP groups were adequate, ranging from .80 to .94 with an average of .88 across groups.

In regard to the four neighborhood SES groups, three were characterized by stability over time, one at the upper end (i.e., relatively higher SES) of the sample's distribution for neighborhood SES, another in the middle of the distribution, and a third at the low end of the distribution. The fourth group was marked by change, starting with relatively high disadvantage at age 5 and climbing to the level of neighborhood SES maintained by the middle stable group.

This pattern of growth within the fourth group indicates movement from lower-SES neighborhoods into more prosperous neighborhoods. Decisions about how to label these groups were based on mean census tract scores for the participants in these groups (i.e., the census tract variables that were included in the factor analysis used to quantify neighborhood SES). Mean census tract scores at age 5 by group are presented in Table 10. The mean age-12 census tract scores by group are presented in Table 11. For the remainder of the paper, the stable low group will be referred to as Poverty-Stricken Stable because the family poverty rate for families living in these communities was roughly 50% (i.e., the percent of families living in poverty in the community according to the census tract data). The Poverty-Stricken Stable group of boys accounted for 5.8% of the PMCP sample. The neighborhood SES group that demonstrated stability at the upper-end of the distribution will be called Lower-Middle-Class because poverty was rare in their neighborhoods, but still present (see Tables 10 and 11). Among the PMCP participants, 54.1% of the sample was classified into this group. The stable group that had neighborhood SES scores that were intermediate of the Poverty-Stricken Stable and Lower Middle-Class groups will be referred to as Lower-Class because poverty was still common in the neighborhoods from which these participants came, but not as much as was the case for the boys from the Poverty-Stricken Stable group. Nearly 35% of the PMCP sample was assigned to the Lower-Class neighborhood group. Finally, the neighborhood SES group that demonstrated movement from lower SES to higher SES neighborhoods will be named Poverty-Stricken Improve. At age 5, the family poverty rate was greater than 50% for the neighborhoods in which these participants lived, but by age 12, these participants were living in communities that only had a mean family poverty rate of 18%. The Poverty-Stricken Improve boys accounted for 5.3%

Table 10. Mean Census Tract Values by Neighborhood Groups at Age 5 for PMCP

| | Poverty-Stricken- Stable (N=17) | Poverty-Stricken-Improve (N=15) | Lower-Class (N=97) | Lower-Middle-Class (N=170) |
|---|---|---|---|---|
| Median Household Income | $16141 ($6786) | $13120 ($3822) | $24052 ($8751) | $35869 ($14813) |
| % of Families Living in Poverty | .49 (.17) | .57 (.09) | .25 (.13) | .09 (.06) |
| % of Families on Public Assistance | .19 (.09) | .20 (.08) | .09 (.05) | .03 (.02) |
| % Unemployed | .11 (.04) | .14 (.02) | .07 (.04) | .04 (.02) |
| % Single-Parent Families | .33 (.17) | .45 (.11) | .18 (.09) | .07 (.04) |
| % of Householders in Neighborhood > 5 years | .51 (.12) | .52 (.05) | .59 (.08) | .64 (.13) |
| % African-American | .82 (.23) | .89 (.06) | .59 (.28) | .12 (.16) |
| % Percent Youth | .18 (.05) | .21 (.03) | .15 (.04) | .12 (.02) |
| Median Household Size | 2.45 (.47) | 2.67 (.38) | 2.34 (.27) | 2.31 (.22) |

*Note.* Standard deviations are reported in parentheses.

Table 11. Mean Census Tract Values by Neighborhood Groups at Age 12 for PMCP

| | Poverty-Stricken-Stable (N=17) | Poverty-Stricken-Improve (N=15) | Lower-Class (N=97) | Lower-Middle-Class (N=170) |
|---|---|---|---|---|
| Median Household Income | $14904 ($6336) | $27759 ($9289) | $26966 ($9536) | $37240 ($12097) |
| % of Families Living in Poverty | .50 (.20) | .18 (.14) | .20 (.10) | .08 (.05) |
| % of Families on Public Assistance | .20 (.10) | .08 (.06) | .08 (.04) | .03 (.02) |
| % Unemployed | .11 (.04) | .06 (.03) | .06 (.02) | .04 (.02) |
| % Single-Parent Families | .32 (.17) | .14 (.13) | .14 (.06) | .07 (.03) |
| % of Householders in Neighborhood > 5 years | .53 (.08) | .63 (.10) | .58 (.07) | .63 (.15) |
| % African-American | .82 (.26) | .38 (.29) | .46 (.30) | .09 (.14) |
| % Percent Youth | .18 (.05) | .15 (.06) | .14 (.03) | .12 (.02) |
| Median Household Size | 2.44 (.47) | 2.36 (.24) | 2.28 (.27) | 2.36 (.20) |

*Note.* Standard deviations are reported in parentheses.

of the sample. Mean posterior assignment probabilities for the four neighborhood SES groups were high, ranging from .93 to .97 with an average of .95.

Overall, 16 groups were created by the joint trajectory analysis described above (i.e., 4 CP groups by 4 neighborhood groups). The number of children and probability of assignment into the various groups created by the joint trajectory analysis are detailed in Table 12. The smallest group was the Chronic CP/Poverty-Stricken Improve neighborhood group, which did not include any children. Ninety-three children were assigned to the largest group, which was the Occasional Rule-Breaker/Lower-Middle-Class neighborhood group.

***Conditional Probabilities for Membership in CP Groups Given Neighborhood SES History and Vice-Versa***

Table 13 contains conditional probabilities for being assigned to the four CP groups given membership in one of the four neighborhood SES groups. The converse, conditional probabilities for being assigned to the four neighborhood SES groups given membership in one of the four CP groups, are reported on in Table 14. A descriptive summary of the probabilities listed in these Tables is provided below, and is followed by the results from a chi-square test used to assess whether Chronic CP children were evenly distributed across neighborhood trajectory groups.

Across all of the neighborhood groups, children were more likely to be assigned to either the Abstainer or Occasional Rule-Breaking groups (51-83% across neighborhood trajectory groups) than the two more deviant CP groups (i.e., Desister and Chronic CP groups, 17-49% across neighborhood trajectory groups). However, the ratio of Abstainers to Occasional-Rule Breakers varied somewhat across neighborhood groups. For instance, boys in the Lower-Class and Lower-Middle-Class neighborhood groups were more likely to be assigned to the Occasional

Table 12. Cell Sizes for CP and Neighborhood SES Trajectory Groups and Probabilities of Assignment in Joint CP/Neighborhood SES Groups for the PMCP Participants

| | Neighborhood SES Group | | | |
|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class | Lower-Middle-Class |
| Abstainers | 4 (.013) | 3 (.010) | 30 (.100) | 49 (.164) |
| Occasional Rule-Breakers | 5 (.017) | 9 (.030) | 48 (.161) | 93 (.311) |
| Desisters | 3 (.010) | 3 (.010) | 12 (.040) | 10 (.033) |
| Chronic CP | 5 (.017) | 0 (.000) | 7 (.023) | 18 (.060) |

*Note.* Joint probabilities are reported in parentheses.

Table 13. Estimated Conditional Probabilities of CP Trajectory Group by Neighborhood SES Trajectory Group for the PMCP Participants

| | Neighborhood SES Group | | | |
|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class | Lower-Middle-Class |
| Abstainers | .301 | .167 | .329 | .297 |
| Occasional Rule-Breakers | .211 | .650 | .470 | .532 |
| Desisters | .184 | .183 | .125 | .068 |
| Chronic CP Boys | .304 | .000 | .076 | .104 |

Table 14. Estimated Conditional Probabilities of Neighborhood SES Trajectory Group by CP Trajectory Group for the PMCP Participants

| | Neighborhood SES Group | | | |
|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class | Lower-Middle-Class |
| Abstainers | .058 | .030 | .380 | .533 |
| Occasional Rule-Breakers | .025 | .069 | .328 | .578 |
| Desisters | .106 | .097 | .432 | .365 |
| Chronic CP Boys | .175 | .000 | .263 | .562 |

Rule-Breaking group (47 and 53%, respectively) than the Abstainer group (33 and 30%, respectively). In the Poverty-Stricken Stable neighborhood group, the reverse was true (30% assigned to the Abstainer versus 21% assigned to the Occasional Rule-Breakers), and in the Poverty-Stricken Improve neighborhood group, the probability of being assigned to the Occasional Rule-Breaking group was more pronounced (65% assigned to the Occasional Rule-Breaking group versus 17% assigned to the Abstainers).

In regard to the more deviant CP groups, the probability of being assigned to the Chronic CP boys group was greatest in the Poverty-Stricken Stable neighborhood group. Over 30% of the boys in this neighborhood group were assigned to the chronic CP group compared to fewer than 11% of the boys in all of the other neighborhood groups. Remarkably, none of the youth from the Poverty-Stricken Improve neighborhood group were classified into the Chronic CP group. Youth from this neighborhood group had a higher chance of being classified into the desister group (18%) than youth from the Lower-Class (13%) and Lower-Middle-Class neighborhood (7%) groups, but had the same probability of desistance as youth from the Poverty-Stricken-Improve neighborhood group.

A chi-square test (16 cells, 4 CP groups x 4 neighborhood SES groups) was conducted to assess whether more boys from the poorer neighborhood groups were assigned to the Chronic CP and Desister groups than would be expected by chance. The chi-square statistic associated with this test was found to be significant ($\chi^2$=16.68, $p < .05$), indicating that boys from the various CP groups were not equally distributed across neighborhood trajectories. More specifically, more Chronic CP and Desister boys were found in the Poverty-Stricken Stable neighborhood group than would be expected if there was no relationship between CP and neighborhood SES. These findings are consistent with results projected for Hypothesis 1.

### *Mean Risk Scores for Environmentally-Based Risk Factors across Neighborhood Trajectory Groups*

Because Raine's (Raine & Venables, 1984) social push theory rests on the assumption that children from disadvantaged environments are exposed to more environmentally-based risk factors that generate vulnerability for CP, a series of one-way ANOVAs were conducted in which the developmental histories of the neighborhood SES groups were compared on the environmentally-based predictor variables included in this study (i.e., maternal depression, marital satisfaction, maternal physical discipline, and maternal rejecting parenting). Results from these analyses are presented in Table 15. Group differences that were found to be significant ($p <$ .05) are described below.

Overall, children from the Lower-Middle-Class neighborhood group were exposed to lower levels of environmentally-based risk than children from the other neighborhood SES groups, including less parental rejection than children from all of the poorer neighborhood groups, fewer maternal depressive symptoms than the children from the Poverty-Stricken Stable neighborhood group, and less favorable views of physical discipline than the mothers of children from the Lower-Class neighborhood groups. As postulated in Hypothesis 2, these findings lend credence to the notion that children from very poor neighborhoods are exposed to more environmentally-based risk factors than children from lower-middle-class communities.

### *Comparison of the Developmental Histories of CP Children across and within Neighborhood Trajectories*

As a means of testing Raine's (Raine & Venables, 1984) social push theory, CP groups were compared across and within neighborhood trajectory groups in a series of one-way ANOVAs. Raine's theory would be supported by findings that during early childhood, CP

Table 15. Mean Risk Scores for Environmentally-Based CP Risk Factors by Neighborhood Trajectory Group for PMCP Sample

| | Poverty-Stricken- Stable (N=17) | Poverty-Stricken-Improve (N=15) | Lower-Class (N=97) | Lower-Middle-Class (N=170) |
|---|---|---|---|---|
| Maternal Depression | 0.48[a] (1.10) | 0.21 (1.20) | 0.05 (0.93) | -0.07[a] (0.84) |
| Marital Satisfaction | -0.35 (1.08) | -0.18 (0.70) | -0.04 (0.84) | 0.06 (0.84) |
| Physical Discipline | -0.29 (0.43) | -0.13 (0.53) | -0.09[b] (0.61) | -0.31[b] (0.68) |
| Rejecting Parenting | 0.35[c] (0.49) | 0.27[d] (0.69) | 0.08[e] (0.58) | -0.11[cde] (0.47) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

children from more prosperous neighborhoods would be characterized by higher levels of risk on CP risk factors that are known to have a biological basis (i.e., in the PMCP sample, ADHD symptoms, behavioral disinhibition, difficult temperament, low Verbal IQ), and less exposure to environmentally-based risk factors (i.e., maternal depression, marital dissatisfaction, maternal physical discipline, maternal rejecting parenting).

Because some of the joint trajectory groups identified by SPGM only included a few boys, for the purpose of comparing CP groups across and within neighborhood trajectories, CP groups from distinct neighborhood SES groups were combined to ensure at least marginal power for the analyses that follow. For example, the Chronic CP groups from the two Poverty-Stricken and Lower-Class neighborhood groups were merged to create a 12-member Chronic CP/Lower-SES neighborhood group that was comparable in size to the 18-member Chronic CP/Lower-Middle-Class neighborhood group. Before their merger, the three Chronic CP groups from the poorer neighborhood trajectory groups only included five, zero, and seven children. For consistency, all of the other CP groups within the three poorer neighborhood trajectory groups were combined with their respective counterparts in the same manner. For example, the three Desister groups from the three poorer neighborhood groups were combined and compared to their counterparts from the Lower-Middle-Class neighborhood group. Likewise so were the three Occasional Rule-Breaking and Abstainer groups. Combining groups in this way seemed justifiable in all cases because all of the CP groups from the two Poverty-Stricken neighborhood groups were very small (see Table 12) and all three poorer neighborhood SES groups had neighborhood SES scores that fell below the scores of the children from the Lower-Middle-Class neighborhood group (see Figure 2).

The results of the ANOVA analyses comparing Chronic CP groups across neighborhood types are presented in Tables 16. Because there were only 18 Chronic CP boys from the Lower-Middle-Class neighborhood group and 12 Chronic CP boys from all of the other neighborhood groups, power for detecting differences remained low despite one of the two chronic CP groups representing the merger of Chronic CP boys across multiple neighborhood types. Nonetheless, two marginally significant differences ($p < .10$) were found. First, the Chronic CP children from the Lower Middle-Class neighborhood group had higher verbal IQs than the Chronic CP boys from the Lower-SES neighborhood group, which as mentioned above, represented the composite of Chronic CP children from the three poorer SPGM-identified neighborhood groups. This is contrary to Hypothesis 3, which predicted that Chronic CP youth from more prosperous communities would demonstrate higher levels of biologically-based CP risk including low Verbal IQ. Second, during early childhood, the boys from the Lower-SES Neighborhood group were exposed to greater parental rejection than the Chronic CP boys from the Lower Middle-Class neighborhood group. This finding is consistent with Hypothesis 3, but had a weaker effect size than was predicted by Hypothesis 3.

Table 17 presents the results of the ANOVA analyses comparing Desisters groups across neighborhood types. Low power was also a concern for analyses that compared Desisters across neighborhood groups because only 10 boys from the Lower-Middle-Class neighborhood group and 18 boys from the Lower-SES neighborhood group were classified as Desisters. Nonetheless, the mothers of Desisters from the Lower-SES neighborhood groups were found to have views of physical discipline that were significantly more favorable than the mothers of Desisters from the Lower-Middle-Class neighborhood group ($p < .05$).

Table 16. Mean Risk Scores for Chronic CP Boys from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | Chronic CP/Lower-SES Neighborhood Groups (N=12) | Chronic CP/Lower-Middle-Class Neighborhood Group (N=18) |
|---|---|---|
| *Child Risk Factors* | | |
| ADHD Symptoms | 0.448 (0.800) | 0.273 (0.921) |
| Behavioral Inhibition | -0.093 (1.424) | -0.480 (1.105) |
| Difficult Temperament | 11.753 (4.776) | 14.679 (6.479) |
| Verbal IQ | 83.511 (8.681) | 93.906 (14.758) |
| *Family Risk Factors* | | |
| Maternal Depression | 0.421 (0.732) | 0.625 (1.238) |
| Marital Satisfaction | -0.427 (1.153) | -0.579 (0.795) |
| Physical Discipline | -0.125 (0.856) | -0.324 (0.643) |
| Rejecting Parenting | 0.418 (0.668) | 0.078 (0.494) |

*Note.* Standard deviations are reported in parentheses.

Table 17. Mean Risk Scores for Desisters from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | Desisters/Lower-SES Neighborhood Groups (N=18) | Desisters/Lower-Middle-Class Neighborhood Group (N=10) |
|---|---|---|
| *Child Risk Factors* | | |
| ADHD Symptoms | 0.543 (0.881) | 0.289 (0.991) |
| Behavioral Inhibition | -0.220 (0.991) | 0.079 (1.003) |
| Difficult Temperament | 13.293 (6.152) | 15.099 (4.481) |
| Verbal IQ | 88.178 (15.532) | 81.022 (13.557) |
| *Family Risk Factors* | | |
| Maternal Depression | 0.618 (0.811) | 0.088 (0.890) |
| Marital Satisfaction | -0.190 (0.992) | 0.029 (0.653) |
| Physical Discipline | 0.019[a] (0.485) | -0.556[a] (0.417) |
| Rejecting Parenting | 0.333 (0.573) | 0.304 (0.668) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Fortunately, there was greater power for ANOVA analyses that compared the Occasional Rule-Breaking boys from the Lower Middle-Class neighborhood group and all other neighborhood trajectory groups, as these groups included 93 and 62 boys, respectively. Table 18 presents the results of the ANOVA analyses comparing Occasional Rule-Breaking groups across neighborhood types. As was true for the Chronic CP Boys, Occasional Rule-Breakers from the Lower-SES neighborhood group experienced significantly greater parental rejection during early childhood and demonstrated lower Verbal IQs ($p < .05$).

There was also sufficient power for ANOVA analyses that compared the Abstainer groups from the Lower Middle-Class neighborhood group and Lower-SES neighborhood group. The results of the ANOVA analyses comparing Abstainer groups across neighborhood types are presented in Tables 19. Forty-nine boys from the Lower Middle-Class neighborhood group and 37 boys from the Lower-SES neighborhood group were classified as Abstainers. Significant group differences ($p < .05$) are reported below. Parental rejection was once again found to differentiate children from the Lower-Middle-Class neighborhood group and children from the Lower-SES neighborhood group, as Abstainers from the Lower-SES neighborhood group were found to have been exposed to higher levels of parental rejection during early childhood. Children from the Lower-SES neighborhood group were also found to be less temperamentally difficult as infants.

For the within-neighborhood group comparisons, the developmental histories of the four CP groups were compared within the Lower-Middle-Class neighborhood trajectory group, and a second time within the average of the three other neighborhood trajectory groups. Results from the within neighborhood trajectory comparisons are presented in Table 20 for the youth from Lower-Middle-Class neighborhoods and in Table 21 for youth from the Lower-SES

Table 18. Mean Risk Scores for Occasional Rule-Breakers from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | Occasional Rule-Breakers/Lower-SES Neighborhood Groups (N=62) | Occasional Rule-Breakers/Lower-Middle-Class Neighborhood Group (N=93) |
|---|---|---|
| *Child Risk Factors* | | |
| ADHD Symptoms | 0.121 (0.820) | -0.032 (0.777) |
| Behavioral Inhibition | 0.071 (0.807) | 0.050 (0.993) |
| Difficult Temperament | 13.389 (5.171) | 13.280 (5.372) |
| Verbal IQ | 90.631[a] (14.908) | 98.558[a] (14.956) |
| *Family Risk Factors* | | |
| Maternal Depression | 0.114 (0.957) | -0.098 (0.741) |
| Marital Satisfaction | -0.078 (0.683) | 0.095 (0.851) |
| Physical Discipline | -0.114 (0.542) | -0.308 (0.706) |
| Rejecting Parenting | 0.481[b] (0.576) | -0.152[b] (0.445) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 19. Mean Risk Scores for Abstainers from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | Abstainers/Lower-SES Neighborhood Groups (N=37) | Abstainers/Lower-Middle-Class Neighborhood Group (N=49) |
|---|---|---|
| *Child Risk Factors* | | |
| ADHD Symptoms | 0.249 (0.894) | -0.319 (0.928) |
| Behavioral Inhibition | 0.206 (1.041) | -0.445 (1.054) |
| Difficult Temperament | 9.863[a] (3.829) | 14.970[a] (5.748) |
| Verbal IQ | 92.627 (12.683) | 97.859 (9.428) |
| *Family Risk Factors* | | |
| Maternal Depression | -0.201 (1.104) | -0.293 (0.695) |
| Marital Satisfaction | 0.023 (0.962) | 0.261 (0.780) |
| Physical Discipline | -0.208 (0.583) | -0.268 (0.698) |
| Rejecting Parenting | 0.081[b] (0.557) | -0.201[b] (0.392) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 20. Mean Risk Scores for by CP Trajectory Groups within Lower-Middle-Class Neighborhood Group

| | Abstainers (N=49) | Occasional Rule-Breakers (N=93) | Desisters (N=10) | Chronic CP (N=18) |
|---|---|---|---|---|
| *Child Risk Factors* | | | | |
| ADHD Symptoms | -0.32[ab] (0.93) | -0.03 (0.78) | 0.29[a] (0.99) | 0.27[b] (0.92) |
| Behavioral Inhibition | -0.04 (1.05) | 0.05 (0.99) | 0.08 (1.00) | -0.48 (1.10) |
| Difficult Temperament | 14.97 (5.75) | 13.28 (5.37) | 15.10 (4.48) | 14.68 (6.48) |
| Verbal IQ | 97.86[c] (9.43) | 98.56[d] (14.96) | 81.02[cde] (13.56) | 93.91[e] (14.76) |
| *Family Risk Factors* | | | | |
| Maternal Depression | -0.29[f] (0.69) | -0.10[g] (0.74) | 0.09 (0.89) | 0.63[fg] (1.24) |
| Marital Satisfaction | 0.26[h] (0.78) | 0.10[i] (0.85) | 0.03 (0.65) | -0.58[hi] (0.80) |
| Physical Discipline | -0.27 (0.70) | -0.31 (0.71) | -0.56 (0.42) | -0.32 (0.64) |
| Rejecting Parenting | -0.21[j] (0.39) | -0.15[k] (0.44) | 0.30[j] (0.67) | 0.08[k] (0.49) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 21. Mean Risk Scores by CP Groups within Lower-SES Neighborhood Group

| | Abstainers (N=37) | Occasional Rule-Breakers (N=62) | Desisters (N=18) | Chronic CP (N=12) |
|---|---|---|---|---|
| *Child Risk Factors* | | | | |
| ADHD Symptoms | -0.25[abc] (0.89) | 0.12[a] (0.82) | 0.54[b] (0.88) | 0.45[c] (0.80) |
| Behavioral Inhibition | 0.21 (1.04) | 0.07 (0.81) | -0.22 (0.91) | -0.09 (1.42) |
| Difficult Temperament | 9.86[de] (3.83) | 13.39[d] (5.17) | 13.29[e] (6.15) | 11.75 (4.78) |
| Verbal IQ | 92.63 (12.68) | 90.63 (14.91) | 88.18 (15.53) | 83.51 (8.68) |
| *Family Risk Factors* | | | | |
| Maternal Depression | -0.21[f] (1.10) | 0.11 (0.96) | 0.62[f] (0.81) | 0.42 (0.73) |
| Marital Satisfaction | 0.02 (0.96) | -0.08 (0.68) | -0.19 (0.99) | -0.43 (1.15) |
| Physical Discipline | -0.21 (0.58) | -0.11 (0.54) | 0.02 (0.48) | -0.13 (0.86) |
| Rejecting Parenting | 0.08 (0.56) | 0.05[g] (0.58) | 0.33 (0.57) | 0.42[g] (0.67) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

neighborhood group. Significant between group differences ($p < .05$) are highlighted below. Unfortunately, for both sets of analyses, the Chronic and Desisting CP groups had fewer than 20 children each, meaning that analyses involving these groups were underpowered. Nonetheless, in both neighborhood types, the Chronic and Desisting groups were found to significantly differ from the Abstainer and Occasional Rule-Breaking groups in several ways. For instance, as presented in Table 20, in the Lower-Middle-Class neighborhood group, the Chronic CP boys were found to have had greater exposure to maternal rejection than the boys from the Abstainer group, and demonstrate more ADHD symptoms during early childhood. In addition, their mothers reported more depressive symptoms and less marital satisfaction than the mothers of the Abstainers and Occasional Rule-Breakers from the same neighborhood group. The Desisters in the Lower-Middle-Class neighborhood group had lower Verbal IQs and demonstrated more ADHD symptoms during early childhood than the Abstainers and Occasional rule-breakers from this same neighborhood group. In addition, the Desisters from the Lower-Middle-Class neighborhood group had greater exposure to maternal rejection than the Abstainers from the Lower-Middle-Class group.

