

Predictors of Behavioral Problems for Students with High-Incidence Disabilities

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Abstract

This prospective longitudinal study investigated the predictive links between multifaceted factors in childhood and short- and long-term behavioral problems for students identified with high-incidence disabilities (learning disabilities and emotional disturbances). An ecological model involving individual, family, and school level factors was used to identify the likelihood of being engaged in acting out in middle childhood, juvenile delinquency in late adolescence, and adult crime in young adulthood. Primary research questions examined (a) the links between disability status and acting out, juvenile delinquency, and adult arrest, (b) the predictive effects of individual, family, and school level factors on later behavior problems, and (c) the moderating effects of ecological factors associated with later behavioral problems.

The primary sample consisted of 1370 economically disadvantaged students from the Chicago Longitudinal Study. Data were collected prospectively from multiple sources (e.g., administrative data, school records, ability test scores, student questionnaires, and teacher and parent surveys) to provide multi-tiered information on early child and family risks (ages 0-5); primary predictors at the individual, family, and school levels (grades 1-6; ages 7-12); and behavioral outcome variables at ages 12-13 (acting out), by age 18 (juvenile delinquency), and by age 26 (adult arrest). Probit regression models were used to examine the main effects of disability status, the predictive effects of individual, family, and school level factors, and the potential moderating effects of ecological factors associated with later behavioral problems for unadjusted analyses, covariate-adjusted analyses, and robustness tests.

Findings indicated that disability status was associated with heightened risks of

behavioral problems regardless of covariate specification. Specifically, controlling for child and family characteristics, students identified with high-incidence disabilities (grades 1-6) had higher rates of acting out, juvenile delinquency, and adult arrest compared to general education students.

The development of behavioral problems was determined by multifaceted factors. High-incidence disability status and the combination of early child and family risks (gender and family risk index), individual level factors (reading comprehension and classroom adjustment), family level factors (parent involvement and child maltreatment), and school level factors (CPC program participation, magnet school attendance, and school mobility) were associated with behavioral problems. Distinct predictive patterns of factors at the individual, family, and school levels were associated with behavioral problems. Reading comprehension, classroom adjustment, and parent involvement were associated with acting out. Classroom adjustment, child maltreatment, CPC program participation, and magnet school attendance were associated, in the expected direction, with juvenile delinquency. Moreover, classroom adjustment and magnet school attendance were associated with lower rates of adult arrest, whereas school mobility was associated with higher rates of adult arrest.

No significant moderating effects were found to change the direction and/or the magnitude of the associations between individual level factors and behavioral problems. Parent involvement and school mobility did not show interaction effects with individual level factors (i.e., reading comprehension and classroom adjustment) on behavioral problems. Findings did not support the hypotheses that the relationships between individual level factors and behavioral problems would vary by the level of parent

involvement and/or school mobility.

Improved understanding of the influence of risk and protective factors on behavioral problems helps researchers and practitioners develop and testify effective prevention and intervention practices for at-risk students including students with high-incidence disabilities. The components of the services should focus on various contexts including individual, family, and school to alter and control the developmental liabilities of behavioral problems for students with high-incidence disabilities. Implications for intervention, policy, and future research to address the needs of students with high-incidence disabilities are discussed.

Key words: behavioral problems, high-incidence disabilities, acting out, juvenile delinquency, adult crime, at-risk students.

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CHAPTER 1

INTRODUCTION

Statement of Problem

Academic, behavioral, and social competencies lead to a trajectory of being successful in schools for children and youth. Students with successful school experience on the basis of academic learning, acceptable behavior, and effective social interaction most often have positive future outcomes (e.g., school completion, social engagement, and successful employment and economic status). Otherwise, the experience of school failure can lead to detrimental outcomes such as school dropout, delinquency, and antisocial life patterns (Walker & Sprague, 1999).

Children and youth with academic and behavioral deficits are vulnerable to school failure in educational and social domains (Kauffman, 2001). Students with disabilities are more likely to have poor educational and social outcomes compared to students without disabilities (Affleck, Edgar, Levine, & Kortering, 1990; Blackorby & Wagner, 1996; Frank, Sitlington, & Carson, 1995). Their disabilities impede their abilities to learn and to facilitate positive peer relationships. Educational and social failure can translate to subsequent school dropout or potentially lead to other forms of social maladjustment such as delinquency and adult crime (Wagner, 1995).

Educational, interpersonal/social, and behavioral problems are characteristics of students with high-incidence disabilities (i.e., learning disabilities [LD] and emotional disturbance [ED]) (Kauffman, 2001; McConaughy & Ritter, 1986). Evidence has shown that students with high-incidence disabilities have negative behavioral outcomes in adolescence and adulthood (Wagner, 1995). One of the poor outcomes, the involvement

of delinquent and antisocial behavior, is a critical issue due to its great cost to society.

Students identified with LD and ED have been identified at greater risk for developing lasting antisocial, delinquent, and criminal behavior than other disabled students and non-disabled students (Wagner, 1995). In addition to problem behavior and poor social/emotional functioning, their long-term behavioral problems such as high arrest and incarceration rates in the juvenile and adult justice system have become a critical concern for mental health services as well as the educational and justice correctional system (Morris & Morris, 2006; Quinn, Rutherford, Leone, Osher, & Poirier, 2005).

There is a disproportionate representation of students with LD and ED in the correctional and criminal justice system. For students with LD, Morgan (1979) indicated that the prevalence rate of LD in the correctional system was 10.5% based on an administrator survey. Nelson and Rutherford (1989) reported that the prevalence rates of LD in the correctional system ranged from 9% to 76% across states. Casey and Keilitz (1990) indicated that the estimated prevalence rate of LD was approximately 35.6% based on a summary of 21 studies. A recent national survey indicated that approximately 39% of students of disabilities in the juvenile correctional system were identified as LD (Quinn et al., 2005). Likewise, for students with ED, Morgan (1979) reported that approximately 16% of offenders in the correctional system were identified as ED in an administrator survey. Murphy (1986) reported the prevalence rates of ED in the correctional system ranging from 16% to 50%. A recent national survey indicated that approximately 47% of students of disabilities in the juvenile correctional system were identified as ED (Quinn et al., 2005). Despite the different approach to measurement, the high prevalence rate of delinquent and criminal behavior for students with LD and ED

leads to increased considerable social costs to meet their educational and mental health needs in addition to the criminal justice service costs.

The existence of disabilities is a risk factor in itself which influences subsequent behavioral problems, but the scope and severity of problems are varied among students with disabilities (Werner, 1999). A variety of risk and protective factors from individual or ecological settings may exacerbate or reduce the likelihood of behavioral problems associated with disabilities (Keogh, 2000; Keogh & Weisner, 1993). Variation in the development of behavioral problems may be the result of interrelated factors and processes that directly and indirectly influence an individual's life course. However, there has been a lack of research examining the vulnerability and resilience of students with high-incidence disabilities from a preventive science perspective (Keogh & Weisner, 1993; Werner, 1999). The reciprocal interaction between student disability characteristics and external ecological settings is unclear. Ecological driven factors at the individual, family, and school levels that may intertwine with individual disabilities and influence subsequent behavioral problems have not been thoroughly investigated (Keogh, 2000).

Understanding the factors directly and indirectly related to the developmental trajectories of behavioral problems is important for developing prevention and intervention services. Evidence has shown that behavioral, interpersonal, and academic difficulties are likely related to antisocial behavior. Early antisocial behavior in childhood and adolescence is associated with adult criminal behavior (Kazdin, 1987). Academic difficulties are associated with a heightened risk for externalizing problem behavior (Hinshaw, 1992a, 1992b; McEvoy & Welker, 2000; Patterson, DeBaryshe, &

Ramsey, 1989). Furthermore, a considerable number of potential variables, involving intra-individual factors (e.g., language delay, low IQ, attention problems, and neurodevelopmental deficits), contextual variables (e.g., coercive parent-child interaction, family adversity, peer and teacher rejection, and school climate), and social factors (e.g., low SES), may function as potentially direct or indirect risk factors for the development of antisocial behavior (Hinshaw, 1992a; Tremblay et al., 1992).

One of the challenges for special education research is to increase our understanding of individual and contextual influences on the development of behavioral problems for students with disabilities (Keogh, 1994). Systematic investigation of individual and ecological predictors related to the development of behavioral problems can be informative for developing preventive intervention (Coie et al., 1993). The sensitivity and effectiveness of intervention can be increased to prevent or ameliorate behavioral problems. However, the predictive patterns of behavioral problems have not been clearly examined for students with high-incidence disabilities. For a more complete account of the mechanisms regulating the development of students with high-incidence disabilities, the relative importance of risk and protective factors in the development of behavioral problems needs to be identified from an ecological perspective. Likewise, further research needs to clarify potential pathways connecting behavioral problems from early childhood through adulthood.

Statement of Purpose

Identifying correlates of and promising practices for the development and treatment of behavioral problems is critical for helping students with high-incidence disabilities meet their needs and challenges. Despite the heterogeneity of disability

characteristics, this study investigated a common core of risk and protective factors related to the development of students with high-incidence disabilities (i.e., LD and ED). The overall purpose of this study was to examine the effects of disability status and multifaceted predictors across different ecological contexts (e.g., individual, family, and school) on behavioral problems for students with high-incidence disabilities. Specifically, this study examined the predictive patterns for different manifestations of behavioral problems across different developmental timepoints (e.g., childhood acting out, adolescence delinquency, and adult crime). Possible moderating variables, which could influence the associations between individual level factors and behavioral problems for students with high-incidence disabilities, were investigated as well.

Methodological Issues

In prior studies of behavioral problems for students with disabilities, most research designs are correlational rather than longitudinal or experimental. The temporal sequence and causal paths related to the developmental course of antisocial behavior are uncertain. Without knowing the temporal precedence of variables and potential confounding or intervening extraneous variables, it is difficult to determine the possible causal linkage among predictors and behavioral outcomes. A longitudinal study can help to identify possible directional influences providing more informative evidence regarding causal inferences. However, prior longitudinal studies on students with special needs are limited because most evidence is retrospective rather than prospective (McKinney, 1989). Murray (2003) pointed out that many longitudinal studies regarding postschool outcomes collected retrospective data in childhood and adolescence to explain subsequent poor outcomes of students with high-incidence disabilities.

Behavioral problems “result from a complex interplay of multiple factors cascading over multiple points in the life course” (Buka & Earls, 1993, p. 46). Little is known about the emergence and impact of different ecological factors on subsequent behavioral problems across different developmental stages. The effects of isolated variables or the correlations among multiple factors and behavioral problems have been examined; however, the independent and combined effects of factors at the individual, family, and school levels on behavioral problems have not been thoroughly specified and investigated from an ecological perspective. There might be interaction both within and between the levels of the system, so potentially nonlinear interactions among many variables need further investigation.

Research Questions

Accordingly, the following three primary questions were addressed:

- a). Is student disability status (i.e., high-incidence disabilities) associated with later behavioral problems (i.e., acting out, juvenile delinquency, and adult arrest)?
- b). Do individual, family, and school level characteristics predict later behavioral problems for students with high-incidence disabilities?
- c). Do ecological/contextual factors at the family and school levels moderate the relationships between individual level factors and later behavioral problems for students with high-incidence disabilities?

CHAPTER 2

LITERATURE REVIEW

Academic and Social/Behavioral Characteristics of High-Incidence Disabilities

Students with high-incidence disabilities including learning disabilities (LD) and emotional disturbance (ED) have significant academic and behavioral difficulties in school settings, and prolonged difficulties may result in deficits that are unresponsiveness to teacher-implemented intervention.

Students with learning disabilities. Learning disabilities (LD) are defined as individuals experiencing deficits in processing information and/or delayed academic progress (Rosenberg, 1997). Students identified with LD, by federal definition, manifest significant difficulties in listening, thinking, speaking, reading, writing, spelling, or mathematical abilities due to the deficits in one or more of the basic psychological processes involved in understanding or using language (Individual with Disabilities Education Act Amendments, 1997).

In addition to persistent academic underachievement, evidence has shown an elevated risk of behavioral and social problems for students with LD. Longitudinal findings indicated that students with LD began to exhibit a persistent pattern of classroom maladaptive behavior in early elementary schools, which was related to prolonged academic underachievement over time (McKinney, 1989). Findings from a meta-analytic study showed that children with LD exhibited significant behavioral deficits (e.g., off-task behavior, conduct disorders, distractibility, and shy/withdrawn behavior) compared to non-LD (Bender & Smith, 1990). McConaughy and Ritter (1986) indicated that boys with LD exhibited more social, emotional, and behavioral problems

including depression, uncommunicativeness, obsessive-compulsive behaviors, social withdrawal, hyperactivity, aggression, and delinquent behavior than non-LD boys.

Students with emotional disturbance. Students with emotional disturbance (ED), by federal definition, manifest one or more maladaptive characteristics including the inability to learn, relationship problems, inappropriate behavior, unhappiness or depression, and physical symptoms or fears over a long period of time, which adversely affect students' educational performance (Individual with Disabilities Education Act Amendments, 1997). Students with ED consist of a diverse group exhibiting a variety of emotional, behavioral, social, and academic difficulties (Cullinan & Sabornie, 2004; Wagner, Kutash, Duchnowski, Epstein, & Sumi, 2005).

Evidence has shown that children and youth with ED exhibit externalizing and/or internalizing problem behaviors that are discordant with their social-interpersonal environments. Findings consistently indicated that students with ED exhibited relatively more externalizing problem behavior than internalizing problem behavior (Epstein, Kauffman, & Cullinan, 1985; Kauffman, Cullinan, & Epstein, 1987; Lane, 2004; Lane & Wehby, 2002; Nelson, Babyak, Gonzalez, & Benner, 2003; Wagner, 1995; Wehby, Lane, & Falk, 2003). The manifestations of problem behavior among students with ED likely lead to serious social difficulties and the loss of learning opportunities in classrooms (Kauffman, 2001; Lane, 2004). Disruptive behavior can influence teacher instructional behavior, which may lead to a poor learning environment and further endanger children with ED for future academic failure (Wehby, et al., 2003; Wehby, Symons, Canale, & Go, 1998; Wehby, Tally, & Falk, 2004).

It has also been found that academic underachievement is one of the primary

characteristics of students with ED. The majority of students with ED typically had greater academic difficulties (one or more years below grade level) than typical-developing peers (Coutinho, 1986; Epstein, Kinder, & Bursuck, 1989; Kauffman, 2001; Kauffman et al., 1987; Scruggs & Mastopieri, 1986; Trout, Nordness, Pierce, & Epstein, 2003). Accurate and specific prevalence rates of academic difficulties among students with ED remained uncertain, ranging from 25% to 97% (Nelson, Benner, Lane, & Smith, 2004). Cullinan, Epstein, and Lloyd (1983) reported that the estimated prevalence of academic difficulties (e.g., reading, math, and literacy) of students with ED ranged from 33% to 81%. Although the specific prevalence rates of academic difficulties are not certain, the high prevalence rate of academic difficulties shows the needs to examine the academic status of students with ED and its relationship with problem behavior.

Comparison of Characteristics of Students with LD and ED

Students with LD and ED have co-occurring academic difficulties and social/behavioral problems. Research findings on the comparisons of educational and social/behavioral functioning between children with LD and ED are not consistent. It appears that there are more similarities than differences between children with LD and ED in academic, social, and behavioral domains.

Academic domain. Research findings on the comparisons of academic achievement between children with LD and ED are inconsistent. Evidence showed no obvious differences in educational performance between students with ED and LD in elementary grades (Margalit, 1989; Scruggs & Mastopieri, 1986). On the other hand, a weak but significant difference (effect size = -.22) in academic achievement was found

between ED and LD in a meta-analytic study (Sabornie, Cullinan, Osborne, & Brock, 2005). Findings indicated that students with ED had higher academic achievement compared to students with LD (Wagner, 1995; Wilson, Cone, Bradley, & Reese, 1986). Students with ED had fewer reading difficulties compared to students with LD (Epstein & Cullinan, 1983; Gajar, 1980; Luebke, Epstein, & Cullinan, 1989).

The few longitudinal studies of academic progress have found that ED groups may have higher intercepts but make less progress over time than LD groups. For example, Anderson, Kutash, and Duchnowski (2001) indicated that students with ED in kindergarten and first grade exhibited higher proficiency levels on reading and math than LD. From a developmental trajectory perspective, no significant mean change differences in math performance over time were found between students with ED and LD. Reading performance of students with LD increased over time, but no significant growth in reading was found for students with ED. Wagner, Silbergliitt, Hartman, Pdtursdottir, & Hoch (2006) also compared the growth level of oral reading fluency between students with ED and LD. Students with ED had higher mean levels of oral reading fluency than LD. However, students with ED had a negative growth curve while students with LD had a positive growth curve. These findings suggest that the impact of ED on academic performance is more negative than LD over time, and students with ED may be less responsive to intervention than students with LD.

Social domain. Findings indicated that students with mild disabilities had poorer social skills and adaptive behavior, exhibited more behavior problems, and experienced more difficulties in peer relationships compared to non-disabled students (Gresham, Elliott, & Black, 1987; Gresham & MacMillan, 1997). Students with LD had difficulties

in establishing or maintaining social relationships (Gresham & Elliott, 1989; Gresham & Reschly, 1986; Ochoa & Olivarez, 1995; Swanson & Malone, 1992) and finding social support from other classmates (Kavale & Forness, 1996). Students with LD had more social skill deficits compared to non-LD students across different informants and different domains of social skills (Kavale & Forness, 1996). Likewise, children with ED were more likely to experience peer rejection than non-disabled peers (Sabornie & Kauffman, 1985; Walker & Bullis, 1991).

Research findings on the comparisons of social characteristics between children with LD and ED are inconsistent. Some findings indicated no significant differences in social skills and competencies between students with LD and ED (Gresham et al., 1987; Margalit, 1995). Some evidence; however, indicated that students with ED had greater difficulties in establishing or maintaining interpersonal relationships with peers and teachers than students with LD (Merrell, Johnson, Merz, & Ring, 1992; Walker, Colvin, & Ramsey, 1995).

Behavior domain. Students with ED and LD both demonstrate behavioral problems, but students with ED exhibit more externalizing and internalizing problem behavior than students with LD. McConaughy, Mattison, and Peterson (1994) found significant differences between students with behavior disorders and LD based on teacher and parent ratings. Students with ED experienced more problem behavior than students with LD, such as acting out, hyperactivity, social maladjustment (Margalit, 1989), externalizing and internalizing behavior (Handwerk & Marshall, 1998), and drug and alcohol use (Elmquist, Morgan, & Bolds, 1992).

*Long-Term Educational and Social/Behavioral Outcomes of High-Incidence**Disabilities*

Research has found that students with LD and ED exhibiting academic and social/behavioral deficits are at risk for pervasive and long-term failure (Epstein et al., 1989; Kauffman, 2001; Landrum, Tankersley, & Kauffman, 2003; Wagner, 1995).

LD. Research on secondary school outcomes indicated that students with LD experienced high dropout rates ranging from 27% to 54% (deBettencourt, Zigmond, & Thornton, 1989; U.S. Department of Education, 2001; White, Schumaker, Warner, Alley, & Deshler, 1980; Zigmond & Thornton, 1985). Research on post-school outcomes indicated that students with LD had poorer employment rates, lower income, lower attendance of postsecondary school, higher arrest rates, and lower independent living compared to non-disabled adults (Blackorby & Wagner, 1996; Murray, Goldstein, & Edger 1997; Murray, Goldstein, Nourse, & Edger, 2000; Wagner, D'Amico, Marder, Newman, & Blackorby, 1992).

ED. Research on secondary school outcomes indicated that students with ED had higher rates of absenteeism, higher school dropout, lower grade point averages, higher greater retention rates, higher course failure, lower graduation rates than non-disables students (Kauffman, 2001; Wagner, 1995). Findings about post-school outcomes also showed that students with ED experienced less independent living, more dropout rates, less attendance of post-secondary school, higher arrest and incarceration rates, and more unemployment than students with any other disabilities and non-disabled students (Carson, Sitlington, & Frank, 1995; Frank et al., 1995; Kauffman, 2001; Landrum et al., 2003; Malmgren, Edgar, & Neel, 1998; Osher, Morrison, & Baliey, 2003; U.S.

Department of Education, 2001; Wagner, 1995; Wagner et al., 1992).

Delinquency, Crime, and High-Incidence Disabilities

Early behavioral problems and heightened risks of juvenile delinquency and later adult crime for students with high-incidence disabilities are of paramount interest and great concern to policy and practice. Despite the consistent findings of academic and social/behavioral deficits as well as negative long-term outcomes in educational and social domains, little is known about the complex interplay of risk and protective factors and the processes contributing to behavioral problems for students with high-incidence disabilities. Empirical research has investigated the association between high-incidence disabilities and antisocial behavior. Research on the linkage between high-incidence disabilities and behavioral problems shows inconsistent findings. Evidence indicated that the presence/absence of disabilities was associated with arrest for adolescence (Wagner et al., 1992; Wagner et al., 1991). Students with LD and ED had higher risks of being arrested than students without LD and ED (Bryant et al., 1995; Doren, Bullis, & Benz, 1996). Findings suggested that there was an established relationship between learning disabilities and juvenile delinquency (Broder, Dunivant, Smith, & Sutton, 1981; Keilitz & Dunivant, 1987). Alternatively, some evidence did not show a clear relationship between the presence of learning disabilities and juvenile delinquency (Broder et al., 1981; Lane, 1980; Malmgren, Abbott, & Hawkins, 1999; Skaret & Wilgosh, 1989). Jonson-Reid, Williams, and Webster (2001) also found that ED status was not related to incarceration for violence offenses.

A number of hypothesized mechanisms have been advanced to specify the relationship between disabilities and delinquent and criminal behavior (Lane, 1980).

School failure theory suggests that students with high-incidence disabilities tend to experience school failure (e.g., rejection experience, negative self-image, or frustration) which causes subsequent school dropout and delinquency (Osher, Woodruff, & Sims, 2002). This hypothesis has been supported by the association found between academic underachievement and delinquent behavior for students with LD (Grande, 1988). Susceptibility theory asserts that personality and cognitive deficits (e.g., impulsivity or inability to conceptualize causality) lead students with disabilities to conduct more criminal and delinquent behavior (Keilitz & Dunivant, 1987). Waldie and Spreen (1993) found that personality traits (e.g., judgment and hyperactivity-impulsivity) instead of school failure might lead to delinquency for students with LD.

These hypothesized models have been criticized. For example, the presence of disabilities may be only one risk factor for increased school failure. Likewise, school failure is only one risk factor among many that influence the development of antisocial behavior. The school setting is only one of the contexts in which students develop negative behavioral outcomes (Lane, 2004). In fact, the presence of LD and ED may not be directly associated with negative behavioral outcomes. Instead, complex risk and protective factors including individual characteristics or external characteristics (e.g., family, school, and community) may be more relevant for negative behavioral outcomes (Morrison & Cosden, 1997). The apparent association between disabilities and the development of antisocial and criminal behavior may be confounded by psychological deficits and social processes.

General Factors in the Development of Antisocial Behavior

The development of various manifestations of antisocial behavior, including

acting out as well as delinquent and criminal behavior, varies by the age of the students. Even though the manifestations of antisocial behavior vary throughout childhood, adolescence, and adulthood, the continuity of antisocial behavior over time has been well documented (Deković, Buist, & Reitz, 2004; Loeber, 1991; Patterson, 1993; Patterson et al., 1989; Walker & Severson, 2002). Early problem behavior in childhood consistently continued into later poor behavioral outcomes in adolescence and adulthood (Bongers, Koot, van der Ende, & Verhulst, 2004; Conroy & Brown, 2004; Loeber, 1982; Loeber & Dishion, 1983; Patterson, 1982). Loeber and Dishion (1983) indicated that antisocial behavior in middle childhood was a strong covariate predicting delinquency. Early antisocial or disruptive behavior predicted long-term criminal behavior in adolescence and adulthood (Loeber, 1982). Such consistent patterns suggest the importance of early identification and intervention for students at risk for developing problem behavior.

Existing research has specified general factors associated with the development of antisocial behavior. Antisocial behavior is associated with biological determinants, psychological determinants, and social processes within the realms of individual, family, peer, and school (Dishion, French, & Patterson, 1995; Hawkins, Catalano, & Miller, 1992; Loeber & Hay, 1997).

Demographic characteristics. Inconsistent findings have been found for the effect of gender on antisocial behavior. Being male was a risk factor predicting serious antisocial behavior over time such as conduct problems in childhood (Kazdin, 1987), delinquency (Elliott, Huizinga, & Ageton, 1985), and adult crime (Federal Bureau of Investigation, 1989). However, Dishion et al. (1995) mentioned that the impact of

gender differences appeared to vary by the severity of antisocial behavior.

Race/ethnicity was associated with antisocial behavior (Patterson et al., 1989; Wilson & Herrnstein, 1985). However, there were mixed and inconsistent findings.

Individual factors. Findings indicated that biological factors (e.g., low birthweight and premature birth) might be related to the involvement of delinquent and criminal behavior, but the results have been mixed. Poor emotional regulation (e.g., anger control and tolerance of frustration) and difficult temperament were associated with an increased likelihood for behavior problems and aggression (Kingston & Prior, 1995; Loeber & Hay, 1997).

Academic failure and externalizing problem behavior during childhood appeared to be strong risk factors for developing later maladjustment in social settings (Hawkins, Dueck, & Lishner, 1988; Hinshaw, 1992a; Kazdin, 1987; Reid & Patterson, 1991).

Academic difficulties were considered as one of the most important risk factors for the development of problem behavior (Broder et al., 1981; Cullinan, Epstein, & Sabornie, 1992; Fessler, Rosenberg, & Rosenberg, 1991; Lane, 1980; Luebke et al., 1989; Rutherford, Nelson, & Wolford, 1985; Zimmerman, Rich, Keilitz, & Broder, 1981).

Poor academic achievement was associated with the onset, frequency, persistence, and severity of antisocial behavior (Maguin & Loeber, 1996). Consistent evidence showed that poor academic performance was related to subsequent adolescent delinquency and violent behavior (Hawkins et al., 1988; Loeber & Farrington, 2000; Loeber, Farrington, Stouthamer-Loeber, Moffit, & Caspi, 1998; Maguin & Loeber, 1996; Winters, 1997).

Early histories of academic underachievement, particularly reading difficulties, were correlated with delinquency and substance use in adolescence (Hinshaw, 1992a;

Hinshaw, Lahey, & Hart, 1993; Maguin & Loeber, 1996).

Research has found that early problem behavior is the strongest established individual level factor of delinquent and criminal behavior in adolescence and adulthood (Loeber & Dishion, 1983; Loeber & Stouthamer-Loeber, 1986). Externalizing problem behavior involving hyperactivity, impulsivity, attention problems, and poor behavioral control was associated with greater levels of antisocial behavior in childhood, adolescence, and adulthood (Campbell, 1990; Farrington, 1998; Kellam, Mayer, Rebok, & Hawkins, 1998; Rabiner, Coie, & the Conduct Problem Prevention Research Group, 2000; White, Moffitt, Caspi, Bartusch, & Stouthamer-Loeber, 1994). The stability of externalizing problem behavior over time has been well documented (Deković et al., 2004; Loeber, 1991; Patterson et al., 1989; Walker & Severson, 2002). Early problem behavior in childhood was consistently associated with later behavioral outcomes in adolescence (Bongers et al., 2004; Conroy & Brown, 2004).

Social competence has been defined as a capacity to integrate cognition, affect, and behavior to achieve social tasks and develop positive outcomes (Bierman & Greenberg, 1996). Social competence includes prosocial behavior as well as abilities to promote intrapersonal (e.g., self-assertion) and interpersonal skills (e.g., get along with others) (Sørlie, Hagen, & Ogden, 2008). Social competence was associated with depression, anxiety, delinquency, and antisocial behavior (Gresham & Elliott, 1990). Webster-Stratton and Lindsay (1999) found that children referred for conduct problems had greater negative attributions, less problem-solving abilities, and poorer social skills than typical developing children during play interactions with friends. Social skill deficits were correlated with the official and self-reported criteria of delinquency

(Dishion, Loeber, Stouthamer-Loeber, & Patterson, 1983). Poor social competence at age 13 was predictive of antisocial behavior at age 15 (Sørlie et al., 2008).

Family factors. Parents influence children's socialization and serve as the main agents in children's developmental processes (Ladd & Troop-Gordon, 2003). Findings indicated that family factors had salient effects on the development of antisocial behavior before late childhood (Patterson, Reid, & Dishion, 1992). Disrupted parenting practices, inconsistent and harsh discipline, and the lack of parent supervision were strong risk factors predictive of subsequent delinquent and criminal behavior (Loeber & Dishion, 1983; Patterson, 1986; Patterson et al., 1989). Inconsistent and punitive discipline and coercive parent-child interaction formed a base for developing aggression (Farrington, 1978; Patterson, 1982). Loeber and Stouthamer-Loeber (1986) indicated that poor parenting practices had cumulative and long-term negative effects on the development of antisocial behavior in adolescence and adulthood.

Other family factors involving poor parent supervision and family conflict were related to antisocial behavior (Farrington, 1998; McCord, Widom, & Crowell, 2001). Teenage mother, family size (e.g., 4 or more children), family structure (e.g., single-parent), parent education, family income, and parent unemployment also predicted later delinquent and criminal behavior (Farrington, 1998; McCord et al., 2001; Patterson et al., 1989; Tremblay, Mâsse, Kurtz, & Vitaro, 1997; Wilson & Herrnstein, 1985). In addition, child neglect/abuse (Farrington, 1998; McCord et al., 2001; Silverman, Reinherz, & Giaconia, 1996; Vega, Zimmerman, Warheit, Apospori, & Gil, 1993) and prior child welfare services (Jonson-Reid & Barth, 2000) were associated with a highlighted risk of subsequent delinquent and criminal offenses.

Peer factors. Research has suggested that peer rejection contributes to the development of antisocial behavior in childhood, adolescence, and adulthood (Parker & Asher, 1987). Peer rejection placed children at risk for developing subsequent externalizing behavior problems such as aggression, acting out, or delinquency in adolescence (Dodge et al., 2003; Kupersmidt & Coie, 1990; Hymel, Rubin, Rowden, & LeMare, 1990). Moreover, deviant peer affiliations were associated with delinquent behavior (Deković, 1999; Dishion, Andrews, & Crosby, 1995; Patterson et al., 1992). Tremblay, Mâsse, Vitaro, and Dobkin (1995) found that affiliations with aggressive peers augmented the development of behavioral problems. However, the influence of specific peer influence such as social pressure and approval predicting youth delinquency and crime remained unknown (Warr, 1996)

School factors. Research in school climate indicated that providing opportunities for students to achieve mastery level and to facilitate academic performance decreased the likelihood of being engaged in antisocial behavior (Glasser, 1998). Effective school practices could provide opportunities to accommodate students' academic and behavioral deficits and increase the likelihood of appropriate behavior (McEvoy & Welker, 2000). The academic quality of schools was associated with the level of school crime and violence (Verdugo & Schneider, 1999). Findings also indicated that grade retention and truancy were associated with antisocial behavior (McCord et al., 2001), but school suspension and expulsion were not consistently related to antisocial behavior.

Neighborhood factors. Evidence has suggested that living in urban areas or socially and economically disadvantaged neighborhoods can be related to children's

aggression, juvenile crime, and adult violence (Kupersmidt, Griesler, DeRosier, Patterson, & Davis, 1995; McCord et al., 2001). Children living in disadvantaged neighborhoods experienced more stressful life events compared to children living in other neighborhood areas (Attar, Guerra, & Tolan, 1994). In urban areas, physical aggression was found more often than in other areas (Tremblay et al., 1997). Moreover, poor socialization in disadvantaged neighborhoods increased the likelihood of being engaged in delinquency (McCord et al., 2001).

Developmental Progression of Antisocial Behavior

The developmental course of antisocial behavior from early childhood through adolescence has been identified (Patterson, 1992; Patterson et al., 1989; Reid & Patterson, 1989). A predictable sequence has been pointed out to illustrate the developmental trajectory of antisocial behavior. First, disruptive parenting practices were identified as influential determinants predicting early antisocial behavior and subsequent delinquent and criminal behavior (Patterson et al., 1989). Early coercive family relationship influenced later academic failure and peer rejection. Last, peer rejection and academic failure led to deviant peer affiliations in later childhood and early adolescence (Dishion, Patterson, Stoolmiller, & Skinner, 1991). The hypothesized sequence consists of multifaceted processes and interactive relationships between individual risk factors and environmental factors which likely lead to the progression of delinquent and criminal behavior.

Factors in the Development of Antisocial Behavior for High-Incidence Disabilities

Although research has addressed general factors associated with the development of antisocial behavior, less attention has been given to identify factors specific to

students with special needs such as high-incidence disabilities. Students with high-incidence disabilities including LD and ED were at risk for developing antisocial, delinquent, and criminal behavior (Quinn et al., 2005). Evidence has shown that there are several contextual factors at the individual, family, and school levels which likely contribute to the development of behavioral problems for students with high-incidence disabilities. In the following sections, these factors will be reviewed specifically in relation to school-aged children with high-incidence disabilities (i.e., LD and ED).

Demographic characteristics. Gender is not a consistent predictor for the development of behavioral problems for students with high-incidence disabilities. Doren et al. (1996) indicated that gender was associated with arrest rates for adolescents with disabilities. Males were more likely to be arrested compared to females (25% vs. 3%). However, McHale, Obrzut, and Sabers (2003) indicated that gender was not related to aggressive behavior of students with ED and LD. Few gender differences were found in disciplinary incidents in the school year for students with disabilities in the Special Education Elementary Longitudinal Study (SEELS)(Blackorby et al., 2007).

Race/ethnicity is not a consistent predictor related to the development of antisocial behavior for students with high-incidence disabilities. Wagner and colleagues (Wagner et al., 1992; Wagner et al., 1991) found that race/ethnicity was a variable predictive of arrest for adolescence with disabilities. However, McHale et al. (2003) indicated that ethnicity was not related to aggressive behavior of students with ED and LD. Blackorby et al. (2007) also indicated that no significant differences between African American and White students with disabilities were found in disciplinary incidents during the school year.

Individual factors. Kauffman et al. (1987) found that poor reading recognition and comprehension were related to the presence of overt problem behavior for students with ED (i.e., conduct disorder and socialized delinquency). Doren et al. (1996) indicated an association between lower social/academic abilities and arrest status for adolescents with disabilities. Coutinho (1986) investigated the relationship between reading achievement (e.g., vocabulary and reading comprehension) at the elementary level and later maladaptive behavior at the secondary level for students with ED. Results showed a predictive relationship between early poor reading and subsequent behavioral disorders, as well as a concurrent relationship between reading problems and behavioral disorders at the secondary level. Reading underachievement was a precursor and also was concurrently associated with behavior disorders. However, Tremblay et al. (1992) examined the causal relationship among early disruptive behavior, early school achievement, and later delinquency longitudinally for high-risk children with low social economic status. No causal link was found between academic underachievement and delinquency when early disruptive behavior was statistically controlled for.

Early disruptive behavior, acting out, impulsiveness, and aggression were risk factors associated with later delinquent and criminal behavior (Elliott et al., 1985; Hawkins et al., 1992). Vance, Bowen, Fernandez, and Thompson (2002) indicated that a history of aggression in childhood was associated with negative behavior outcomes for adolescence with ED. Blackorby et al. (2007) examined the relationships of social skills and classroom behaviors (i.e., cooperating with peers, following directions, persistence in completing tasks, and completing homework on time) with social outcomes (i.e., belonging to the extracurricular school or community group membership and

disciplinary incidents in the school year) for students with disabilities. Findings indicated that classroom adaptive behaviors (e.g., following directions and persistence in completing tasks) were associated with fewer disciplinary incidents at schools, but classroom maladaptive behavior was associated with more disciplinary incidents at schools (Blackorby et al., 2007). Vance et al. (2002) found that good problem-solving abilities and interpersonal skills were associated with better behavioral outcomes for high-risk adolescents with aggression and ED.

Family factors. Parent involvement and family support have been considered necessary elements for promoting the educational success of students with disabilities and have been emphasized in special education policy since the mandate of P.L.94-142. Family involvement and support were associated with social adjustment outcomes (Epstein, 1987; Vance et al., 2002). Family factors such as family encouragement, high family expectation, family involvement in schools or community life, and household income were related to fewer disciplinary incidents in the school year for students with disabilities (Blackorby et al., 2004; Newman & Davis, 2004; Newman, Wagner, & Guzman, 2002). On the other hand, it has been also found that several aspects of family can be risk factors for poor child development. Negative parent-child relationships in childhood was a risk factor associated with negative behavior outcomes for students with ED (Vance et al., 2002). Low family income was related to negative outcomes for students with disabilities (Wagner et al., 2003). A history of consistent parental employment was a protective factor for behavioral problems of students with ED (Vance et al., 2002). Family status such as a single-parent household was negatively associated with aggressive behavior of students with ED and LD (McHale et al., 2003).

School factors. Blackorby et al. (2007) indicated that school factors (e.g., vocational courses, regular educational placement, support of social integration, and multidisciplinary collaboration) were associated with the social development of children with disabilities. School mobility leading to unstable school environments was associated with academic difficulties and negative behavioral problems for students with disabilities (Demie, 2002; Marder, Wagner, & Sumi, 2003). Tobin and Sugai (1999) found that students experiencing more school moves had more adjustment difficulties in high school for students with ED. Changing a student's social, academic, and physical contexts led to more negative impact on the developmental trajectories of students with ED. Mobility often led to school dropout and influenced school completion outcomes (Tobin & Sugai, 1999). Doren et al. (1996) indicated that adolescents with disabilities dropping out from school were more likely to be arrested than those who did not drop out. Approximately 73% of students with ED were arrested within 3 to 5 years after dropping out of school (U.S. Department of Education, 1994).

Summary of Known and Established Predictors

There are various general factors that place children and youth at risk for later antisocial, delinquent, and criminal behavior. The above review on known and established predictors in antisocial behavior involved demographic characteristics, individual factors, family factors, school factors, and neighborhood factors. Even though the majority of studies considered single risk factors at the points of time, the particular loading of risk factors and the interaction of risk factors could account for the emergence or progression of antisocial behavior. It is unlikely that certain single factors can explain the development of antisocial behavior. Instead, behavioral problems can likely result

from a complex interplay of individual, family, school, neighborhood, and community characteristics.

Despite growing awareness of the relationship between the presence/absence of high-incidence disabilities and antisocial behavior, relatively little research has focused on the direct/indirect effects of individual characteristics and environmental factors on the development of antisocial behavior for students with high-incidence disabilities.

Although disabilities may not directly cause the development of antisocial behavior, students with learning and behavioral disorders have a greater risk for being engaged in delinquent and criminal behavior. Educational failure, poor social skills, negative school climate or quality, as well as lack of community support may be related to the disproportionate number of youths with disabilities in the correctional system. Individual and environmental characteristics and the relation to the development of antisocial behavior need to be investigated for students with high-incidence disabilities.

The theoretical foundation of risk/resiliency within ecological systems provides a framework for understanding the complex factors that affect the development of behavioral problems. The predictive patterns of later behavioral problems for at-risk students including students with disabilities were further examined from an ecological risk/protective perspective in the current study.

Theoretical Foundation

Negative behavioral outcomes are determined by a complicated interplay among various factors from an ecological perspective. A variety of risk and protective factors may influence the development of behavioral problems for students with disabilities. The sections below discuss the fundamental elements of risk and protective factors as

well as ecological system theory.

Risk and protective factors. Risk factors are defined as negative conditions detrimental to child development and increase the likelihood of negative outcomes (Garmezy, 1983; Keogh & Weisner, 1993). Werner and Smith (1992) considered biological or psychosocial risks as risk factors increasing the likelihood of negative outcomes. Stressful life situations may lead to a variety of possible negative developmental outcomes. Risk factors are likely confounded or associated with each other and influence developmental paths. The paths between antecedent risk factors and subsequent outcomes are likely not linear. The causal status of risk factors predicting outcomes may be unclear due to the influence of other unmeasured variables.

Protective factors are defined as conditions that reduce the likelihood of having negative outcomes. Sameroff (1982) described protective factors as conditions facilitating child development positively. Garmezy, Masten, and Tellegen (1984) described protective factors as “dispositional attributes, environmental conditions, biological predispositions, and positive events that can act to contain the expression of deviance or pathology” (p. 109). On the other hand, protective factors function as mediators and have buffering effects on risk exposure leading to a decreased likelihood or frequency of later problem behavior (Rutter, 1979). Protective factors are “environmental contextual variables that mediate the expression of potentially harmful biological and psychosocial events over time” (Werner, 1986, p. 18).

Risk and protective factors do not function independently but influence each other. Keogh and Weisner (1993) suggested that the effects of risk factors vary with changing ecological and cultural contexts. When problematic individual characteristics and risky

circumstances lead to poor outcomes, protective factors tend to facilitate better outcomes from an interactive and transactional perspective. The early identification of risk and protective factors, potentially malleable determinants, and their interrelationships may help to develop effective prevention for negative outcomes.

Ecological framework. Ecological system theory suggests that variation in individual development is related to bi-directional or transactional influences within and between four nested environmental systems. The ecological system includes a) a microsystem which represents immediate environments such as family, school, or neighborhood environments (e.g., mother-child interaction at home or peer interaction in classrooms), b) a mesosystem which consists of connections among immediate contexts such as home and school, c) an exosystem which includes external settings indirectly influencing child development such as parent's workplace, and d) a macrosystem which indicates larger cultural settings (e.g., the culture or socioeconomic status of the community) (Bronfenbrenner, 1989). To examine child development, not only the effects of individual and immediate social contexts but also the interaction with larger environment need to be specified.

Regarding the functioning of students with disabilities, it is likely that complex combinations rather than single risk factors lead to negative developmental outcomes (Gallimore, Bernheimer, MacMillan, Speece, & Vaughn, 1999; Wiener, 2003). In addition to the adverse influences of biological factors, developmental outcomes are influenced by reciprocal child-environment interactions (Sameroff & Seifer, 1990; Werner & Smith, 1992). Investigating the individual-environment interactions can help explain the social functioning of children with disabilities and understand the influence

of adversity on developmental trajectories within educational contexts (e.g., teachers and classrooms) and other ecological systems (e.g., family, neighborhood, and community conditions) (Wiener, 2003).

Application of the theoretical foundation to the current study. Risk and protective factors such as individual characteristics and social/contextual experience contribute to learning and behavioral development for students with disabilities. Given this, it becomes critical to examine not only the direct association between individual deficits and negative outcomes, but also the impact of contextual factors that may enhance or impede adult outcomes. Research needs to take into account an ecological perspective to examine risk and protective factors in different domains or contexts (Werner, 1993; Werner, 1999). The specific relationships between child psychosocial functioning and contexts as well as the ways that contextual factors affect the developmental process for children with disabilities need further investigation (Sorensen et al., 2003).

A conceptual framework based on ecological risk/resilience has been used to examine the development of students with disabilities in a limited number of studies. Murray (2003) mentioned the necessity for organizing a framework integrating risk, protective factors, vulnerability, and resilience to understand the complexities of life course and poor adult outcomes for youth with high-incidence disabilities. The risk/resilience framework can be applied to understand factors and processes that affect the adverse adult outcomes of students with disabilities over life courses. Morrison and Cosden (1997) used the conceptual framework of risk and resiliency to examine the relationships between LD and non-academic outcomes (e.g., emotional adjustment, family functioning, school dropout, substance abuse, and juvenile delinquency). Risk

and protective factors interacted with disabilities to influence student adjustment.

Keogh and Weisner (1993) suggested an ecocultural perspective on risk and protective factors for educational and personal-social development of LD. Single indicators or main-effect models could not validly explain the development of poor outcomes. Rather, findings showed that risk and protective factors in the child, family, and social contexts in aggregated data could validly identify child behavioral problems. Individual, family, and school characteristics, as well as the interaction among factors need to be taken into consideration when specifying plausible risk and protective factors. Research findings can be used to form an ecological risk/protective theory for building prevention and policies to support the development of students with disabilities.

Conceptual Framework

The conceptual framework in Figure 1 is structured to be consistent with an ecological perspective such that negative behavioral outcomes of students with high-incidence disabilities are the result of a complex influence of different types of elements. Primary research questions were developed to examine the association between high-incidence disabilities and behavioral problems as well as the predictive effects of individual, family, and school level factors, and the potential moderating effects of ecological factors associated with behavioral problems for students with high-incidence disabilities. However, the assumed relations between the onset and progression of behavioral problems (i.e., acting out, juvenile delinquency, and adult arrest) were not examined in this study. The variables in Figure 1 are organized based on the temporal sequence ordering from ages 0-3, early childhood, middle childhood, to late adolescence and young adulthood. The boxes present covariates, factors at the individual,

family, and school levels, indicators nested in different levels of factors, and negative behavioral outcomes at different developmental stages. The arrows between the variables represent the proposed temporal sequence and direct or indirect patterns of relationships, designated by the solid lines and by the dashed lines, respectively. Relevant covariates include gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student word analysis. Individual student characteristics include academic performance in reading and classroom adjustment. Predictors in family contexts include parent involvement and child maltreatment. Student experience in school contexts includes participation in the Child-Parent Center (CPC) preschool program, magnet school attendance, school mobility, number of years in special education placement, and grade retention.

Ages 0-3 early childhood middle childhood late adolescence early adulthood

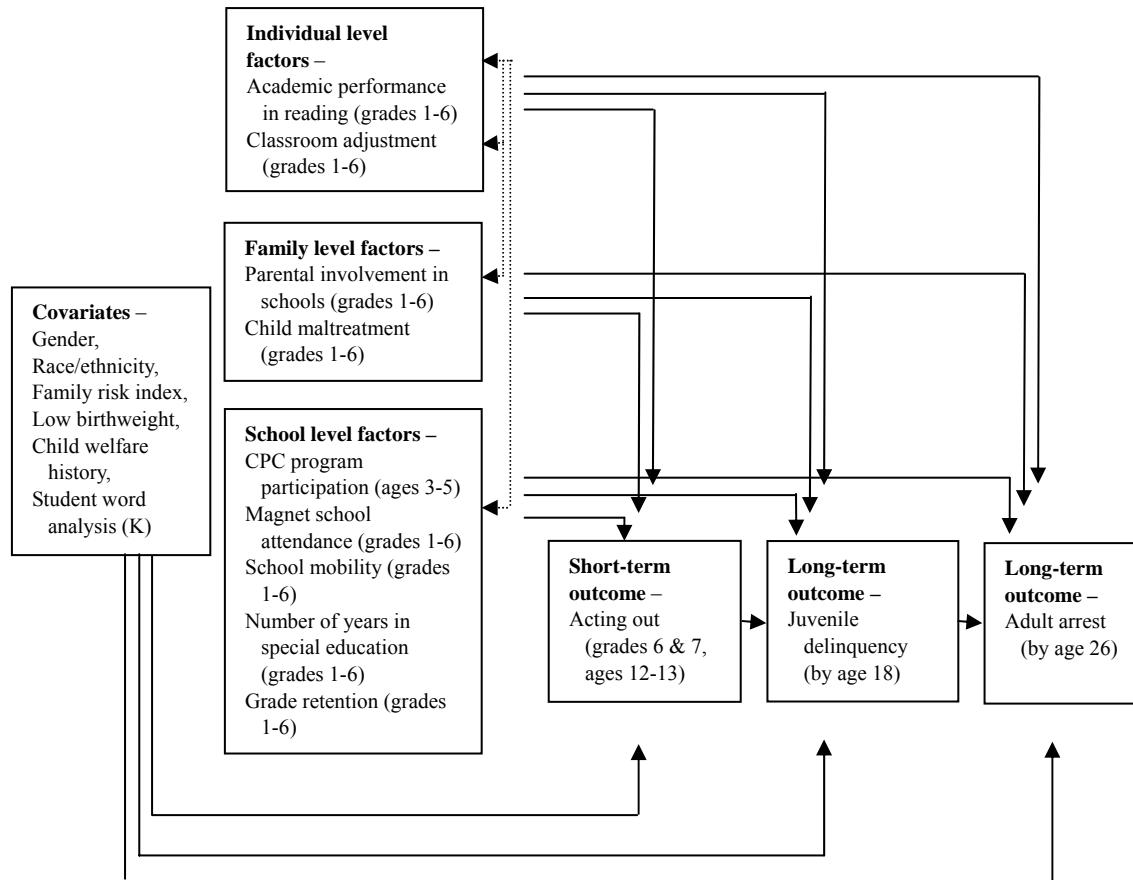


Figure 1. Conceptual framework of predictors and behavioral outcomes for students with high-incidence disabilities

CHAPTER 3

METHOD

This chapter outlines the details of the methods in this study, including the study design, sample, measures of predictors, behavioral outcomes, and covariates, as well as data analyses.