In regard to the Lower-SES neighborhood group, as presented in Table 21, the Chronic CP Boys were found to have had developmental histories characterized by significantly higher levels of ADHD symptomology than the Abstainers, and greater exposure to maternal rejection than the Occasional Rule-Breakers. The Desisters from this neighborhood group were also found to have demonstrated more ADHD symptomology during early childhood than the Abstainers. In addition, as infants they were found to have demonstrated more difficult temperaments than the Abstainers from the Lower-SES neighborhood group.

Thus to review, children's trajectories of CP and neighborhood SES could each be summarized by four groups within the PMCP sample, and a modest relationship was detected between children's group membership in the various CP groups and neighborhood groups. More specifically, children reared in lower SES neighborhoods were found to be at significantly greater risk for classification into the Chronic CP group than children from more prosperous neighborhood groups. Classification into one of the poorer neighborhood groups was associated with significantly greater exposure to environmentally-based risk factors, including maternal rejection, maternal beliefs that were supportive of physical discipline, and maternal depressive symptoms.

The results from the PMCP analyses described above generally did not support the notion that environmentally-based risk factors play a greater role in the development of CP in poor communities than in middle-class communities, nor the converse, that biologically-based risk factors play a greater role in the development of CP in upper-income communities. Analyses comparing Chronic CP boys from lower-middle-class and poorer neighborhood groups failed to detect any statistically significant differences between the groups. Although marginal differences were found between Chronic CP boys from lower-middle-class and lower-SES neighborhoods in regard to Verbal IQ and exposure to maternal rejection, these risk factors also differentiated boys from these community types who only occasionally engaged in CP. This suggests that the risk factors that distinguished chronic CP youth from the lower-middle-class and poorer neighborhoods may not be specific to CP status, but to poor and lower-middle-class communities in general. Stated differently, the risk factors that differentiated CP groups across communities may simply be due to the correlation between neighborhood SES and the risk factors in question.

However, the findings described above should be interpreted cautiously because some of the CP groups were very small and the analyses comparing them were underpowered.

In regard to the Desisters, one group difference was found between lower-middle-class and lower-SES communities that failed to replicate when the other CP groups were compared across neighborhood types. The mothers of Desisters from the Lower-SES neighborhood group had more favorable views of physical discipline than the mothers of the Desisters from the Lower-Middle-Class neighborhood group.

Regarding the within-neighborhood group comparisons, the results reviewed above suggest that some CP risk factors predict CP regardless of environment type, as maternal rejection and ADHD symptoms were found to differentiate high-CP groups from low-CP groups in middle-class and poorer communities. On the other hand, some risk factors were found to be context-dependent. Both maternal depression and martial disagreement were only related to CP group status in lower-middle-class neighborhoods.

## Preadolescent PYS Results

### *Descriptive Statistics and Bivariate Correlations*

Descriptive statistics for CP, neighborhood SES, and the individual, family, and peer predictor variables from the preadolescent PYS analyses are presented in Table 22. With the exception of the PMCP study, it is not possible to directly assess how the PYS participants compare to participants in other longitudinal studies in regard to frequency and severity of antisocial behavior because the CP measure that was employed was created for this study. Once again, as the CP measure developed for this study represents an average of maternal ratings on items tapping covert and overt antisocial behavior from the CBCL (scale of '0' to '2'), the mothers of the PYS participants saw their children as engaging in some deviant behaviors, but on

Table 22. Means and Standard Deviations for Study Variables for Preadolescence PYS Analyses

| | Child's Age | *M* | SD |
|---|---|---|---|
| *Maternal Reports of CP* | | | |
| CBCL | 8 | .23 | .21 |
| CBCL | 8.5 | .23 | .22 |
| CBCL | 9 | .24 | .22 |
| CBCL | 9.5 | .23 | .23 |
| CBCL | 10 | .22 | .24 |
| CBCL | 10.5 | .19 | .23 |
| CBCL | 11 | .21 | .22 |
| CBCL | 12 | .23 | .24 |
| *Neighborhood SES* | | | |
| 1990 U.S. Census | 8 | -.93 | 1.62 |
| 1990 U.S. Census | 8.5 | -.88 | 1.56 |
| 1990 U.S. Census | 9 | -.82 | 1.53 |
| 1990 U.S. Census | 9.5 | -.77 | 1.50 |
| 1990 U.S. Census | 10 | -.76 | 1.49 |
| 1990 U.S. Census | 10.5 | -.72 | 1.45 |
| 1990 U.S. Census | 11 | -.68 | 1.42 |
| 1990 U.S. Census | 12 | -.64 | 1.40 |
| *Census Tract Data at 8* | | | |
| Median Household Income | 8 | 17708.86 | 8562.81 |
| % of Families Living in Poverty | 8 | .29 | .26 |
| % of Families on Public Assistance | 8 | .25 | .20 |
| % Unemployed | 8 | .17 | .13 |
| % Single-Parent Families | 8 | .19 | .19 |
| % of Householders in Nbh. > 5 years | 8 | .59 | .13 |
| % African-American | 8 | .47 | .39 |
| % Percent Youth | 8 | .14 | .05 |
| Mean Household Size | 8 | 2.52 | .34 |
| *Census Tract Data at Phase 12* | | | |
| Median Household Income | 12 | 19307.34 | 8857.30 |
| % of Families Living in Poverty | 12 | .25 | .22 |
| % of Families on Public Assistance | 12 | .21 | .17 |
| % Unemployed | 12 | .15 | .11 |
| % Single-Parent Families | 12 | .15 | .15 |
| % of Householders in Nbh. > 5 years | 12 | .60 | .13 |
| % African-American | 12 | .43 | .39 |
| % Percent Youth | 12 | .14 | .05 |
| Mean Household Size | 12 | 2.52 | .31 |

Table 22. Continued

| | Child's Age | *M* | SD |
|---|---|---|---|
| *Predictor Variables* | | | |
| Hyperactive-Impulsive-Inattentive (HIA) | 7.5 | 9.16 | 3.51 |
| CAT, Reading | 7 | 50.91 | 30.68 |
| CAT, Language | 7 | 46.10 | 32.14 |
| Attitudes about Delinquency | 7.5 | 13.20 | 4.21 |
| Maternal Stress | 7.5 | 3.23 | 2.16 |
| Marital Agreement | 7.5 | 24.30 | 4.81 |
| Parent-Child Relationship Quality | 7.5 | -45.35 | 7.05 |
| Physical Discipline | 7.5 | 3.63 | .96 |
| Supervision | 7.5 | -11.65 | 3.02 |
| Deviant Friends | 7.5 | 4.08 | 2.66 |

an infrequent basis. The mothers of the PMCP participants rated their sons similarly, but appear to have reported slightly less CP on average.

Regarding the neighborhood data, mean values at ages 8 and 12 for the various census tract scores used to create the neighborhood poverty factors were included in Table 22 to provide greater detail about neighborhood conditions for participants in the PYS sample during the course of this study. The census tract variables that were used to define neighborhood SES suggest that on average, the participants from the PYS sample were from high-risk communities characterized by poverty, unemployment, and residential instability. However, as was true for the PMCP participants, the proportion of participants living in such communities declined over time. In comparison to the PMCP participants, it appears based on an examination of mean scores for the census tract variables that the PYS participants were on average living in slightly poorer neighborhoods. For example, the mean rate of poverty for the neighborhoods in which the PMCP participants were living in at age 5, the first time neighborhood SES was assessed in the PMCP sample, was less (.19) than it was for the PYS sample at age 8 (.29), the first time neighborhood SES was assessed in that sample. However, based on an examination of standard deviations for the census tract variables, the PYS participants demonstrated greater variability in neighborhood SES, suggesting that although the participants from the PYS sample were on average living in poorer neighborhoods, more PYS participants lived in upper-income communities than PMCP participants.

In regard to the predictor variables, most represent composites from multiple measures that were created specifically for the PYS study or have been used in only a few other studies. Therefore, it is difficult to assess how the PYS participants' scores on these measures compare to participants from other studies. However, on the Reading and Language subtests of the

California Achievement Test, the PYS participants achieved mean percentile scores of 46.1% and 50.9%. This indicates that on average, PYS participants had age appropriate language and reading skills. However, these variables had large standard deviations, suggesting that many of the PYS participants had below average abilities, and conversely many had above average abilities.

Bivariate correlation coefficients appear in Tables 23 through 25. Table 23 contains correlations coefficients between the eight measures of CP and neighborhood SES collected between the ages 8 and 12. As was true for the PMCP sample, both CP and neighborhood SES demonstrated moderate stability over time, but decreasing as the length of time between assessments increased. More specifically, for CP, correlations ranged between .63 and .80 (in each case, $p < .05$). The weakest observed correlation was between children's CP scores at age 8 and 12. For neighborhood SES, correlations ranged between .70 and .96 (in each case, $p < .05$). As was true for CP, the weakest observed correlation was for children's neighborhood SES scores between ages 8 and 12.

Regarding the strength of relations between CP and neighborhood SES, only three measures of neighborhood SES were found to significantly predict CP across the eight assessment points. Specifically, modest but significant relations were detected between neighborhood SES at age 9.5 and maternal reports of CP at age 9 ($r = -.09$, $p < .05$) and 10 ($r = -.09$, $p < .05$). Also, maternal reports of CP at age 10 were predicted by neighborhood SES at age 9.5 ($r = -.09$, $p < .05$). As only 3 of 64 correlations computed between CP and neighborhood SES were significant (i.e., 4.7%) and this percentage would be expected by chance, the three significant findings should be interpreted with extreme caution. Moreover, the overall pattern

indicates that the relationship between CP and neighborhood SES in the PYS sample is extremely modest.

Bivariate correlation coefficients between the eight measures of CP collected between the ages of 8 and 12 and the predictor variables are presented in Table 24. Moderate associations were detected between maternal reports of CP and maternal and teacher reports of hyperactive-impulsive-inattentive behaviors (correlations as high as .43, $p < .01$). Maternal reports of CP were also found to modestly correlate with maternal reports of parental stress (correlations as high as .26, $p < .01$) and marital agreement (correlations as high as .14, $p < .05$), child reports of parent-child relationship quality (correlations as high as .33, $p < .01$), and child and maternal reports of parental supervision (correlations as low as -.16, $p < .01$), parental use of physical discipline (correlations as high as .13, $p < .01$), and children's exposure to deviant friends (correlations as high as .22, $p < .01$). In addition, children's performances on the Reading and Language subtests of the CAT were also found to modestly predict maternal reports of CP (correlations as low as -.12, $p < .01$).

In Table 25, correlation coefficients are presented for the eight measures of neighborhood SES collected between ages 8 and 12 and the predictor variables. According to child reports, boys from lower SES neighborhoods had more negative relationships with their mothers (correlations as low as -.15, $p < .01$) and expressed more favorable views of delinquent behavior (correlations as low as -.15, $p < .01$). In addition, boys in lower SES communities obtained lower achievement scores on the Reading and Language subtests of the CAT (correlations as high as .18, $p < .01$). Beyond these findings, youth and mothers reported that boys in lower SES communities were physically disciplined more by their mothers (correlations as low as -.13, $p <$

Table 23. Correlations Between CP and Neighborhood SES for Preadolescent PYS Analyses

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. CP, Age 8 | .74** | .69** | .71** | .71** | .70** | .67** | .63** | -.06 | -.06 | -.07 | -.07 | -.07 | -.06 | -.04 | -.03 |
| 2. CP, Age 8.5 | --- | .76** | .71** | .73** | .68** | .67** | .63** | -.08+ | -.08+ | -.07 | -.08 | -.07 | -.06 | -.04 | -.04 |
| 3. CP, Age 9 | | --- | .76** | .74** | .71** | .71** | .64** | -.07 | -.07 | -.07 | -.09+ | -.08+ | -.08+ | -.04 | -.05 |
| 4. CP, Age 9.5 | | | --- | .80** | .78** | .76** | .66** | -.05 | -.05 | -.09* | -.08+ | -.07 | -.07 | -.05 | -.02 |
| 5. CP, Age 10 | | | | --- | .80** | .77** | .71** | -.05 | -.05 | -.09* | -.09* | -.08+ | -.07 | -.06 | -.02 |
| 6. CP, Age 10.5 | | | | | --- | .80** | .70** | -.02 | -.02 | -.06 | -.05 | -.05 | -.05 | .00 | .00 |
| 7. CP, Age 11 | | | | | | --- | .76** | -.03 | -.01 | -.03 | -.02 | -.02 | -.02 | .00 | .02 |
| 8. CP, Age 12 | | | | | | | --- | -.01 | .00 | -.01 | -.01 | .00 | -.02 | -.01 | .02 |
| 9. Neighborhood SES, Age 8.5 | | | | | | | | --- | .92** | .83** | .79** | .77** | .75** | .72** | .70** |
| 10. Neighborhood SES, Age 9 | | | | | | | | | --- | .89** | .86** | .83** | .80** | .78** | .77** |
| 11. Neighborhood SES, Age 9.5 | | | | | | | | | | --- | .94** | .92** | .88** | .83** | .81** |
| 12. Neighborhood SES, Age 10 | | | | | | | | | | | --- | .96** | .89** | .85** | .83** |
| 13. Neighborhood SES, Age 10.5 | | | | | | | | | | | | --- | .92** | .88** | .83** |
| 14. Neighborhood SES, Age 11 | | | | | | | | | | | | | --- | .95** | .88** |

Table 23. Continued

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15. Neighborhood SES, Age 11.5 | | | | | | | | | | | | | | --- | .90** |
| 16. Neighborhood SES, Age 12 | | | | | | | | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

Table 24. Correlations Between CP and Predictor Variables for Preadolescent PYS Analyses

| Variable | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. CP, Age 8 | .43** | -.12** | -.10* | .00 | .24** | .08 | .31** | .13** | .14** | .21** |
| 2. CP, Age 8.5 | .42** | -.09+ | -.06 | .01+ | .25** | .07 | .33** | .11* | .16** | .19** |
| 3. CP, Age 9 | .41** | -.10* | -.08 | .00 | .24** | .08 | .29** | .11* | .06 | .16** |
| 4. CP, Age 9.5 | .39** | .11* | -.06 | .03 | .26** | .14* | .29** | .13** | .11* | .22** |
| 5. CP, Age 10 | .39** | -.08+ | -.04 | .00 | .24** | .11 | .28** | .09* | .10* | .20** |
| 6. CP, Age 10.5 | .34** | -.05 | -.06 | .00 | .18** | .13* | .24** | .09* | .09+ | .20** |
| 7. CP, Age 11 | .39** | -.08 | -.04 | -.03 | .26** | .14* | .25** | .09+ | .05 | .17** |
| 8. CP, Age 12 | .36** | -.10* | -.06 | -.01 | .21* | .04 | .19** | .05 | .08+ | .19** |
| 9. HIA | --- | -.35** | -.27** | .10* | .20** | .10 | .31** | .16** | .13** | .19** |
| 10. CAT, Reading | | --- | .79** | -.22** | -.15** | -.12+ | -.22** | -.07 | -.11* | -.04 |
| 11. CAT, Language | | | --- | -.23** | -.11* | -.06 | -.20** | -.02 | -.12** | -.01 |
| 12. Attitudes about Delinquency | | | | --- | .02 | .07 | .24** | .12** | .11* | .03 |
| 13. Maternal Stress | | | | | --- | .36** | .29** | .04 | .10* | .11* |
| 14. Marital Agreement | | | | | | --- | .14* | -.05 | .02 | -.01 |
| 15. Parent-Child Relationship Quality | | | | | | | --- | .18** | .18** | .11* |

Table 24. Continued

| Variable | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|
| 16. Physical Punishment | | | | | | | | --- | .10* | .10* |
| 17. Supervision | | | | | | | | | --- | .11* |
| 18. Deviant Friends | | | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

Table 25. Correlations Between Neighborhood SES and Predictor Variables for Preadolescent PYS Analyses

| Variable | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Neighborhood SES, Age 8 | -.14** | .14** | .18** | -.13** | -.08+ | -.03 | .12** | -.13** | .18** | -.13** |
| 2. Neighborhood SES, Age 8.5 | -.17** | .13** | .16** | -.15** | -.07 | -.04 | .12** | -.10* | .19** | -.13** |
| 3. Neighborhood SES, Age 9 | -.14** | .11* | .14** | -.13** | -.05 | -.02 | .12** | -.09+ | .19** | -.12** |
| 4. Neighborhood SES, Age 9.5 | -.16** | .12* | .16** | .13** | -.09 | -.02 | .15** | -.08 | .19** | -.11** |
| 5. Neighborhood SES, Age 10 | -.13** | .10* | .13** | -.11* | -.08+ | -.02 | .14** | -.08+ | .18** | -.10* |
| 6. Neighborhood SES, Age 10.5 | -.11** | .13** | .13* | -.11* | -.08+ | -.01 | .09* | -.11* | .19** | -.13** |
| 7. Neighborhood SES, Age 11 | -.13** | .16** | .15** | -.11* | -.07 | -.01 | .09+ | -.10* | .18** | -.14** |
| 8. Neighborhood SES, Age 12 | -.09+ | .18** | .18** | -.13** | -.05 | .00 | .09+ | -.10* | .18** | -.11* |
| 9. HIA | --- | -.35** | -.27** | .10* | .20** | .10 | -.31** | .16** | -.13** | .19** |
| 10. CAT, Reading | | --- | .79** | -.22** | -.15** | -.12+ | .22** | -.07 | .11* | -.04 |
| 11. CAT, Language | | | --- | -.23** | -.11* | -.06 | .20** | -.02 | .12** | -.01 |
| 12. Attitudes about Delinquency | | | | --- | .02 | .07 | -.24** | .12** | -.11* | .03 |
| 13. Maternal Stress | | | | | --- | .36** | -.29** | .04 | -.10* | .11* |
| 14. Marital Agreement | | | | | | --- | -.14* | -.05 | -.02 | -.01 |
| 15. Parent-Child Relationship Quality | | | | | | | --- | -.18** | -.18** | -.11* |

Table 25. Continued

| Variable | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|
| 16. Physical Punishment | | | | | | | | --- | .10* | .10* |
| 17. Supervision | | | | | | | | | --- | -.11* |
| 18. Deviant Friends | | | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

.01), were supervised less by their mothers (correlations as low as -.19, $p < .01$), and had more deviant friends (correlations as low as -.14, $p < .01$).

***Individual and Joint Trajectories of CP & Neighborhood SES***

The same procedures were used to estimate the best-fitting individual and joint trajectory models of CP and neighborhood SES as those described above for the PMCP sample. Once again, results from the univariate analyses will be presented first.