Design

This study was based on data from the Chicago Longitudinal Study (CLS, 1999). The CLS is an ongoing longitudinal study investigating the effects of a school-based early intervention program and tracking the progress of a cohort of 1539 inner-city children who attended early childhood programs in the Chicago Public Schools in 1985-1986. An intervention study, the Child-Parent Center (CPC) preschool program, is nested in the longitudinal study. The CPC preschool program, a government-funded early childhood program, was implemented as a preventative intervention for at-risk children living in high poverty over a 6-year period from preschool to grade 3. The elements of the CPC preschool program include academic/language skills, the socialization of young children, parental involvement, comprehensive health and social services, and family support services (Reynolds, 2000; Reynolds, Mavrogenes, Bezruczko, & Hagemann, 1996). The early intervention program has been documented to benefit the achievement of economically disadvantaged children (Reynolds, 1999; 2000).

On the basis of a matched-group quasi-experimental, longitudinal research design, the large-scale program included a cohort of 989 children enrolled in the CPC preschool program in 20 sites in preschool (half-day program) and kindergarten (half-day or

all-day program) during 1985-1986. It also included a matched cohort of 550 children of the same age enrolled in alternative preschool programs (all-day kindergarten intervention programs at age 5) in 5 different Chicago public schools, which were randomly selected from 27 sites participating in the Chicago Effective School Project in similar, impoverished neighborhoods. Home residency in school neighborhoods eligible for the Elementary and Secondary Education Act Title I services was a prerequisite for the enrollment of the CPC preschool program. The CPC intervention group was recruited from family volunteers. Likewise, school-community representatives also went door-to-door to recruit participants to reduce family selection bias and seek children with the greatest educational needs into the CPC preschool program. The comparison group, not living in the attendance areas of the CPC preschool program, was matched with the CPC intervention group according to the eligibility for intervention, family socioeconomic status, gender, and race/ethnicity (CLS, 1999).

As Tremblay (2002) indicated, nesting prevention trials within longitudinal studies is a cost effective and ethical approach to explore the developmental mechanisms of child development. The longitudinal study can be used to explore the patterns of developmental trajectories, and the intervention can examine whether the developmental trajectories are modified while manipulating possible factors linked with outcome variables. The longitudinal, prospective CLS provides a basis to investigate behavioral outcomes of at-risk students including students with disabilities.

Sample

The participants for this study were drawn from the original sample of 1539 students in the CLS, who were predominantly minority children (93% African American

and 7% Hispanic). The primary sample for this study consisted of 1370 CLS children (89.01% of the original sample) who had active information on special education placement in the Chicago Public Schools and had at least one valid data point on the outcome measures of acting out, juvenile delinquency, or adult crime (see Figure 2). Originally, the information about special education (N=1377) was collected from administrative sources from October 1986 to October 1999 in the Chicago Public School System, Illinois. The measure of acting out included 1058 children who had records for acting out in either grade 6 or grade 7 from the Teacher-Child Rating Scale (Hightower, Spinnell, & Lotyczewski, 1989). The measure of juvenile delinquency consisted of 1406 children who resided in the Chicago area at age 10 or older. These official delinquency petitions were collected primarily from juvenile court records in Cook County, Illinois. The measure of adult arrest was comprised of 1473 cases, including 1) anyone who had information from the Illinois Board of Higher Education from years 2002 to 2005, 2) anyone who had criminal records by age 26, 3) anyone who had employment information since 1998, 4) anyone who was part of the public aid sample, and 5) anyone who had finished the adult survey at ages 22/24.

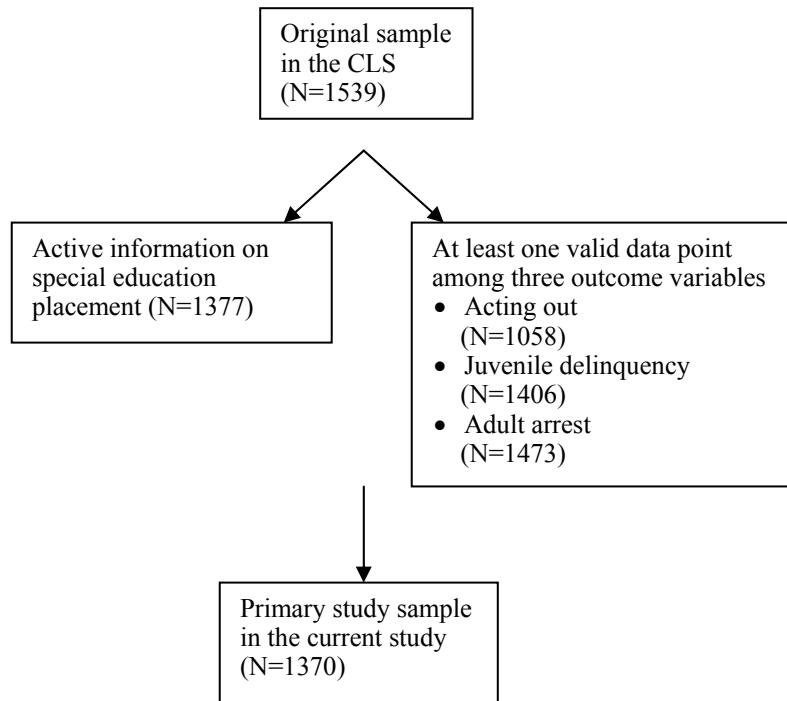


Figure 2. Selection criteria for the primary study sample.

Table 1 displays sample means for child and family characteristics of the original sample and the primary study sample, as well as the mean differences compared to the attrition group. In terms of the descriptive characteristics of the original sample, more than half of students were female (50.3%). Students were predominately African-American (92.9%). The number of early family risks at ages 0-3 was nearly 5. Specifically, for early family risks at ages 0-3, fewer than 55% of parents completed high school, 76.5% of family status was single parent, 66.3% of mothers were unemployed, 83.8% of families were eligible for free school lunch, 16.6 % of families had 4 or more children at home, 76% of children lived in school areas in which 60% or more children resided in low-income families, 16.2% of mothers were a teen parent at childbirth, and 62.8% of families received aid to families with dependent children

(AFDC). Additionally, 11.8% of children had low birthweight. Fewer than 4% of families had child welfare history at ages 0-3. The average rate of student word analysis was 63.75 at age 5.

In terms of the demographic characteristics of the primary study sample, 50.8% of students were female. Students were predominately African-American (93.2%). The number of early family risks was nearly 4.6. Specifically, for early family risks at ages 0-3, fewer than 55% of parents completed high school, 77.3% of family status was single parent, 67% of mothers were unemployed, 84.8% of families were eligible for free school lunch, 16.7 % of families had 4 or more children at home, 76.1% of children lived in school areas in which 60% or more children resided in low-income families, 16.4% of mothers were a teen parent at childbirth, and 63.7% of families received AFDC. Additionally, 11.8% of children had low birthweight. 3.9% of families had child welfare history at ages 0-3. The average rate of student word analysis was 63.61 at age 5.

Table 1 also presents a comparison of the primary study sample and the attrition sample on child and family demographic characteristics. The primary study sample and the attrition sample were comparable on background characteristics including gender, race/ethnicity, mother education, mother unemployment, family structure, low-income neighborhood, teen age mother, low birthweight, child welfare history, and student word analysis. However, there were significant differences between the primary study sample and the attrition sample. The primary study sample had a greater family risk index, more single-parent family status, increased eligibility for free lunch, and more families receiving AFDC compared to the attrition sample. These differences were further considered and included in the analysis model to control for possible attrition bias.

Table 1. Description of Demographic Characteristics for the Original Sample, Primary Study Sample, and Attrition Sample

Variables	Original Sample N=1539	Primary Study Sample N=1370	Attrition Sample N=169	P-value
Gender (female, %)	50.3	50.8	46.0	.245
Race/ethnicity (African-American, %)	92.9	93.2	90.7	.236
Family risk index (ages 0-3)	4.52	4.56	4.20	.008**
-Maternal education-mother did not complete high school (ages 0-3, %)	54.3	54.3	53.8	.910
-Single-parent family status (ages 0-3, %)	76.5	77.3	69.8	.031*
-Mother unemployment (ages 0-3, %)	66.3	67.0	60.9	.116
-Eligibility for free lunch (ages 0-3, %)	83.8	84.8	75.1	.001**
-Family structure-having 4 or more children at home (ages 0-3, %)	16.6	16.7	16.0	.808
-Neighborhood indicator- 60% or more children reside in low-income families (ages 0-3, %)	76.0	76.1	74.6	.651
-Teenage mother at childbirth (<age 18, %)	16.2	16.4	14.8	.604
-AFDC (ages 0-3, %)	62.8	63.7	55.0	.027*
Low birthweight (<2,500gms, %)	11.8	11.8	11.8	.975
Child welfare history (ages 0-3, %)	3.8	3.9	3.6	.839
Student word analysis (age 5)	63.75	63.61	64.90	.235

Note. * significant at .05 level ($p < .05$). ** significant at .01 level ($p < .01$). Statistical significance tests were conducted for primary study sample and its corresponding attrition sample. Test statistics are Pearson Chi-squares except for family risk index and the student word analysis, which is F statistic.

Measures

Data in the CLS regarding demographic attributes as well as individual, family and school experience were collected prospectively (CLS, 1999). Additionally, extensive psychological and behavioral outcomes (e.g., acting out, social maladjustment and dysfunction in adolescence, and adult serious antisocial behavior) were systematically collected from multiple sources in multiple waves until age 26. The CLS contained a variety of data sources including administrative data, ability test scores, student questionnaires, as well as teacher and parent surveys, which were collected with the assistance of the Chicago Public Schools, the Chicago Office of Early Childhood, the Cook County Department of Family Services, the juvenile court system, and the

Department of Correction (CLS, 1999; Reynolds, & Ou, 2004). The temporal sequence of covariates, predictors, and outcomes helps to set up a plausible causal direction of effects. Covariate measures were conducted at ages 0-5. Predictor variables were primarily collected in elementary grades, at ages 7-12, prior to proximal (e.g., acting out) and distal (e.g., juvenile delinquency and adult arrest) behavioral outcomes. Behavioral outcome variables were measured at ages 12-13 (acting out), by age 18 (juvenile delinquency), and by age 26 (adult arrest). The covariate measures, predictor measures, and outcome measures are described below. Table 2 presents the valid cases, means, maximum, minimum, and standard deviations for the measures.

Predictor variables in this study were identified according to the following criteria:

- a) Status/alterable predictors: Status and alterable predictors were classified and differentiated by the extent to which educators could in principle alter the predictors. Status predictors included demographic characteristics (e.g., gender and race/ethnicity), personal characteristics (e.g., disabilities status and low birthweight), family risk index, child welfare history, and past school experience (i.e., reading performance in kindergarten). Alterable predictors such as individual level variables (e.g., classroom adjustment and academic achievement), family level variables (e.g., parent involvement and child abuse/neglect), and school level variables (CPC program participation, magnet school attendance, the number of years in special education, school mobility, and grade retention) might be influenced by educators, families, and students and might be more likely to be amenable to intervention;
- b) Risk/protective factors: Risk factors indicated that the increase in a specific variable was associated with increased negative outcomes. Protective factors indicated that the increase in a specific variable was associated with

decreased negative outcomes. If risk and protective factors are alterable, the findings will be more informative for policy decisions and the design of interventions for students with disabilities or other at-risk students.

Predictor Measures

Individual, family, and school level factors were included in the analyses to examine the predictive effects on subsequent behavioral problems. Individual level factors in childhood included student academic performance and classroom adjustment in elementary grades.

Academic achievement. Academic achievement was a continuous variable measured by averaging the child's reading comprehension in grades 1 to 6 (ages 7-12) on the standardized group-administrated achievement test, the Iowa Test of Basic Skills (ITBS) (Hieronymus & Hoover, 1990). The ITBS is a measure of cognitive maturity including listening skills, word analysis, language, vocabulary, and math. ITBS raw scores were converted to developmental standard scores and used to determine cognitive growth over time and across grade levels. The reading scale consisted of 58 items which measured the understanding of text passages ($\alpha = .92$).

Classroom adjustment. Classroom adjustment was a continuous variable indicating the mean of the composite scores of social-emotional maturity in grades 1 through 6 (ages 7-12). Classroom adjustment was measured by teacher rating of socio-emotional maturity in schools. Socio-emotional maturity was a composite score based on six items, including "concentrates on work;" "follows directions;" "is self confident;" "gets along well with others;" "participants in group discussions;" and "takes responsibility for actions;" in which the child's performance was rated on a 5-point scale

from poor to excellent (1= poor/not at all; 2= fair/some; 3= satisfactory/average; 4= above average; and 5= excellent/much). The scale was administrated from grade 1 to grade 6 yearly ($\alpha = .91$).

Social and contextual variables at the family and school levels were considered as predictors that might also have moderating or mediating effects influencing students' academic performance and classroom adjustment and subsequent behavioral outcomes. Family characteristics included parent involvement in the child elementary school experience and child maltreatment (i.e., abuse/neglect) in elementary grades.

Parent involvement. Parent involvement was a continuous variable defined as the number of years of teachers' rating of parent's participation in schools as average or better in grades 1 through 6 (ages 7-12). Parent involvement in the child elementary school experience was rated by teachers on a 5-point scale (1=poor/not at all; 2=fair/some; 3=satisfactory/average; 4=above average; and 5=excellent/much).

Child abuse/neglect. Child abuse/neglect was a dichotomous variable indicating whether the child experienced abuse/neglect based on the report of the Child Protective System of the Illinois Department of Child and Family Services and/or petitions to the Cook County juvenile system at ages 7 to12. Children with one or more maltreatment petitions were coded 1 and children with no histories were coded 0.

School characteristics included the availability of school support and students' use of resources and experience in school contexts, including CPC program participation, magnet school attendance, school mobility, the number of years in special education placement, and grade retention in elementary grades.

CPC program participation. Participation in the CPC preschool program was a

dichotomous variable indicating whether the child attended a CPC preschool program, using administrative data from the Chicago Public Schools. Children participating in the CPC preschool program for 1 or 2 years from age 3 were coded 1. Children in the comparison group with alternative programs in a full day kindergarten were coded 0.

Magnet school attendance. Magnet schools are public schools offering specialized curricula. Magnet schools often aim to promote academic opportunity and excellence. Magnet school attendance was measured in grades 1 through 6 (ages 7-12). Children who attended magnet schools for 1 or more years were coded 1 and children who did not attend a magnet school were coded 0. Previous studies indicate that magnet school participation is associated with greater school achievement and social adjustment (Reynolds, Ou, & Topitzes, 2004).

School mobility. School mobility was a continuous variable indicating the number of school moves that the child had in grades 1 through 6 (ages 7-12). Data were obtained from school administrative system records yearly. School mobility might be related to lower academic performance, higher dropout, and the occurrence of problem behavior (Temple & Reynolds, 1999). The instability of the learning environment might exacerbate children's academic and behavioral development.

The number of years in special education placement. The number of years in special education placement was used as an indicator for special education in grades 1 through 6 (ages 7-12). Special education placement was tracked through the Chicago Public Schools.

Grade retention. Grade retention was a dichotomous variable indicating whether children were retained in grades 1 through 6 (ages 7-12). Children retained in grades 1

through 6 were coded 1, and other students who were not retained in grades 1 through 6 were coded 0.

Outcome Variables

The outcome measures included the assessments of proximal and distal behavioral outcomes in middle childhood, late adolescence, and young adulthood. The measures of negative behavioral outcomes included proximal outcomes such as acting out in middle childhood (ages 12-13), and distal outcomes such as juvenile delinquency in late adolescence (by age 18) as well as adult crime in early adulthood (by age 26).

Acting out. Acting out in middle childhood was a dichotomous variable measured by the Teacher-Child Rating Scale (Hightower et al., 1989). The problem behavior and delinquency subscale included 18 items which assessed acting out, shy-anxious behavior, and learning problems rated on a 5-point scale (1= “not a problem;” 2= “mild;” 3= “moderate;” 4= “serious;” and 5= “very serious problem”). The score for acting out was the summed scores of 6 items including “disruptive in class;” “fidgety, difficulty sitting still;” “disturbs others while they are working;” “constantly seeks attention;” “overly aggressive to peers;” and “deviant, obstinate, stubborn.” The survey was administrated in grades 6 and 7 ($\alpha = .94$). Acting out was a dichotomous variable based on the mean of the composite scores of acting out in grades 6 and 7. Children with one standard deviation or more above the mean of acting out were coded 1 (high/problematic acting out). Others were coded 0 (normal to low acting out). One standard deviation above the mean was 18.5.

Juvenile delinquency. Juvenile delinquency was a dichotomous outcome variable which indicated poor social functioning and conduct in adolescence. Juvenile

delinquency was measured between 1990 and 1998 (ages 10-18) from administrative records including the Cook County juvenile court and two other mid-western locations. Juvenile arrest consisted of formal petitions of students who were arrested on criminal charges and went before a judge. Some petitions may cause a warning or referral to social service agencies. Students with any juvenile arrest records were coded 1, and others were coded 0.

Adult arrest. Adult arrest was a dichotomous variable that measured adult arrest by age 26 though official court reports of criminal records at the county, state, and federal level. Primary records came from the Cook County court system. Secondary records were obtained from the Illinois Department of Correction and other mid-western states (e.g., Wisconsin, Minnesota, and Iowa). Students with any adult arrest records were coded 1, and others were coded 0.

Covariates

A set of comprehensive predictors related to child and family characteristics were collected from ages 0 to 5. The measures of covariates included gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student word analysis. These child and family background characteristics may be correlated with academic performance and behavioral outcomes of children participating in the CPC preschool program and subsequent school intervention remedial services (Conyers, Reynolds, & Ou, 2003). Child and family background characteristics that may affect educational achievement and behavioral outcomes were statistically controlled for to clarify the relative contributions of the attributes. All variables were dichotomous variables except family risk index and student word analysis.

Gender. Gender was a dichotomous variable. Males were coded 0 and females were coded 1. This variable was collected from school records.

Race/ethnicity. Race/ethnicity was coded dichotomously. Hispanic children were coded 0 and Africa-American children were coded 1. This variable was collected from school records.

Family risk index. Family risk index was the sum of eight dichotomous socioeconomic risk factors associated with child and family related functioning (Bendersky & Lewis, 1994; Rutter, 1987). Family risk index included maternal education (i.e., mother did not complete high school), single-parent family status, mother unemployment, eligibility for free lunch status, family structure (i.e., having 4 or more children living in the household), residence in low-income neighborhoods (i.e., 60% or more of children were from low-income families), teen age mother at childbirth, and family attendance in the public assistance programs (i.e., AFDC) from birth to age 3. Given the parsimonious model, family risk index was used as a cumulative risk which represented the number of risk factors. Approximately 10% of the sample had missing data on aforementioned family risk indicators. Cohen, Cohen, West, & Aiken (2003) suggested that imputation is a procedure to cope with the missing data by estimating and modeling the missing data points. The missing variables were estimated and filled in with estimated values using the expectation-maximization algorithm methods (Reynolds et al., 2004).

Low birthweight. Low birthweight was a dichotomous variable. A child was coded 1 if the birthweight was less than 2500 grams. The data were collected from birth records in 1979 and 1980 from the Illinois Department of Public Health.

Child welfare history. Child welfare history was a dichotomous variable that indicated whether the child or a family received child protective services or received other child welfare services due to abuse or neglect reports at ages 0-3. The data included petitions to the juvenile court and referrals to the Child Protection Division of the Illinois Department of Children and Family Services.

Student word analysis. Student word analysis was a continuous variable measured by the word analysis subscale scores from the ITBS (Level 5 Form 7) at the end of kindergarten (Spring of 1986). There were 35 items in the word analysis section which evaluated pre-literacy skills (e.g., letter-sound correspondence and word attack skills). Developmental standard scores were used, which have equal-interval scale properties that are comparable across grades. The test manual indicated that the ITBS internal consistency reliability was .87.

Student school readiness. Student school readiness was an indicator of early cognitive ability and developmental preparedness. Student school readiness in kindergarten was added as an alternative covariate to validate the robustness of the results. The variable was measured by comprehensive scale scores, including listening skills, word analysis, vocabulary, language, and mathematics, on the basis of the ITBS (Level 5 Form 7) in the Fall of 1985. The variable was selected because of the hypothesized association with covariates and outcome measures.

Table 2. Descriptive Statistics for Covariates, Predictors, and Outcome Variables

Variables	Sample	Minimum	Maximum	Mean	Std. Deviation
Covariates					
Gender (female, %)	1,370	.00	1.00	.508	.500
Race/ethnicity (African-American, %)	1,370	.00	1.00	.932	.252
Family risk index (ages 0-3)	1,370	.00	7.00	4.565	1.663
-Maternal education-mother did not completed high school (ages 0-3, %)	1,370	.00	1.00	.543	.498
-Single-parent family status (ages 0-3, %)	1,370	.00	1.00	.773	.419
-Mother unemployment (ages 0-3, %)	1,370	.00	1.00	.670	.470
-Eligibility for free lunch (ages 0-3, %)	1,370	.00	1.00	.848	.359
-Family structure-having 4 or more children at home (ages 0-3, %)	1,370	.00	1.00	.167	.373
-Neighborhood indicator- 60% or more children reside in low-income families (ages 0-3, %)	1,370	.00	1.00	.761	.426
-Teenage mother at childbirth (<age 18, %)	1,370	.00	1.00	.164	.370
-AFDC (ages 0-3, %)	1,370	.00	1.00	.637	.481
Low birthweight (<2,500gms, %)	1,370	.00	1.00	.118	.322
Child welfare history (ages 0-3, %)	1,370	.00	1.00	.039	.193
Student word analysis (age 5)	1,370	22.00	99.00	63.609	13.242
Student school readiness	1,370	28.00	83.00	47.329	8.788
Predictors					
Individual level					
Reading comprehension	1,366	54.75	140.83	98.325	14.757
Classroom adjustment	1,366	8.00	29.60	18.940	4.347
Family level					
Parent involvement in schools	1,363	.00	6.00	2.032	1.496
Any child maltreatment	1,370	.00	1.00	.062	.241
School level					
Any CPC program participation	1,370	.00	1.00	.650	.477
Any magnet school attendance	1,367	.00	1.00	.116	.321
School mobility	1,359	.00	5.00	.823	.986
Number of years in special education placement	1,370	.00	5.00	.372	1.023
Any grade retention	1,367	.00	1.00	.250	.435
Outcomes					
Acting out	1,056	.00	1.00	.179	.384
Juvenile delinquency	1,370	.00	1.00	.204	.403
Adult arrest	1,370	.00	1.00	.424	.494

Descriptive statistics

Table 2 provides descriptive statistics for covariates, predictors, and outcome variables in this study. To examine the nature of the relationships between covariate, predictors and behavioral outcomes, an unadjusted bivariate analysis was conducted. Table 3 shows the unadjusted bivariate Pearson correlations between covariates, selected independent variables, and three outcome variables. Based on the correlation matrix, all measures of behavioral outcomes were statistically correlated as expected, ranging from .21 to .39 ($p < .01$). Most covariates were intercorrelated. In terms of the correlations between covariates and behavioral outcomes, gender, family risk index, student word analysis, and student school readiness were correlated with all behavioral outcomes.

Most predictor variables at the individual, family, and school levels were correlated with acting out, juvenile delinquency, and adult crime. Individual level factors were negatively correlated with all behavioral outcomes. Reading comprehension was correlated with acting out ($r = -.17, p < .01$), juvenile delinquency ($r = -.20, P < .01$), and adult arrest ($r = -.22, p < .01$). Classroom adjustment was the strongest correlate predicting acting out ($r = -.31, p < .01$), juvenile delinquency ($r = -.25, p < .01$), and adult arrest ($r = -.30, p < .01$).

The correlations between predictors at the family and school levels and behavioral outcomes were lower than the correlations between individual level factors and behavioral outcomes. Family level factors were correlated with all behavioral outcomes. For instance, parent involvement was negatively correlated with acting out ($r = -.20, p < .01$), juvenile delinquency ($r = -.16, p < .01$), and adult arrest ($r = -.18, p < .01$). Child

maltreatment was positively correlated with juvenile delinquency ($r=.09$, $p < .01$) and adult arrest ($r=.07$, $p < .01$). Likewise, small to moderate correlations were shown between school level factors and behavioral outcomes. CPC program participation was negatively correlated with acting out ($r=-.06$, $p < .05$) and juvenile delinquency ($r=-.10$, $p < .01$). Magnet school attendance was negatively correlated with juvenile delinquency ($r=-.10$, $p < .01$) and adult arrest ($r=-.11$, $p < .01$). School mobility was positively correlated with juvenile delinquency ($r=.06$, $p < .05$) and adult arrest ($r=.11$, $p < .01$). The number of years in special education placement was positively correlated with acting out ($r=.08$, $p < .01$), juvenile delinquency ($r=.12$, $p < .01$), and adult crime ($r=.10$, $p < .01$). Grade retention was positively correlated with acting out ($r=.09$, $p < .01$), juvenile delinquency ($r=.14$, $p < .01$), and adult crime ($r=.14$, $p < .01$). Due to the range restrictions of dichotomous outcome measures (e.g., acting out, juvenile delinquency, and adult arrest), probit regression (described below) was used as an optimal analytic strategy for analyzing dichotomous outcomes.

Table 3. Intercorrelations among Covariates, Predictors, and Outcomes

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Gender	.02																	
2. Race/ethnicity	.02	.15**																
3. Family risk index	.02																	
4. Low birthweight	.05	.08**	.10**															
5. Child welfare history	.01	.01	.06*	.04														
6. Student word analysis	.10**	.04	-.15**	-.08**	-.03													
7. Student school readiness	.08**	.11**	-.13**	-.06*	-.06*	.53**												
8. Reading comprehension	.21**	-.09**	-.23**	-.09**	-.06*	.55**	.50**											
9. Classroom adjustment	.30**	-.11**	-.16**	-.08**	-.03	.42**	.39**	.69**										
10. Parent involvement	.13**	-.09**	-.20**	-.07*	-.04	.25**	.24**	.43**	.48**									
11. Any child maltreatment	.00	.05	.08**	.02	.03	-.06*	-.08**	-.07*	-.05	-.13**								
12. Any CPC program participation	.05	.01	-.01	-.04	-.05	.22**	.26**	.18**	.13**	.15**	-.03							
13. Any magnet school attendance	.09**	.07**	-.14**	.00	-.04	.19**	.26**	.26**	.11**	.06*	-.06*	.14**						
14. School mobility	-.04	.03	.15**	.01	.04	-.10**	-.16**	-.14**	-.15**	-.17**	.09**	-.13**	-.13**					
15. Number of years in special education	-.13**	.03	.04	.01	.07*	-.22**	-.19**	-.33**	-.28**	-.15**	.07**	-.12**	-.05	.05*				
16. Any grade retention	-.19**	.01	.12**	.05	.02	-.35**	-.30**	-.54**	-.42**	-.30**	.03	-.12**	-.13**	.14**	.21**			
17. Acting out	-.17**	.04	.08*	.02	.01	-.11**	-.12**	-.17**	-.31**	-.20**	.06	-.06*	-.02	.03	.08**	.09**		
18. Juvenile delinquency	-.33**	.03	.13**	-.01	.04	-.12**	-.08**	-.20**	-.25**	-.16**	.09**	-.10**	-.10**	.06*	.12**	.14**	.25**	
19. Adult arrest	-.44**	.04	.10**	-.01	.06*	-.11**	-.10**	-.22**	-.30**	-.18**	.07**	-.05	-.11**	.11**	.10**	.14**	.21**	.39**

Note. * Pearson correlation is significant at the .05 level (2-tailed). ** Pearson correlation is significant at the .01 level (2-tailed).

Data Analyses

Missing Data Analysis and Propensity Scores

According to Cohen et al. (2003), the possible impact of incomplete data needs to be investigated. Missing data analyses were used to determine whether sample participants with available data were different from those with incomplete data on outcome variables (e.g., acting out, juvenile delinquency, and adult arrest) given a comprehensive set of demographic information (i.e., gender, race/ethnicity, family risk index, mother education, single-parent family status, mother unemployment, eligibility for free lunch, having 4 or more children at home, 60% or more of children living in low-income families, teen age mother, receiving AFDC, low birthweight, child welfare history, student word analysis, having a social security number [by February 2007], under age in the CPC program [the date of birth was after August 1980], over age in the CPC program [the date of birth was before August 1979], and very low birthweight). The acting out sample size was 1058 (68.7% of the original sample). The juvenile delinquency sample size was 1406 (91.4% of the original sample). The adult crime sample size was 1473 (95.7% of the original sample). The acting out sample size had the most serious problem with missing data. Chi-square tests and F tests were conducted to examine attrition using the dichotomous missing data indicators as the independent variables and covariates as the dependent variables. Chi-square tests were conducted to cross-classify the dichotomous missing data indicators and dichotomous covariates. F tests were used for testing the dichotomous missing data indicators and continuous covariates (see Table 4).

Table 4. Attrition Analysis for Outcome Measures of Acting out, Juvenile Delinquency, and Adult Arrest

Variables	Behavioral outcomes		Acting out (ages 12-13)		Juvenile delinquency (by age 18)		Adult arrest (by age 26)	
	Study sample N=1058	Attrition sample N=481	Study sample N=1406	Attrition sample N=133	Study sample N=1473	Attrition sample N=66		
Gender (female, %)	50.5	49.9	50.4	48.8	50.3	50.0		
Race/ethnicity (African-American, %)	92.9	93.0	93.2	89.6	93.1	87.9		
Family risk index (ages 0-3)	4.57	4.42	4.54	4.39	4.52	4.56		
-Maternal education-mother did not complete high school (ages 0-3, %)	54.7	53.2	54.2	54.9	53.9	62.1		
-Single-parent family status (ages 0-3, %)	77.3	74.6	77.7**	63.2	76.6	74.2		
-Mother unemployment (ages 0-3, %)	67.7	63.4	66.3	66.9	65.9+	75.8		
-Eligibility for free lunch (ages 0-3, %)	85.8**	79.2	83.6	85.7	83.6	86.4		
-Family structure-having 4 or more children at home (ages 0-3, %)	16.7	16.4	16.3	20.3	17.0+	9.1		
-Neighborhood indicator- 60% or more children reside in low-income families (ages 0-3, %)	75.0	78.2	76.1	74.4	76.2	69.7		
-Teenage mother at childbirth (<age 18, %)	16.3	16.0	16.6	12.0	16.6+	7.6		
-AFDC (ages 0-3, %)	63.5	61.1	62.9	61.7	62.4	71.2		
Low birthweight (<2,500gms, %)	11.3	12.7	12.0	9.0	12.0	6.1		
Very low birthweight	4.3	3.5	4.3	2.3	4.2	1.5		
Child welfare history (ages 0-3, %)	3.7	4.2	4.0	2.3	3.9	1.5		
Student word analysis (age 5)	63.54	64.21	63.64	64.93	63.75	63.87		
Have social security number	98.4**	82.7	97.4**	52.6	95.9**	40.9		
Underage in the CPC program	23.2	19.5	22.4	18.0	22.0	22.7		
Overage in the CPC program	1.0	1.5	1.1	1.5	1.2	1.5		

Note. * significant at .05 level (two tailed, p<.05). ** significant at .01 level (two tailed, p<.01).

+significant at .10 level (two tailed, p<.10) .Statistical significance tests were conducted for acting-out behavior sample, juvenile delinquency sample, and adult crime sample and its corresponding attrition sample respectively. Test statistics are Pearson Chi-squares except for family risk index and the student word analysis, which is F statistic.

As shown in Table 4, mean comparisons indicated that the acting out sample and the attrition sample were comparable on child and family background characteristics except eligibility for free lunch and having a social security number. The acting out sample had greater eligibility for free lunch than the attrition sample (85.8% vs. 79.2%, $p < .01$). The acting out sample also had more tracking information such as a social security number than the attrition sample (98.4% vs. 82.7%, $p < .01$). The juvenile delinquency sample was approximately identical with the attrition sample on demographic variables except single parents and having a social security number. A greater percentage of the juvenile delinquency sample than the attrition sample had single parents (77.7% vs. 63.2%; $p < .01$). The juvenile delinquency sample had more tracking information such as a social security number than the attrition sample (97.4% vs. 52.6%, $p < .01$). Likewise, Table 4 also shows similarities between the adult arrest sample and the attrition sample on attributes, with the exception of having a social security number (95.9% vs. 40.9%; $p < .01$). Additionally, according to the mean comparisons on selected child and family characteristics, a similar pattern was found for the acting out sample, the juvenile delinquency sample, and the adult crime sample, suggesting that similar inter-group equivalence for these study samples.

Overall, the similarity of the outcome sample and their attrition groups on child and family characteristics indicated a low likelihood of selection and attrition bias posing a threat to internal validity. Because the analysis of the mean comparisons showed a few significant differences between the outcome samples and their attrition groups, a propensity score was introduced as an alternative method to explore and control possible attrition effects. A propensity score summarized covariate information

into a single number, which indicated the likelihood of being in an attrition group given a set of known covariates. When the attrition was independent of outcome measures given the observed child and family characteristics, the attrition was not confounded. A propensity score was created for each behavioral outcome and included as a covariate to adjust the estimate of possible attrition bias on each behavioral outcome.

Given these covariates, the propensity score was estimated by gender, race/ethnicity, family risk index, mother not completing high school, single parent, mother unemployment, eligibility for free lunch, having 4 or more children at home, 60% or more of children living in low-income families, teen age mother, receiving AFDC, low birthweight, child welfare history, having a social security number by February 2007, under age in the CPC program, over age in the CPC program, and very low birthweight for adjusting the attrition bias in the outcome measures of acting out, juvenile delinquency, and adult arrest, respectively.

Question 1 through 3

For the analyses of questions 1 through 3, probit regression analysis was used to predict a discrete, dichotomous outcome variable from any continuous or dichotomous predictor variables. The coefficients of parameter estimates associated with each independent variable have no direct interpretations. Therefore, to make the results directly interpretable, the probit coefficients were transformed to quantify marginal effects of the selected independent variables on the probability of outcomes. The probit transformation converted proportions to the corresponding z-score of a normal distribution. Marginal effects displayed percentage point increases or decreases in the

likelihood of the outcomes with changes in selected independent variables, holding constant all other variables at their respective means. For example, for acting out, a marginal effect would be the change in the probability of being involved in acting out when the continuous variable increases by one unit (e.g., classroom adjustment).

Similarly, a marginal effect would be the change in the probability of being involved in acting out due to a discrete change in a dichotomous variable (e.g., any CPC program participation or none).

In addition to marginal effects, group means for the outcome variables, percentage increase or reduction, level of statistical significance, as well as effect sizes were used to quantify the strength and magnitude of the relationships. P values of .05 and .01 were employed to evaluate whether the prediction of main effects were significant statistically. However, the p value of .01 was employed to evaluate whether the interaction terms were significant statistically. In the probit regression analysis, some variables could not be estimated due to perfect failure prediction ($X=0$ predicts $Y=0$), perfect success prediction ($X=1$ predicts $Y=1$), or collinearity (X s are highly correlated). The signs “---” reported in Tables denoted variables which were not able to be estimated and were dropped from the probit model. Effect sizes were computed to evaluate the magnitude of a standardized mean difference between groups or the degree of the associations between the independent variables and behavioral outcomes and were interpreted according to Cohen’s benchmarks. A value of .20 was a small effect size, .50 was a medium effect size, and .80 or more were considered to be a large effect size. Effect sizes for dichotomous outcome variables were calculated by the difference of the probit transformations of proportions between group 1 and group 0 (Cohen et al., 2003), that is,

the difference between the standard normal deviate transformed proportions (p_1 and p_2) for the two groups.

Hierarchical regression analyses were used (Cohen et al., 2003) when conducting unadjusted analyses, covariate-adjusted analyses, and robustness analyses. For unadjusted analyses, each behavioral outcome was regressed on the predictor variables to determine unadjusted coefficients and mean differences. For covariate-adjusted analyses, to examine if the effects of the predictor variables on behavioral outcomes were attributed to child and family background characteristics, adjusted coefficients and mean differences were estimated with the statistical control of covariates including gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student reading in kindergarten. To examine the robustness of the effects of predictors on behavioral outcomes, alternative model specifications were used to investigate the variation by adding one alternative covariate into the probit model or using different age specifications (e.g., students with high-incidence disabilities in grades 1 through 6 or in grades 1 through 12).

The probit model was applied for the entire study sample and the separate subgroups. Separate subgroup analyses were used to investigate the predictive effects within a subgroup, without comparisons to other subgroups or to the entire study sample. Separate subgroup analyses are often less likely to show statistical significance due to the smaller sample sizes. To avoid unreliable interpretations about the predictive effects, the sample size should be large enough to increase the power to detect statistically significant differences. If the power for subgroup analyses is not sufficient due to the limitation of the sample size, then the results of the entire study sample can be used to

indicate possible predictive effects in a particular subgroup. Statistical tests for interaction for the data from the entire study sample are more appropriate and valid than separate subgroup analyses in determining whether a differential effect exists (Pocock, Assmann, Enos, & Kasten, 2002). In the current study, the probit model was applied for the entire study sample and students with high-incidence disabilities in separate subgroup analyses. In addition, the interaction terms of individual, family, and school level factors multiplied by high-incidence disabilities were tested.

The association between disability status and later behavioral problems. In the first question, disabilities were expected to be associated with poor behavioral outcomes while controlling for identified early child and family risk indicators. Specifically, the current study focused on whether students identified with high-incidence disabilities had a greater likelihood of being involved in behavioral problems compared to general education students. Unadjusted analyses, covariate-adjusted analyses, and robustness analyses were used to examine whether students identified with disabilities had a greater likelihood of behavioral problems. The steps to investigate question 1 were as follows.

First, descriptive analyses were used to examine differences in the rates of proximal and distal behavioral outcomes for students with and without disabilities in elementary grades and in grades 1 through 12. The percentage (unadjusted rates) of acting out, juvenile delinquency and adult arrest are presented in the descriptive findings for the entire study sample and students with disabilities, respectively, in Table 5.

Second, the major research question was to assess whether poor behavioral outcomes vary between students with and without disabilities (see Tables 6 & 7; Figures 3 & 4). For a better estimate of group differences on the outcomes, probit regression

models were developed to estimate the adjusted relationships among the variables of interest (i.e., disability status) and behavioral outcome variables and to test if the patterns were replicated regardless of the covariate specifications. To determine whether the predictive effects on behavioral outcomes were attributed to child and family characteristics, adjusted coefficients and mean differences were estimated with the statistical controls of covariates including gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student word analysis. Different age specifications (elementary grades or grades 1-12) were applied in the probit models. Last, alternative model specifications with the control of an alternative covariate (i.e., student school readiness in kindergarten, see Appendix 1) were conducted to test the robustness of these the findings.

Third, the patterns of behavioral problems among students identified with disabilities, the retained students, and general education students without records of special educational placement and grade retention were examined. To further examine group differences, the variations of behavioral outcomes were investigated for students with high-incidence disabilities (i.e., 79.8% LD and 20.2 % ED; grades 1-6), with other disabilities (e.g., hard of hearing, speech or language impairment, educable mentally handicapped, physically handicapped, other health impairment; grades 1-6), with later-identified disabilities (first placement after grade 6, 86.4% high-incidence disabilities [68.4% LD and 31.6 % ED]), with grade retention histories but no special education placement, and general education students without any history of special education placement and grade retention. Appendix 2 and Appendix 3 show the descriptive statistics for behavioral outcomes for different subtypes of students. For the

purpose of group comparisons, probit regression models with dummy variables representing subtypes of groups (with general education students as the reference group) were used to predict acting out, juvenile delinquency, and adult arrest. Adjusted coefficients and mean differences between subgroups were estimated while controlling statistically for child and family background characteristics. Table 8 and Figure 5 show the marginal effects of group contrasts of subtypes of students predicting acting out, juvenile delinquency, and adult arrest, respectively. Robustness tests were used to test if the relationships were replicated regardless of alternative covariates (see Appendix 4). Alternative model specifications were then conducted to investigate whether the magnitude of the relationships changed when age specifications of high-incidence disabilities and other disabilities in elementary grades were replaced with grades 1 through 12 (see Appendix 5).

Predictive effects of individual, family, and school level factors on later behavioral problems. For the second question, the extent to which individual, family, and school level factors were associated with behavioral outcomes for the entire study sample and the separate subgroups, in particular high-incidence disabilities, was examined. Interaction tests were used to test whether high-incidence disabilities moderated the predictive effects of individual, family, and school level factors on acting out, juvenile delinquency, and adult crime.

First, to examine the independent effects of individual, family, and school level factors on the likelihood of negative behavioral outcomes, covariate-adjusted analyses were used to identify the relations between individual, family, and school level factors and negative behavioral outcomes. The patterns of individual, family, and school level

factors predicting acting out (see Tables 9, 10, & 11), juvenile delinquency (see Tables 12, 13, & 14), and adult arrest (see Tables 15, 16, & 17) were examined for the entire study sample and the separate subgroups including students with high-incidence disabilities, other disabilities, later-identified disabilities, grade retention only, and general education students without any history of grade retention and special education placement. Alternative models with age specifications were used to test whether the patterns of individual, family, and school level factors predicting acting out, juvenile delinquency, and adult arrest for students with high-incidence disabilities in elementary grades and in grades 1 through 12 were identical (see Appendices 6, 7, & 8).

Second, to investigate the combined relationships, covariate-adjusted analyses were used to predict acting out, juvenile delinquency, and adult arrest from multiple levels of factors in full models for the entire study sample and the separate subgroups (see Tables 18, 19, & 20; Figures 6, 7, & 8). Further investigations of age specifications were conducted to validate the robustness of the existing models for students with high-incidence disabilities in elementary grades and in grades 1 through 12 (see Appendix 9).

Third, to validate the predictive patterns of behavioral problems for students with high-incidence disabilities, three alternative model specifications were included to examine interaction effects for high-incidence disabilities in elementary grades. First, disability status (with general education students as a reference group) and the interaction terms of individual, family, and school level factors by high-incidence disabilities were included in the base model (i.e., full model). Then the interaction terms of individual, family, and school level factors by grade retention only were added into

the first alternative models and the interaction effects of high-incidence disabilities and grade retention were examined (see Tables 21, 22, & 23). Last, the reference group (i.e., general education students) was replaced with grade retention only. Alternative models with age specifications investigated the interaction effects of high-incidence disabilities in grades 1 through 12 as well (see Appendices 10, 11, & 12)

Fourth, to examine the relative importance of individual, family, and school level factors for explaining behavioral outcomes, the independent factors were entered hierarchically in the probit models to evaluate the addition to the variance over or above the contributions accounted for by prior predictors. Hierarchical regression analysis was conducted for the entire study sample and students with high-incidence disabilities in elementary grades and grades 1 through 12. Hierarchical regression analysis was used as a theory-based approach to evaluate the relative influence of these factors. Covariates were entered first, followed by individual level factors, and then family level factors. In the final step, school level factors were entered (See Tables 24 & 25; Figures 9 & 10).

Moderating effects of ecological factors at the family and school levels on the individual level factors-behavioral problems associations. For the third question, the moderating effects of family and school level factors on individual level factors and their relations to acting out, juvenile delinquency, and adult arrest were examined. Interaction terms such as reading comprehension by parent involvement, reading comprehension by school mobility, classroom adjustment by parent involvement, and classroom adjustment by school mobility were added as moderators of the relationships between individual, family, and school level factors and behavioral outcomes.

First, covariate-adjusted analyses were used to examine whether interaction effects

existed between individual, family, and school level factors and behavioral outcomes.

This study examined if selected ecological predictors such as parent involvement and school mobility moderated the associations between individual level factors (i.e., reading comprehension and classroom adjustment) and behavioral outcomes. The focus of the analysis was whether the interaction terms influenced the direction and magnitude of the relationships between individual factors and behavioral outcomes for students with high-incidence disabilities in elementary grades and in grades 1 through 12 (see Table 26). The probit models tested the effects of the interaction terms in addition to the replication of the main-effect analyses. If the main effects of individual, family, and school level factors were significant, these predictors played an independent role in behavioral outcomes. On the other hand, a significant interaction would indicate a moderating effect of family and school level factors. That is, individual level factors had a different impact on behavioral outcomes of high versus low level of parent involvement and school mobility.

Second, to validate the patterns of the main and moderating effects on behavioral outcomes, the models including individual, family, and school level factors, and covariates, as well as the interaction terms were tested for the entire study sample. To validate the patterns for separate groups, in particular students with high-incidence disabilities, three alternative model specifications were used to examine the moderating effects of high-incidence disabilities in elementary grades. First, disability status (with general education students as a reference group) and the interaction terms of individual, family, and school level factors by high-incidence disabilities were included in the full models. The interaction terms for individual, family, and school level factors by grade

retention only were then added into the first alternative model and the moderating effects of high-incidence disabilities and grade retention only were examined (see Tables 27, 28, & 29). Last, the reference group (i.e., general education students) was replaced with grade retention only. Alternative models with age specifications investigated the interaction effects of high-incidence disabilities in grades 1 through 12, as well (see Appendices 13, 14, & 15).

CHAPTER 4

RESULTS

This chapter reports the results corresponding to the main research questions: (a) Is student disability status (i.e., high-incidence disabilities) associated with later behavioral problems (i.e., acting out, juvenile delinquency, and adult arrest)? (b) Do individual, family, and school level characteristics predict later behavioral problems for students with high-incidence disabilities? and, (c) Do ecological/contextual factors at the family and school levels moderate the relationships between individual level factors and later behavioral problems for students with high-incidence disabilities? The research findings reported based on these major research questions include (a) unadjusted analyses and the adjusted main effect relationships between disability status, high-incidence disabilities in particular, and behavioral problems; (b) the independent and combined relationships between individual, family, and school level factors and behavioral problems based on covariate-adjusted analyses and robustness tests with alternative model specifications; and (c) the moderating effects on the links between individual level factors and behavioral problems, as well as robustness tests of the findings based on alternative model specifications.

Association between Disability Status and Later Behavioral Problems

Question 1 examined the predictive patterns of behavioral problems at different developmental stages among students who were identified with disabilities. It was hypothesized that students with disabilities, high-incidence disabilities in particular, were more likely to be involved in negative behavioral outcomes including acting out, juvenile delinquency, and adult arrest.

Preliminary Descriptive Findings

The unadjusted rates of different manifestations of behavioral problems are presented in Table 5. Of the entire study sample, approximately 18% had acting out, 20.4% were involved in juvenile delinquency, and 42.4% had adult arrest. The descriptive findings on unadjusted analyses showed that students identified with disabilities had higher rates of acting out, juvenile delinquency, and adult arrest than students without disabilities (see Table 5).

Table 5. Unadjusted Means of Behavioral Problems for Students with Disabilities

Behavioral outcomes	Overall students N=1370	Students with disabilities (grades 1-12)		Students with disabilities (grades 1-6)	
		None	Any	None	Any
Acting out (ages 12-13, %)	17.9	15.1	31.0**	16.2	28.3**
Juvenile delinquency (by age 18, %)	20.4	16.9	37.3**	18.2	34.4**
Adult arrest (by age 26, %)	42.4	38.6	60.6**	40.1	56.8**

Note. Test statistics are Pearson Chi-squares. * significant at .05 level ($p < .05$). ** significant at .01 level ($p < .01$).