To start, univariate CP models with two through six groups were evaluated. Table 26 contains BIC scores for these models. According to the BIC scores assigned to each model, the five-group solution provided the best fit. However, the four-group solution was selected as the optimal model instead because one of the five groups included in the five-group solution only had 10 of the 503 PYS participants assigned to it. It was decided that this would be too small a cell for conducting group comparisons, especially after being subdivided by neighborhood trajectory groups in the joint trajectory analysis to follow.

The four-group solution was selected over the six-group solution, which had a lower BIC score, because the six-group solution also included small groups. One group that was found in the six-group solution had only four members assigned to it. Instructing SPGM to combine the groups from the six-group model into four groups seemed appropriate because all of the groups in the six-group model were marked by stability, and in many cases were difficult to discriminate because of having similar CP scores over time. After the four-group solution was selected, nonsignificant trajectory coefficients were removed from the model to improve its fit. This resulted in a four-group model with three groups that required an intercept, linear, and quadratic terms to define their growth, and a forth group whose growth could be defined solely by its intercept. The BIC score for the final four-group model is presented in Table 26.

Table 26. BIC by Model Type for CP and Neighborhood SES from Ages 8 to 12 for PYS Participants

| Model | Order | BIC |
|---|---|---|
| *CP* | | |
| a. Two group | 2 2 | -255.24 |
| b. Three group | 2 2 2 | 122.87 |
| c. Four group | 2 2 2 2 | 323.40 |
| d. Five group | 2 2 2 2 2 | 426.32 |
| e. Six group | 2 2 2 2 2 2 | 416.12 |
| f. four group | 2 0 2 2 | 328.85 |
| | | |
| *Neighborhood SES* | | |
| a. Two group | 2 2 | -5624.91 |
| b. Three group | 2 2 2 | -4711.30 |
| c. Four group | 2 2 2 2 | -4472.19 |
| d. Five group | 2 2 2 2 2 | -4213.69 |
| e. Six group | 2 2 2 2 2 2 | -4151.99 |
| f. Seven group | 2 2 2 2 2 2 2 | -4139.61 |
| g. Five group | 2 2 0 2 0 | -4225.93 |

*Note.* Entries in the second column denote the parameters used to define the shape of each group's trajectory. Groups represented by the number 0 were defined solely by their intercepts. Groups represented by the number 1 were defined by their intercepts and a linear growth term. Finally, groups represented by the number 2 were defined by their intercepts, a linear growth term, and a quadratic term.

In regards to the neighborhood SES model, table 26 lists BIC scores for univariate models with two through seven groups. The seven-group solution provided the best fit for the data. However, the five-group model was selected as the optimal model because the six- and seven-group solutions split groups from the five-group solution into smaller groups, which had similar slopes and that were difficult to distinguish. Thus, the more parsimonious five-group solution was selected over the six- and seven-group solutions. As mentioned previously, researchers who use SPGM commonly opt for the more parsimonious model when having to choose between models that only vary in slight ways, even if this means opting for the model with the smaller BIC (Brame et al., 2001; Nagin, 2005). To enhance the five-group solution's overall fit, nonsignificant trajectory coefficients from the five-group model were removed. This resulted in two groups that could be defined solely by the intercept and three groups which required an intercept and linear and quadratic terms to explain their growth. The BIC score for this final model is depicted in Table 26.

After deciding upon optimal univariate models, the joint trajectory model was specified using the number of groups and the shape of trajectories from the univariate models. Parameter estimates for both sets of trajectories are presented in Table 27. In addition, estimated group sizes and posterior assignment probabilities for both sets of trajectory groups are reported in Table 27. Figures 3 and 4 display these trajectories graphically and as would be predicted by the parameter estimates for the trajectories reported on in Table 27. More specifically, the parameter estimates reported on in Table 27 determine the shape of the predicted trajectories in the figures. The observed trajectories in Figures 3 and 4 represent mean CP scores for the members of each CP group and mean neighborhood SES scores for the neighborhood SES groups over time, respectively.

Table 27. Estimated Trajectory Parameters, Percentages, and Posterior Assignment Probabilities for CP and Neighborhood SES Groups from the Preadolescent PYS Sample

| | Intercept | | Slope | | Quadratic | | Est. % of | Post. Assignment Prob. | |
|---|---|---|---|---|---|---|---|---|---|
| Trajectory Group | β | *SD* | β | *SD* | β | *SD* | Population | *M* | *SD* |
| *CP* | | | | | | | | | |
| Abstainers | -0.098*** | 0.018 | -0.016*** | 0.006 | 0.015* | 0.005 | 21.61% | .94 | .11 |
| Occasional Rule-Breakers | 0.158*** | 0.008 | ---- | ----- | ---- | ---- | 49.5% | .91 | .15 |
| Frequent Rule-Breakers | 0.391*** | 0.012 | -0.001 | 0.005 | 0.005 | 0.003 | 24.3% | .96 | .10 |
| Chronic CP Boys | 0.852*** | 0.025 | 0.021 | 0.011 | -0.029** | 0.008 | 4.7% | .97 | .07 |
| *Neighborhood SES* | | | | | | | | | |
| Poverty-Stricken-Stable | -3.757*** | 0.039 | -0.021 | 0.021 | 0.099** | 0.017 | 12.7% | .99 | .02 |
| Poverty-Stricken-Improve | -1.762*** | 0.065 | 0.861*** | 0.039 | -0.196** | 0.028 | 5.1% | .98 | .08 |
| Lower-Class/Poor | -1.532*** | 0.030 | ----- | ----- | ---- | ----- | 16.2% | .96 | .10 |
| Lower-Class | -0.476*** | 0.033 | 0.069 | 0.016 | -0.041* | 0.013 | 25.7% | .95 | .10 |
| Lower-Middle-Class | 0.454*** | 0.017 | ----- | ----- | ------ | ----- | 40.3% | .98 | .07 |

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

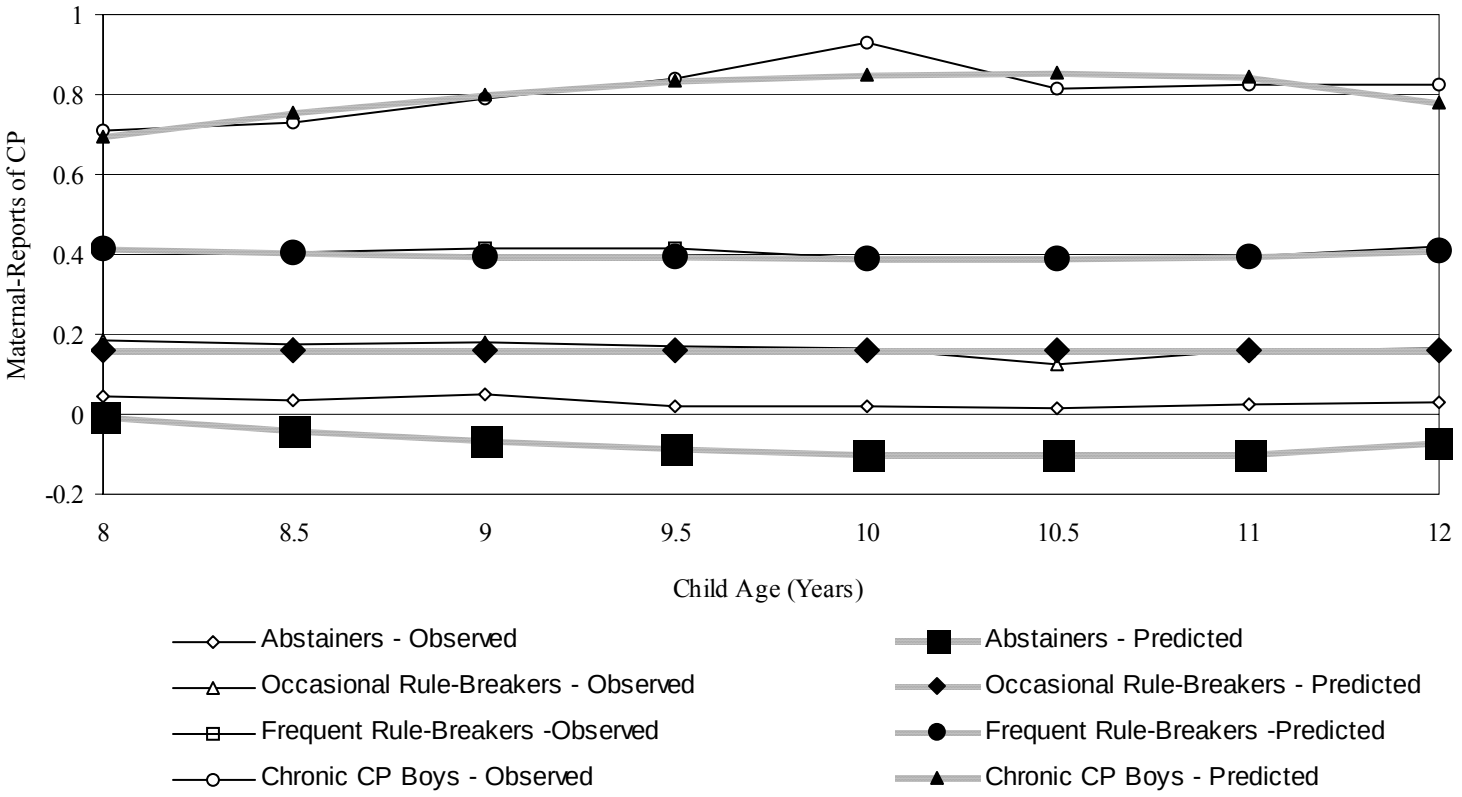


Figure 3. Maternal reports of CP by CP trajectory group for preadolescent PYS sample

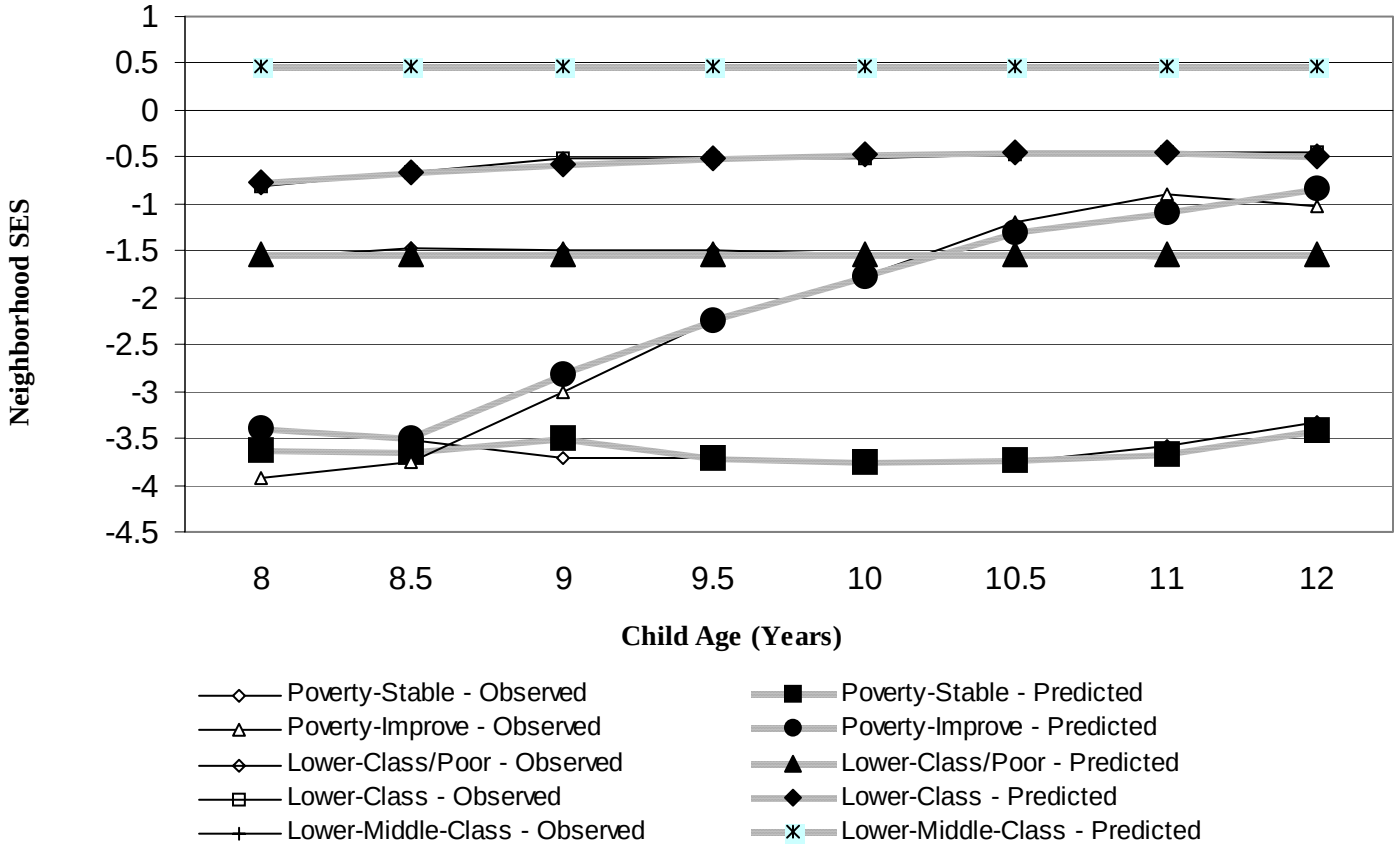


Figure 4. Neighborhood SES scores by neighborhood SES trajectory groups in PMCP Sample

As can be seen in Figure 3, all four of the CP groups were characterized by relative stability, despite minor changes over time. The least deviant of the CP groups was marked by little CP from ages 8 to 12. This group included 21.6% of the PYS sample and will be referred to as Abstainers for the remainder of this dissertation. Another group, which included 41.5% of the PYS sample, demonstrated more CP than the group described above, but less CP than the mean for the sample. This group will be referred to as Occasional Rule-Breakers. A third group had mean CP scores that were approximately twice as high as the sample mean. These children accounted for 24.3% of the sample and will be dubbed Frequent Rule-Breakers. Finally, the last CP group was involved in nearly twice as much CP as the Frequent Rule-Breakers and four times as much CP as the mean for the sample. This group, which included 4.7% of the PYS sample, will be referred to as Chronic CP boys. Mean posterior assignment probabilities for the four CP groups were high, ranging from .91 to .97 with an average of .95 across groups.

In regard to the four neighborhood SES groups, four were characterized by stability over time and one by change. Three of the stable groups had neighborhood SES scores that were above the sample mean. The fourth stable group had neighborhood SES scores well below the sample mean. At age 8, the fifth group, which demonstrated change over time, had neighborhood SES scores that were similar to the stable group from the poorest neighborhoods, but by age 12, had neighborhood SES scores that fell in between the mean neighborhood SES scores for the second and third most prosperous neighborhood groups. Again, decisions about how to label these groups were based on mean census tract scores for participants classified into these groups (i.e., the census tract variables that were included in the factor analysis). Mean census tract scores at age 8 by group are presented in Table 28. The mean age-12 census tract scores by group are presented in Table 29. For the remainder of this dissertation, the stable group from the

Table 28. Mean Census Tract Values by Neighborhood Groups at Age 8 for PYS sample

| | Poverty-Stricken Stable (N=64) | Poverty-Stricken-Improve (N=26) | Lower-Class/Poor (N=81) | Lower - Class (N=130) | Lower-Middle-Class (N=202) |
|---|---|---|---|---|---|
| Median Household Income | $6699.38 ($2849.43) | $5841.65 ($593.39) | $12565.17 ($3923.24) | $16863.03 ($4928.08) | $25369.32 ($5656.57) |
| % of Families Living in Poverty | .70 (.17) | .78 (.04) | .37 (.13) | .26 (.17) | .09 (.05) |
| % of Families on Public Assistance | .55 (.13) | .62 (.06) | .31 (.10) | .23 (.13) | .09 (.04) |
| % Unemployed | .37 (.09) | .42 (.06) | .20 (.07) | .15 (.09) | .07 (.03) |
| % Single-Parent Families | .47 (.18) | .56 (.10) | .20 (.10) | .16 (.12) | .06 (.03) |
| % of Householders in Neighborhood > 5 years | .50 (.06) | .47 (.05) | .60 (.08) | .60 (.12) | .62 (.16) |
| % African-American | .88 (.17) | .87 (.07) | .85 (.19) | .53 (.30) | .09 (.15) |
| % Percent Youth | .18 (.04) | .19 (.02) | .16 (.08) | .14 (.04) | .11 (.02) |
| Median Household Size | 2.8 (.46) | 3.0 (.30) | 2.5 (.29) | 2.4 (.32) | 2.5 (.23) |

*Note.* Standard deviations are reported in parentheses.

Table 29. Mean Census Tract Values by Neighborhood Groups at Age 12 for PYS sample

| | Poverty-Stricken Stable (N=64) | Poverty-Stricken-Improve (N=26) | Lower-Class/Poor (N=81) | Lower-Class (N=130) | Lower-Middle-Class (N=202) |
|---|---|---|---|---|---|
| Median Household Income | $7369.84 ($3917.76) | $15977.46 ($5486.59) | $12837.60 ($4614.41) | $18653.18 ($5281.54) | $26485.48 ($6752.16) |
| % of Families Living in Poverty | .68 (.19) | .28 (.13) | .36 (.13) | .21 (.10) | .09 (.07) |
| % of Families on Public Assistance | .53 (.15) | .26 (.12) | .31 (.11) | .18 (.08) | .08 (.04) |
| % Unemployed | .36 (.10) | .16 (.08) | .20 (.08) | .13 (.05) | .07 (.03) |
| % Single-Parent Families | .46 (.18) | .17 (.08) | .19 (.09) | .13 (.08) | .06 (.03) |
| % of Householders in Neighborhood > 5 years | .51 (.07) | .62 (.11) | .60 (.09) | .61 (.13) | .63 (.16) |
| % African-American | .89 (.13) | .65 (.30) | .85 (.21) | .45 (.29) | .08 (.16) |
| % Percent Youth | .18 (.03) | .16 (.10) | .15 (.05) | .13 (.03) | .11 (.02) |
| Median Household Size | 2.8 (.42) | 2.4 (.27) | 2.5 (.25) | 2.4 (.31) | 2.5 (.26) |

*Note.* Standard deviations are reported in parentheses.

poorest neighborhoods will be referred to as Poverty-Stricken Stable because across assessments, the poverty rate in the neighborhoods from which these participants lived was approximately 70%. This Poverty-Stricken Stable group accounted for 12.7% of the PYS sample. The neighborhood SES group that demonstrated stability at the upper-end of the distribution will be called Lower-Middle-Class because on average, poverty was rare in these neighborhoods, but was still present. Among the PYS participants, 40.3% of the sample was classified into this group. The next most prosperous neighborhood SES group, which was also characterized by stability, will be referred to as Lower-Class because poverty was less common in the neighborhoods of these youth compared to the neighborhoods from which the Poverty-Stricken Stable boys came from, but more common than in the neighborhoods of the Lower-Middle-Class children. This Lower-Class group included 25.7% of the PYS sample. The fourth stable group included 16.2% of the PYS participants and will be referred to as Lower-Class/Poor because poverty was quite common in these neighborhoods, but not as common as it was in the Poverty-Stricken Stable neighborhood. Finally, the group that moved into higher SES neighborhoods over time will be named Poverty-Stricken Improve because at age 8, the family poverty rate of their neighborhoods was approximately .78, but by age 12, their family poverty rate was .28. This group accounted for 5.1% of the sample. Mean posterior assignment probabilities for the five-neighborhood SES groups were quite high, ranging from .95 to .996 with an average of .98 across groups.

Overall, 20 groups were created by the joint trajectory analysis described above (i.e., 4 CP groups by 5 neighborhood groups). The number of children and probability of assignment into the various groups are detailed in Table 30. The smallest group was the Chronic CP group from the Poverty-Stricken Improve neighborhood group, which included only one child. One-

Table 30. Cell Sizes for CP and Neighborhood SES Groups and Probabilities of Assignment in Joint CP/Neighborhood SES Groups for the Preadolescent PYS Trajectory Models

| | Neighborhood SES Group | | | | |
|---|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class/Poor | Lower-Class | Lower-Middle-Class |
| Abstainers | 11 (.022) | 4 (.008) | 21 (.042) | 27 (.054) | 39 (.078) |
| Occasional Rule-Breakers | 31 (.062) | 12 (.024) | 45 (.089) | 67 (.133) | 108 (.215) |
| Frequent Rule-Breakers | 17 (.034) | 9 (.018) | 12 (.024) | 28 (.056) | 49 (.097) |
| Chronic CP Boys | 5 (.010) | 1 (.002) | 3 (.006) | 8 (.016) | 6 (.012) |

*Note.* Joint probabilities are reported in parentheses.

hundred and eight children were assigned to the largest group, which was the Occasional Rule-Breaking/Lower-Middle-Class neighborhood group.

***Conditional Probabilities for Membership in CP Groups Given Neighborhood SES History and Vice-Versa***

Table 31 contains conditional probabilities for being assigned to the four CP groups given membership in one of the five neighborhood SES groups. The converse, conditional probabilities for being assigned to the five neighborhood SES groups given membership in one of the four CP groups, are presented in Table 32. A descriptive summary of the probabilities listed in these Tables is provided below, and is followed by the results from a chi-square test used to assess whether or not CP children were evenly distributed across neighborhood trajectory groups.