Acting out

The results of unadjusted analyses revealed that the rates of acting out for students with disabilities were statistically higher than students without disabilities. A higher rate (31.0%) of students with disabilities in grades 1 through 12 had acting out compared with 15.1% of students without disabilities ($p < .01$). Students with disabilities in grades 1 through 6 had a rate of 28.3% acting out compared with 16.2% of students without disabilities ($p < .01$).

Juvenile Delinquency

Students with disabilities had a greater rate of juvenile delinquency than students without disabilities. Students with disabilities in grades 1 through 12 had a higher rate of 37.3% juvenile delinquency compared with 16.9% of students without disabilities

($p < .01$). Approximately 34% of students with disabilities in grades 1 through 6 were involved in juvenile delinquency compared to 18.2% of students without disabilities ($p < .01$).

Adult Arrest

For adult arrest, as expected, there were large differences between students with disabilities and students without disabilities in adult arrest. Students with disabilities in grade 1 through 12 had a higher rate of adult arrest (60.6%) than students without disabilities (38.6%, $p < .01$). Students with disabilities in grades 1 through 6 had a rate of 56.8% adult arrest compared with 40.1% of students without disabilities ($p < .01$).

Overall, the results of unadjusted analyses suggested that there were significant relationships between disability status and acting out, juvenile delinquency, and adult arrest. Students with disabilities had higher rates compared to students without disabilities on each behavioral outcome.

Disability Status and Later Behavioral Problems

The results of unadjusted analyses showed that disability status was significantly associated with acting out, juvenile delinquency, and adult arrest. To further explore the strength of the relationships between disability status and later behavioral outcomes, covariate-adjusted tests which controlled for gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student word analysis were used as more stringent tests. Marginal effects were estimated based on probit regression models. Table 6 provides a summary of the adjusted main effects. Results of marginal effects, model fit statistics, number of observations, and level of significance based on probit regression models for each behavioral outcome by disability status are presented in Table 7.

Table 6. Adjusted Means of Behavioral Problems for Students with Disabilities

Behavioral outcomes	Students with disabilities (grades 1-12)		Students with disabilities (grades 1-6)	
	None	Any	None	Any
Acting out (ages 12-13, %)	15.1	24.1*	15.8	21.8
Juvenile delinquency (by age 18, %)	14.9	24.7**	15.5	22.9*
Adult arrest (by age 26, %)	39.3	48.9*	40.1	46.0

Note. Test statistics are Pearson Chi-squares. * significant at .05 level ($p < .05$). ** significant at .01 level ($p < .01$) controlling for gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student word analysis.

Table 7. Marginal Effects of Disability Status Predicting Acting Out, Juvenile Delinquency, and Adult Arrest for Primary Study Sample (Covariate-Adjusted Analyses)

Predictors	Acting Out		Juvenile Delinquency		Adult Arrest	
	Model A	Model B	Model C	Model D	Model E	Model F
Students with disabilities (grades 1-12)	.090*		.097**		.096*	
Students with disabilities (grades 1-6)		.060+		.075*		.060
Covariates						
Gender (female)	-.112**	-.121**	-.251**	-.257**	-.429**	-.435**
Race/ethnicity (African-American)	.060	.063	.039	.042	.099+	.102+
Family risk index	.015+	.015*	.033**	.033**	.031**	.031**
Low birthweight (<2,500gms)	.012	.012	-.004	-.006	-.004	-.005
Child welfare history	.002	.005	.063	.066	.166*	.167*
Student word analysis	-.002*	-.002*	-.001+	-.002*	-.002	-.002+
Propensity score	-.116	-.124	-.184	-.189	.075	.069
Log likelihood	-467.670	-469.954	-589.622	-592.315	-778.956	-780.849
LR χ^2	56.96	52.39	208.33	202.95	309.61	305.82
Prob> X^2	.000	.000	.000	.000	.000	.000
Pseudo R^2	.057	.053	.150	.148	.166	.164
Number of observation	1056	1056	1370	1370	1370	1370

Note. ** significant at .01 level (two tailed, $p < .01$). * significant at .05 level (two tailed, $p < .05$).

+significant at .10 level (two tailed, $p < .10$)

Acting out

Tables 6 and 7 (Models A and B) present the disabilities/acting out association. The disabilities/acting out association was the second strongest relationship behind the gender/acting out association in the model. Disabilities in grades 1 through 12 were significantly associated with acting out, with a marginal effect of .09 ($p < .05$). A marginal effect of .09 indicated that the adjusted rate of acting out for students with disabilities was 9 percentage points higher than that of students without disabilities (24.1% vs. 15.1%). In other words, being a student with a disability in grades 1 through 12 increased the likelihood of being involved in acting out by 9 percentage points. The effect size for the relationship between disabilities and acting out was .33.

Disabilities in grades 1 through 6 were marginally associated with acting out, with a marginal effect of .06 ($p < .10$), which represented a 6 percentage point difference between students with and without disabilities. Of students with disabilities in grades 1 through 6, 21.8% were involved in acting out compared to 15.8% for students without disabilities. The effect size for the relationship between disabilities and acting out was .23.

Juvenile Delinquency

Tables 6 and 7 (Models C and D) present a slightly stronger disabilities/juvenile delinquency association than the disabilities/acting out association. As shown in Table 7, disabilities in grades 1 through 12 were associated with juvenile delinquency, with a marginal effect of .097 ($p < .01$). Students with disabilities in grades 1 through 12 had a rate of 24.7 % compared to 14.9% for students without disabilities, indicating a 9.7 percentage point difference on juvenile delinquency. The effect size for the relationship

between disabilities and juvenile delinquency was .37.

Disabilities in grades 1 through 6 were significantly associated with juvenile delinquency. The marginal effect of disabilities in grades 1 through 6 in this model was .075 ($p < .05$). Students with disabilities had a 7.5 percentage point higher rate of juvenile delinquency compared to students without disabilities (22.9% vs. 15.5%). The effect size for the relationship between disabilities and juvenile delinquency was .30.

Adult Arrest

Tables 6 and 7 (Models E and F) present a relatively stronger disabilities/adult arrest association than the disabilities/acting out association. Disabilities in grades 1 through 12 were associated with adult arrest. The marginal effect associated with disabilities in grades 1 through 12 was .096 ($p < .05$), representing a 9.6 percentage point difference in the adjusted rate between students with and without disabilities (48.9% vs. 39.3%), with an effect size of .25.

Disabilities in grades 1 through 6 were not associated with adult arrest. The marginal effect associated with adult arrest was .06 ($p > .10$), indicating a 6 percentage point difference. The rate of adult arrest for students with disabilities in grades 1 through 6 was 46% compared to 40.1% for students without disabilities. The effect size for the relationship between disabilities and adult arrest was .15.

Overall, when child and family background characteristics were controlled for, most relationships between disability status and acting out, juvenile delinquency, and adult arrest still existed (see Figures 3 & 4).

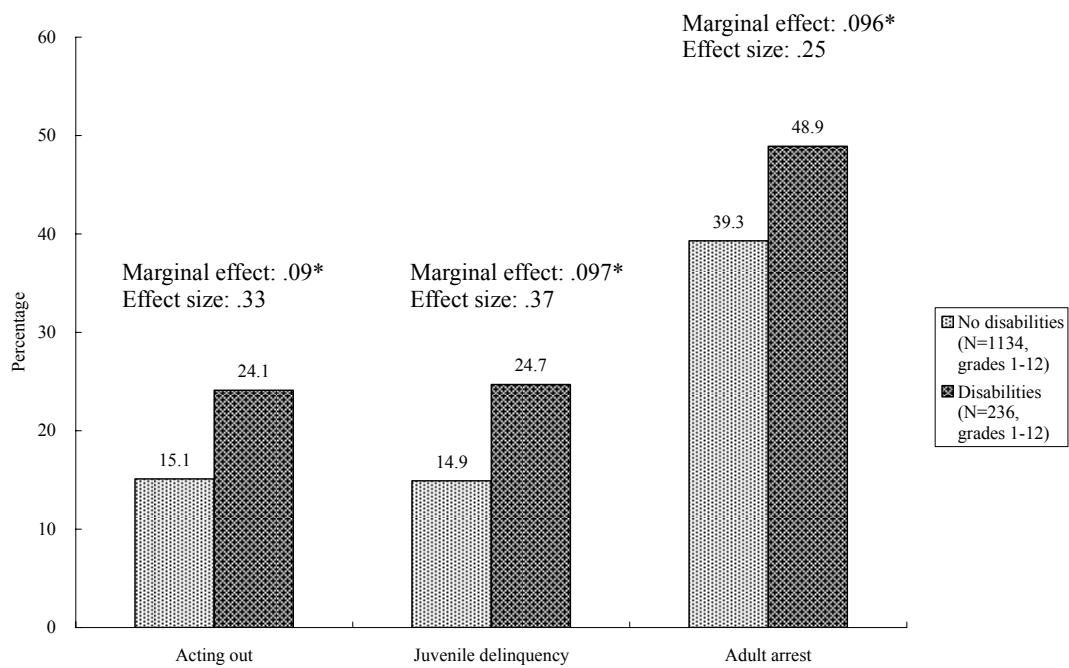


Figure 3. Adjusted means and marginal effects of behavioral problems for students with/without disabilities in grades 1-12

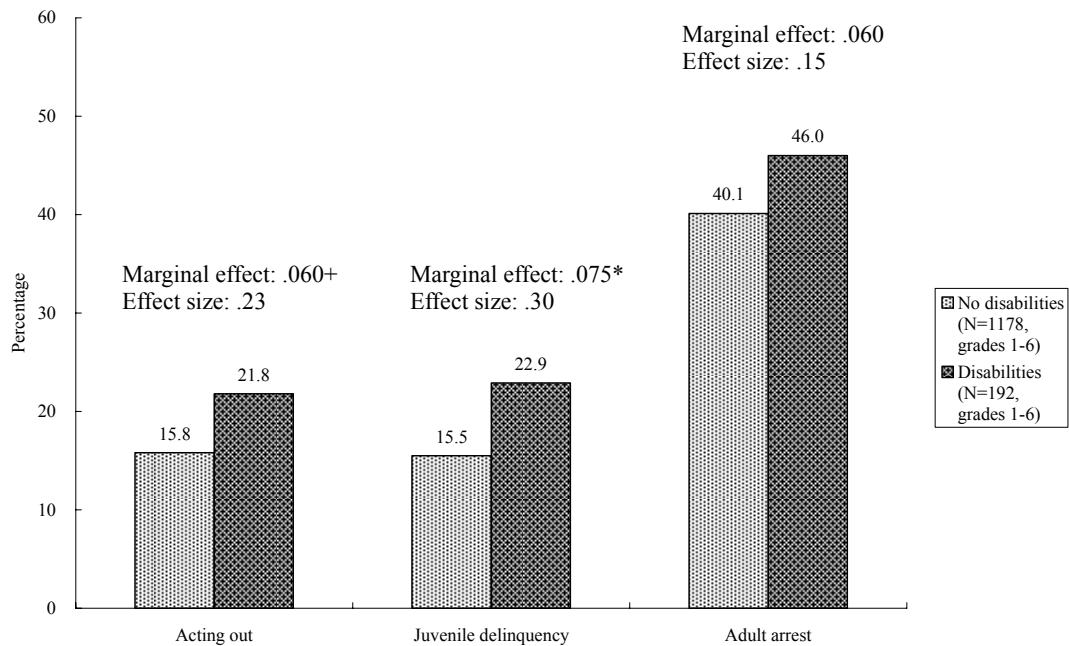


Figure 4. Adjusted means and marginal effects of behavioral problems for students with/without disabilities in grades 1-6

Alternative Analysis for Robustness Test

To further test the robustness of the findings, alternative model specifications including student school readiness as an alternative covariate were tested to examine whether the relationships between disability status and acting out, juvenile delinquency, and adult arrest remained (see Appendix 1). The findings suggested robust relationships across acting out, juvenile delinquency, and adult arrest with alternative model specifications. The patterns of disability status predicting acting out, juvenile delinquency, and adult arrest were not altered in alternative model specifications.

Magnitude of Main Effects of Disabilities Status

In general, students with disabilities had higher rates of negative behavioral outcomes than students without disabilities. After adjusting for differences in child and family background characteristics, students with disabilities in grades 1 through 12 had higher rates of acting out, juvenile delinquency, and adult arrest than students without disabilities in grades 1 through 12. Nevertheless, having disabilities in grades 1 through 6 was only significantly associated with juvenile delinquency. Overall, the results indicated small effect sizes for disabilities in predicting acting out, juvenile delinquency, and adult arrest.

The consistency in the estimated effects based on covariate-adjusted analysis and alternative model specifications suggested that the effects of disability status were not influenced differently by child and family background characteristics and by an alternative covariate. The addition of an alternative covariate such as student school readiness yielded identical patterns of behavioral outcomes. In other words, disabilities were consistently associated with acting out, juvenile delinquency, and adult crime,

regardless of alternative model specifications.

Group Contrasts of Subtypes of Disability Status for Behavioral Problems

Appendices 2 and 3 present the unadjusted rates of behavioral problems for subtypes of students. In addition to students with disabilities (i.e., high-incidence disabilities, other disabilities, and later-identified disabilities), students with grade retention only and general education students were included as subgroups for comparison. As shown in Appendix 2, nearly 32% of students with high-incidence disabilities in elementary grades had acting out. During follow-up in adolescence and adulthood, approximately 40% had delinquency records and 61.3% had adult criminal records. Of students with other disabilities in elementary grades, 21.4% acted out, 26% were juvenile delinquents, and approximately 50% had a record of adult arrest. Of students with later-identified disabilities, 42.9% were reported to act out, 50% were juvenile delinquents, and 77.3% had adult arrest. Of students with grade retention only, 21.5% had acting out, 26.4% had juvenile delinquency, and 50.8% had adult arrest. Of general education students, 13.3% had acting out, 14.3% had juvenile delinquency, and approximately 35% had adult arrest. As shown in Appendix 3, of students with high-incidence disabilities in grades 1 through 12, 35.9% previously had acting out, 42% had delinquency records, and 65.6% had adult criminal records. Of students with other disabilities in grades 1 through 12, 20.3% had acting out, 27.9% had juvenile delinquency, and approximately 51% had adult arrest.

To further examine any difference in the predictive effects of subtypes of disability status on behavioral outcomes, students with high-incidence disabilities and other disabilities in elementary grades, later-identified disabilities after elementary

grades, and grade retention only were specified as dummy variables in the alternative models. General education students were considered as a reference group in this model. Table 8 and Figure 5 present marginal effects representing percentage point differences between subtypes of disability status predicting acting out, juvenile delinquency, and adult arrest.

The primary predictor of interest in this study was high-incidence disabilities. The hypothesis was that students with disabilities were more likely to be involved in acting out, juvenile delinquency, and adult arrest compared to general education students. Students with disabilities might perform differently than those with grade retention records. However, for students with high-incidence disabilities in grades 1 through 6, 55.5% of students had a grade retention history. Based on school records, approximately 42% of students had early grade retention before the identification of disabilities. For students with other disabilities, 35.6% of students had a grade retention history. Approximately 26% of students had early grade retention before the identification of disabilities. For students with later-identified disabilities (86.4% high-incidence disabilities), 50% of students had an early grade retention history before the identification of disabilities. Consequently, it is difficult to differentiate behavioral problems for students with disabilities, students with grade retention only, and students with disabilities who also had grade retention histories prior or after the identification of disabilities.

Table 8. Marginal Effects of Group Contrast of Subtypes of Students Predicting Acting Out, Juvenile Delinquency, and Adult Arrest (Covariate-Adjusted Analyses)

Predictors	Behavioral outcomes	Acting out (ages 12-13)	Juvenile Delinquency (by age 18)	Adult Arrest (by age 26)
Subgroups				
Students with high incidence disabilities (grades 1-6)	.123*	.147**	.126*	
Students with other disabilities (grades 1-6)	.043	.051	.037	
Later-identified students (after grade 6)	.193*	.181*	.232**	
Students with grade retention histories only	.046	.050	.056	
General education students w/o special education & grade retention (reference group)				
Covariates				
Gender (female)	-.105**	-.243**	-.422**	
Race/ethnicity (African-American)	.055	.036	.096+	
Family risk index	.013+	.031**	.029**	
Low birthweight (<2,500gms)	.014	-.005	-.005	
Child welfare history	.004	.062	.168*	
Student word analysis	-.001	-.001	-.001	
Propensity score	-.106	-.179	.074	
Log likelihood	-465.473	-586.705	-776.284	
LRX ²	61.35	214.17	314.95	
Prob>X ²	.000	.000	.000	
Pseudo R ²	.062	.154	.169	
Number of observation	1056	1370	1370	

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10).

Acting out

As shown in Table 8 and Figure 5, students with high-incidence disabilities in elementary grades and students with later-identified disabilities after elementary grades were more likely to be involved in acting out than general education students. The marginal effect (.123) for students with high-incidence disabilities in elementary grades indicated a 12.3 percentage point difference in acting out compared to general education students ($p < .05$). The marginal effect (.193) for students with later-identified disabilities after elementary grades indicated a 19.3 percentage point difference in acting out compared to general education students ($p < .05$). Although students with other

disabilities and students with grade retention only were not significantly different from general education students, their marginal effects were in the expected direction.

Juvenile Delinquency

As shown in Table 8 and Figure 5, high-incidence disabilities in elementary grades and later-identified disabilities after elementary grades were positively associated with juvenile delinquency. The marginal effect for students with high-incidence disabilities represented a 14.7 percentage point difference in juvenile delinquency compared to general education students ($p < .01$). The marginal effect for juvenile delinquency was .181 for later-identified disabilities, meaning the difference in the rates of juvenile delinquency between students with later-identified disabilities and general education students was 18.1 ($p < .05$). Although the rates of juvenile delinquency for students with other disabilities and students with grade retention only were not significantly different from general education students, their marginal effects were in the expected direction.

Adult Arrest

High-incidence disabilities in elementary grades and later-identified disabilities after elementary grades were positively associated with adult arrest (see Table 8 and Figure 5). The marginal effect for students with high-incidence disabilities represented a 12.6 percentage point difference in adult arrest compared to general education students ($p < .05$). The marginal effect for students with later-identified disabilities was .232, meaning the difference in the rates of adult arrest between students with later-identified disabilities and general education students was 23.2 ($p < .01$). Although students with other disabilities and students with grade retention were not significantly different from general education students, their marginal effects were in the expected direction.

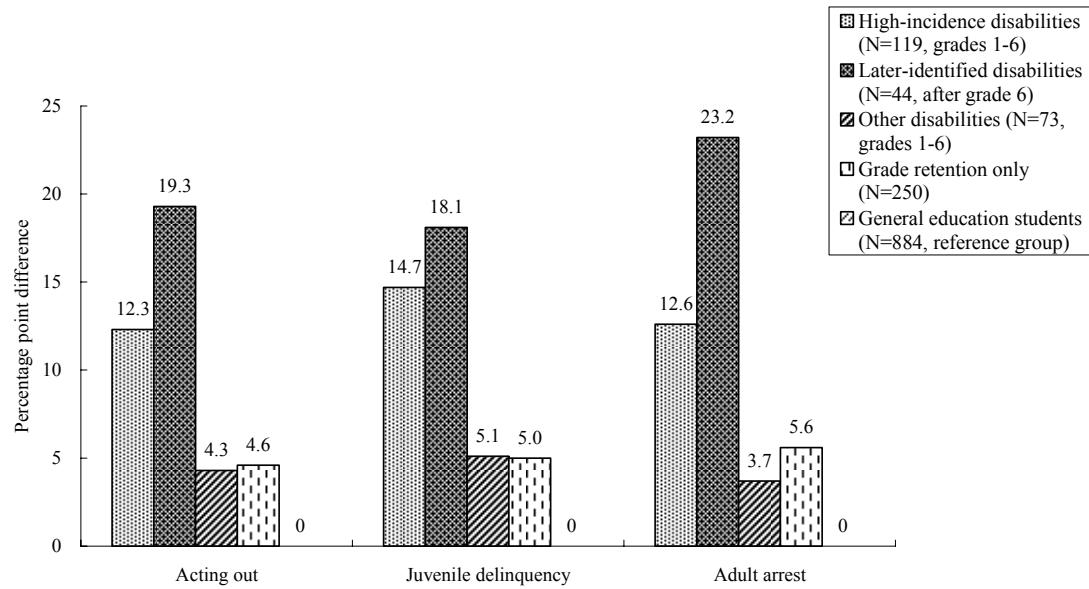


Figure 5. Percentage point difference for subtypes of students on acting out, juvenile delinquency, and adult arrest compared to general education students

Alternative Analysis for Robustness Test

The alternative predictor models added student school readiness in kindergarten to predict each behavioral problem (see Appendix 4). All predictive patterns remained identical and the marginal effects of predictors associated with acting out, juvenile delinquency, and adult arrest were statistically significant for students with high-incidence disabilities and students with later-identified disabilities. The robustness test showed that the contribution of adding student school readiness was not more than the base prediction model for acting out, juvenile delinquency, and adult arrest.

Alternative Analysis for Age Specifications

To further examine whether the patterns were consistent across ages, students with

high-incidence disabilities and students with other disabilities in grades 1 through 12, as well as students with grade retention only were specified as dummy variables in the alternative models. General education students were considered as a reference group in this model (see Appendix 5). The findings indicated that students with high-incidence disabilities in grades 1 through 12 were positively associated with acting out, juvenile delinquency, and adult arrest. The marginal effects of acting out, juvenile delinquency, and adult arrest for students with high-incidence disabilities in grades 1 through 12 were approximately .148, which indicated a 14.8 percentage point difference in acting out, juvenile delinquency, and adult arrest compared to general education students.

Subtypes of Disabilities Status for Behavioral Problems

The results of group contrasts revealed that students with high-incidence disabilities in elementary grades and students with later-identified disabilities after elementary grades had higher rates of acting out, juvenile delinquency, and adult arrest compared to general education students. Regardless of alternative age-specific models, students with high-incidence disabilities in grades 1 through 12 were more likely to be involved in negative behavioral outcomes compared to general education students.

Summary for the Association between Disability Status and Later Behavioral Problems

An enduring group difference for students with/without disabilities in grades 1 through 12 appeared across acting out (ages 12-13), juvenile delinquency (by age 18), and adult arrest (by age 26) when covariates were introduced. Disabilities in grades 1 through 6 was only related to juvenile delinquency regardless of the covariate control. In group contrast analyses, students with high-incidence disabilities in elementary grades

and students with later-identified disabilities after elementary grades had significantly higher acting out, juvenile delinquency, and adult arrest compared to general education students. Students with high-incidence disabilities in elementary grades were more likely to be engaged in acting out, juvenile delinquency, and adult arrest compared to general education students. The percentage point differences compared to general education students ranged from 12.3% to 14.7%. Likewise, students with later-identified disabilities after elementary grades were more likely to be involved in acting out, juvenile delinquency, and adult arrest than general education students. The percentage point differences compared to general education students ranged from 18.1 % to 23.2%. Similar patterns were found consistently regardless of robustness tests with the control of an alternative covariate (i.e., student school readiness) and for alternative age-specific models as well.

Predictive Effects of Individual, Family, and School Level Factors on Later Behavioral Problems

Research question 2 asked whether individual, family, and school level factors were associated with acting out, juvenile delinquency, and adult arrest. The independent and combined effects of individual, family, and school level factors on later behavioral problems were examined. Single-factor models with the covariate control were used to examine the independent associations between selected factors at the individual, family, and school levels and acting out, juvenile delinquency, and adult arrest, respectively (see Tables 9-17 and Appendices 6-8). Full prediction models with the covariate control were used to investigate the combined effects of multiple factors at the individual, family, school levels on later behavioral problems simultaneously (see Tables 18-20 and

Appendices 9).

The models examining the relationships between individual, family, and school level factors and acting out, juvenile delinquency, and adult arrest were applied to the entire study sample and the separate subgroups. Within the analyses of the independent and combined effects, descriptive information concerning differential patterns of individual, family, and school level factors predicting behavioral outcomes for the entire study sample and the separate subgroups are provided. Within separate subgroup analyses, the patterns of behavioral outcomes for high-incidence disabilities were the primary focus. Alternative model specifications using interaction terms from individual, family, and school level factors multiplied by high-incidence disabilities as well as grade retention only were used to validate the predictive effects of individual, family, and school level factors on behavioral outcomes for high-incidence disabilities (see Tables 21-23 and Appendices 10-12). Additionally, the relative importance of individual, family, and school level factors were further differentiated based on the independent and combined effects on behavioral outcomes (see Tables 24 & 25).