As is evident in the tables, children from the Poverty-Stricken Stable neighborhood group were more likely to be assigned to the Chronic CP group (8.1%) than children from the other neighborhood groups (percentages for the other groups ranged from 3-6.1%). However, the chi-square test conducted (20 cells, 4 CP groups x 5 neighborhood SES groups) to determine whether Chronic CP boys were equally distributed across neighborhood trajectory groups was nonsignificant ($\chi^2$=6.38, $p$ = .17). This indicates that although the Poverty-Stricken Stable boys had a slightly higher rate of being classified into the Chronic CP group, this rate was not any greater than what would be expected by chance and contradictory to the expectations of Hypothesis 1.

Table 31. Estimated Conditional Probabilities of CP Trajectory Group by Neighborhood SES Trajectory Group for the Preadolescent PYS Analyses

| | Neighborhood SES Group | | | | |
|---|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class/Poor | Lower-Class | Lower-Middle-Class |
| Abstainers | .190 | .146 | .294 | .225 | .196 |
| Occasional Rule-Breakers | .445 | .491 | .504 | .476 | .519 |
| Frequent Rule-Breakers | .284 | .326 | .169 | .239 | .251 |
| Chronic CP Boys | .081 | .037 | .033 | .061 | .034 |

Table 32. Estimated Conditional Probabilities of Neighborhood SES Trajectory Group by CP Trajectory Group for the Preadolescent PYS Analyses

| | Neighborhood SES Group | | | | |
|---|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class/Poor | Lower-Class | Lower-Middle-Class |
| Abstainers | .112 | .034 | .221 | .268 | .365 |
| Occasional Rule-Breakers | .114 | .050 | .165 | .248 | .423 |
| Frequent Rule-Breakers | .148 | .068 | .113 | .253 | .418 |
| Chronic CP Boys | .220 | .039 | .115 | .333 | .293 |

### *Mean Risk Scores for Environmentally-Based Risk Factors across Neighborhood Trajectory Groups*

Results from ANOVA analyses comparing the extent to which children from the five neighborhood SES groups were exposed to environmentally-based risk factors are presented in Table 33. The significant differences that were found between the various neighborhood trajectory groups are reported below ($p < .05$). According to self and maternal reports, children from Lower-Middle-Class neighborhoods were more likely to be supervised by their mothers than boys from all other neighborhood groups. In addition, the boys from lower-middle-class neighborhoods were less likely to have strained relationships with their parents than boys from the two Poverty-Stricken neighborhoods and boys from Lower-Class neighborhoods. Boys from the Lower-Middle-Class neighborhood group were also less likely to be disciplined physically than boys from the Lower-Class and Lower-Class/Poor neighborhood groups, and less likely to have deviant friends than children from the Poverty-Stricken Stable group. Furthermore, the mothers of boys from the Lower-Middle-Class neighborhood group reported less parental stress than the mothers of boys from the Lower-Class neighborhood group. These findings again lend credence to the notion that children in less prosperous communities are exposed to more environmentally-based risk factors than children from poorer communities, as predicted by Hypothesis 2.

### *Comparison of the Developmental Histories of CP Children within and across Neighborhood Trajectories*

The results from ANOVA analyses comparing CP groups across neighborhood trajectories are presented in Tables 34-36. Once again, because of small cell sizes for specific groups (e.g., there was only one Chronic CP boy from the Poverty-Stricken Improve

Table 33. Mean Risk Scores for Environmentally-Based CP Risk Factors by Neighborhood Trajectory Group for Preadolescent PYS Sample

| | Poverty-Stricken Stable (N=64) | Poverty-Stricken Improve (N=26) | Lower-Class/Poor (N=81) | Lower-Class (N=130) | Lower-Middle-Class (N=202) |
|---|---|---|---|---|---|
| Maternal Stress | 24.55 (3.91) | 24.68 (4.44) | 24.47 (4.03) | 25.41[a] (5.09) | 23.38[a] (5.09) |
| Marital Agreement | 3.41 (2.46) | 4.13 (2.23) | 3.18 (2.09) | 2.88 (2.12) | 3.31 (2.15) |
| Parent-Child Relationship Quality | -47.13[bc] (6.61) | -47.73 (8.14) | -44.76[b] (6.72) | -46.12[d] (7.58) | -44.22[cd] (6.60) |
| Physical Punishment | 3.67 (.99) | 3.81 (1.06) | 3.81[e] (.98) | 3.73[f] (.94) | 3.45[ef] (.92) |
| Supervision | -12.51[g] (3.75) | -12.88[h] (3.02) | -12.04[i] (3.43) | -11.88[j] (2.89) | -10.89[ghij] (2.44) |
| Deviant Friends | 4.87[kl] (2.67) | 4.49 (2.16) | 4.41 (2.66) | 3.85[k] (2.59) | 3.78[l] (2.71) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 34. Mean Risk Scores for High-CP Boys from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | High-CP/Lower-SES Neighborhood Group (N=83) | High-CP/Lower-Middle-Class Neighborhood Group (N=55) |
|---|---|---|
| HIA | 11.52 (2.11) | 10.88 (2.53) |
| CAT, Reading | 39.01[a] (27.05) | 57.38[a] (26.83) |
| CAT, Language | 35.59[b] (31.10) | 55.28[b] (31.30) |
| Attitudes about Delinquency | 14.31[c] (5.10) | 12.16[c] (3.88) |
| Maternal Stress | 26.41 (4.120) | 25.57 (5.67) |
| Marital Agreement | 3.29 (2.14) | 3.82 (2.26) |
| Parent-Child Relationship Quality | -49.34[d] (7.63) | -46.39[d] (7.09) |
| Physical Punishment | 3.93[e] (.99) | 3.53[e] (.90) |
| Supervision | -12.89[f] (3.12) | -11.10[f] (2.43) |
| Deviant Friends | 4.92 (2.80) | 4.97 (2.65) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 35. Mean Risk Scores for Occasional Rule-Breakers from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | Occasional Rule-Breakers/Lower-SES Neighborhood Group (N=155) | Occasional Rule-Breakers/ Lower-Middle-Class Neighborhood Group (N=108) |
|---|---|---|
| HIA | 9.50[a] (2.94) | 8.41[a] (3.51) |
| CAT, Reading | 47.17[b] (32.45) | 58.73[b] (29.37) |
| CAT, Language | 41.38[c] (31.13) | 56.47[c] (29.10) |
| Attitudes about Delinquency | 13.70[d] (4.19) | 12.60[d] (3.46) |
| Maternal Stress | 24.53[e] (4.50) | 23.03[e] (4.52) |
| Marital Agreement | 3.28 (2.24) | 3.35 (1.96) |
| Parent-Child Relationship Quality | -45.47 (6.71) | -44.06 (6.35) |
| Physical Punishment | 3.74[f] (.91) | 3.50[f] (.93) |
| Supervision | -11.81[g] (3.22) | -10.91[g] (2.50) |
| Deviant Friends | 4.16 (2.54) | 3.68 (2.62) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 36. Mean Risk Scores for Abstainers from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | Abstainers/Lower-SES Neighborhood Group (N=63) | Abstainers/Lower-Middle-Class Neighborhood Group (N=39) |
|---|---|---|
| HIA | 7.03 (3.42) | 5.93 (4.17) |
| CAT, Reading | 50.44 (31.16) | 60.70 (29.45) |
| CAT, Language | 40.90 (35.37) | 53.70 (30.63) |
| Attitudes about Delinquency | 13.06 (4.54) | 12.24 (3.36) |
| Maternal Stress | 23.86[a] (4.69) | 21.23[a] (4.64) |
| Marital Agreement | 2.62 (2.12) | 2.68 (2.40) |
| Parent-Child Relationship Quality | -43.38 (6.48) | -41.59 (5.62) |
| Physical Punishment | 3.52 (1.04) | 3.21 (.89) |
| Supervision | -11.99[b] (3.39) | -10.55[b] (2.29) |
| Deviant Friends | 3.69[c] (2.38) | 2.40[c] (2.34) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

neighborhood group), certain trajectory groups with similar characteristics were combined to ensure at least marginal power for group comparisons. Thus, for the between-group neighborhood trajectory comparisons, the Frequent Rule-Breaking and Chronic CP groups from the four poorer neighborhood SES groups were combined to create a High-CP/Lower-SES neighborhood group, which was subsequently compared to a High-CP/Lower-Middle-Class neighborhood group that represented a composite of the Frequent Rule-Breaking and Chronic CP groups from the Lower-Middle-Class neighborhood group. The groups that were combined to create the High-CP/Lower-SES neighborhood group included between 1 and 28 children before being merged (see Table 30). The two groups that were combined to create the High-CP/Lower-Middle-Class neighborhood group included 45 and 6 children before their merger. The Abstainers and Occasional Rule Breakers from the four poorer neighborhood groups were combined in the same manner to create Abstainer/Lower-SES neighborhood and Occasional Rule-Breakers/Lower-SES neighborhood groups that were compared to their counterparts from the Lower-Middle-Class neighborhood group. In Table 30, group sizes are provided for the various CP and neighborhood groups before they were combined.

Overall, the High-CP/Lower-Middle-Class neighborhood group was found to differ from the High-CP/Lower-SES neighborhood group in several ways when compared in a series of one-way ANOVAs. The results from ANOVA analyses comparing these groups are presented in Table 34. Significant between group differences are summarized below ($p < .05$). More specifically, High-CP boys from lower-middle-class neighborhoods were found to have less favorable views toward deviant behavior, experience more parental supervision and less physical discipline, have better relationships with their parents, and demonstrate better developed language and reading skills as measured by the CAT.

Occasional Rule Breakers from lower-middle-class neighborhoods were also found to differ from their counterparts from lower-SES neighborhoods in several ways when compared in a series of one-way ANOVAs. Table 35 summarizes the results from ANOVA analyses comparing the High-CP/Lower-Middle-Class neighborhood and High-CP/Lower-SES neighborhood groups. Again, significant between-group differences are reported below ($p < .05$). Occasional Rule-Breakers from the Lower-Middle-Class neighborhood group had less favorable views of delinquency and experienced higher levels of parental supervision, but lower levels of physical discipline than the Occasional Rule-Breakers from the Lower-SES neighborhood group. In addition, the Occasional Rule-Breakers from the Lower-Middle-Class neighborhood group were rated by their mothers as engaging in fewer hyperactive-impulsive-inattentive behaviors, and their mothers reported feeling less stressed. These children also achieved higher scores on the Reading and Language subtests of the CAT.

In regard to the Abstainers, results from ANOVA analyses comparing youth from this group across neighborhood types are presented in Table 36. As indicated in the table, children from the Lower-Middle-Class neighborhood group were found to have fewer deviant friends ($p < .05$) and were more closely supervised by their mothers during middle childhood ($p < .05$). In addition, the mothers of Abstainers from the Lower-Middle-Class neighborhood group were less likely to endorse stress on self-report questionnaires than the mothers of Abstainers from the Lower-SES neighborhood group ($p < .05$).

For the within-neighborhood group comparisons, the developmental histories of the High-CP groups (i.e., Frequent Rule-Breaking and Chronic CP groups) were compared to the developmental histories of the Occasional Rule-Breaking and Abstainer groups, once within the Lower-Middle-Class neighborhood trajectory group, and a second time within the average of the

four other neighborhood trajectory groups. Results from the within-neighborhood trajectory comparisons are presented in Tables 37 for the youth from lower-middle-class neighborhoods and in Table 38 for youth from lower-SES neighborhoods. The risk factors that were found to significantly ($p < .05$) differentiate CP groups from the same neighborhood trajectory are summarized below. Within the Lower-Middle-Class neighborhood group, the boys in the High-CP group were found to have had less positive relationships with their parents and have had more deviant friends than the boys in the other two CP groups. In addition, the boys in the High-CP groups from Lower-Middle-Class neighborhoods were rated by their mothers as engaging in more hyperactive-impulsive-inattentive behaviors than boys in the other two CP groups. The mothers of the High-CP boys within Lower-Middle-Class neighborhoods also endorsed less martial agreement than the mothers of the Abstainers and more stress than the mothers of Abstainers and Occasional Rule-Breakers.

In regard to the four lower-SES neighborhoods, significant group differences are reported below ($p < .05$). As presented in Table 38, High-CP boys obtained lower reading scores on the CAT than the Abstainers and were rated by their mothers as engaging in more hyperactive-impulsive-inattentive behaviors than the Occasional Rule-Breaking and Abstainer boys. In addition, the High-CP boys were found to have had worse relationships with their parents and more deviant friends than the boys in the other two CP groups. The High-CP boys within the Lower-SES neighborhood groups were also found to have been exposed to higher levels of physical discipline than Abstainers, and less Supervision than the Occasional Rule-Breakers. In addition, the mothers of the High-CP boys within the Lower-SES neighborhood groups endorsed more stress than the mothers of the other two CP groups from the same background.

Table 37. Mean Risk Scores by CP Trajectory Groups within Lower-Middle-Class Neighborhood Group for Preadolescent PYS Analyses

| | Abstainers (N=39) | Occasional Rule-Breakers (N=108) | High-CP (N=55) |
|---|---|---|---|
| HIA | 5.93[ab] | 8.41[ac] | 10.88[bc] |
| | (4.17) | (3.51) | (2.53) |
| CAT, Reading | 60.70 | 58.73 | 57.38 |
| | (29.45) | (29.37) | (26.83) |
| CAT, Language | 53.70 | 56.47 | 55.28 |
| | (30.63) | (29.10) | (31.30) |
| Attitudes about Delinquency | 12.24 | 12.60 | 12.16 |
| | (3.36) | (3.46) | (3.88) |
| Maternal Stress | 21.23[d] | 23.03[e] | 25.57[de] |
| | (4.64) | (4.52) | (5.67) |
| Marital Agreement | 2.68[f] | 3.35 | 3.82[f] |
| | (2.40) | (1.96) | (2.26) |
| Parent-Child Relationship Quality | -41.59[gh] | -44.06[gi] | -46.39[hi] |
| | (5.62) | (6.35) | (7.09) |
| Physical Punishment | 3.21 | 3.50 | 3.53 |
| | (.89) | (.93) | (.90) |
| Supervision | -10.55 | -10.91 | -11.10 |
| | (2.29) | (2.50) | (2.43) |
| Deviant Friends | 2.40[jk] | 3.68[jl] | 4.97[kl] |
| | (2.34) | (2.62) | (2.65) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 38. Mean Risk Scores by CP Trajectory Groups within the Combined Lower-SES Neighborhood Group

| | Abstainers (N=63) | Occasional Rule-Breakers (N=155) | High-CP (N=83) |
|---|---|---|---|
| HIA | 7.03[ab] (3.42) | 9.50[ac] (2.94) | 11.52[bc] (2.11) |
| CAT, Reading | 50.44[d] (31.16) | 47.17 (32.45) | 39.01[d] (27.05) |
| CAT, Language | 40.90 (35.37) | 41.38 (31.13) | 35.59 (31.10) |
| Attitudes about Delinquency | 13.06 (4.54) | 13.70 (4.19) | 14.31 (5.10) |
| Maternal Stress | 23.86[e] (4.69) | 24.53[f] (4.50) | 26.41[ef] (4.12) |
| Marital Agreement | 2.62 (2.12) | 3.28 (2.24) | 3.29 (2.14) |
| Parent-Child Relationship Quality | -43.38[gh] (6.48) | -45.47[gi] (6.71) | -49.34[hi] (7.63) |
| Physical Punishment | 3.52[j] (1.04) | 3.74 (.91) | 3.93[j] (1.00) |
| Supervision | -11.99[k] (3.39) | -11.81 (3.22) | -12.89[k] (3.12) |
| Deviant Friends | 3.69[l] (2.38) | 4.16[m] (2.54) | 4.92[lm] (2.80) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Thus to summarize, within the preadolescent portion of the PYS analyses, SPGM identified four CP and five neighborhood SES groups. Children reared in the poorest neighborhood SES group had only a slightly greater chance of being assigned to the Chronic CP group than children from the other neighborhood SES groups, and this difference was not significant. However, children who were reared in the poorest neighborhoods had greater exposure to environmentally-based CP risk factors than the children from middle-class neighborhoods.

In regard to the ANOVA analyses that compared CP risk factors across and within neighborhood trajectory groups, all but one of the risk factors that were found to differentiate the High-CP/Lower-Middle-Class neighborhood boys from the High-CP/Lower-SES neighborhood boys, also differentiated the Occasional Rule Breakers and Abstainers from their respective counterparts across neighborhood types. This suggests that the differences found between the two High-CP groups are not unique to children who engage in high levels of CP, and is likely representative of differences between children from poor- and lower-middle-class neighborhoods matched on other characteristics. The only risk factor that differentiated the two High-CP groups was having poor parent-child relationships. This risk factor also differentiated the High-CP groups from the Occasional Rule-Breaking and Abstainer groups within the Lower-Middle Class and Lower-SES neighborhood groups.

In regard to other CP risk factors, children's attitudes about CP differentiated the High-CP and Occasional Rule-Breaker groups from lower-middle-class and lower-SES neighborhoods, but failed to distinguish between the high- and low-CP groups in either of the two neighborhood groups. On the other hand, parental supervision differentiated all three CP groups across neighborhood trajectories, but only distinguished between the High-CP children

from the Occasional-Rule-Breakers in the lower-SES neighborhoods. Maternal physical discipline and children's achievement scores differentiated between the High-CP and Occasional Rule-Breaker groups when compared across neighborhood trajectory groups, but only predicted membership in the High-CP group in the Lower-SES neighborhood group.

In regard to having deviant friends, this variable predicted membership in the High-CP groups within both types of neighborhood groups. However, for the across-neighborhood trajectory comparisons, having deviant friends only differentiated between the Lower-Middle-Class neighborhood/Abstainer and Lower-SES neighborhood/Abstainer groups.

Hyperactive-impulsive-inattentive behaviors also predicted membership in the High-CP groups within both types of neighborhoods, but did not differentiate between High-CP boys across neighborhood types. This was also true for maternal stress. Marital satisfaction was the only variable that was found to differentiate between high- and low-CP boys from lower-middle-class neighborhoods but it did not differentiate between these groups within the Lower-SES neighborhood group.

## Middle Childhood to Late Adolescence PYS Results

### *Descriptive Statistics and Bivariate Correlations*

Because the second set of PYS analyses involve different measures than the preadolescent PYS analyses and/or involve measures collected at different ages, descriptive statistics and bivariate correlations are reviewed for the variables included in these analyses. Consequently, descriptive statistics for the CP, neighborhood SES, and the predictor variables that were included in the middle childhood to late adolescence PYS analyses are presented in Table 39. Once again, because the CP measure that was employed in this study was created specifically for this study, it is not possible to directly assess how the PYS participants compare

Table 39. Means and Standard Deviations for Study Variables for Middle Childhood to Late Adolescence PYS Analyses

| | Child's Age | *M* | SD |
|---|---|---|---|
| *Self Reports of CP* | | | |
| SRD | 10.5 | .07 | .12 |
| SRD | 11 | .08 | .13 |
| SRD | 12 | .12 | .21 |
| SRD | 13 | .13 | .23 |
| SRD | 14 | .15 | .26 |
| SRD | 15 | .16 | .28 |
| SRD | 16 | .13 | .27 |
| SRD | 17 | .12 | .25 |
| SRD | 18 | .07 | .18 |
| *Neighborhood SES* | | | |
| 1990 U.S. Census | 10.5 | -.96 | 1.64 |
| 1990 U.S. Census | 11 | -.92 | 1.60 |
| 1990 U.S. Census | 12 | -.88 | 1.58 |
| 1990 U.S. Census | 13 | -.79 | 1.60 |
| 1990 U.S. Census | 14 | -.72 | 1.53 |
| 1990 U.S. Census | 15 | -.64 | 1.47 |
| 1990 U.S. Census | 16 | -.59 | 1.42 |
| 1990 U.S. Census | 17 | -.55 | 1.40 |
| 1990 U.S. Census | 18 | -.54 | 1.42 |
| *Census Tract Data at Phase G* | | | |
| Median Household Income | 10.5 | 18782.84 | 8658.90 |
| % of Families Living in Poverty | 10.5 | .26 | .23 |
| % of Families on Public Assistance | 10.5 | .22 | .18 |
| % Unemployed | 10.5 | .15 | .12 |
| % Single-Parent Families | 10.5 | .16 | .16 |
| % of Householders in Nbh. > 5 years | 10.5 | .60 | .13 |
| % African-American | 10.5 | .44 | .39 |
| % Percent Youth | 10.5 | .14 | .05 |
| Mean Household Size | 10.5 | 2.52 | .32 |
| *Census Tract Data at Phase V* | | | |
| Median Household Income | 18 | 22120.87 | 15230.60 |
| % of Families Living in Poverty | 18 | .21 | .20 |
| % of Families on Public Assistance | 18 | .17 | .15 |
| % Unemployed | 18 | .12 | .10 |
| % Single-Parent Families | 18 | .13 | .13 |
| % of Householders in Nbh. > 5 years | 18 | .61 | .13 |
| % African-American | 18 | .35 | .38 |

Table 39. Continued

| | Child's Age | *M* | SD |
|---|---|---|---|
| *Census Tract Data at Phase V* | | | |
| % Percent Youth | 18 | .13 | .05 |
| Mean Household Size | 18 | 2.55 | .32 |
| *Predictor Variables* | | | |
| Hyperactive-Impulsive-Inattentive (HIA) | 7.5-10 | .00 | .86 |
| CAT, Reading | 7 | 50.91 | 30.68 |
| CAT, Language | 7 | 46.10 | 32.14 |
| Attitudes about Delinquency | 7.5-10 | .00 | .68 |
| Maternal Stress | 7.5-10 | -.01 | .84 |
| Marital Agreement | 7.5-10 | .05 | .93 |
| Parent-Child Relationship Quality | 7.5-10 | .00 | .84 |
| Physical Discipline | 7.5-10 | -.01 | .68 |
| Supervision | 7.5-10 | 0.01 | .70 |
| Deviant Friends | 7.5-10 | .00 | .75 |

to participants in other large longitudinal studies in regard to frequency and severity of antisocial behavior. However, because the CP measure that was employed represents an average of self-report items on the SRD, with 'no' responses being scored as '0,' and 'yes' responses being scored as '1' multiplied by the severity of the item as defined by Loeber and colleagues (1998), it can be concluded that on average, the PYS participants were engaging in some deviant behavior, but on an irregular basis.

Regarding the neighborhood data, mean values at ages 10.5 and 18 for the various census tract scores used to create the neighborhood poverty factors were included in Table 39 to provide greater detail about what neighborhoods conditions were like for participants in the PYS sample throughout the span of the study. As was true for the preadolescent portion of the PYS analyses, the census tract variables that were used to define neighborhood SES suggest that on average, the participants from the PYS sample were from low-income communities characterized by high-levels of poverty, unemployment, and residential instability. However, as was also true for the preadolescent portion of the PYS analyses, the sample demonstrated a high level of variability in neighborhood poverty, and the percentage of participants living in poor communities declined over time.

Bivariate correlation coefficients appear in Tables 40 through 42. In Table 40, correlation coefficients are presented among the nine measures of CP and neighborhood SES collected between the ages 10.5 and 18. Both CP and neighborhood SES demonstrated stability over time, but the stability of youth-reported CP was found to be less than the stability of neighborhood SES (for CP, correlations ranged from .05 to .51, and for neighborhood SES, correlations ranged from .64 to .95) and lower than the stability of maternal reports of CP provided by the mothers of the PMCP and PYS participants at younger ages (see Tables 5 & 23). Whereas all of the

Table 40. Correlations Between CP and Neighborhood SES Scores for Older PYS Analyses

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. CP, Age 10.5 | .34* | .27* | .25* | .24* | .26* | .17* | .14* | .13* | -.09+ | -.08+ | -.12* | .10* | -.14* | -.10* | -.07 | -.08+ | -.09+ |
| 2. CP, Age 11 | --- | .33* | .25* | .23* | .14* | .12* | .13* | .05 | -.02 | .00 | .02 | .02 | .00 | .02 | -.02 | .00 | -.01 |
| 3. CP, Age 12 | | --- | .41* | .43* | .41* | .25* | .25* | .27* | -.06 | -.05 | -.07 | -.06 | -.08+ | -.07 | -.05 | -.01 | -.08 |
| 4. CP, Age 13 | | | --- | .39* | .42* | .35* | .25* | .24* | -.06 | -.06 | -.06 | -.04 | -.05 | -.03 | -.03 | -.02 | -.03 |
| 5. CP, Age 14 | | | | --- | .45* | .40* | .30* | .38* | -.10* | -.07 | -.08+ | -.07 | -.05 | -.05 | -.05 | -.06 | -.06 |
| 6. CP, Age 15 | | | | | --- | .51* | .42* | .33* | -.09+ | -.05 | -.07 | -.06 | -.08 | .00 | -.01 | .00 | .01 |
| 7. CP, Age 16 | | | | | | --- | .40* | .34* | -.10* | -.06 | -.06 | -.08+ | -.08 | -.02 | -.03 | -.09+ | -.01 |
| 8. CP, Age 17 | | | | | | | --- | .40* | -.09+ | -.10* | -.11* | -.07 | -.10* | -.10* | -.06 | .00 | -.07 |
| 9. CP, Age 18 | | | | | | | | --- | .07 | .08 | .07 | .08+ | .08+ | .06 | .06 | .08+ | .08+ |
| 10. Nbh. SES, Age 10.5 | | | | | | | | | --- | .95* | .87* | .80* | .79* | .72* | .68* | .64* | .64* |
| 11.Nbh. SES, Age 11 | | | | | | | | | | --- | .90* | .80* | .79* | .75* | .70* | .64* | .67* |
| 12. Nbh. SES, Age 12 | | | | | | | | | | | --- | .88* | .87* | .78* | .74* | .69* | .72* |
| 13.Nbh. SES, Age 13 | | | | | | | | | | | | --- | .88* | .81* | .78* | .74* | .74* |

Table 40. Continued

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14. Nbh. SES, Age 14 | | | | | | | | | | | | | --- | .88* | .80* | .77* | .76* |
| 15. Nbh. SES, Age 15 | | | | | | | | | | | | | | --- | .86* | .79* | .78* |
| 16. Nbh. SES, Age 16 | | | | | | | | | | | | | | | --- | .84* | .84* |
| 17.Nbh. SES, Age 17 | | | | | | | | | | | | | | | | --- | .80* |
| 18. Nbh. SES, Age 18 | | | | | | | | | | | | | | | | | --- |

+p < .10, *p < .05.

Table 41. Correlations Between CP and Predictor Variables for Older PYS Analyses

| Variable | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. CP, Age 10.5 | .13** | .04 | .12* | .10* | .07 | .07 | -.20** | .10* | -.11* | .10* |
| 2. CP, Age 11 | .09+ | .00 | .07 | .10* | .03 | -.02 | -.08+ | .07 | -.04 | .10* |
| 3. CP, Age 12 | .14** | -.06 | -.05 | .07 | .06 | .11+ | -.09* | .04 | -.08+ | .16** |
| 4. CP, Age 13 | .17** | -.04 | -.01 | .01 | .14** | .03 | -.11* | .04 | -.05 | .16** |
| 5. CP, Age 14 | .15** | -.02 | -.01 | .03 | .15** | .16** | -.18** | .08+ | -.09+ | .17** |
| 6. CP, Age 15 | .16** | -.11* | -.08+ | .04 | .13** | .02 | -.15** | .04 | -.07 | .18** |
| 7. CP, Age 16 | .07 | -.08 | -.06 | .01 | .12* | .09 | -.12* | -.03 | -.07 | .10* |
| 8. CP, Age 17 | .08+ | -.08 | -.04 | .03 | .09+ | .04 | -.17** | .06 | -.05 | .12* |
| 9. CP, Age 18 | .02 | .04 | .06 | .02 | -.01 | -.04 | -.01 | .00 | .02 | .04 |
| 10. HIA | --- | -.30** | -.26** | .13** | .26** | .16** | -.34** | .28** | -.16** | .27** |
| 11. CAT, Reading | | --- | .79** | -.28** | -.15** | -.04 | .24** | -.09+ | .16** | -.04 |
| 12. CAT, Language | | | --- | -.29** | -.12* | -.03 | .23** | -.05 | .16** | .00 |
| 13. Attitudes about Delinquency | | | | --- | .01 | -.03 | -.29** | .09+ | -.19** | .04 |
| 14. Maternal Stress | | | | | --- | .42** | -.38** | .16** | -.23** | .17** |

Table 41. Continued

| Variable | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| 15. Marital Agreement | | | | | | --- | -.18** | .02 | -.11* | .09 |
| 16. Parent-Child Relationship Quality | | | | | | | --- | -.30** | -.40** | -.18** |
| 17. Physical Punishment | | | | | | | | --- | -.23** | .12** |
| 18. Supervision | | | | | | | | | --- | -.17** |
| 19. Deviant Friends | | | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

Table 42. Correlations Between Neighborhood SES Scores and Predictor Variables for Older PYS Analyses

| Variable | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Neighborhood SES, Age 10.5 | -.14** | .12** | .13** | -.11* | -.06 | .00 | .11* | -.21** | .24** | -.20** |
| 2. Neighborhood SES, Age 11 | -.13 | .15** | .14** | -.12** | -.04 | .00 | .10* | -.20** | .20** | -.19** |
| 3. Neighborhood SES, Age 12 | -.12** | .18** | .17** | -.13** | -.04 | .02 | .10* | -.21** | .19** | -.18** |
| 4. Neighborhood SES, Age 13 | -.10* | .15 | .12** | -.11* | -.06 | -.01 | .09+ | -.21** | .21** | -.13** |
| 5. Neighborhood SES, Age 14 | -.10* | .18** | .15** | -.11* | -.05 | .02 | .09+ | -.21** | .19** | -.14** |
| 6. Neighborhood SES, Age 15 | -.08+ | .18** | .14** | -.08+ | -.06 | -.02 | .07 | -.19** | .16** | -.12** |
| 7. Neighborhood SES, Age 16 | -.07 | .16** | .14** | -.09* | -.04 | -.01 | .07 | -.17** | .14** | -.12** |
| 8. Neighborhood SES, Age 17 | -.10+ | .19** | .18** | -.13** | -.07 | -.02 | .10* | -.18** | .18** | -.10* |
| 9. Neighborhood SES, Age 18 | -.12 | .17** | .17** | -.15** | -.07 | -.06 | .11* | -.17** | .17** | -.08+ |
| 10. HIA | --- | -.30** | -.26** | .13** | .26** | .16** | -.34** | .28** | -.16** | .27** |
| 11. CAT, Reading | | --- | .79** | -.28** | -.15** | -.04 | .24** | -.09+ | .16** | -.04 |
| 12. CAT, Language | | | --- | -.29** | -.12* | -.03 | .23** | -.05 | .16** | .00 |
| 13. Attitudes about Delinquency | | | | --- | .01 | -.03 | -.29** | .09+ | -.19** | .04 |
| 14. Maternal Stress | | | | | --- | .42** | -.38** | .16** | -.23** | .17** |

Table 42. Continued

| Variable | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| 15. Marital Agreement | | | | | | --- | -.18** | .02 | -.11* | .09 |
| 16. Parent-Child Relationship Quality | | | | | | | --- | -.30** | -.40** | -.18** |
| 17. Physical Punishment | | | | | | | | --- | -.23** | .12** |
| 18. Supervision | | | | | | | | | --- | -.17** |
| 19. Deviant Friends | | | | | | | | | | --- |

+p < .10, *p < .05, **p < .01.

measures of CP included in the PMCP and preadolescent PYS analyses were related over time, the age-11 version of the measure used for the older PYS cohort failed to be associated with adolescent's reports of CP on this measure at age 18.

Regarding the strength of relations between CP and neighborhood SES, measures of these variables were generally unrelated. However, there were a few exceptions, and in each case higher neighborhood SES predicted lower rates of CP (e.g., CP at 10.5 negatively predicted neighborhood SES at age 12, $r$ = -.12, $p$ < .01)

Bivariate correlation coefficients between the nine measures of CP collected between ages 10.5 and 18 and the predictor variables are presented in Table 41. All of the predictor variables were found to be associated with at least one measurement of CP over time, but in general, the relations that were detected were modest (e.g., the strongest relationship detected between CP and any of the risk factors was for parent-child relationship quality, $r$ =.20, $p$ < .01)

In Table 42, correlation coefficients are presented among the nine measures of neighborhood SES and the predictor variables collected between ages 10.5 and 18. In general, boys residing in lower SES neighborhoods obtained lower scores on the reading and language subtests of the CAT ($r$ as high as .18 across ages, $p$ < .01), were rated by their mothers as engaging in more hyperactive-impulsive-inattentive behaviors ($r$ as low as -.19 across ages, $p$ < .01), had more favorable views toward delinquent behavior ($r$ as low as -.15 across ages, $p$ < .01), had more negative relationships with their parents ($r$ as low as -.11 across ages, $p$ < .05), were supervised less ($r$ as high as .24 across ages, $p$ < .01), experienced more physical discipline ($r$ as low as -.21 across ages, $p$ < .01), and had more deviant friends ($r$ as low as -.20 across ages, $p$ < .01).

### *Individual and Joint Trajectories of CP & Neighborhood SES*

The same procedures were used to estimate the best-fitting individual and joint trajectory models of CP and neighborhood SES as were employed with the two other sets of analyses. Once again, the univariate models were evaluated first.

In Table 43, BIC scores are presented for univariate CP models with two through seven groups. According to the BIC scores, the seven-group solution provided the best fit. However, after other criteria were considered, the three-group solution was selected as the most optimal model. After the fifth group was added, the addition of each new group included cell sizes that were too small to compare with inferential statistics to the other CP groups (e.g., the six-group solution included a group that only had four members, and the seven-group solution had a group with seven members). Furthermore, the seven-group solution included a few groups with low mean posterior assignment probabilities (as low as .60), meaning that there was a greater than acceptable probability that some individuals in this model were misclassified. The five-group solution would have been chosen as the best-fitting model, except that some of its groups had borderline posterior assignment probabilities (as low as .77), which dropped to unacceptable (as low as .62) when the model's nonsignificant trajectory coefficients were removed. The four-group solution had similar problems, having a group with a mean posterior assignment probability of .73. This led to the selection of the three-group solution. There was no need to remove nonsignificant trajectory coefficients from the three-group solution because all of the groups required quadratic terms to account for their growth.

In regards to the neighborhood SES model, Table 43 lists BIC scores for univariate models with two through seven groups. Once again, the seven-group solution provided the best fit for the data, but when other criteria were considered, the five-group model appeared to be the

Table 43. BIC by Model Type for CP and Neighborhood SES from Ages 10.5 to 18 for PYS Participants

| Model | Order | BIC |
|---|---|---|
| *CP* | | |
| a. Two group | 2 2 | -2278.40 |
| b. Three group | 2 2 2 | -2060.89 |
| c. Four group | 2 2 2 2 | -2059.08 |
| d. Five group | 2 2 2 2 2 | -2020.45 |
| e. Six group | 2 2 2 2 2 2 | -2018.11 |
| f. Seven group | 2 2 2 2 2 2 2 | -2015.58 |
| | | |
| *Neighborhood SES* | | |
| a. Two group | 2 2 | -5895.30 |
| b. Three group | 2 2 2 | -5130.77 |
| c. Four group | 2 2 2 2 | -4889.40 |
| d. Five group | 2 2 2 2 2 | -4591.61 |
| e. Six group | 2 2 2 2 2 2 | -4577.93 |
| f. Seven group | 2 2 2 2 2 2 2 | -4534.48 |
| g. Five group | 2 2 1 1 0 | -4591.55 |

*Note.* Entries in the second column denote the parameters used to define the shape of each group's trajectory. Groups represented by the number 0 were defined solely by their intercepts. Groups represented by the number 1 were defined by their intercepts and a linear growth term. Finally, groups represented by the number 2 were defined by their intercepts, a linear growth term, and a quadratic term.

most optimal model. The seven-group model was faulty because one of the groups in the model only had four participants assigned to it, which would be an insufficient number to compare to other groups using inferential statistics. The five-group model was chosen over the six-group solution because in the six-group solution one of the groups from the five-group model was divided into two groups that had similar slopes and that were difficult to distinguish. As mentioned previously, researchers who use SPGM commonly opt for the more parsimonious model when having to choose between two models that only vary in slight ways, even if this means opting for the model with the smaller BIC (Brame et al., 2001; Nagin, 2005). For this reason, the more parsimonious five-group solution was selected over the seven-group solution as the best-fitting model. To enhance the five-group solution's overall fit, nonsiginificant trajectory coefficients from the five-group model were removed. This resulted in a model that included one group that could be defined solely by the intercept, two other groups which required the intercept and linear terms to define their growth, and two other groups that required these terms and a quadratic term to define their growth.

The joint trajectory model was specified next using the number of groups and the shape of trajectories from the univariate models. Parameter estimates for both sets of trajectories are presented in Table 44. In addition, estimated group sizes and posterior assignment probabilities for both sets of trajectory groups are reported on in Table 44. In Figures 5 and 6, trajectories are displayed graphically as observed and as would be predicted by the parameter estimates for the trajectories reported on in Table 44. More specifically, the parameter estimates reported on in Table 44 determine the shape of the predicted trajectories in the figures. The observed trajectories in Figures 5 and 6 represent mean CP scores for the members of each CP group and mean neighborhood SES scores for the neighborhood SES groups across time, respectively.

Table 44. Estimated Trajectory Parameters, Percentages, and Posterior Assignment Probabilities for CP and Neighborhood SES Groups from the Middle Childhood to Late Adolescence PYS Analyses

| | Intercept | | Slope | | Quadratic | | Est. % of | Post. Assignment Prob. | |
|---|---|---|---|---|---|---|---|---|---|
| Trajectory Group | β | *SD* | β | *SD* | β | *SD* | Population | *M* | *SD* |
| *CP* | | | | | | | | | |
| Low-CP | -0.064*** | 0.006 | -0.003* | 0.001 | -.001 | 0.0007 | 80.8% | .90 | .17 |
| Frequent Rule-Breakers | 0.404 | 0.022 | -0.011*** | 0.005 | -0.023 | 0.002 | 12.4% | .97 | .01 |
| Highly-Delinquent | 0.743*** | 0.021 | 0.043* | 0.007 | -0.036*** | 0.003 | 6.8% | .94 | .11 |
| *Neighborhood SES* | | | | | | | | | |
| Poverty-Stricken-Stable | -4.294*** | 0.057 | -0.062*** | 0.016 | 0.034** | 0.008 | 8.0% | .99 | .01 |
| Poverty-Stricken-Improve | -1.241*** | 0.072 | 0.548*** | 0.023 | -0.99** | 0.010 | 5.4% | .99 | .07 |
| Lower-Class/Poor | -1.574*** | 0.031 | 0.049*** | 0.011 | ----- | ----- | 18.4% | .95 | .10 |
| Lower-Class | -0.541*** | 0.029 | 0.055*** | 0.009 | ----- | ----- | 26.3% | .95 | .09 |
| Lower-Middle-Class | 0.402*** | 0.018 | ----- | ----- | ------ | ------ | 41.8% | .96 | .12 |

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

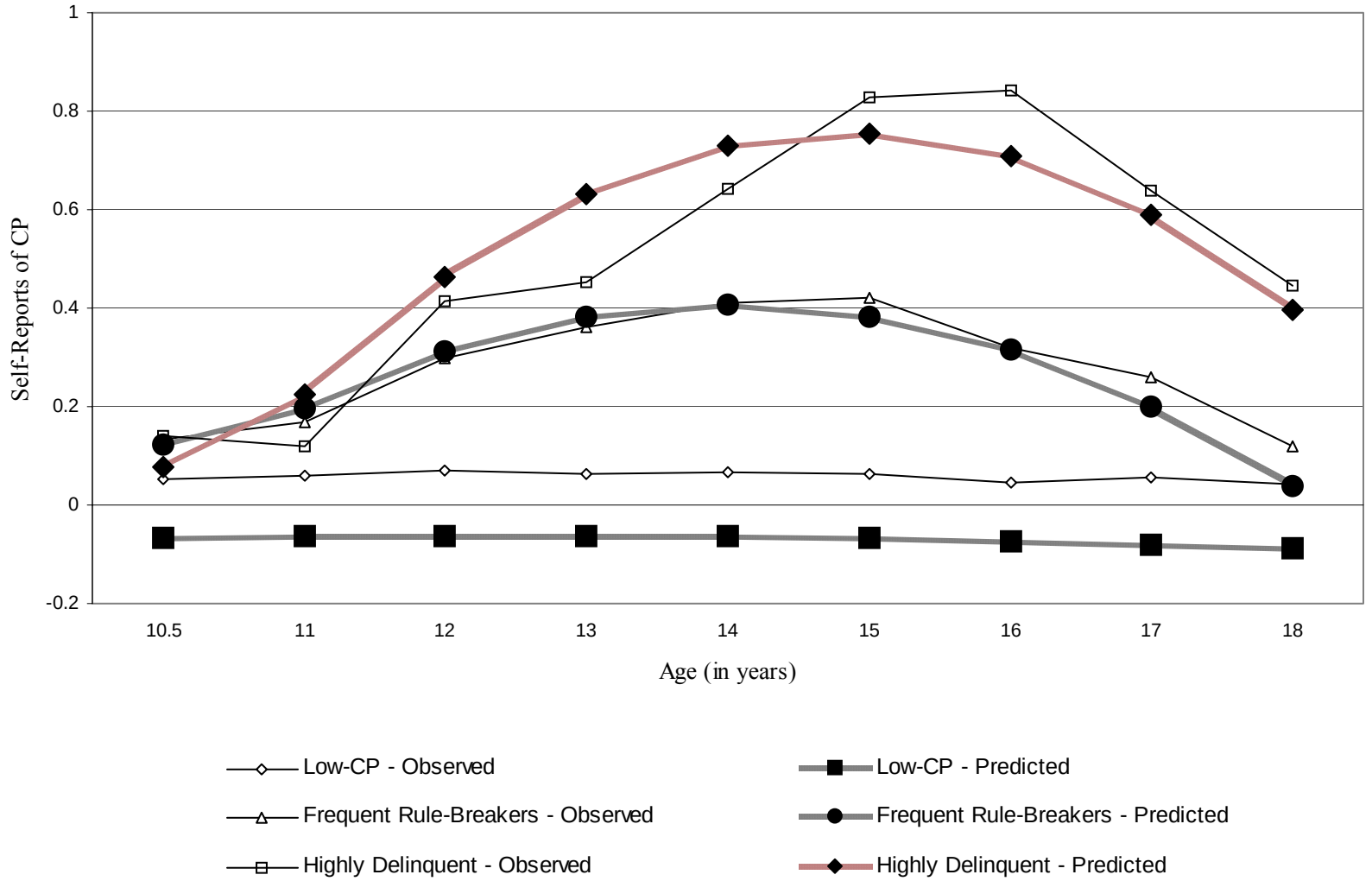


Figure 5. Self-reports of CP by CP trajectory group for older PYS analyses.