Independent Relationships between Individual, Family, and School Level Factors and Later Behavioral Problems

In the preliminary correlation analysis, Table 4 shows the unadjusted bivariate relationships between every factor and the outcome measures of acting out, juvenile delinquency, and adult arrest for the entire study sample. Individual, family, and school level factors were mostly correlated with acting out, juvenile delinquency, and adult crime. Classroom adjustment appeared to be the strongest predictor of acting out, juvenile delinquency, and adult arrest. Reading comprehension and parent involvement

appeared to be the next two highest correlations. These preliminary correlations suggested further analyses of the patterns of single and combined contributions of individual, family, and school level factors predicting behavioral outcomes.

For the analyses of the independent relationships, Model A examined the extent to which individual level factors were associated with later behavioral outcomes independent of family and school level factors. Model B tested the extent to which family level factors were associated with behavioral outcomes independent of individual and school level factors. Model C investigated the extent to which school level factors were associated with behavioral outcomes independent of individual and family level factors. The estimated effects of individual, family, and school level factors on acting out (see Tables 9, 10, & 11), juvenile delinquency (see Tables 12, 13, & 14), and adult arrest (see Tables 15, 16, & 17) were examined for the entire study sample and the separate subgroups (i.e., general education students, high-incidence disabilities, later-identified disabilities, other disabilities, and grade retention only), respectively.

Acting out

Individual level. As shown in Table 9, the relationships between individual level factors and acting out were evaluated with the control of covariates in Model A. After controlling for covariates, reading comprehension was positively but only weakly related to acting out for the entire study sample. The marginal effect for reading comprehension was .003 ($p < .05$), suggesting that a one-unit increase in reading comprehension was associated with a .3 percentage point increase in acting out for the entire study sample. In separate subgroup analyses, the reading comprehension/acting out associations were in the positive direction, but not significant for the separate subgroups. For students with

high incidence disabilities, the reading comprehension/acting out association was not significant, with a marginal effect of .010.

The relationship between classroom adjustment and acting out was in the expected negative direction. For the entire study sample, the marginal effect for classroom adjustment was -.033 ($p < .01$), suggesting that for a one-unit increase in classroom adjustment, students were 3.3 percentage points less likely to be involved in acting out. The significant relationships were consistent across different subgroups with marginal effects ranging from -.026 to -.074, except for later-identified students. For students with high incidence disabilities, the marginal effect of classroom adjustment was -.074, suggesting that a one-unit increase in classroom adjustment led to a decrease of acting out by 7.4 percent ($p < .01$).

Family level. In Model B (see Table 10), the relationships between family level factors and acting out were evaluated with the covariate control. Parent involvement was the only significant predictor in this model for the entire study sample, with a marginal effect of -.041 ($p < .01$). For each unit increase in parent involvement, students were 4.1 percentage points less likely to be involved in acting out. For separate subgroup analyses, the relationships for the separate subgroups were in the expected direction, with marginal effects ranging from -.029 to -.088. In addition to the significant parent involvement/acting out association for general education students ($p < .01$) and students with grade retention ($p < .05$), the associations for the rest of the subgroups were not significant. For students with high-incidence disabilities, parent involvement was not significantly predictive of acting out, with a marginal effect of -.029.

Findings indicated that child maltreatment in elementary grades was not

associated with acting out. Child maltreatment had no discernible relationship with acting out for the entire study sample and the separate subgroups in Model B. For students with high-incidence disabilities, child maltreatment was not significantly predictive of acting out, with a marginal effect of .175.

School level. In Model C (see Table 11), school level factors were rarely related to acting out. CPC program participation, magnet school attendance, school mobility, the number of years in special education, and grade retention were not significantly associated with acting out for the entire study sample and the separate subgroups. The exception was the school mobility/acting out association for students with later-identified disabilities. The marginal effect was -.364 ($p < .01$), suggesting a one-unit increase in school mobility was associated with a decreased likelihood of acting out by 36.4 percent for students with later-identified disabilities. The association is contrary to the research hypothesis. However, due to the small sample size ($N=44$), the power for the analyses was limited. For students with high-incidence disabilities in elementary grades, none of the school level factors in the model were significantly predictive of acting out.

Table 9. Marginal Effects of Individual Level Factors Predicting Acting Out for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model A – individual level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension	.003*	.002+	.010+	.003	.002	.002
Classroom adjustment	-.033**	-.026**	-.074**	.000	-.046*	-.041**
Family level						
Parent involvement in schools						
Any child maltreatment						
School level						
Any CPC program participation						
Any magnet school attendance						
School mobility						
Number of years in special education placement						
Any grade retention						
Covariates						
Gender (female)	-.073**	-.060*	-.182+	.030	-.134	-.015
Race/ethnicity (African-American)	.030	-.016	-.049	---	---	---
Family risk index	.010	.009	.059+	-.153+	-.023	.011
Low birthweight (<2,500gms)	.000	-.017	.038	.309	.122	-.048
Child welfare history	.017	.073	-.160	---	.144	.144
Student word analysis	.000	.000	.000	.002	.001	-.001
Propensity score	-.094	.192	-1.760*	2.376	.563	-.452
Log likelihood	-429.506	-230.887	-46.157	-19.821	-22.523	-87.554
LRX ²	131.71	73.51	28.46	4.59	12.16	14.06
Prob> X ²	.000	.000	.001	.709	.144	.080
Pseudo R ²	.133	.137	.236	.104	.213	.074
Number of observation	1052	680	96	32	54	177

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Table 10. Marginal Effects of Family Level Factors Predicting Acting Out for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model B – family level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension						
Classroom adjustment						
Family level						
Parent involvement in schools	-.041**	-.030**	-.029	-.088	-.088+	-.070*
Any child maltreatment	.048	.077	.175	-.269	.005	-.013
School level						
Any CPC program participation						
Any magnet school attendance						
School mobility						
Number of years in special education placement						
Any grade retention						
Covariates						
Gender (female)	-.116**	-.096**	-.264**	-.067	-.194+	-.050
Race/ethnicity (African-American)	.049	.015	-.068	---	---	---
Family risk index	.008	.008	.042	-.158+	-.044	.004
Low birthweight (<2,500gms)	.011	-.018	.087	.390	.146	-.025
Child welfare history	.003	.072	-.197	---	.289	.051
Student word analysis	-.001	-.001	.003	.005	.000	-.001
Propensity score	-.105	.242	-1.750*	2.160	.944	-.250
Log likelihood	-457.568	-248.734	-50.838	-19.114	-24.527	-90.319
LR χ^2	75.19	37.53	19.10	6.01	8.15	8.53
Prob> X^2	.000	.000	.024	.539	.419	.383
Pseudo R^2	.076	.070	.158	.136	.143	.045
Number of observation	1051	679	96	32	54	177

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Table 11. Marginal Effects of School Level Factors Predicting Acting Out for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model C – school level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension						
Classroom adjustment						
Family level						
Parent involvement in schools						
Any child maltreatment						
School level						
Any CPC program participation	-.029	-.021	-.190+	.218	-.159	-.066
Any magnet school attendance	.030	.066	.370	---	---	-.112
School mobility	-.001	.004	-.050	-.364**	.104	-.008
Number of years in special education placement	.008	---	-.008	---	-.009	---
Any grade retention	.020	---	.117	-.046	-.031	.003
Covariates						
Gender (female)	-.122**	-.107**	-.297**	-.443**	-.189	-.040
Race/ethnicity (African-American)	.059	.015	-.069	---	---	---
Family risk index	.015+	.015+	.061+	-.231*	-.035	.017
Low birthweight (<2,500gms)	.015	-.007	.095	.646**	.181	-.048
Child welfare history	.006	.086	-.206	---	.267	.078
Student word analysis	-.002*	-.002+	.004	-.009	.000	-.002
Propensity score	-.076	.243	-1.908*	5.780+	.979	-.432
Log likelihood	-466.202	-253.947	-48.343	-14.439	-22.145	-92.456
LRX ²	49.46	26.24	21.04	15.36	6.86	4.26
Prob> X ²	.000	.003	.050	.053	.739	.935
Pseudo R ²	.050	.049	.179	.347	.134	.023
Number of observation	1045	676	94	32	47	177

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Juvenile Delinquency

Individual level. As shown in Table 12, in Model A, no significant relationship between reading comprehension and juvenile delinquency was found for the entire study sample. For separate subgroup analyses, none of the reading comprehension/juvenile delinquency associations were significant for the separate subgroups, except students with later-identified disabilities. The marginal effect for reading comprehension was -.029 ($p < .05$), suggesting a one-unit increase in reading comprehension for students with later-identified disabilities was associated with a 2.9 percentage point decrease in juvenile delinquency. For students with high-incidence disabilities, no significant reading comprehension/juvenile delinquency association existed.

The relationship between classroom adjustment and juvenile delinquency was in the expected negative direction. For the entire study sample, classroom adjustment was significantly predictive of juvenile delinquency. The marginal effect was -.013 ($p < .01$), suggesting that a one-unit increase in classroom adjustment was significantly associated with a 1.3 percentage point decrease in juvenile delinquency. In separate subgroup analyses, the relationships between classroom adjustment and acting out were mostly in the expected negative direction. The results did not show significant relationships across the separate subgroups except for general education students, with a marginal effect of -.010 ($p < .01$). For students with high-incidence disabilities, classroom adjustment was not significantly predictive of juvenile delinquency.

Family level. In Model B (see Table 13), the relationships between family level factors and juvenile delinquency were evaluated with the covariate control. Parent involvement was a significant predictor in this Model for the entire study sample, with a

marginal effect of -.023 ($p < .01$). Each increase in parent involvement was associated with a 2.3 percentage decrease in juvenile delinquency. In separate subgroup analyses, the relationships were mostly in the expected negative direction, but the parent involvement/juvenile delinquency associations were only significant for general education students and students with other disabilities. For students with high-incidence disabilities, parent involvement was not statistically associated with juvenile delinquency, with a marginal effect of .016.

A significant child maltreatment/juvenile delinquency association existed for the entire study sample in Model B, with a marginal effect of .109 ($p < .05$). Any child maltreatment in the elementary grades was associated with a 10.9 percentage point increase in juvenile delinquency. However, child maltreatment had no discernible relationship with juvenile delinquency for the separate subgroups. For students with high-incidence disabilities, child maltreatment was not statistically associated with juvenile delinquency, with a marginal effect of .169.

School level. In Model C (see Table 14), the CPC program participation/juvenile delinquency association was in the negative direction for the entire study sample and the separate subgroups. The evidence showed significant differences in juvenile delinquency by CPC program participation for the entire study sample, with a marginal effect of -.051 ($p < .05$). Any CPC program participation was associated with a 5.1 percentage point decrease in juvenile delinquency. In separate subgroup analyses, significant associations between CPC program participation and juvenile delinquency were found for general education students (-.049, $p < .05$), but not for the rest of the subgroups. There was a significant association between magnet school attendance and juvenile

delinquency for the entire study sample, with a marginal effect of $-.064$ ($p < .05$). Any magnet school attendance was associated with a 6.4 percentage point decrease in juvenile delinquency. In separate subgroup analyses, the associations were not significant. In addition to the predictive effects of CPC program participation and magnet school attendance, no significant effects of school mobility, the number of years in special education placement, and grade retention on juvenile delinquency were found for the entire study sample and the separate subgroups. Specifically, for students with high-incidence disabilities, none of the school level factors were statistically associated with juvenile delinquency.

Table 12. Marginal Effects of Individual Level Factors Predicting Juvenile Delinquency for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model A – individual level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension	.000	.001	.008	-.029*	.001	-.003
Classroom adjustment	-.013**	-.010**	-.023	.020	-.022	-.002
Family level						
Parent involvement in schools						
Any child maltreatment						
School level						
Any CPC program participation						
Any magnet school attendance						
School mobility						
Number of years in special education placement						
Any grade retention						
Covariates						
Gender (female)	-.231**	-.182**	-.241*	---	-.330**	-.290**
Race/ethnicity (African-American)	.016	-.010	.159	---	-.021	.058
Family risk index	.029**	.027**	.060+	.059	-.030	.028
Low birthweight (<2,500gms)	-.014	-.018	.074	-.303	-.102	.040
Child welfare history	.052	.085	.182	---	---	.017
Student word analysis	.000	-.001	-.002	.030*	-.002	.003
Propensity score	-.136	-.071	-.435	-.109	1.416	-.108
Log likelihood	-579.321	-309.431	-70.194	-19.563	-30.889	-126.470
LR χ^2	217.11	100.68	14.54	7.99	18.79	35.05
Prob> X^2	.000	.000	.104	.239	.016	.000
Pseudo R^2	.158	.140	.094	.170	.223	.122
Number of observation	1362	881	116	35	68	249

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Table 13. Marginal Effects of Family Level Factors Predicting Juvenile Delinquency for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model B – family level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension						
Classroom adjustment						
Family level						
Parent involvement in schools	-.023**	-.016*	.016	-.075	-.103*	-.023
Any child maltreatment	.109*	.058	.169	---	-.075	.135
School level						
Any CPC program participation						
Any magnet school attendance						
School mobility						
Number of years in special education placement						
Any grade retention						
Covariates						
Gender (female)	-.255**	-.200**	-.269**	---	-.357**	-.291**
Race/ethnicity (African-American)	.032	.004	.145	---	.058	.080
Family risk index	.028**	.025**	.061+	.036	-.056	.029
Low birthweight (<2,500gms)	-.005	-.015	.089	---	-.104	.057
Child welfare history	.067	.082	.258	-.033	---	-.017
Student word analysis	-.001+	-.002*	.002	.009	-.002	.002
Propensity score	-.186	-.086	-.724	-.101	.515	-.245
Log likelihood	-583.926	-311.280	-72.560	-20.550	-29.292	-124.985
LR χ^2	211.08	96.68	14.56	2.76	21.98	35.35
Prob> X^2	.000	.000	.104	.737	.005	.000
Pseudo R^2	.153	.134	.091	.063	.273	.124
Number of observation	1363	880	119	32	68	248

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Table 14. Marginal Effects of School Level Factors Predicting Juvenile Delinquency for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model C – school level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension						
Classroom adjustment						
Family level						
Parent involvement in schools						
Any child maltreatment						
School level						
Any CPC program participation	-.051*	-.049*	-.142	-.167	-.218+	-.014
Any magnet school attendance	-.064*	-.051+	.044	---	-.081	.014
School mobility	.004	.012	-.029	.098	.031	-.013
Number of years in special education placement	.016+	---	-.054	---	.042	---
Any grade retention	.026	---	-.065	.147	.032	-.037
Covariates						
Gender (female)	-.254**	-.200**	-.290**	---	-.384**	-.297**
Race/ethnicity (African-American)	.046	.011	.162	---	.077	.092
Family risk index	.032**	.025**	.058	.029	-.037	.034+
Low birthweight (<2,500gms)	-.008	-.017	.036	---	-.094	.040
Child welfare history	.053	.073	.215	-.119	---	.001
Student word analysis	-.001	-.002+	.001	.016+	.000	.002
Propensity score	-.222+	-.061	-1.216+	-1.558	.831	-.227
Log likelihood	-582.882	-308.653	-69.414	-21.273	-28.236	-126.508
LRX ²	213.60	101.01	18.82	4.56	23.43	34.35
Prob> X ²	.000	.000	.093	.713	.015	.000
Pseudo R ²	.155	.141	.119	.097	.293	.120
Number of observation	1358	877	117	35	67	248

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Adult Arrest

Individual level. In Model A (see Table 15), reading comprehension was not associated with adult arrest for the entire study sample and the separate subgroups. For students with high-incidence disabilities, reading comprehension was not significantly related to adult arrest, with a marginal effect of -.003. Classroom adjustment was significantly associated with adult arrest for the entire study sample, with a marginal effect of -.023, suggesting that a one-unit increase in classroom adjustment decreased the likelihood of being involved in juvenile delinquency by 2.3 percent. Separate subgroup analyses revealed that the relationships between classroom adjustment and adult arrest were in the expected direction for most subgroups. The classroom adjustment/adult arrest associations were significant for general education students and students with grade retention only. For students with high-incidence disabilities, the classroom adjustment/adult arrest association was not significant, with a marginal effect of -.017.

Family level. Among family level factors (Table 16, Model B), parent involvement for the entire study sample was negatively associated with adult arrest, with a marginal effect of -.037 ($p < .01$). The result suggested that a one-unit increase in parent involvement was associated with a decrease in adult arrest by 3.7 percent. Separate subgroup analyses revealed that the parent involvement/adult arrest association was only significant for general education students. For students with high-incidence disabilities, parent involvement was not predictive of adult arrest, with a marginal effect of -.048.

Child maltreatment was statistically significantly related to adult arrest for the entire study sample but not for the separate subgroups. The marginal effect of child maltreatment associated with adult arrest was .139. The result suggested that any child

maltreatment was associated with a 13.9 percentage point increase in adult arrest for the entire study sample. In separate subgroup analyses, the relationships between child maltreatment and adult arrest were in the expected positive direction, but none were statistically significant. For students with high-incidence disabilities, no predictive effects were found for child maltreatment on adult arrest, with a marginal effect of .168.

School level. Among school level factors (see Table 17, Model C), magnet school attendance was negatively related to adult arrest for the entire study sample. The marginal effect for magnet school attendance was -.098, suggesting that any magnet school attendance was associated with a 9.8 percentage point decrease in adult arrest. Separate subgroup analyses showed that the magnet school attendance/adult arrest association was significant for general education students, with a marginal effect of -.096. School mobility was associated with adult arrest for the entire study sample. The marginal effect for school mobility was .039 ($p < .01$), suggesting that a one-unit increase in school mobility was associated with a 3.9 percentage point increase in adult arrest. In addition to the predictive effects of magnet school attendance and school mobility, any CPC program participation, the number of years in special education, and grade retention were not predictive of adult arrest for the entire study sample and the separate subgroups. Specifically, for students with high-incidence disabilities, school level factors were not significantly predictive of adult arrest.

Table 15. Marginal Effects of Individual Level Factors Predicting Adult Arrest for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model A – individual level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension	.000	-.001	-.003	-.004	.004	.000
Classroom adjustment	-.023**	-.023**	-.017	.002	-.009	-.034*
Family level						
Parent involvement in schools						
Any child maltreatment						
School level						
Any CPC program participation						
Any magnet school attendance						
School mobility						
Number of years in special education placement						
Any grade retention						
Covariates						
Gender (female)	-.398**	-.340**	-.505**	-.197	-.484**	-.541**
Race/ethnicity (African-American)	.054	-.041	.504**	---	.226	.206
Family risk index	.026**	.028**	.028	-.011	-.028	.007
Low birthweight (<2,500gms)	-.019	-.007	-.058	-.456	.072	.020
Child welfare history	.151*	.133	.097	---	.422*	-.017
Student word analysis	.001	.001	.004	.008	-.006	.000
Propensity score	.156	.453	-.029	-4.012	.118	-2.248
Log likelihood	-759.958	-490.512	-61.461	-18.872	-40.422	-128.955
LR χ^2	135.71	161.81	32.89	7.81	18.91	87.18
Prob> X^2	.000	.000	.000	.350	.026	.000
Pseudo R^2	.181	.142	.211	.171	.190	.253
Number of observation	1362	881	116	41	72	249

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Table 16. Marginal Effects of Family Level Factors Predicting Adult Arrest for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model B – family level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension						
Classroom adjustment						
Family level						
Parent involvement in schools	-.037**	-.030**	-.048	.038	-.088	-.045
Any child maltreatment	.139*	.075	.168	---	.331+	.149
School level						
Any CPC program participation						
Any magnet school attendance						
School mobility						
Number of years in special education placement						
Any grade retention						
Covariates						
Gender (female)	-.432**	-.367**	-.517**	-.179	-.511**	-.565**
Race/ethnicity (African-American)	.085	.001	.461**	---	.228	.248
Family risk index	.025**	.028**	.025	-.004	-.065	.005
Low birthweight (<2,500gms)	-.010	-.001	-.010	-.452	.094	.033
Child welfare history	.162*	.137	.173	---	.457**	-.088
Student word analysis	-.001	-.001	.004	.006	-.005	.000
Propensity score	.114	.369	-.090	-5.094	-.419	-2.152
Log likelihood	-769.437	-500.063	-61.773	-18.297	-38.146	-129.706
LR χ^2	319.69	141.84	35.24	7.21	23.47	84.24
Prob> X^2	.000	.000	.000	.302	.005	.000
Pseudo R^2	.172	.124	.222	.165	.235	.245
Number of observation	1363	880	119	38	72	248

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Table 17. Marginal Effects of School Level Factors Predicting Adult Arrest for the Primary Study Group and Separate Subgroups (Covariate-Adjusted Analyses)

Predictors	Model C – school level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension						
Classroom adjustment						
Family level						
Parent involvement in schools						
Any child maltreatment						
School level						
Any CPC program participation	.007	.005	-.146	.215	-.086	.071
Any magnet school attendance	-.098*	-.096*	.231	---	.060	-.258+
School mobility	.039**	.070**	-.048	-.040	.086	.012
Number of years in special education placement	.014	---	-.034	---	.025	---
Any grade retention	.015	---	-.075	-.061	-.091	.153
Covariates						
Gender (female)	-.433**	-.378**	-.575**	-.447	-.525**	-.554**
Race/ethnicity (African-American)	.100+	.004	.484**	---	.258	.259+
Family risk index	.026**	.023*	.039	-.012	-.043	.010
Low birthweight (<2,500gms)	-.003	.009	-.044	-.348	.063	.020
Child welfare history	.156*	.116	.197	---	.386+	-.066
Student word analysis	-.001	-.001	.003	.002	-.006	-.001
Propensity score	.157	.469	.174	-5.610	.283	-2.347
Log likelihood	-766.077	-490.751	-58.409	-17.864	-38.249	-130.071
LR χ^2	317.83	155.41	40.00	9.83	21.91	83.59
Prob> X^2	.000	.000	.000	.277	.039	.000
Pseudo R^2	.172	.137	.255	.216	.223	.243
Number of observation	1358	877	117	41	71	248

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Alternative Analysis for Age Specifications

The descriptive information for students with high-incidence disabilities in grades 1 through 6 and grades 1 through 12 is provided in Appendices 6, 7, and 8. The direction of the relationships between individual level factors and acting out (see Appendix 6, Model A), juvenile delinquency (see Appendix 7, Model A), and adult arrest (see Appendix 8, Model A) was consistent between students with high-incidence disabilities in grades 1 through 6 and grades 1 through 12. The classroom adjustment/acting out association was significant for students with high-incidence disabilities in grades 1 through 6 ($p < .05$), but was marginally significant for students with high-incidence disabilities in grades 1 through 12 ($p < .10$).

The direction and the significance of the relationships between family level factors and acting out (see Appendix 6, Model B), juvenile delinquency (see Appendix 7, Model B), and adult arrest (see Appendix 8, Model B) were relatively consistent between students with high-incidence disabilities in grades 1 through 6 and grades 1 through 12. Neither parent involvement nor child maltreatment were associated significantly with acting out, juvenile delinquency, and adult arrest, although their marginal effects were in the expected direction.

The direction and the magnitude of the relationships between school level factors and acting out (see Appendix 6, Model C), juvenile delinquency (see Appendix 7, Model C), and adult arrest (see Appendix 8, Model C) were relatively consistent between students with high-incidence disabilities in grades 1 through 6 and grades 1 through 12. None of the school level factors were related to acting out, juvenile delinquency, and adult arrest.

Independent Predictive Effects of Individual, Family, and School Level Factors

At the individual level, most relationships between reading comprehension and acting out, juvenile delinquency, and adult arrest were not statistically significant for the entire study sample and the separate subgroups. Classroom adjustment was statistically associated with a decreased likelihood of acting out, juvenile delinquency, and adult arrest for the entire study sample. For the separate subgroups, significant predictive effects of classroom adjustment on each behavioral outcome were found to be consistent for general education students. However, classroom adjustment was not consistently associated with behavioral outcomes for other subgroups. Specifically, for students with high-incidence disabilities, classroom adjustment had significant effects on acting out, but no enduring significant effects on juvenile delinquency and adult arrest.