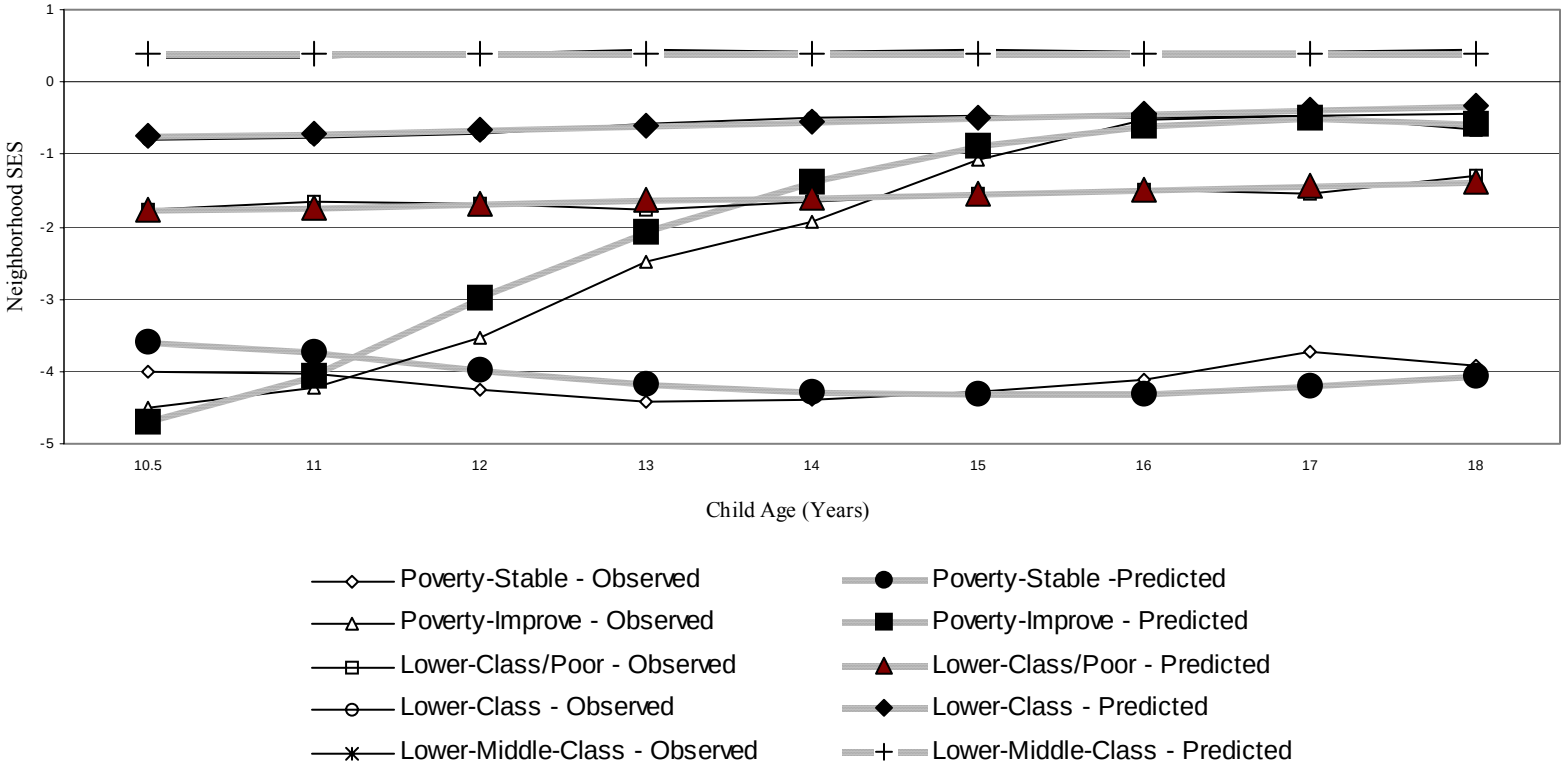


Figure 6. Neighborhood SES scores by neighborhood SES trajectory groups for older PYS analyses.

As can be seen in Figure 5, one of the three CP groups was characterized by modest levels of CP from ages 10.5 to 18. This group included 80.8% of the PYS sample and will be referred to as Low-CP youth. Another group, which included 12.4% of the sample, was involved in low to moderate levels of CP at the beginning of the trajectory, but demonstrated growth in this behavior during the first few years, followed by a decline during the last few years. This group will be referred to as Frequent Rule Breakers. Finally, the third group followed the same pattern as the Frequent Rule-Breakers, but their growth in CP was far more dramatic at the beginning stages of the trajectory, and their decline far less dramatic during the last few years. This third group included 6.8% of the PYS sample and will be referred to as Highly-Delinquent youth. Mean posterior assignment probabilities for the five CP groups were high, ranging from .90 to .97 with an average of .94 across groups.

In regard to the neighborhood SES groups, the five neighborhood SES groups identified were almost identical to those identified for the preadolescence PYS analyses. Therefore, the same labels were used to identify neighborhood groups in the second set of PYS analyses as were used in the first set of PYS analyses. These labels were deemed justifiable based on the mean census tract scores for the five neighborhood groups, which are presented in Table 45 for age-10.5 census tract scores and Table 46 for age-18 census tract scores. For the middle childhood to late adolescence PYS analyses, 8.0% of the PYS participants were assigned to the Poverty-Stricken Stable group. Another 5.4% of the PYS were assigned to the Poverty-Stricken-Improve neighborhood group. The Lower-Class/Poor neighborhood group had 18.4% of the sample assigned into it, and the Lower-Class neighborhood group was assigned another 26.3% of the PYS sample. Finally, 41.8% of the PYS participants were classified into the Lower-Middle-

Table 45. Mean Neighborhood Characteristics by Trajectory Groups at Age 10.5 for PYS sample

| | Poverty-Stricken-Stable (N=40) | Poverty-Stricken-Improve (N=27) | Lower-Class/Poor (N=93) | Lower-Class (N=127) | Lower-Middle-Class (N=215) |
|---|---|---|---|---|---|
| Median Household Income | $7295.63 ($4985.84) | $6051.37 ($554.18) | $13067.02 ($3765.53) | $17606.91 ($4538.25) | $25869.82 ($6512.42) |
| % of Families Living in Poverty | .70 (.20) | .75 (.05) | .35 (.11) | .23 (.10) | .10 (.07) |
| % of Families on Public Assistance | .54 (.17) | .60 (.06) | .30 (.09) | .20 (.08) | .09 (.05) |
| % Unemployed | .36 (.11) | .40 (.06) | .20 (.07) | .14 (.05) | .07 (.03) |
| % Single-Parent Families | .47 (.18) | .53 (.12) | .18 (.07) | .14 (.07) | .06 (.04) |
| % of Householders in Neighborhood > 5 years | .51 (.07) | .47 (.05) | .61 (.09) | .59 (.12) | .63 (.15) |
| % African-American | .87 (.19) | .87 (.08) | .86 (.14) | .49 (.29) | .09 (.15) |
| % Percent Youth | .18 (.04) | .20 (.02) | .16 (.08) | .14 (.04) | .11 (.02) |
| Mean Household Size | 2.73 (.42) | 2.97 (.37) | 2.44 (.23) | 2.44 (.33) | 2.49 (.26) |

*Note.* Standard deviations are reported in parentheses.

Table 46. Mean Neighborhood Characteristics by Trajectory Groups at Age 18 for PYS sample

| | Poverty-Stricken-Stable (N=40) | Poverty-Stricken-Improve (N=27) | Lower-Class/Poor (N=93) | Lower-Class (N=127) | Lower-Middle-Class (N=215) |
|---|---|---|---|---|---|
| Median Household Income | $7459.90 ($5341.06) | $19425.12 ($7756.30) | $16144.66 ($6310.45) | $20785.28 ($7742.68) | $28913.36 ($19532.50) |
| % of Families Living in Poverty | .68 (.19) | .22 (.16) | .29 (.11) | .19 (.11) | .09 (.09) |
| % of Families on Public Assistance | .54 (.15) | .18 (.13) | .25 (.09) | .16 (.09) | .08 (.05) |
| % Unemployed | .36 (.10) | .13 (.07) | .16 (.07) | .11 (.05 | .06 (.03) |
| % Single-Parent Families | .46 (.18) | .12 (.13) | .16 (.05) | .12 (.08) | .05 (.03) |
| % of Householders in Neighborhood > 5 years | .51 (.07) | .58 (.15) | .62 (.10) | .61 (.12) | .63 (.14) |
| % African-American | .87 (.18) | .43 (.35) | .74 (.28) | .35 (.31) | .06 (.12) |
| % Percent Youth | .18 (.03) | .15 (.05) | .15 (.07) | .13 (.04) | .12 (.03) |
| Mean Household Size | 2.79 (2.58) | 2.58 (.34) | 2.46 (.27) | 2.50 (.33) | 2.56 (.30) |

*Note.* Standard deviations are reported in parentheses.

Class neighborhood group. Mean posterior assignment probabilities for the five CP groups were again high, ranging from .95 to .9996 with an average of .97 across groups.

Overall, 15 groups (i.e., 3 CP groups by 5 neighborhood groups) were created by the joint trajectory analysis described above. The number of children and probability of assignment into the various groups created by the joint trajectory analysis are detailed in Table 47. The smallest group was the Highly-Delinquent/Poverty-Stricken Improve neighborhood group, which only included two children. One-hundred and eighty-four children were assigned to the largest group, which was the Low-CP youth/Lower-Middle-Class neighborhood group.

***Conditional Probabilities for Membership in CP Groups Given Neighborhood SES History and Vice-Versa***

Table 48 contains conditional probabilities for being assigned to the three CP groups given membership in one of the five neighborhood SES groups. The converse, conditional probabilities for being assigned to the five neighborhood SES groups given membership in one of the five CP groups, are presented in Table 49. A descriptive summary of the probabilities listed in these Tables is provided below, and is followed by the results from a chi-square test used to assess whether or not CP children were evenly distributed across neighborhood trajectory groups.

Children from the Poverty-Stricken-Stable group were more likely to be assigned to the Highly Delinquent group than children from any other neighborhood group (14.5% for the youth from the Poverty-Stricken Stable Group versus less than 7.4% for all other groups). However, the chi-square test conducted (15 cells, 5 CP groups x 3 neighborhood SES groups) to determine whether Highly Delinquent youth were equally distributed across neighborhood trajectory groups was nonsignificant ($\chi^2 = 5.89$, $p = .21$). This indicates that although the Poverty-Stricken Stable

Table 47. Cell Sizes for CP and Neighborhood SES Trajectory Groups and Probabilities of Assignment in Joint CP/Neighborhood SES Groups for the Older PYS Trajectory Models

| | Neighborhood SES Group | | | | |
|---|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class/Poor | Lower-Class | Lower-Middle-Class |
| Low-CP | 30 (.060) | 20 (.040) | 79 (.157) | 99 (.197) | 184 (.366) |
| Frequent Rule-Breakers | 4 (.008) | 5 (.010) | 9 (.018) | 20 (.040) | 20 (.040) |
| Highly-Delinquent | 6 (.012) | 2 (.004) | 5 (.010) | 8 (.016) | 12 (.020) |

*Note.* Joint probabilities are reported in parentheses.

Table 48. Estimated Conditional Probabilities of CP Trajectory Group by Neighborhood SES Trajectory Group for the Middle Childhood to Late Adolescence PYS Analyses

| | Neighborhood SES Group | | | | |
|---|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class/Poor | Lower-Class | Lower-Middle-Class |
| Low-CP | .729 | .710 | .841 | .761 | .851 |
| Frequent Rule-Breakers | .126 | .216 | .102 | .182 | .085 |
| Highly-Delinquent | .145 | .074 | .057 | .057 | .065 |

Table 49. Estimated Conditional Probabilities of Neighborhood SES Trajectory Group by CP Trajectory Group for the Middle Childhood to Late Adolescence PYS Analyses

| | Neighborhood SES Group | | | | |
|---|---|---|---|---|---|
| CP Trajectory Group | Poverty-Stricken Stable | Poverty-Stricken-Improve | Lower-Class/Poor | Lower-Class | Lower-Middle-Class |
| Low-CP | .082 | .095 | .151 | .386 | .286 |
| Frequent Rule-Breakers | .073 | .048 | .191 | .248 | .441 |
| Highly-Delinquent | .171 | .059 | .154 | .221 | .396 |

boys had a slightly higher rate of being classified into the Highly Delinquent group, this rate was not any greater than what would be expected by chance and contradictory to the expectations of Hypothesis 1.

***Mean Risk Scores for Environmentally-Based Risk Factors across Neighborhood Trajectory Groups***

Results from ANOVA analyses comparing the extent to which children from the five neighborhood SES groups were exposed to environmentally-based risk factors are presented in Table 50. Group differences that were found to be significant ($p < .05$) are described below.

According to self and maternal reports, children from middle-class neighborhoods were more likely to be supervised by their mothers than boys from all other neighborhood groups, and boys from the two Poverty-Stricken neighborhood groups had the most deviant friends prior to age 10.5. In addition, boys from lower-middle-class neighborhoods were less likely to have negative relationships with their parents than boys from the two Poverty-Stricken neighborhood groups. Once again, these findings are consistent with the notion that children in less prosperous communities are exposed to more environmentally-based risk factors than children from poorer communities, as predicted by Hypothesis 2.

***Comparison of the Developmental Histories of CP Children within and across Neighborhood Trajectories***

Significant findings ($p < .05$) from ANOVA analyses comparing CP groups across neighborhood trajectories are summarized below. Once again, trajectory groups with similar characteristics were combined to ensure at least marginal power for group comparisons because some of the joint trajectory groups only included a few boys (e.g., there were only two members of the Frequent Rule-Breaker/Poverty-Stricken Improve neighborhood group). Thus, for the

Table 50. Mean Risk Scores for Environmentally-Based CP Risk Factors by Neighborhood Trajectory Group for Older PYS Sample

| | Poverty-Stricken Stable (N=40) | Poverty-Stricken Improve (N=27) | Lower-Class/Poor (N=93) | Lower-Class (N=127) | Lower-Middle-Class (N=215) |
|---|---|---|---|---|---|
| Maternal Stress | .09 (.60) | -.01 (.85) | .03 (.75) | .07 (.89) | -.09 (.89) |
| Marital Agreement | .21 (.98) | -.37 (.92) | -.03 (.86) | .05 (1.04) | .08 (.89) |
| Parent-Child Relationship Quality | -.23[a] (.72) | -.15 (.75) | .01 (.81) | .00 (.82) | .06[a] (.89) |
| Physical Punishment | .32[bcd] (.59) | .20[e] (.70) | .06[bg] (.61) | .03[cf] (.68) | -.15[defg] (.70) |
| Supervision | -.19[h] (.69) | -.31[ij] (.87) | -.14[k] (.61) | -.02[il] (.67) | .16[hjkl] (.69) |
| Deviant Friends | .27[mno] (.85) | .48[pqr] (.89) | -.06[mp] (.64) | -.04[nq] (.71) | .06[or] (.75) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

between-group neighborhood trajectory comparisons, the Frequent Rule-Breakers and Highly-Delinquent youth groups from the four poorer neighborhood groups were combined to create a High-CP/Lower-SES neighborhood group. This High-CP/Lower-SES group was subsequently compared to a High-CP/Lower-Middle-Class neighborhood group that represented a composite of the Frequent Rule-Breaking and Highly Delinquent groups from within the Lower-Middle-Class neighborhood SES group. For consistency, the Low-CP youth groups from the four poorer neighborhoods were also combined and compared to the Low-CP/Lower-Middle-Class neighborhood group. Table 47 lists group sizes for the various CP and neighborhood groups before they were combined.

The results from ANOVA analyses comparing High-CP youth across neighborhood trajectory groups are presented in Table 51. Contrary to Hypothesis 3, the developmental histories of the High-CP groups from lower-middle-class and poorer neighborhoods were not found to differ on any of the predictor variables, though two marginal differences were detected ($p < .10$). The mothers of High-CP youth from the Lower-SES neighborhood group reported more stress and marital agreement than the mothers of High-CP youth from the Lower-Middle-Class neighborhood group.

On the other hand, several statistically significant differences ($p < .05$) were found between the Low-CP youth from lower-middle-class and poorer neighborhoods. The results from ANOVA analyses comparing Low-CP youth across neighborhood trajectory groups are presented in Table 52. The mothers of the children from lower-middle-class neighborhoods were more likely to report marital agreement ($p < .05$), and the youth from this neighborhood group were less likely to express favorable views of delinquency than their counterparts from lower-SES neighborhoods ($p < .05$). In addition, according to youth and maternal reports, Low-CP

Table 51. Mean Risk Scores for High-CP Boys from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | High-CP/Lower-SES Neighborhood Group (N=59) | High-CP/Lower-Middle-Class Neighborhood Group (N=32) |
|---|---|---|
| HIA | 0.35<br>(0.69) | 0.19<br>(0.78) |
| CAT, Reading | 47.27<br>(31.56) | 52.32<br>(32.35) |
| CAT, Language | 44.16<br>(34.78) | 48.48<br>(28.07) |
| Attitudes about Delinquency | -0.003<br>(0.50) | 0.19<br>(0.78) |
| Maternal Stress | 0.39<br>(0.90) | -0.0003<br>(0.97) |
| Marital Agreement | 0.46<br>(1.16) | -0.03<br>(0.91) |
| Parent-Child Relationship Quality | -0.17<br>(0.68) | 0.12<br>(0.68) |
| Physical Punishment | 0.30<br>(0.84) | 0.15<br>(0.87) |
| Supervision | -0.10<br>(0.73) | -0.04<br>(0.75) |
| Deviant Friends | 0.28<br>(0.77) | 0.40<br>(0.59) |

Table 52. Mean Risk Scores for Abstainers from Lower-SES Neighborhoods and Lower-Middle-Class Neighborhoods

| | Abstainers/Lower-SES Neighborhood Group (N=228) | Abstainers/Lower-Middle-Class Neighborhood Group (N=184) |
|---|---|---|
| HIA | 0.03[a] (0.83) | -0.19[a] (0.92) |
| CAT, Reading | 45.86[b] (31.27) | 57.90[b] (28.17) |
| CAT, Language | 40.46[c] (32.11) | 53.08[c] (30.81) |
| Attitudes about Delinquency | 0.12[d] (0.69) | -0.16[d] (0.67) |
| Maternal Stress | -0.03 (0.76) | -0.10 (0.88) |
| Marital Agreement | -0.13[e] (0.86) | 0.10[e] (0.89) |
| Parent-Child Relationship Quality | -0.08[f] (0.64) | 0.15[f] (0.71) |
| Physical Punishment | -0.03 (0.77) | -0.10 (0.89) |
| Supervision | -0.11[g] (0.67) | 0.20[g] (0.68) |
| Deviant Friends | -0.01 (0.73) | -0.14 (0.75) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

youth from lower-middle-class neighborhoods were more likely to be carefully supervised during middle childhood ($p < .05$), and according to maternal and teacher reports, less likely to have engaged in high levels of hyperactive-impulsive-inattentive behaviors ($p < .05$).

For the within-neighborhood group comparisons, the developmental histories of the High-CP groups, which represented the merger of the Frequent Rule-Breaking and Highly Delinquent groups, were compared to the developmental histories of the Low-CP groups, once within the Lower-Middle-Class neighborhood trajectory group, and a second time within the average of the four other neighborhood trajectory groups. Results from the within-neighborhood trajectory comparisons are presented in Tables 53 for youth from lower-middle-class neighborhoods and in Table 54 for youth from poorer neighborhoods. Significant group differences ($p < .05$) are mentioned below. Within the Lower-Middle-Class neighborhood group, the High-CP groups were found to have had developmental histories characterized by higher levels of hyperactive-impulsive-inattentive behavior, more deviant friends, and more favorable views of delinquent behavior than the youth from the Low-CP group in the same neighborhood type. As reported in Table 54, within the Lower-SES neighborhood group, membership in the High-CP group was also found to be predicted by having deviant friends and higher levels of hyperactive-impulsive-inattentive behaviors. In addition, high levels of maternal stress, low levels of parental agreement, and having a negative relationship with one's mother were also found to predict classification into the High-CP group within the Lower-SES neighborhood group.

Thus to summarize, three groups were needed to describe CP development among the PYS participants from 10.5 to 18, and five groups were found to best characterize their histories of neighborhood SES. Children classified into one of the poorer neighborhood SES groups had a

Table 53. Mean Risk Scores by CP Trajectory Groups within Lower-Middle-Class Neighborhood Group

| | Abstainers (N=184) | High-CP (N=32) |
|---|---|---|
| HIA | -0.19<br>(0.92) | 0.19<br>(0.78) |
| CAT, Reading | 57.90<br>(28.17) | 52.32<br>(32.35) |
| CAT, Language | 53.08<br>(30.81) | 48.48<br>(28.07) |
| Attitudes about Delinquency | -0.16[a]<br>(0.67) | 0.19[a]<br>(0.73) |
| Maternal Stress | -0.10<br>(0.88) | -.003<br>(0.97) |
| Marital Agreement | 0.10<br>(0.89) | 0.15<br>(0.87) |
| Parent-Child Relationship Quality | 0.16<br>(0.71) | 0.12<br>(0.68) |
| Physical Punishment | -0.10<br>(0.89) | 0.15<br>(0.87) |
| Supervision | 0.20<br>(0.68) | -0.04<br>(0.75) |
| Deviant Friends | -0.14[b]<br>(0.75) | 0.40[b]<br>(0.59) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

Table 54. Mean Risk Scores by CP Trajectory Groups within Lower-SES Neighborhood Groups

| | Abstainers (N=228) | High-CP (N=59) |
|---|---|---|
| HIA | 0.03[a] (0.83) | 0.35[a] (0.69) |
| CAT, Reading | 45.86 (31.27) | 47.27 (31.56) |
| CAT, Language | 40.46 (32.11) | 44.16 (34.78) |
| Attitudes about Delinquency | 0.12 (0.69) | -0.03 (0.50) |
| Maternal Stress | -0.03[b] (0.76) | 0.39[b] (0.90) |
| Marital Agreement | -0.13[c] (0.86) | 0.46[c] (1.16) |
| Parent-Child Relationship Quality | -0.08 (0.64) | -0.17 (0.64) |
| Physical Punishment | -0.03[d] (0.77) | 0.30[d] (0.84) |
| Supervision | -0.12 (0.67) | -0.10 (0.73) |
| Deviant Friends | -0.02[e] (0.73) | 0.28[e] (0.77) |

*Note.* Means with the same superscripts differ significantly at the $p < .05$ level. Standard deviations are reported in parentheses.

slightly greater chance of being assigned to the most deviant CP group, but as was true for the preadolescent PYS analyses, their increased probability of being assigned to the most deviant CP group was not significant.