At the family level, the predictive effects of parent involvement on behavioral problems were statistically significant for the entire study sample. Parent involvement was associated with a decreased likelihood of acting out, juvenile delinquency, and adult arrest. For the separate subgroups, significant predictive effects on each behavioral outcome were found to be consistent for general education students. However, the predictive effects of parent involvement were not consistently significant for behavioral outcomes for other subgroups. For students with high-incidence disabilities, parent involvement was not significantly associated with acting out, juvenile delinquency, and adult arrest. On the other hand, the predictive effects of child maltreatment on acting out, juvenile delinquency, and adult arrest were generally in the positive direction. Child maltreatment had no significant effects on acting out, but had distal effects on juvenile delinquency and adult arrest for the entire study sample. Most relationships were not

significant for the separate subgroups.

At the school level, the CPC program participation/juvenile delinquency associations were significant for the entire study sample and general education students. Magnet school attendance was predictive of a decreased likelihood of juvenile delinquency and adult arrest for the entire study sample. The magnet school attendance/adult arrest association was significant for general education students as well in separate subgroup analyses. School mobility was negatively related to acting out for students with later-identified disabilities, but positively associated with adult arrest for the entire study sample and general education students. In general, school level factors were not significantly associated with acting out, juvenile delinquency, and adult arrest for students with disabilities or with grade retention histories.

Combined Relationships between Individual, Family, and School Level Factors and Later Behavioral Problems

To examine the combined relationships between individual, family, and school level factors and behavioral outcomes, full models as well as alternative model specifications for interaction tests were used to validate the linkages. Tables 18, 19, and 20 show full models (individual, family, and school level factors as well as covariates) predicting acting out, juvenile delinquency, and adult arrest for the entire study sample and the separate subgroups.

Acting out

As shown in Table 18, when including individual, family, and school level factors as well as the covariates, the full model predicting acting out was statistically significant for the entire study sample ($p < .01$). The full model accounted for 14.6% of the variance

in acting out. Reading comprehension, classroom adjustment, and parent involvement were associated with acting out, with marginal effects of .003 ($p < .05$), -.033 ($p < .01$), and -.018 ($p < .05$). The patterns of the combined relationships between individual, family, and school level factors and acting out were consistent with the patterns found for the independent relationships.

In separate subgroup analyses, the full model explained 15% of the variance in acting out for general education students ($p < .01$). Reading comprehension was positively associated with acting out, with a marginal effect of .003 ($p < .05$). That was slightly different from the pattern identified in the analysis of the independent relationships. The significance of classroom adjustment remained, suggesting that classroom adjustment was associated with a decreased likelihood of being involved in acting out by 2.6 percent. Parent involvement was no longer predictive of acting out in the full model.

The full model explained 27.2% of the variance in acting out for students with high-incidence disabilities ($p < .01$). The patterns of the combined relationships between individual, family, and school level factors and acting out were consistent with the patterns found in the independent relationships. Classroom adjustment was the only significant predictor linked with a decreased likelihood of being engaged in acting out (-.077, $p < .01$). One unit increase on classroom adjustment was associated with a 7.7 percentage point reduction in acting out.

The full model explained 45% of the variance in acting out for students with later-identified disabilities, at a non-significant level ($p > .05$). Child maltreatment appeared to be a significant predictor for acting out in the full model, with a marginal

effect of .729, which was different from the patterns found for the independent relationships. Child maltreatment experienced by an individual was positively related to acting out. School mobility remained a negative predictor related to acting out, with a marginal effect of -.666 ($p < .01$).

The full model explained 49.6% of the variance in acting out for students with other disabilities ($p < .05$). Classroom adjustment did not remain a significant predictor for acting out. Only the number of years in special education placement was associated with acting out, with a marginal effect of -.050 ($p < .05$), which was different from the patterns identified in the independent relationships.

The full model explained 12.1% of the variance in acting out for students with grade retention only, at a non-significant level ($p > .05$). Consistent with the patterns of the independent relationships, classroom adjustment and parent involvement remained as significant predictors associated with a decreased likelihood of being engaged in acting out. Classroom adjustment and parent involvement were predictive of acting out, with marginal effects of -.043 ($p < .01$) and -.059 ($p < .05$).

Table 18. Marginal Effects of Individual, Family, and School Level Factors Predicting Acting Out for the Primary Study Group and Separate Subgroups (Combined Effects, Covariate-Adjusted Analyses)

Predictors	Full model– individual + family + school level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension	.003*	.003*	.009	.013	.000	.003
Classroom adjustment	-.033**	-.026**	-.077**	-.085	-.070+	-.043**
Family level						
Parent involvement in schools	-.018*	-.009	-.001	-.062	.047	-.059*
Any child maltreatment	.053	.087	.179	.729**	---	.012
School level						
Any CPC program participation	-.030	-.020	-.164	.461+	-.319	-.101
Any magnet school attendance	.000	.024	.503+	---	---	-.143
School mobility	-.011	-.008	-.017	-.666**	.186	-.030
Number of years in special education placement	-.004	---	-.003	---	-.050*	---
Any grade retention	-.036	---	.105	.194	-.336+	-.042
Covariates						
Gender (female)	-.072**	-.061*	-.213*	-.412**	-.214	-.031
Race/ethnicity (African-American)	.029	-.018	-.099	---	---	---
Family risk index	.007	.009	.063+	-.266 *	-.006	.009
Low birthweight (<2,500gms)	-.002	-.025	.097	.794**	.105	-.033
Child welfare history	.018	.079	-.150	---	.378	.117
Student word analysis	.000	.000	.002	-.023	.005	.000
Propensity score	-.022	.227	-1.868*	6.856	1.236	-.453
Log likelihood	-418.890	-226.674	-42.869	-12.157	-12.316	-82.940
LRX ²	142.90	80.20	31.99	19.92	24.27	22.78
Prob> X ²	.000	.000	.010	.069	.029	.064
Pseudo R ²	.146	150	.272	.450	.496	.121
Number of observation	1042	674	94	32	43	176

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Juvenile Delinquency

As shown in Table 19, the full model including individual, family, and school level factors significantly predicted juvenile delinquency for the entire study sample ($p < .01$). The full model accounted for 17.4% of the variance in juvenile delinquency. Classroom adjustment was significantly associated with juvenile delinquency, with a marginal effect of -.013 ($p < .01$). Parent involvement was no longer predictive of juvenile delinquency in the full model. Child maltreatment was still positively associated with juvenile delinquency (.118, $p < .05$). CPC program participation and magnet school attendance remained significant predictors associated with juvenile delinquency, with marginal effects of -.047 and -.062, respectively ($p < .05$).

In separate subgroup analyses, the full model significantly explained 15.7% of the variance in juvenile delinquency for general education students ($p < .01$). The significance of classroom adjustment remained, suggesting that classroom adjustment was associated with a decreased likelihood of being involved in juvenile delinquency by 1 percent ($p < .01$). Parent involvement was no longer linked with juvenile delinquency in the full model. At the school level, CPC program participation did not remain a significant predictor, but magnet school attendance was associated with juvenile delinquency (-.059, $p < .05$).

The full model explained 13.0% of the variance in juvenile delinquency for students with high-incidence disabilities, at a non-significant level ($p > .05$). The patterns of the combined relationships between individual, family, and school level factors and juvenile delinquency were consistent with the patterns for the independent relationships. None of the individual, family, and school level factors were predictive of

juvenile delinquency.

The full model explained 18.3% of the variance in juvenile delinquency outcomes for students with later-identified disabilities, at a non-significant level ($p > .05$). Reading comprehension was no longer associated with juvenile delinquency. Additionally, the full model explained 38.9% of the variance in juvenile delinquency outcomes for students with other disabilities ($p < .01$). Parent involvement was no longer predictive of juvenile delinquency. Last, the full model explained 13.4% of the variance in juvenile delinquency outcomes for students with grade retention only ($p < .01$). Individual, family, and school level factors were not associated with juvenile delinquency for students with later-identified disabilities, other disabilities, and grade retention in the analyses of the combined relationships.

Table 19. Marginal Effects of Individual, Family, and School Level Factors Predicting Juvenile Delinquency for the Primary Study Group and Separate Subgroups (Combined Effects, Covariate-Adjusted Analyses)

Predictors	Full model – individual + family + school level factors					
	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension	.001	.001	.004	-.031	.002	-.004
Classroom adjustment	-.013**	-.010**	-.028	.027	-.009	-.002
Family level						
Parent involvement in schools	-.012	-.008	.023	-.048	-.099+	-.024
Any child maltreatment	.118*	.049	.183	---	-.074	.156
School level						
Any CPC program participation	-.047*	-.045+	-.128	-.279	-.237	-.001
Any magnet school attendance	-.062*	-.059*	.052	---	-.072	.045
School mobility	-.004	.004	-.016	.023	.016	-.029
Number of years in special education placement	.008	---	-.047	---	.041	---
Any grade retention	-.002	---	-.041	-.025	-.044	-.053
Covariates						
Gender (female)	-.230**	-.178**	-.271**	---	-.372**	-.287**
Race/ethnicity (African-American)	.021	-.007	.169	---	.128+	.044
Family risk index	.027**	.024**	.047	.047	-.064	.026
Low birthweight (<2,500gms)	-.012	-.024	.044	---	-.119	.040
Child welfare history	.036	.070	.184	-.351	---	-.009
Student word analysis	.000	-.001	.000	.035*	.000	.003
Propensity score	-.175	-.049	-.946	-1.418	.771	-.094
Log likelihood	-564.628	-302.371	-66.539	-17.522	-24.200	-122.964
LR χ^2	238.30	112.96	19.87	8.02	30.83	18.17
Prob> X^2	.000	.000	.226	.627	.009	.000
Pseudo R^2	.174	.157	.130	.183	.389	.134
Number of observation	1350	875	114	32	66	246

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Adult Arrest

As shown in Table 20, the full model including individual, family, and school level factors significantly predicted adult arrest for the entire study sample ($p < .01$). The full model accounted for 19.3% of the variance in adult arrest. Consistent with the patterns identified for the independent relationships, classroom adjustment remained a predictor related to a decreased likelihood of being involved in adult arrest with a marginal effect of -.022 ($p < .01$). Parent involvement and child maltreatment were no longer predictive of adult arrest in the full model, which was different from the patterns identified in the analyses of the independent relationships. Among school level factors, CPC program participation and magnet school attendance were still linked with adult arrest with marginal effects of -.106 and .033, respectively ($p < .05$).

In separate subgroup analyses, the full model significantly explained 15.8% of the variance in adult arrest for general education students ($p < .01$). At the individual level, the significance of classroom adjustment remained, suggesting that classroom adjustment was associated with a decreased likelihood of being involved in adult arrest by 2.3 percent ($p < .01$). At the family level, parent involvement was no longer linked with adult arrest in the full model. At the school level, magnet school attendance and school mobility remained significant predictors of adult arrest, with marginal effects of -.109 and .058, respectively ($p < .01$).

The full model explained 26.7% of the variance in adult arrest for students with high-incidence disabilities ($p < .01$). The patterns of the combined relationships among individual, family, and school level factors and adult arrest were consistent with the patterns identified for the independent relationships. None of the individual, family, and

school level factors were related to adult arrest.

The full model accounted for 24.7% of the variance in adult arrest for students with later-identified disabilities ($p > .05$). None of the individual, family, and school level factors were related to adult arrest. The full model significantly explained 27.3% of the variance in adult arrest for students with other disabilities ($p < .05$). Predictors at the individual, family, and school levels were not associated with adult arrest. The full model explained 27.2% of the variance in adult arrest for students with grade retention only ($p < .01$). Classroom adjustment remained the only predictor associated with adult arrest with a marginal effect of -.029 ($p < .05$). In general, the patterns in the combined relationships were consistent with the patterns identified in the independent relationships for students with later-identified disabilities, other disabilities, and grade retention only.

Table 20. Marginal Effects of Individual, Family, and School Level Factors Predicting Adult Arrest for the Primary Study Group and Separate Subgroups (Combined Effects, Covariate-Adjusted Analyses)

Full model – individual + family + school level factors						
Predictors	Primary study group (N=1370)	General education students (N=884)	High-incidence disabilities (N=119)	Later-identified disabilities (N=44)	Other disabilities (N=73)	Grade retention only (N=250)
Predictors						
Individual level						
Reading comprehension	.000	.000	-.005	-.008	.006	-.001
Classroom adjustment	-.022**	-.023**	-.014	.008	-.015	-.029*
Family level						
Parent involvement in schools	-.014	-.006	-.016	.065	-.116+	-.032
Any child maltreatment	.118+	.062	.050	---	.344	.178
School level						
Any CPC program participation	.013	.010	-.136	.220	-.061	.058
Any magnet school attendance	-.106*	-.109*	.255	---	-.071	-.247
School mobility	.033*	.058**	-.034	-.103	.072	.007
Number of years in special education placement	-.004	---	-.037	---	.017	---
Any grade retention	-.046	---	-.124	-.133	-.192	.158
Covariates						
Gender (female)	-.405**	-.345**	-.575**	-.584+	-.581**	-.553**
Race/ethnicity (African-American)	.054	-.040	.473**	---	.387+	.217
Family risk index	.019*	.020+	.029	.002	-.061	-.003
Low birthweight (<2,500gms)	-.017	-.012	-.045	-.334	.048	.039
Child welfare history	.136+	.105	.119	---	.447*	-.065
Student word analysis	.001	.002	.004	.001	-.007	.001
Propensity score	.277	.581	.234	-8.636	-.335	-2.234
Log likelihood	-742.256	-477.990	-56.386	-16.483	-35.263	-124.071
LR χ^2	354.19	179.20	40.99	10.84	26.46	92.74
Prob> X^2	.000	.000	.001	.457	.048	.000
Pseudo R^2	.193	.158	.267	.247	.273	.272
Number of observation	1350	875	114	38	70	246

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10). “---“ variable is dropped because of collinearity or predicting failure perfectly.

Alternative Analysis for Age Specifications

Subsequent analyses were conducted to test whether the patterns were consistent between students with high-incidence disabilities in grades 1 through 6 and in grades 1 through 12 (see Appendix 9). The direction and the magnitude of individual, family, and school level factors predicting acting out, juvenile delinquency, and adult arrest were consistent between students with high-incidence disabilities in grades 1 through 6 and grades 1 through 12. Most individual, family, and school level factors had no predictive effects on behavioral outcomes for high-incidence disabilities in elementary grades and in grades 1 through 12. The classroom adjustment/acting out association was significant for high-incidence disabilities in elementary grades, but not for high-incidence disabilities in grades 1 through 12. The child maltreatment/juvenile delinquency association was significant for high-incidence disabilities in grades 1 through 12, but not for high-incidence disabilities in elementary grades.

Interaction Test for the Effects of the Presence/Absence of High-Incidence Disabilities on the Combined Relationships

The purpose of the alternative analysis was to investigate the predictive patterns of acting out, juvenile delinquency, and adult arrest for students with high-incidence disabilities. Instead of conducting separate subgroup analyses, another way to determine the relationships between predictors and behavioral outcomes for students with high-incidence disabilities was by testing alternative model specifications including the full model, disability status, and interaction terms by high-incidence disabilities. The interaction tests were used to differentiate the predictive patterns of behavioral problems for the entire study sample and students with high-incidence disabilities. Using the full

model as the reference point, alternative model specifications included dummy variables for disability status and interaction terms of individual, family, and school level factors multiplied by high-incidence disabilities in grades 1 through 6 (see Tables 21, 22, & 23). These alternative models investigated the differential effects of interaction term pile-ups and reference groups.

In the first model (Model A), alternative predictors (e.g., disability status, dummy variables with general education students as the reference group) and interaction terms showing the interaction between high-incidence disabilities and individual, family, and school level factors were added to the base model. In the second model (Model B), alternative interaction terms of individual, family, and school level factors multiplied by grade retention were added to Model A. In the third model, other alternative predictors (e.g., disability status, replacing general education students with grade retention only as the reference group) and interaction terms of individual, family, and school level factors multiplied by high-incidence disabilities were added to the base model. A significance level, $p < .01$, was employed to evaluate whether the interaction terms were significant.

Acting out

As shown in Table 21, for disability status, there were no significant group differences between students with high-incidence disabilities in elementary grades and the reference groups in the alternative models (general education students and students with grade retention only). In Model A, the predictive patterns of individual, family, and school level factors for acting out were consistent while controlling for the effects of disability status and the moderating effects of high-incidence disabilities on individual, family, and school level factors. Reading comprehension, classroom adjustment, and

parent involvement were associated with acting out. High-incidence disabilities had no moderating effects on individual, family, and school level factors.

In Model B, the predictive patterns of individual, family, and school level factors for acting out were consistent while controlling for the effects of disability status and the moderating effects of high-incidence disabilities as well as grade retention only on individual, family, and school level factors. Reading comprehension, classroom adjustment, and parent involvement remained significant predictors for acting out. High-incidence disabilities and grade retention had no moderating effects on any individual, family, and school level factors.

In Model C, the predictive patterns of individual, family, and school level factors for acting out were consistent while controlling for the effects of disability status and the moderating effects of high-incidence disabilities on individual, family, and school level factors. Reading comprehension, classroom adjustment, and parent involvement were associated with acting out. High-incidence disabilities had no moderating effects on any of the individual, family, and school level factors.

Table 21. Marginal Effects of Individual, Family, and School Level Factors Predicting Acting Out
(Combined effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-6)

Predictors	Full model	Model A	Model B	Model C
Disability status				
Students with high incidence disabilities (grades 1-6)	.055	.057	.039	
Students with other disabilities (grades 1-6)	.007	.012	-.007	
Later-identified students (after grade 6)	.134	.152+	.114	
Students with grade retention histories only ^c	.014	.338		
General education students w/o special education & grade retention ^{a,b}				-.014
Individual, family, & school level				
Reading comprehension	.003*	.003*	.003*	.003*
Classroom adjustment	-.033**	-.033**	-.031**	-.033**
Parent involvement in schools	-.018*	-.019*	-.019*	-.019*
Any Child maltreatment	.053	.043	.049	.043
Any CPC program participation	-.030	-.027	-.025	-.027
Any magnet school attendance	.000	.006	-.013	.006
School mobility	-.011	-.010	-.011	-.010
Number of years in special education placement	-.004	-.002	.002	-.002
Any Grade retention	-.036	-.042	-.053	-.042
Interaction terms				
Hi16 × Reading comprehension	.003	.003	.003	.003
Hi16 × Classroom adjustment	-.026	-.025	-.023	
Hi16 × Parent involvement in schools	.023	.015	.023	
Hi16 × Any child maltreatment	.043	.022	.040	
Hi16 × Any CPC program participation	-.154	-.167	-.147	
Hi16 × Any magnet school attendance	.205	.177	.198	
Hi16 × School mobility	-.000	-.002	.000	
Hi16 × Number of years in special education placement	-.031	-.033	-.029	
Hi16 × Any grade retention	-.038	-.017	-.034	
Grade retention only × Reading comprehension		.001		
Grade retention only × Classroom adjustment		-.033		
Grade retention only × Parent involvement in schools		-.086+		
Grade retention only × Any child maltreatment		-.064		
Grade retention only × Any CPC program participation		-.054		
Grade retention only × Any magnet school attendance		-.088		
Grade retention only × School mobility		-.033		
Grade retention only × Any grade retention		.029		
Covariates				
Gender (female)	-.072**	-.064**	-.062**	-.064**
Race/ethnicity (African-American)	.029	.029	.023	.029
Family risk index	.007	.006	.006	.006
Low birthweight (<2,500gms)	-.002	-.001	.003	-.001
Child welfare history	.018	.021	.022	.021
Student word analysis	.000	-.000	-.000	-.000
Propensity score	-.022	.002	-.006	.002
Log likelihood	-418.890	-414.169	-411.216	-414.169
LRX ²	142.90	152.34	158.25	152.34
Prob>X ²	.000	.000	.000	.000
Pseudo R ²	.146	.155	.161	.155
Number of observation	1042	1042	1042	1042

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C.

Juvenile Delinquency

As shown in Table 22, for disability status, there were no significant group differences between students with high-incidence disabilities and the reference groups (general education students and students with grade retention only). In Model A, the predictive patterns of individual, family, and school level factors for juvenile delinquency were relatively consistent with the full model when the effects of disability status and the moderating effects of high-incidence disabilities on individual, family, and school level factors were controlled. Classroom adjustment, CPC program participation, and magnet school attendance were associated with a decreased likelihood of being engaged in juvenile delinquency. Child maltreatment did not remain a significant predictor. High-incidence disabilities had no moderating effects on any of the individual, family, and school level factors.

In Model B, the significance of classroom adjustment and CPC program participation for predicting juvenile delinquency remained. However, child maltreatment and magnet school attendance were no longer linked with juvenile delinquency. Additionally, high-incidence disabilities and grade retention had no moderating effects on any of the individual, family, and school level factors.

In Model C, the direction and magnitude of the relationships between individual, family, and school level factors and juvenile delinquency as well as of the interaction terms were equivalent to Model A. Classroom adjustment, CPC program participation, and magnet school attendance were still predictive of juvenile delinquency. High-incidence disabilities had no moderating effects on any of the individual, family, and school level factors.

Table 22. Marginal Effects of Individual, Family, and School Level Factors Predicting Juvenile Delinquency (Combined effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-6)

Predictors	Full model	Model A	Model B	Model C
Disability status				
Students with high incidence disabilities (grades 1-6)	.232	.235	.229	
Students with other disabilities (grades 1-6)	.023	.026	.022	
Later-identified students (after grade 6)	.125	.115	.123	
Students with grade retention histories only ^c	.002	.239		
General education students w/o special education & grade retention ^{a,b}				-.001
Individual, family, & school level				
Reading comprehension	.001	.001	.001	.001
Classroom adjustment	-.013**	-.011**	-.011**	-.011**
Parent involvement in schools	-.012	-.015+	-.015+	-.015+
Any Child maltreatment	.118*	.106+	.103+	.106+
Any CPC program participation	-.047*	-.051*	-.053*	-.051*
Any magnet school attendance	-.062*	-.068*	-.061+	-.068*
School mobility	-.004	-.005	-.001	-.005
Number of years in special education placement	.008	.002	-.000	.002
Any Grade retention	-.002	.000	.003	.000
Interaction terms				
Hi16 × Reading comprehension	.003	.003	.003	.003
Hi16 × Classroom adjustment	-.014	-.012	-.013	
Hi16 × Parent involvement in schools	.035	.036	.035	
Hi16 × Any child maltreatment	.062	.077	.062	
Hi16 × Any CPC program participation	-.091	-.070	-.091	
Hi16 × Any magnet school attendance	.106	.145	.106	
Hi16 × School mobility	-.023	-.033	-.023	
Hi16 × Number of years in special education placement	-.053	-.052	-.053	
Hi16 × Any grade retention	-.065	-.089	-.065	
Grade retention only × Reading comprehension		-.005		
Grade retention only × Classroom adjustment		.006		
Grade retention only × Parent involvement in schools		-.003		
Grade retention only × Any child maltreatment		.066		
Grade retention only × Any CPC program participation		.070		
Grade retention only × Any magnet school attendance		.144		
Grade retention only × School mobility		-.047		
Grade retention only × Any grade retention		-.061		
Covariates				
Gender (female)	-.230**	-.233**	-.239**	-.233**
Race/ethnicity (African-American)	.021	.023	.019	.023
Family risk index	.027**	.027**	.026**	.027**
Low birthweight (<2,500gms)	-.012	-.013	-.020	-.013
Child welfare history	.036	.038	.038	.038
Student word analysis	.000	.000	.000	.000
Propensity score	-.175	-.163	-.153	-.163
Log likelihood	-564.628	-558.326	-555.032	-558.326
LRX ²	238.30	250.90	257.49	250.90
Prob>X ²	.000	.000	.000	.00
Pseudo R ²	.174	.184	.188	.184
Number of observation	1350	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C.