As would be predicted by the social push hypothesis, children who were reared in the poorest neighborhoods had greater exposure to environmentally-based CP risk factors than the children from lower-middle-class neighborhoods, but contrary to this hypothesis, no significant differences were found between the High-CP groups from lower-middle-class and lower-SES neighborhoods. Regarding the within-neighborhood group comparisons of high- and low-CP youth, having deviant friends and demonstrating hyperactive-impulsive-inattentive behaviors were found to predict CP regardless of neighborhood type. However, having more favorable views of delinquent behavior was only found to predict membership in the High-CP group in lower-middle-class neighborhoods. On the other hand, high maternal stress, low parental agreement, and having a bad relationship with one's parents were found to predict CP only in the poorer neighborhoods.

## DISCUSSION

This study had three major aims. The first was to examine whether there was a relationship between children's developmental histories of CP and neighborhood risk. Based on prior research and theory about how neighborhoods influence children, it was hypothesized that boys from poorer neighborhoods would be more likely than their peers from lower-middle-class neighborhoods to follow a trajectory of CP that was marked by high levels of CP from early childhood to late adolescence. This was only found to be true in the PMCP sample, and the strength of the association between children's CP and neighborhood risk in the PMCP sample was modest.

A second aim was to examine whether children from poorer neighborhood were exposed to more environmentally-based CP risk factors (e.g., peer deviance, rejecting parenting) than children from lower-middle-class neighborhood trajectories. Consistent with the expectations of this hypothesis, children from poorer neighborhood were generally found to be exposed to more environmentally-based risk factors than their peers from lower-middle-class neighborhoods across the PMCP and PYS cohorts.

Finally, in accord with Raine's (Raine & Venables, 1984) social push hypotheses, it was expected that children from riskier environments would have developmental histories characterized by higher levels of environmentally-based risk factors and lower levels of biologically-based risk factors than their counterparts from more advantaged environments. Results were generally not supportive of the social push hypothesis. Although CP youth from poorer communities were frequently found to have greater exposure to environmentally-based risk factors than CP youth from more prosperous communities, these risk factors were also generally found to discriminate non-CP youth across communities. On the other hand, the biologically based risk factors were mostly unrelated to community risk status among CP youth.

Before reviewing the pattern of findings in reference to other relevant literature, because of some novel features of the current study's design (e.g., the use of SPGM to model children's trajectories of CP and neighborhood SES concurrently), it is important to review aspects of its methodology that complicate interpretations of the results. This is followed by a more detailed discussion of the findings and their implications for future research, intervention, and social policy.

**A Brief Review of the Study's Methodology**

Several review papers have documented a modest, but consistent relationship between children's exposure to neighborhood poverty and their involvement in CP (Ingoldsby & Shaw, 2002; Leventhal & Brooks-Gunn, 2000). However, almost all of the prior studies that have been conducted on this topic have relied on measures of CP and/or neighborhood risk that were collected at only one time point. Thus, they reveal little about how children's developmental trajectories of CP are affected by long- versus short-term exposure to neighborhood risk. The present study was designed to improve upon previous research in this area by using SPGM, Nagin's (1999, 2005) semiparametric, group-based approach for classifying children into groups based on their histories of neighborhood SES and CP over time. Subsequent analyses examined how membership in the various CP groups related to membership in the neighborhood SES groups. Utilizing an analytic tool that could account for children's histories of neighborhood SES, as opposed to their neighborhood SES at one time point, was deemed important based on developmental differences in how children respond to neighborhood risk (Halpern-Fisher et al., 1997; Elliott et al., 1996), and research suggesting that chronic stressors have a greater impact on children's adjustment than acute stressors (Duncan, 1996; Garbarino et al., 1991; Korenman, Miller, & Sjaastad, 1995). Although families often move into neighborhoods with similar qualities as their old neighborhoods (Massey et al., 1994; Winslow, 2001), it was expected that some children within the PMCP and PYS samples would move into more prosperous neighborhoods because of life events that resulted in improved financial resources (e.g., remarriage, new employment), and conversely, that some children would move into poorer neighborhoods because of life events resulting in economic hardships (e.g., job loss, divorce).

Across all three sets of analyses, a non-stable neighborhood trajectory group was identified that included boys who had been living in poor neighborhoods at the start of the data

collection, but who moved into more prosperous communities over time. Although in each case, this group was small, the identification of this group across analyses highlights why it is important to consider neighborhood SES longitudinally. Studies that only measure neighborhood SES at one time point may under- or over-estimate the degree to which CP and neighborhood SES covary because of differences in how children who move from poor neighborhoods compare to those who remain in the same locales.

Another reason for using SPGM in this study was because it is a *person-oriented* analytic tool that uses objective criteria for classifying individuals into groups. This was important because one goal was to examine how various CP risk factors relate to children's patterns of antisocial behavior across communities, and much of the previous research that has been conducted on this topic has relied on variable-oriented analytic techniques that assess the strength of associations among *variables*. As mentioned in the Introduction, this is problematic when evaluating how CP risk factors relate to CP across communities because many environmentally-based CP risk factors demonstrate range restriction in upper-income communities. Because range restriction attenuates the size of correlations between variables, it could provide an underestimate of whether and how strongly neighborhood risk status is associated with risk of child CP across communities. Person-oriented analytic tools, such as SPGM are impacted less by range restriction than variable-oriented methods, and as a result represent an improved way of assessing how various CP risk factors covary with children's trajectories of CP across diverse communities.

**Relations between Children's Trajectories of Neighborhood SES and CP**

For the analyses examining associations between children's trajectories of CP and neighborhood SES, the probability of being assigned to the most deviant CP group was

examined across neighborhood trajectory groups. A relationship between these variables was implied if children from the poorer neighborhood groups had an increased likelihood of assignment into the more elevated and chronic CP groups. Consistent with previous literature on neighborhood influences, and as predicted in hypothesis 1, children exposed to prolonged neighborhood poverty had the greatest likelihood of being assigned to the highest-CP group across all three cohorts.

In the analyses of older PYS youth, children exposed to prolonged neighborhood poverty were nearly twice as likely as children from any other neighborhood background to be assigned to the most deviant CP group. Similarly, in the PMCP analyses, children exposed to chronic poverty were nearly three times as likely to be assigned to the most deviant CP group. However, among the younger PYS sample, the difference in probability of assignment to the most deviant CP group was negligible across neighborhood trajectory groups.

Moreover, when chi-square tests were conducted to assess whether high-CP youth were equally distributed among the various SPGM-identified neighborhood groups, only the chi-square test for the PMCP sample was found to be significant. This means that even though more children from the poorest neighborhood groups in the PYS sample tended to be assigned to the most deviant CP groups in both the younger and older cohorts, the distribution of CP groups across the various neighborhood SES groups did not differ from what would be expected by chance.

Taken together, the findings from PMCP and PYS analyses provide weak support for the notion that children's exposure to neighborhood poverty increases their risk for involvement in high levels of CP. The current results are not consistent with much of the previous literature on this topic (Brooks-Gunn et al., 1997; Ingoldsby & Shaw, 2002). As mentioned in the

Introduction, several review papers have documented modest, but consistent associations between neighborhood risk and children's antisocial behavior (Ingoldsby & Shaw, 2002; Leventhal & Brooks-Gunn, 2000). This raises questions about why inconsistent results were found across samples in this study and secondly, why the results were not consistent with previous research on neighborhood risk and youth antisocial behavior.

In regard to the first question, one potential explanation for the discrepant results across samples has to do with how many families within each sample were from upper-income communities. Although both samples included numerous children from extremely deprived communities, there were far more children in the PYS sample from upper-income communities than in the PMCP sample. This difference between samples could have impacted the results if associations between CP and neighborhood SES were non-linear. More specifically, if neighborhood conditions only influence children in extremely deprived environments, the impact of neighborhood poverty on CP may be attenuated in samples that include a disproportionately large number of children from upper-income communities, as was the case for the PYS samples relative to the PMCP. This explanation is also speculative; however, some support can be found for the notion that the impact of neighborhood conditions on CP are far greater in extremely deprived neighborhoods than in other community types. More specifically, in a study of how risk and protective factors relate to youth's involvement in CP, Wikström and Loeber (2000) found that having many risk and few protective factors was predictive of adolescent CP in all types of neighborhoods except those where public housing was common. In such communities, children who had many protective and few risk factors demonstrated similar levels of CP as those with the reverse pattern of protective and risk factors. Wikström, and Loeber concluded that this was the case because in such communities, neighborhood conditions are so adverse that they

overwhelm the influence of individual and family variables. Similar findings were reported by Gorman-Smith and Tolan (Gorman-Smith et al., 1998; Gorman-Smith et al., 1999; Tolan et al., 2003), who found that positive family factors (e.g., family cohesion) were not protective against children's CP in extremely impoverished neighborhoods. Collectively, these findings suggest that neighborhood conditions and CP relate in a nonlinear manner, and lend additional credence to the notion that associations between neighborhood risk and child CP were reduced in the PYS samples relative to the PMCP sample because of the higher proportion of children from upper-income communities.

In regard to why the findings from this study were discrepant from much of the previous research on neighborhood poverty, one possibility may be that the measures of CP employed in this study were less sensitive to neighborhood conditions than those employed by other researchers. For instance, Wikström, and Loeber (2000) found that youth in the older two samples of the PYS who had engaged in at least one seriously delinquent act (e.g., car theft, attack to seriously hurt or kill, force sex, sell drugs) were more than twice as likely to live in neighborhoods in which public housing was common than in advantaged neighborhoods (i.e., neighborhoods in the top quartile of the sample on the same measure of neighborhood risk as was employed in the present study). This difference became even more pronounced when the comparing how late-starters (i.e., youth who first engaged in a serious delinquent act during adolescence) were distributed across communities. These findings suggest strong neighborhood influences on serious delinquency, particularly during adolescence. This is relevant because the measure of CP employed in the PMCP and preadolescent PYS analyses included many minor antisocial behaviors (e.g., swearing, lying or cheating); more serious deviant behaviors were omitted from this measure because they are less common before adolescence (Patterson, 1992;

Stanger et al., 1997). In regard to the analyses of older PYS youth, although the CP measure that was employed included many serious delinquent behaviors (e.g., assault, rape), it also included several less serious delinquent behaviors (e.g., stealing things worth less than $5). Thus, because the measures used in this study for the most part did not represent serious forms of antisocial behavior, the magnitude of association between neighborhood risk and antisocial behavior may have been attenuated compared to previous studies that focused primarily on serious types of antisocial activities (e.g. felonies).

Another reason why the findings from this study varied from previous literature on neighborhood effects may have involved the study's longitudinal design. As mentioned in the Introduction, previous studies of neighborhood risk and CP have relied on measures that were only collected at one time point of one or both of these constructs. As a consequence, they have revealed little about how children's developmental trajectories of CP are affected by long- versus short-term exposure to neighborhood risk. The present study was the first to include longitudinal measures of both neighborhood risk and CP. This suggests that studies of neighborhood SES and CP that rely on single measures of one or both of these constructs may overestimate the importance of neighborhood influences on children's trajectories of CP. This has important implications for prevention and intervention research. The findings from this study imply that simply targeting youth from poor communities for intervention may not be appropriate. Instead, it may be of greater value to focus prevention and intervention efforts on youth exposed to more reliable predictors of CP (e.g., parental psychopathology, Marmerstein, Malone, & Iacono, 2004) or youth exposed to neighborhood risk and a variety of other CP risk factors.

However, the results from this study should be interpreted cautiously because although both the PMCP and PYS samples were large and included many poor families, only a small

percentage of the participants in these studies were classified as living in extremely deprived environments for an extended period of time. Similarly only a small percentage of the participants across samples were classified as belonging to the persistent and high CP groups. Before definitive conclusions can be drawn about how children's trajectories of neighborhood risk and CP relate, it will be important to replicate the findings described above with samples that include more youth from extremely deprived neighborhoods and that include a higher proportion of children involved in frequent, serious, and chronic CP. Unfortunately, conducting a study with a greater number of these youth could be a challenge because poverty and psychopathology have been linked to high rates of attrition in some longitudinal studies (Claus, Kindleberger, & Dugan, 2002; Clark, Niaura, King, & Pera, 1996), and the samples included in this study each over-selected for one of these qualities (i.e., poverty for the PMCP sample, and externalizing symptoms for the PYS sample). Nevertheless, both investigations only included a small percentage of participants who could be classified into the persistently impoverished neighborhood group (5.8-12.7% of participants across analyses) and the most persistent and serious CP group (4.7-10% of participants across analyses). Perhaps to study these youth, researchers need to oversample children who evidence high levels of neighborhood risk and CP in addition to high levels of other risk factors associated with persistent CP (e.g., ADHD, maternal stress).

**Exposure to Environmentally Based Risk Factors across Communities**

As mentioned previously, the social push hypothesis (Raine & Venables, 1984) predicts that CP children from disadvantaged environments should have fewer biologically-based risk factors for CP than CP children from lower-risk environments, and the converse for environmentally-based risk factors. This prediction rests upon the assumption that children from

deprived environments are exposed to higher levels of environmentally-based risk factors for CP that push them towards CP than are children from more advantaged environments. Correlational studies also have documented relations between neighborhood quality and children's affiliation with deviant peers (Brody et al., 2001; Ingoldsby et al., 2003), and children's exposure to familial risk factors such as family conflict and unsupportive parenting (Brody et al., 2001; Duncan, Duncan, & Okut, 2002), but these associations have never been studied in relation to children's trajectories of neighborhood SES.

Overall, results from this study confirm that children from poorer and more prosperous communities vary in the extent to which they are exposed to environmentally-based risk factors, as was predicted in Hypothesis 2. This finding was replicated across all three samples. For example, in the PMCP sample, maternal rejection, maternal depressive symptoms, and maternal views on physical discipline were found to differentiate children from lower-middle-class neighborhoods and poorer neighborhood groups. In the PYS sample, across both cohorts, children from lower-middle-class neighborhoods were found to be supervised more closely than their peers from poorer neighborhoods, and on average had better relationships with their mothers. In addition, the lower-middle-class youth were found to have fewer deviant friends. Also, youth from the Lower-Middle-Class neighborhood group in the older PYS cohort were found to have had less exposure to maternal physical discipline, and their mothers reported less stress.

Assuming these results are replicable, the findings described above should shed light on why children from lower-SES environments are generally found to be at greater risk for CP, even though in the present study only inconsistent support could be found for such a relationship. These findings have important implications for researchers interested in CP prevention, because

not only do they identify children from poor neighborhoods as a population at risk for CP via their increased exposure to risk factors, they also suggest appropriate treatment targets for a family-based prevention program in poor communities. Many of the risk factors that were found to differentiate neighborhood trajectory groups in the analyses described above have been found to be malleable (e.g., maternal depression, Peden, Rayens, & Hall, 2005) and could be addressed through parent training or family therapy. However, before implementing such a program, it will be important to further differentiate which youth from these communities are at greatest risk for a persistent trajectory of maladjustment. Some of the risk factors that were found to distinguish neighborhood trajectory groups in the PMCP and PYS samples may not actually increase the majority of children's risk for CP in low-income communities. For instance, several studies have demonstrated that the impact of physical discipline on children's adjustment varies by culture, and that for ethnic groups that view this form of discipline as normative, such as African Americans, children's adjustment is unrelated to their exposure to physical discipline (Deater-Deckard, Dodge, Bates & Pettit, 1996; Lansford et al., in press). This is pertinent to this study because both the PMCP and PYS samples include a high proportion of African American youth (Ingoldsby, et al., 2003; Loeber et al., 1998).

## A Comparison of the Developmental Histories of CP Youth across and within Neighborhood SES Trajectories

The results of analyses comparing how the highly deviant CP groups compared across middle-class and lower-income communities were marked by inconsistency. For the PMCP sample and the older PYS cohort, no significant differences were found between groups. For the younger PYS cohort, almost all of the differences that were found between groups also discriminated between the lower-CP groups from these community types. This suggests that the

differences found between the high-CP groups across neighborhood types are probably best explained by the association between risk factors and neighborhood poverty rather than between CP and neighborhood SES. An interactive effect would be implied if the two high-CP groups from the middle- and lower-class communities differed on certain risk factors that were not found to discriminate the lower-CP groups from the same community types.

The only risk factor that differentiated high- from low-CP children exclusively within community type was parent-child relationship quality. Boys who held positive feelings about the relationships they had with their parents were more likely to be assigned to the High-CP/Poor SES neighborhood group than the boys from the High-CP/Lower-Middle-Class neighborhood group. This suggests that strained parent-child relations have a greater association with CP in poor communities than in lower-middle-class communities. Because children who do not feel close to their parents might be more likely to turn to their peers for emotional support and deviant peers are more pervasive in poorer communities (as found in the present study), boys in low-SES communities who seek out their peers for support have a greater likelihood of associating with deviant peers than boys from higher-SES communities. These deviant peers are then likely to provide the boys with training in and reinforcement for engaging in CP (Moffitt, 1993; Patterson & Yoerger, 1997). This explanation for the greater association between CP and parent-child relationship quality in poorer neighborhoods is consistent with research on why children join gangs (Walker-Barnes & Mason, 2001). It is also consistent with findings on factors associated with resilient outcomes, where having a close-parent child relationship has been found to serve as a protective factor in high-risk environments (Masten & Reed, 2002). This finding, in conjunction with previous research on the importance of parent-child closeness in high-risk environments, suggests that a family-based prevention program designed to improve

the quality of parent-child relationships in low-income communities might deter some youth in poor communities from engaging in CP.

However, the difference in parent-child relationship quality between CP groups across communities should be interpreted cautiously because the same risk factor failed to differentiate the high-CP groups across communities in the older PYS cohort. This discrepancy in findings may be due to developmental differences in how children are affected by parent-child relationship quality, as children's views of their relationship's with their parents were evaluated at an earlier age in the younger PYS cohort (i.e., ages 8 to 12).

Unfortunately, the results from the PMCP sample help only modestly in clarifying whether there are developmental differences in how CP children respond to strained parent-child relationships because the most deviant CP groups within the PMCP sample were small and analyses severely underpowered to detect differences (less than .20 for detecting a moderate effect for some analyses). Also, parent-child relationship quality was not assessed in the PMCP sample until the early school-age period when trajectories of CP also were being measured. As stated in the Methods section, for the PMCP sample, only predictor variables measured during early childhood were included in this study because it is difficult to determine whether risk factors measured concurrently precede or follow the onset of CP. However, it should be noted that the High-CP/Lower-Middle-Class and High-CP/Poorer-SES neighborhood groups from the PMCP sample differed marginally in the extent to which they were exposed to rejecting parenting during early childhood. Rejecting parenting may present a proxy for parent-child relationship quality among the PMCP risk factors. However, rejecting parenting also was found to differentiate one of the lower CP groups from poorer- and lower-middle-income communities within this sample. This suggests that this risk factor marginally differentiates boys from poor

and lower-middle-class neighborhoods matched on their CP because of differences in rejecting parenting across neighborhood SES rather than because of differing levels of CP.

Thus, given the pattern of inconsistency described above, perhaps the safest conclusion that can be drawn about how CP children from poor- and middle-class communities vary is that they generally have much in common. When differences were evident, many were attributable to the impact of neighborhood poverty on children in general, rather than interactions between neighborhood poverty and biologically- or environmentally-based risk. Incidentally, of the various risk factors on which CP groups were compared in this study, only parent-child relationship quality discriminated high-CP group status across communities, without differentiating between their low-CP counterpart groups. This suggests a possible interactive effect between parent-child relationship quality and neighborhood SES. However, before definitive conclusions can be drawn about the role of parent-child relationship quality across communities, the finding that parent-child relationship quality differentiates high- CP boys from poor and lower-middle-class neighborhoods needs to be replicated. As mentioned previously, this finding failed to replicate when tested within the same sample at a later age, but this could be because of developmental differences in how children are affected by parent-child relations.

Regarding Desisters (i.e., boys whose CP declined over time), little can be said about what differentiated Desisters from lower-middle-class and poorer neighborhoods because this population of boys was only found among the PMCP participants, and analyses comparing these youth were underpowered (i.e., the larger of the two groups included only 18 boys). However, the findings from the PMCP sample suggest that maternal physical discipline may be an important discriminating factor. The mothers of Desisters from the lower SES neighborhood groups viewed physical discipline significantly more favorably than did the mothers of Desisters

from the higher-SES neighborhood group. This predictor variable did not differentiate between other CP groups across communities. This implies an interactive effect between neighborhood poverty and maternal physical discipline that cannot be explained by the physical discipline/neighborhood poverty relationship. Unfortunately, alternative explanations for this interactive effect cannot be found in the extant literature on desisters because predictors of desistance have never been studied across communities. One potential explanation for this finding is that in poorer neighborhoods, CP risk factors are so pervasive that to deter children who demonstrate early antisocial tendencies from becoming persistently delinquent, authoritarian parents are needed who are willing to use force when necessary to discipline their children. Another possibility has to do with how ethnicity moderates the relationship between physical discipline and CP. As mentioned previously, physical discipline has been found consistently to be predictive of CP in Caucasian populations, but less consistently so in samples of African American youth (Deater-Deckard, et al., 1996; Lansford et al., in press). As a higher percentage of African American participants from the PMCP sample were living in low-income communities than Caucasian participants, it is possible that physical discipline scores for Desisters from poorer neighborhoods were inflated by African American families.

In regard to the within-neighborhood group comparisons, some risk factors were consistently found to discriminate classification of the most deviant CP groups across lower-middle-income and poorer communities, while others were only found to be predictive of CP in one type of environment. The risk factors found to generalize across neighborhood settings included ADHD symptoms, deviant friends, and rejecting parenting. Risk factors that were found to be predictive of CP only in lower-SES neighborhood settings included high maternal stress, low parental supervision, having strained relations with one's parents, low achievement scores,

and increased exposure to physical discipline. Marital agreement was also found to be related to children's CP scores in lower-SES neighborhoods in one of three sets of analyses, but in the other two analytic sets, the reverse was found to be true for marital agreement or marital satisfaction. Maternal depression was the only risk factor found to be predictive of CP in lower-middle-class neighborhoods that was not also associated with elevated levels of CP in poorer neighborhoods. These findings suggest that some risk factors vary in their importance across communities and imply interactive effects between neighborhood SES and many of the risk factors included in this study.

It is noteworthy that ADHD symptoms, rejecting parenting, and peer deviance predicted CP across community types, because, according to Moffitt's (1993) theory about LCP and AL youth (see page 6 in the Introduction for a review), the developmental histories of LCP children should be characterized by neuropsychological deficits and environmental risk factors that exacerbate their risk. Moffitt considered ADHD one type of neuropsychological deficit because it has a biological basis and interferes with the ability of children to solve problems, manage their impulses, and regulate their emotions (Campbell, 2000; Caspi & Moffitt, 1995). According to Moffitt's early-starter model, environmental risk factors that are likely to exacerbate children's risk for CP include hostile parenting and inconsistent discipline. Thus, these findings imply that Moffitt's theory generalizes across diverse environments, at least for ADHD.

Moffitt (1993) also considered low IQ a type of neuropsychological deficit, but as mentioned above, this risk factor was only found to be related to CP in the poorer neighborhood groups. This suggests that aspects of Moffitt's theory have more relevance for children from lower-income communities, as low Verbal IQ appears to have a greater influence on CP in such environments. This finding is also consistent with research on resiliency, which has identified a

high IQ as a protective factor from maladjustment in high-risk environments (Masten & Coatsworth, 1998)

In regard to peer deviance, Moffitt (1993) argued that LCP youth would be involved with deviant peers throughout life and serve as role models for AL youth during adolescence. Unfortunately, no measures of deviant peer affiliation were administered to youth in either study prior to the beginning of the trajectory modeling period for reasons stated above, so no inferences can be drawn about the validity of Moffitt's theory in regard to the association between peer deviance and the development of AL antisocial behavior. However, in regard to Moffitt's assertion about the effects of deviant peer affiliation on LCP youth during adolescence, the finding that having deviant friends was associated with CP within poor and lower-middle-class communities is consistent with Moffitt's notions about the role of friendships in the development of LCP youth across communities.

Regarding risk factors that were uniquely predictive of CP in lower-SES neighborhoods, the finding involving strained parent-child relationships in lower-SES neighborhoods affirms the need to develop family-based prevention program to foster parent-child relationships in low-income communities. The finding that parental supervision was more important in lower-SES neighborhoods was expected based on several prior studies documenting stronger relations between parental supervision and children's CP in lower-income communities than in upper-income communities (Ingoldsby, 2001; Pettit et al., 1999; Rankin & Quane, 2002). Theoretically, parents have more adversities to protect children from in lower-income communities. On the other hand, the finding that physical discipline was only associated with CP in lower-income communities was surprising based on previous research discussed earlier about physical discipline being unrelated to CP among African American youth (Deater-Deckard et al., 1996).

Ironically, the most logical explanation for why physical discipline was found to be predictive of CP group status only in lower-income communities involved range restriction. Although the analytic plan developed was designed to protect against range restriction, it was only able to do so for the between-group neighborhood trajectory analyses. The comparison of within-neighborhood CP groups was still vulnerable to range restriction. As mentioned previously, range restriction is problematic because it attenuates correlations between variables. This is a concern because it can lead to variables interacting simply because of insufficient range for one variable under specific conditions of the other variable, not because of a true interactive effect. Physical discipline, for example, is less common in upper-income communities (Furstenberg, 1993; Garbarino & Kostenly, 1993). This makes it difficult to determine whether the interactive effect implied by finding that physical discipline only predicted CP group status in the poorer community group was due to physical discipline impacting children from poor- and upper-income communities differently or this parenting quality being restricted in range in the upper-income communities. Unfortunately, it is also unclear to what extent range restriction affected the analyses involving maternal stress and children's achievement on the CAT, which were both found in the present investigation to be uniquely predictive of CP group status in poorer communities.

Based on the potential concerns expressed about range restriction, it was a surprise to find that maternal depression was a better predictor of CP in lower-middle-class neighborhoods than poorer neighborhoods. First, maternal depressive symptoms are typically found to be negatively correlated with SES (Miech, Caspi, Moffitt, Wright, & Silva, 1999). Second, as evident in Table 15, within the PMCP sample maternal depressive symptoms demonstrated slightly more variability in the lower-income neighborhoods than in lower-middle-class

neighborhoods (maternal depression was not measured in the PYS sample). Perhaps one reason why the association between maternal depression and child conduct problems would be stronger in lower-middle-income versus poorer neighborhoods involves genetic influences. Theoretically, if mothers in lower-SES communities are faced with greater levels of social adversity than mothers in higher-SES neighborhoods, then mothers who demonstrate high levels of depressive symptoms in higher-SES environments might do so because of genetic rather than environmental influences. This explanation would be consistent with the social push hypothesis, and although highly speculative, is supported by research demonstrating that depression is heritable (McGue & Christensen, 1997) and that children's CP is predicted by their mother's depressive symptoms (Kim-Cohen, Moffitt, Taylor, Pawlby, & Caspi, 2005).

Of course, the findings described above need to be interpreted in light of the concerns mentioned earlier about range restriction. Therefore, it will be important to replicate these findings in other samples and with other analytic tools before they can be used to guide decisions about appropriate populations to target for intervention.

**Conclusions about the Social Push Hypothesis**

So what then should be concluded about the validity of Raine's (Raine & Venables, 1984) social push hypothesis? The between-group neighborhood trajectory analyses generally failed to uncover reliable differences between CP groups that varied with respect to neighborhood SES, and although the within-neighborhood trajectory comparisons of CP groups uncovered several risk factors that were uniquely predictive of CP in one environment type, range restriction could not be ruled out as a confound. Furthermore, although there was some tendency for environmentally-based risk factors to be more closely related to CP in the more economically-deprived neighborhoods, there was no indication that the converse was true for

biologically-based risk factors (e.g., ADHD symptoms, IQ/Achievement, temperament), as would be expected according to the social push hypothesis. Thus, the findings of the present study are generally inconsistent with the social push hypothesis.

However, the findings described above, in isolation, should not be used to reject the social push hypothesis. As mentioned in the Introduction, several prior studies have found stronger relations between children's physiological functioning in low-risk environments and their participation in CP (Raine, 2002; Raine & Venables, 1984). Neighborhood SES and the various risk factors that were included in this study may have failed to interact in a manner that was consistent with the social push hypothesis because neighborhood SES is a relatively distal risk factor, and the social push hypothesis may demonstrate greater validity when tested with more proximal risk factors. The lack of support for the social push hypothesis also may have been due to the measures utilized (maternal and teacher reports of ADHD, observations of difficult temperament and behavioral inhibition, and performance on tests of IQ and achievement). As neither the PMCP nor PYS were designed to test the social push hypothesis, many proxies were used to assess biological risk. Although some of the behaviors that were used for this purpose are considered to be indicators of neuropsychological impairment by some investigators (Blair, Peters, & Granger, 2004; Moffitt, 1993; Speltz, DeKylen, Calderon, Greenberg, & Fisher, 1999; Willis & Weiler, 2005), and demonstrate high levels of heritability (Biederman & Farone, 2002; DiLalla et al., 1994; Plomin, 1999; Wachs & Bates, 2001), they are less precise indicators of biological risk than measures of physiological functioning and neurochemcial correlates of CP. It is possible that the interactive effects predicted by the social push hypothesis only apply when examining how CP youth relate across communities on these more precise, non-proxy biological measures. Although the explanations proposed for this

study's findings are speculative, in the future it will be important to further examine under what conditions the social push hypothesis is relevant. This should help clarify how children's biological characteristics and environmental experiences interact to shape their behavior.

**Limitations**

This study has several limitations that should warrant caution when interpreting the results. First, although the study was based on two samples, neither included girls nor a large number of ethnic minorities other than African Americans. Additional replications will be needed with boys *and* girls from diverse backgrounds before definitive conclusions can be made about how the risk factors included in this study relate to CP across communities.

Another concern noted earlier was that some of the analyses comparing CP groups across and within trajectories were underpowered due to SPGM creating small cell sizes. This undoubtedly impacted the results, because for some analyses (e.g., the ANOVA analysis comparing the 18 and 12 Chronic CP boys from poor and lower-middle-class neighborhoods), there was only sufficient power to detect very large effects (e.g., power for detecting a medium effect for analyses comparing Chronic CP boys across communities was below .20). To increase power for the analyses, various neighborhood and CP trajectory groups were combined, but this may have biased the findings in other ways. For instance, across analyses, the various CP groups from the lower SES neighborhoods were combined and compared to their counterpart CP groups from the highest SES neighborhood group. Also, for the two sets of PYS analyses, the two most deviant CP groups were combined and compared to the other CP groups. If the CP groups from the lower SES neighborhoods had variable developmental histories, combining them into one group would lead to different conclusions about how CP youth compare across low- and middle-SES communities than would be reached if each CP group within each neighborhood trajectory

was compared to its counterpart CP group in all of the other neighborhood trajectory groups. Similarly, if the two most deviant CP groups in the PYS sample had different developmental histories, combining them would alter how the most deviant CP group within the PYS analyses compared to the other CP groups. Although efforts were made to combine groups in this study in a manner that made intuitive sense (e.g., lower SES neighborhood groups were merged to create a poor neighborhood group, higher CP groups were merged to create a high-CP group), no objective criteria were available for deciding upon how to combine groups in this study. Thus, it is unclear what information was lost about the various groups by having to combine them with other groups.

Another concern had to do with the using more than one sample to test this study's hypothesis. Although the PMCP and PYS samples had much in common (e.g., both included ethnically-diverse boys) and including them both allowed for an assessment of how well the results replicated across samples, there were many ways in which the samples differed that interfered with comparing them (e.g., similar but distinct variables were collected across samples, data were collected at different ages). Also, for the older PYS analyses, a measure of CP was utilized that was based on self-reports rather than maternal-reports, and that included more serious antisocial behaviors than the measures of CP used in the PMCP and preadolescent PYS analyses. This further complicated the comparison of results across analyses.

An additional concern mentioned earlier was that biological risk in the present investigation had to be inferred from behavioral measures of traits that have been found to be heritable. As these behavioral traits are influenced by environmental conditions in addition to genetics (Biederman & Farone, 2002; Turkenheimer, Haley, Waldron, D'Onofrio, & Gottessman, 2003; Wachs & Bates, 2001), inferences about which children had the highest level

of biological risk in the PMCP and PYS samples may have been inaccurate. This could have led to faulty conclusions in the present study about the relevance of the social push hypothesis to high- and low-SES neighborhoods.

The measures used to assess CP in the present study may also have affected the conclusions reached about how children's trajectories of neighborhood SES and CP relate. As mentioned earlier, Wikström, and Loeber (2000) found a close relationship between children's exposure to neighborhood risk and their engagement in serious delinquency. This is a concern in the present investigation because the measure of CP used in the PMCP and preadolescent analyses was predominantly based on minor delinquent acts, and the CP measure employed in the older PYS analyses included both minor and serious delinquent behaviors.

Yet another concern was that for some of the analyses, the same informant was used to measure CP and predictor variables. This is problematic because variables that are measured via the same informant tend to correlate more than measures based on reports from multiple informants (Fergusson & Horwood, 1993). Thus, relations detected between measures provided by the same informant could be spurious or artificially high in this study. As mentioned previously, measures in the PMCP samples that were assessed via maternal report appeared to predict maternal reports of CP to a slightly higher degree than those assessed through other means.

Finally, it should be noted that even though the predictor variables were measured prior to the first assessment points for CP and neighborhood SES across analyses, risk factors were not randomly assigned to children, nor were children randomly assigned to neighborhood and/or CP groups. This means that when a relationship is found between a risk factor and a group, the direction of effects cannot be determined (Onwuegbuzie, & Daniel, 2002).

**Future Directions**

Although this study's findings help answer many questions about what predicts CP across communities, the findings from this study raise many new questions about factors associated with CP among at-risk children. For instance, the Abstainer groups from poor communities generally were exposed to more CP risk factors than the Abstainer groups from better-off neighborhoods, yet both groups of youth refrained from engaging in CP. What prevents these Abstainer youth from lower-income neighborhoods from becoming delinquent over time? Relatedy, the one finding that was consistent across analyses was that children from the poorer neighborhood trajectories were at increased risk for exposure to environmentally-based CP risk factors, yet in only one of three sets of analyses was a significant relationship found between children's trajectories of CP and neighborhood SES. Why was residence in a lower-income community consistently associated with greater exposure to risk factors for CP, but only inconsistently related to children's actual involvement in CP over time?

These intriguing findings suggest that we may need new models to identify children at-risk for CP in lower-income communities because some risk factors are so common in poorer communities that even well-behaved children in such communities are exposed to them. This could be because some variables that are considered to be risk factors for CP in middle-income communities do not actually enhance CP risk among populations that are highly prevalent in lower-income communities (e.g., physical discipline does not predict CP among African-Americans, Deater-Deckard et al., 1996; Lansford et al., in press) or because the predictors of CP in lower-income communities are multi-factorial, and focusing on how specific risk factors relate to CP in isolation is misguided. In the future, it may be more fruitful to study how various combinations of individual and family risk factors in lower-income communities relate to CP rather than studying how specific risk factors impact CP in such communities.

Some prior research on protective processes suggests that it may also be misguided to study how risk factors for CP relate to CP in the absence of protective factors. Researchers interested in resiliency have identified a bevy of child and family characteristics that protect children from CP in high-risk environments (Masten & Reed, 2002; Owens & Shaw, 2003; Werner & Smith, 1982) and research conducted by Stouthamer-Loeber, Loeber, Wei, Farrington, and Wikström (2002) suggests that the protective factors are at least as important as risk factors in predicting children's involvement in CP. It could be that in disadvantaged communities, the balance of risk and protective factors matters more than which specific risk factors children were exposed. This notion could have relevance for the findings of the current study, which focused on specific risk factors, but failed to find many that differentiated CP youth across communities.

With respect to Raine's (Raine & Venables, 1984) social push hypothesis, although the findings from this study did not lend credence to this theory, it may be that the theory is more applicable when focusing on constellations of biological and environmental risk factors instead of specific risk factors. This investigator plans to revisit this issue with the samples included in this study to assess whether the highly deviant CP groups differ across communities in their total number of biological and environmental risk factors. This may help clarify under what conditions the social push hypothesis is found to be valid, and help researchers determine how to tailor intervention efforts to youth from diverse communities.

In the extended future, as a means of addressing some of the limitations discussed above, this investigator would also like to re-evaluate the social push hypothesis with a new sample that is recruited specifically for the purpose of assessing how neighborhood risk and other CP risk factors interact across environments. Ideally, this sample would include boys and girls from multiple ethnic groups, a large number of youth from extremely impoverished environments, and

a substantial population of highly deviant youth. Recruiting a sample with these characteristics would probably require over-sampling children from government subsidized housing projects, and targeting families that report multiple family-based CP risk factors (e.g., parental psychopathology) on screening measures prior to the onset of the study. Measures of physiological processes and neurochemical correlates of CP would ideally be collected on the participants in this sample as a means of assessing biological risk rather than having to infer such risk. These methodological strategies would increase the study's generalizability and eliminate some of the confounds raised throughout this Discussion.

**Conclusions**

This study sheds light on why children from poor neighborhoods are at increased risk for CP, helps clarify how children's CP and neighborhood experiences relate, and suggests risk factors that might vary in their importance across communities. More specifically, this study suggests that children from poor communities have greater exposure to familial and peer risk than their counterparts from more prosperous communities. However, being reared in a high-risk community does not always lead to CP. Only among young children did prolonged exposure to neighborhood poverty result in an increased risk for chronic CP, and even then, the majority of children from such communities were able to refrain from high-levels of CP. The children who were found to be at the greatest risk for CP in such communities were those who demonstrated high levels of ADHD symptoms, had strained relations with their parents, performed poorly on tests of IQ and achievement, had mother who were stressed, experienced high levels of physical discipline and rejecting parenting, and low levels of supervision. For children from more prosperous communities, ADHD symptoms, rejecting parenting, maternal depression, and peer deviance were found to differentiate high-CP children from youth who generally refrained from

this kind of behavior. In regard to factors that differentiated high-CP youth across communities, only parent-child relationship quality seemed to matter, as all other differences found between high CP groups across neighborhood type also differentiated low-CP groups from low- and high-SES communities. This suggests that parent-child relationship quality may have a greater impact on CP in low-income communities than in more prosperous communities, but this finding will need to be replicated in other samples before definitive conclusions can be made about the role of parent-child relations on children's trajectories of CP across communities

# APPENDICES

# APPENDIX A

## CBCL items used to measure maternal reports of CP in PMCP Sample

Cruelty to animals

Cruelty, bullying or meanness to others

Destroys things belonging to his family or other children

Disobedient at home

Disobedient at school

Gets in many fights

Lying or cheating

Physically attacks people

Runs Away from home

Sets fires

Steals at home

Steals outside of home

Swearing or obscene language

Temper tantrums or hot temper

Threatens people

Truancy, skips school

Uses alcohol or drugs for nonmedical purposes

Vandalism

# Appendix B

## CBCL and TBC items used to measure maternal reports of ADHD in PMCP Sample

Can’t concentrate; Can’t pay attention

Can’t sit still, restless or hyperactive

Fidgety

Impulsive or acts without thinking

## Appendix C

**SRD items used to assess CP for middle childhood to late adolescence PYS analyses and weights assigned to items**

If respondents answered any of these questions positively, they were subsequently asked whether they had participated in these behaviors since the last assessment. Yes responses were assigned the weight reported below and then summed. The weights were based on severity scales developed by Loeber and colleagues (1998).

| Item | Weight |
|---|---|
| Have you ever purposely damaged or destroyed property that did not being to you, for example, painting, breaking, cutting, or marking up something? | 1 |
| Have you ever purposely set fire to a house, building, car, or other property or tried to do so? | 2 |
| Have you ever avoided paying for things you were supposed to pay for, such as movies, bus or subway rides, food, or computer services? | 2 |
| Have you ever gone into or tried to go into a building to steal something? | 2 |
| Have you ever stolen or tried to steal things worth $5 or less? | 2 |
| Have you ever taken something from a store without paying for it? | 2 |
| Have you ever tried to steal things worth more than $5 but less than $50? | 3 |
| Have you ever tired to steal things worth $50 and $100? | 3 |

**Appendix C Continued**

| Item | Weight |
|---|---|
| Have you ever tried to steal things worth more than $100? | 3 |
| Have you ever taken something from a car that did not belong to you? | 3 |
| Have you ever gone joyriding, that is, taken a motor vehicle, such as a car or motorcycle, for a ride or drive without the permission of the owner? | 3 |
| Have you ever used checks illegally or used a slug or fake money to pay for something? | 3 |
| Have you ever used or tried to use credit cards or bank cards without the permission of the owner? | 3 |
| Have you ever snatched a purse or wallet or picked a pocket? | 3 |
| Have you ever been involved with in a gang fight? | 3 |
| Have you ever stolen or tried to steal a motor vehicle such as a car or motorcycle? | 4 |
| Have you ever attacked someone with a weapon with the idea of seriously hurting or killing them? | 4 |
| Have you ever hit someone with the idea of hurting them? | 4 |

Appendix C Continued

| Item | Weight |
|---|---|
| Have you ever used a weapon, force, or strong-arm methods to get money or things from people? | 4 |
| Have you ever physically hurt or threatened to hurt someone to get them to have sex with you? | 4 |
| Have you ever had or tried to have sexual relations with someone against their will? | 4 |

## Appendix D

### CBCL and TRF items used to measure Hyperactive-Impulsive-Attention Problems in PYS Sample

Trouble Concentrating (CBCL & TRF)

Restless (CBCL & TRF)

Impulsive (CBCL & TRF)

Talks Too Much (CBCL & TRF)

Talks Out of Turn (TRF only)

Wants Things Now (CBCL only)

Impatient (CBCL & TRF)

Trouble Following Directions (CBCL & TRF)

Irresponsible (CBCL & TRF)

Inattentive (CBCL & TRF)

Fails to Finish (CBCL & TRF)

Daring (CBCL only)

Fidgets (CBCL & TRF)

Difficulty Learning (TRF only)

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