Adult Arrest

As shown in Table 23, for disability status, there were no significant group differences between students with high-incidence disabilities and the reference groups in the analyses of alternative models (general education students and students with grade retention only). In Model A, the predictive patterns of individual, family, and school level factors for adult arrest were consistent when the effects of disability status and the moderating effects of high-incidence disabilities on individual, family, and school level factors were controlled. Classroom adjustment, magnet school attendance, and school mobility were associated with adult arrest. High-incidence disabilities had no moderating effects on any of the individual, family, and school level factors.

In Model B, the significance of classroom adjustment, magnet school attendance, and school mobility in predicting adult arrest remained while controlling for the moderating effects of high-incidence disabilities and grade retention. The results indicated that high-incidence disabilities and grade retention did not moderate the relationships between individual, family, and school level factors on adult arrest.

In Model C, the significance of classroom adjustment, magnet school attendance, and school mobility in predicting adult arrest remained. The moderating effects of high-incidence disabilities on individual, family, and school level factors were not significant, suggesting that high-incidence disabilities had no particular moderating effect on behavioral outcomes. The results further validated the patterns identified from separate subgroup analyses for students with high-incidence disabilities.

Table 23. Marginal Effects of Individual, Family, and School Level Factors Predicting Adult Arrest
(Combined Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-6)

Predictors	Full model	Model A	Model B	Model C
Disability status				
Students with high incidence disabilities (grades 1-6)	.068	.093	.061	
Students with other disabilities (grades 1-6)	.001	.025	-.006	
Later-identified students (after grade 6)	.166+	.233*	.159	
Students with grade retention histories only ^c	.007	.155		
General education students w/o special education & grade retention ^{a,b}				-.007
Individual, family, & school level				
Reading comprehension	.000	.000	.000	.000
Classroom adjustment	-.022**	-.022**	-.022**	-.022**
Parent involvement in schools	-.014	-.015	-.015	-.015
Any Child maltreatment	.118+	.108	.107	.107
Any CPC program participation	.013	.014	.013	.014
Any magnet school attendance	-.106*	-.099*	-.102*	-.099*
School mobility	.033*	.036*	.039*	.036*
Number of years in special education placement	-.004	.004	.010	.004
Any Grade retention	-.046	-.040	-.090	-.040
Interaction terms				
Hi16 × Reading comprehension		-.003	-.003	-.003
Hi16 × Classroom adjustment		.003	.001	.003
Hi16 × Parent involvement in schools		-.021	-.022	-.021
Hi16 × Any child maltreatment		-.034	-.023	-.034
Hi16 × Any CPC program participation		-.152	-.145	-.152
Hi16 × Any magnet school attendance		.404*	.389+	---
Hi16 × School mobility		-.060	-.074	-.060
Hi16 × Number of years in special education placement		-.027	-.034	-.027
Hi16 × Any grade retention		-.142	-.032	-.141
Grade retention only × Reading comprehension				---
Grade retention only × Classroom adjustment				-.014
Grade retention only × Parent involvement in schools				-.011
Grade retention only × Any child maltreatment				.045
Grade retention only × Any CPC program participation				.021
Grade retention only × Any magnet school attendance				-.062
Grade retention only × School mobility				---
Grade retention only × Any grade retention				.262+
Covariates				
Gender (female)	-.405**	-.405**	-.395**	-.405**
Race/ethnicity (African-American)	.054	.046	.042	.046
Family risk index	.019*	.018+	.016+	.018+
Low birthweight (<2,500gms)	-.017	-.016	-.019	-.016
Child welfare history	.136+	.139+	.134+	.139+
Student word analysis	.001	.001	.001	.001
Propensity score	.277	.304	.317	.304
Log likelihood	-742.256	-735.425	-732.125	-735.425
LRX ²	154.19	367.85	374.45	367.85
Prob>X ²	.000	.000	.000	.000
Pseudo R ²	.193	.200	.204	.200
Number of observation	1350	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C. “---” variable is dropped because of collinearity or predicting failure perfectly.

Alternative Analysis for Age Specifications

Using the full model as the reference point, alternative age-specific models included dummy variables for disability status and interaction terms of individual, family, and school level factors multiplied by high-incidence disabilities in grades 1 through 12 (see Appendices 10, 11, & 12). These alternative models investigated the differential effects of interaction term pile-ups and reference groups for high-incidence disabilities in grades 1 through 12.

Acting out. As shown in Appendix 10, the effects of disability status were altered due to different age specifications. Students with high-incidence disabilities in grades 1 through 12 were associated with a greater likelihood of being involved in acting out by approximately 21 percent compared to general education students ($p < .05$) in Models A and B. The predictive patterns of individual, family, and school level factors for acting out in Models A, B, and C were consistent with the full model and previous alternative model specifications. Reading comprehension, classroom adjustment, and parent involvement were associated with acting out at ages 12-13. High-incidence disabilities in grades 1 through 12 and grade retention only had no moderating effects on the predictive patterns of individual, family, and school level factors for acting out.

Juvenile delinquency. In Appendix 11, the effects of disability status on juvenile delinquency were altered due to different age specifications. Students with high-incidence disabilities in grades 1 through 12 were associated with a greater likelihood of being engaged in juvenile delinquency by nearly 20 percent compared to general education students in Models A and B ($p < .05$). The predictive patterns of individual, family, and school level factors for juvenile delinquency were consistent with

the full model and previous alternative model specifications. Classroom adjustment, CPC program participation, and magnet school attendance were associated with juvenile delinquency. However, child maltreatment was no longer associated with juvenile delinquency. Additionally, high-incidence disabilities in grades 1 through 12 and grade retention only had no moderating effects on the predictive patterns of individual, family, and school level factors for juvenile delinquency.

Adult arrest. In Appendix 12, students with high-incidence disabilities in grades 1 through 12 were associated with a greater likelihood of being involved in adult arrest by 21.8 percent compared to general education students in Model B only ($p < .05$). The predictive patterns of individual, family, and school level factors for adult arrest were consistent with the full model and previous alternative models. Classroom adjustment and school mobility were associated with adult arrest. However, magnet school attendance was no longer associated with adult arrest in Models A and C. Additionally, high-incidence disabilities in grades 1 through 12 and grade retention only had no moderating effects on the predictive patterns of individual, family, and school level factors for adult arrest.

Combined Predictive Effects of Individual, Family, and School Level Factors

At the individual level, reading comprehension had proximal effects on acting out for the entire study sample as well as for general education students in separate subgroup analyses. Reading comprehension was not significantly associated with juvenile delinquency and adult arrest for the entire study sample and the separate subgroups. The patterns were consistent in alternative model specifications. On the other hand, classroom adjustment was the most consistent and robust predictor associated with

proximal and distal behavioral outcomes. Findings indicated that classroom adjustment was associated with a decreased likelihood of acting out, juvenile delinquency, and adult arrest for the entire study sample, and the significant associations still existed in alternative model specifications. In separate subgroup analyses, classroom adjustment was associated with acting out, juvenile delinquency, and adult arrest for general education students. Classroom adjustment was associated with acting out and adult arrest for students with grade retention. For students with high-incidence disabilities, classroom adjustment had negative effects only on acting out but not on juvenile delinquency and adult arrest.

At the family level, parent involvement was associated with a decreased likelihood of acting out for the entire study sample and students with grade retention only in separate subgroup analyses. Parent involvement had no effects on distal behavioral outcomes (i.e., juvenile delinquency and adult arrest) for the entire study sample and the separate subgroups. On the other hand, the patterns of child maltreatment predicting behavioral outcomes were inconsistent. The child maltreatment/acting out association was only found significant for students with later-identified disabilities. The child maltreatment/juvenile delinquency association was found significant for the entire study sample, but was not significant in alternative model specifications. In addition, child maltreatment did not have any association with adult arrest.

For the entire study sample, at the school level, CPC program participation was associated with a decreased likelihood of juvenile delinquency. In separate subgroup analyses, CPC program participation was not related to any proximal or distal behavioral outcomes for the separate subgroups. Magnet school attendance had no effects on acting

out, but was related to juvenile delinquency and adult arrest for the entire study sample and general education students in separate subgroup analyses. No significant patterns of magnet school attendance predicting juvenile delinquency and adult arrest were found for students with disabilities and students with grade retention only. School mobility had no predictive effects on acting out and juvenile delinquency for the entire study sample and the separate subgroups. The school mobility/adult arrest associations were found for the entire study sample and general education students in separate subgroup analyses. The number of years in special education placement and any grade retention were not significantly related to any behavioral outcomes for the entire study sample and the separate subgroups.

Separate subgroup analyses showed that individual, family, and school level factors were not predictive of acting out, juvenile delinquency, and adult arrest for students with high-incidence disabilities. The exception was the classroom adjustment/acting out association. Separate subgroup analyses appeared less likely to show statistical significance due to the small sample size. To increase the power to detect statistically significant differences, interaction tests for the entire study sample were employed as a more appropriate and valid approach to determine whether a differential effect existed. Based on the interaction tests, there was no evidence of moderating effects for high-incidence disabilities on the relationships between individual, family, and school level factors on acting out, juvenile delinquency, and adult arrest. That is, high-incidence disabilities did not have any differential effect on individual, family, and school level factors. The interaction tests helped to validate the predictive patterns of behavioral problems for high-incidence disabilities and increased the power

to detect any predictive effects. The results from the interaction tests for the entire study sample were used to determine the predictive patterns of individual, family, and school level factors on later behavioral problems for students with high-incidence disabilities. Overall, distinct predictive patterns of determinants at the individual, family, and school levels were associated with acting out, juvenile delinquency, and adult arrest. Reading comprehension, classroom adjustment, and parent involvement were associated with the occurrence of acting out. Classroom adjustment, child maltreatment, CPC program participation, and magnet school attendance were related to juvenile delinquency. Classroom adjustment, magnet school attendance, and school mobility were associated with adult arrest.

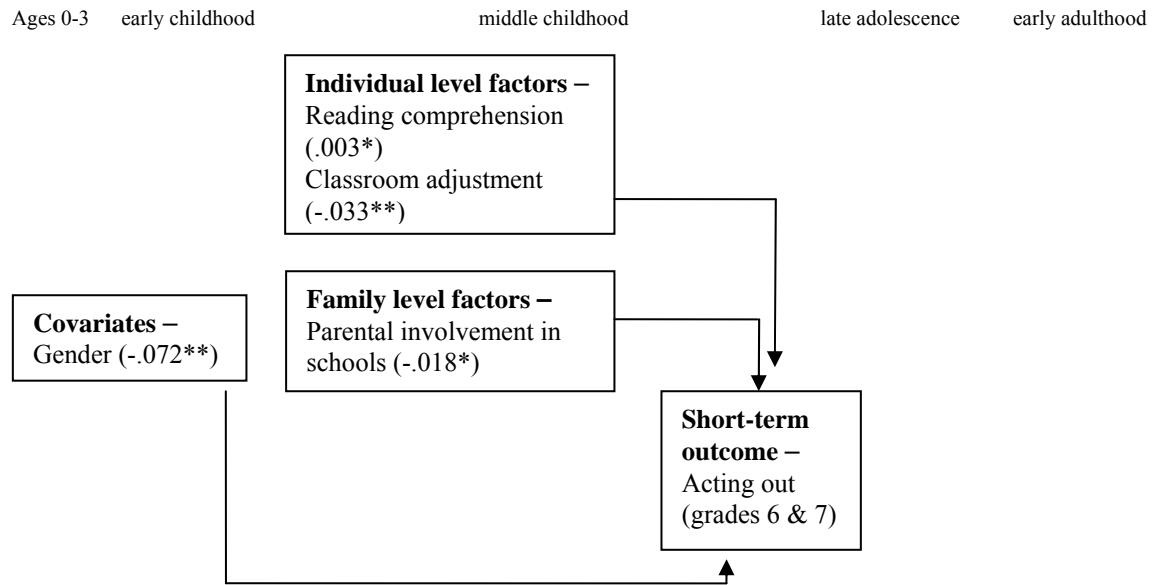


Figure 6. Predictive patterns of acting out for students with high-incidence disabilities

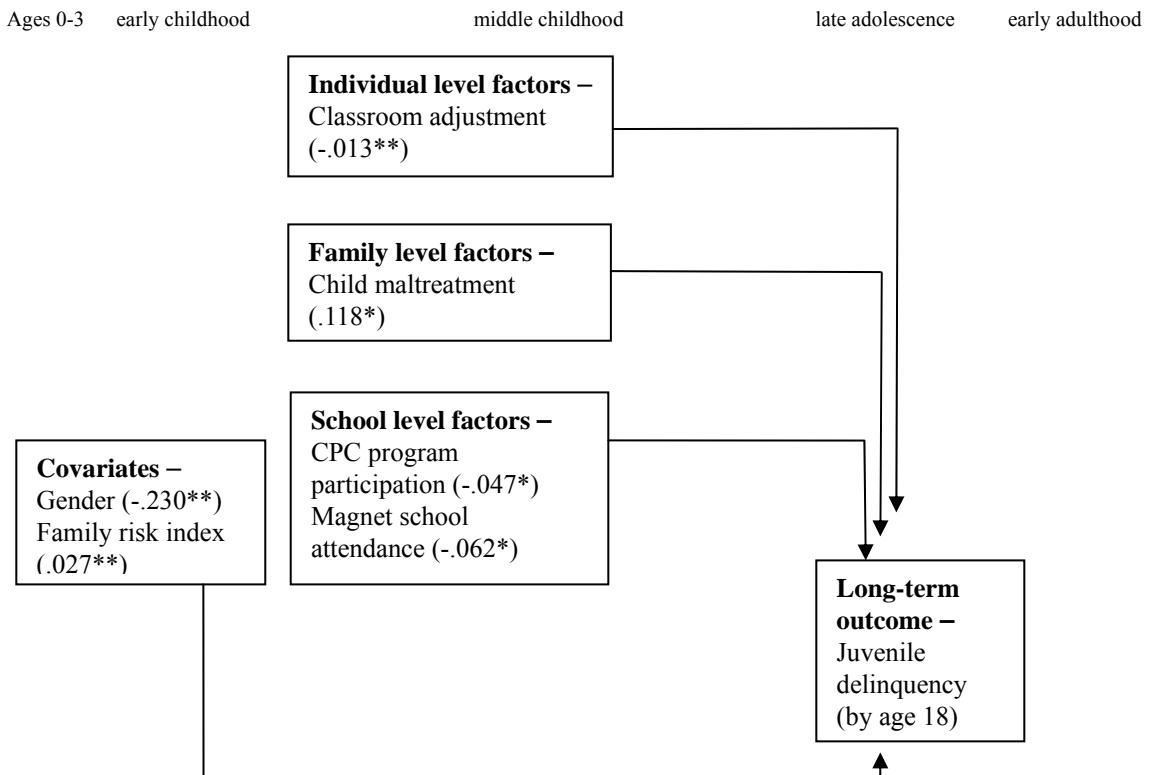


Figure 7. Predictive patterns of juvenile delinquency for students with high-incidence disabilities

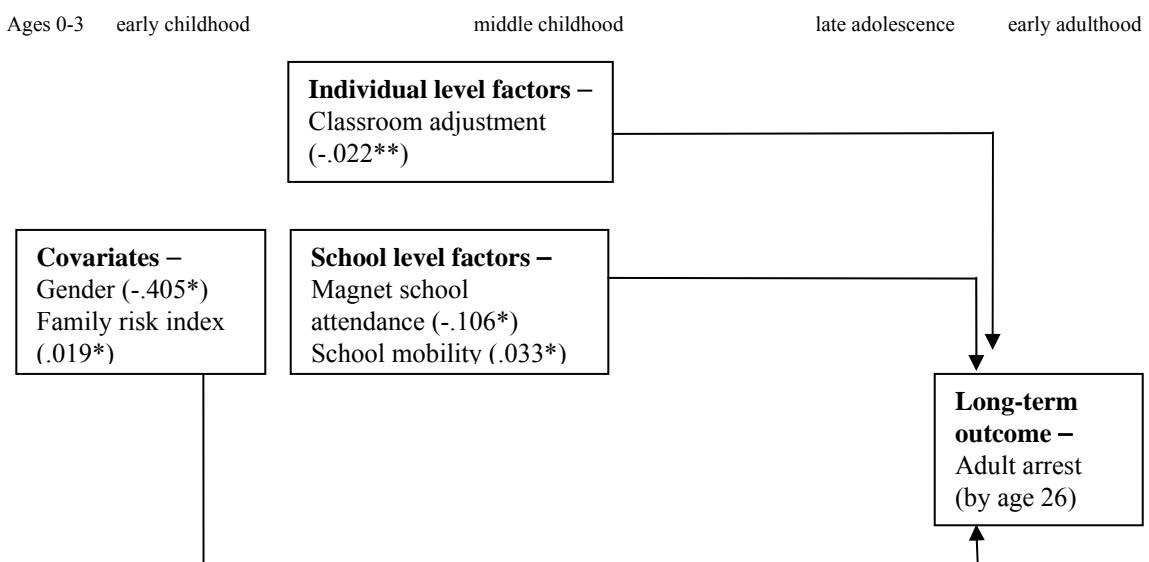


Figure 8. Predictive patterns of adult arrest for students with high-incidence disabilities

Relative Importance of Individual, Family, and School Level Factors

The study further examined the relative importance and contributions of individual, family, and school level factors for students with high-incidence disabilities. To explore the relative importance of individual, family, and school level factors in a sequential way, covariates were entered first as the base model, followed by individual level factors, then family level factors, then school level factors. The relative importance was evaluated according to the addition over and above the contributions accounted for by the prior sets of predictors. Covariate variables accounted for a significant amount of the variance in acting out, juvenile delinquency, and adult arrest (.050, .142, and .163, respectively). Results showed that the addition of individual, family, and school level factors all contributed to a significant increase in explaining the variance in acting out, juvenile delinquency, and adult arrest beyond the variance accounted for by the covariates. Individual level factors explained more variance for acting out, juvenile delinquency, and adult arrest, relative to family and school level factors, for the entire study sample, with a R^2 change of .083, .016, and .018, respectively (see Table 24 and Figure 9).

As shown in Table 25 and Figure 10, for students with high-incidence disabilities in grades 1 through 6, in general, covariate variables accounted for a significant amount of the variance in acting out, juvenile delinquency, and adult arrest (.147, .082, and .204, respectively). The addition of individual, family, and school level factors all contributed to a significant increase in explaining the variance in acting out, juvenile delinquency, and adult arrest beyond the variance accounted for by the covariates. For proximal behavioral outcomes, individual level factors had more influence on acting out, relative

to family and school level factors, with a R^2 change of .089. For distal behavioral outcomes, school level factors had more influence on juvenile delinquency and adult arrest, relative to individual and family level factors, with a R^2 change of .025 and .046, respectively. Similarly, for students with high-incidence disabilities in grades 1 through 12, covariates also accounted for a similar amount of the variance in acting out, juvenile delinquency, and adult arrest (.093, .081, and .177, respectively). School level factors explained more of the variance in acting out, juvenile delinquency, and adult arrest than individual and family level factors, with a R^2 change of .026, .024, and .035, respectively.

To sum up, individual level factors explained a significant amount of variation in acting out, juvenile delinquency, and adult crime for the entire study sample. For students with high-incidence disabilities, individual level factors explained a greater amount of the variance for acting out compared to family or school level factors. School level factors explained more of the variance for juvenile delinquency and adult arrest compared to individual and family level factors.

Table 24. Hierarchical Regression Analysis of Individual, Family, and School Level Predictors Predicting Acting Out, Juvenile Delinquency, and Adult Arrest from for the Primary Study Group (N=1370)

Steps/Predictors	Acting out (ages 12-13)				Juvenile delinquency (by age 18)				Adult arrest (by age 26)			
	Log likelihood	LRX ²	R ²	R ² change	Log likelihood	LRX ²	R ²	R ² change	Log likelihood	LRX ²	R ²	R ² change
Step 1. Covariates	-471.482	49.34	.050**		-595.330	196.91	.142**		-781.835	303.85	.163**	
Step 2. Covariates + Individual level	-429.506	131.71	.133**	.083	-579.321	217.11	.158**	.016	-759.958	135.71	.181**	.018
Step 3. Covariates + Individual level + Family level	-426.335	137.26	.139**	.006	-573.806	224.05	.163**	.005	-754.675	342.97	.185**	.004
Step 4. Covariates + Individual level + Family level + School level	-418.890	142.90	.146**	.007	-564.628	238.30	.174**	.011	-742.256	354.19	.193**	.008

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10).

Table 25. Hierarchical Regression Analysis of Individual, Family, and School Level Predictors Predicting Acting Out, Juvenile Delinquency, and Adult Arrest for High-Incidence Disabilities (Grades 1-6 & 1-12)

Steps/Predictors	Acting out (ages 12-13)				Juvenile delinquency (by age 18)				Adult arrest (by age 26)			
	Log likelihood	LRX ²	R ²	R ² change	Log likelihood	LRX ²	R ²	R ² change	Log likelihood	LRX ²	R ²	R ² change
Grades 1-6												
Step 1. Covariates	-51.510	17.76	.147*		-73.315	13.05	.082+		-63.226	32.34	.204**	
Step 2. Covariates + Individual level	-46.157	28.46	.236**	.089	-70.194	14.54	.094	.012	-61.462	32.89	.211**	.007
Step 3. Covariates + Individual level + Family level	-45.898	28.98	.240**	.004	-69.350	16.23	.105	.011	-60.669	34.47	.221**	.010
Step 4. Covariates + Individual level + Family level + School level	-42.869	31.99	.272*	.032	-66.539	19.87	.130	.025	-56.386	40.99	.267**	.046
Grades 1-12												
Step 1. Covariates	-75.846	15.49	.093*		-98.159	17.33	.081*		-83.199	35.70	.177**	
Step 2. Covariates + Individual level	-73.804	19.58	.117*	.024	-95.810	17.46	.084*	.003	-82.050	35.44	.178**	.001
Step 3. Covariates + Individual level + Family level	-72.751	21.68	.130*	.013	-94.244	.038	.099*	.015	-81.223	37.09	.186**	.008
Step 4. Covariates + Individual level + Family level + School level	-69.314	25.61	.156	.026	-90.782	25.35	.123	.024	-77.013	43.77	.221**	.035

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10).

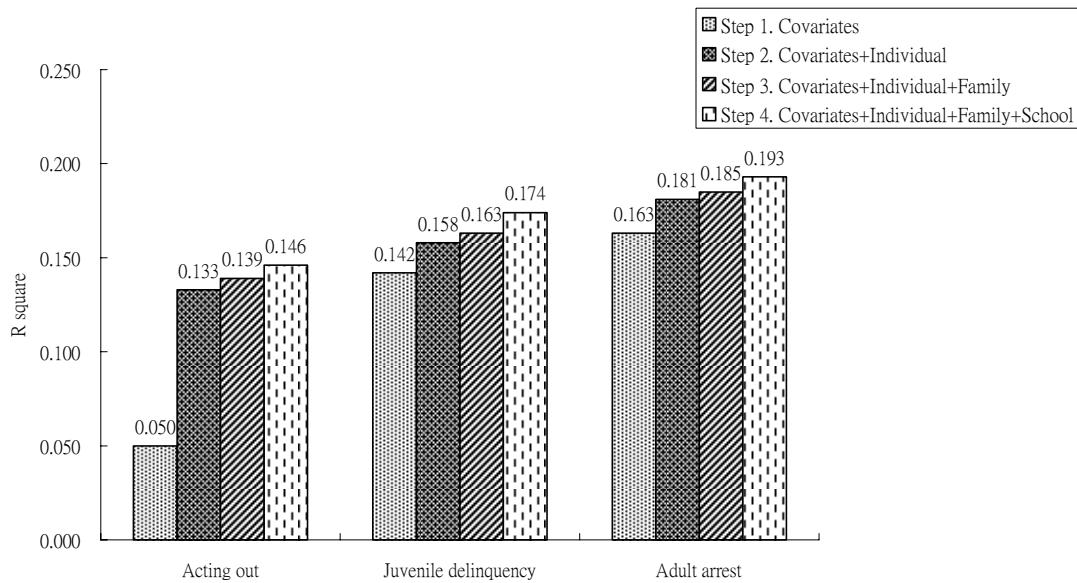


Figure 9. The variation of behavioral problems explained by individual, family, and school level factors for the entire study sample

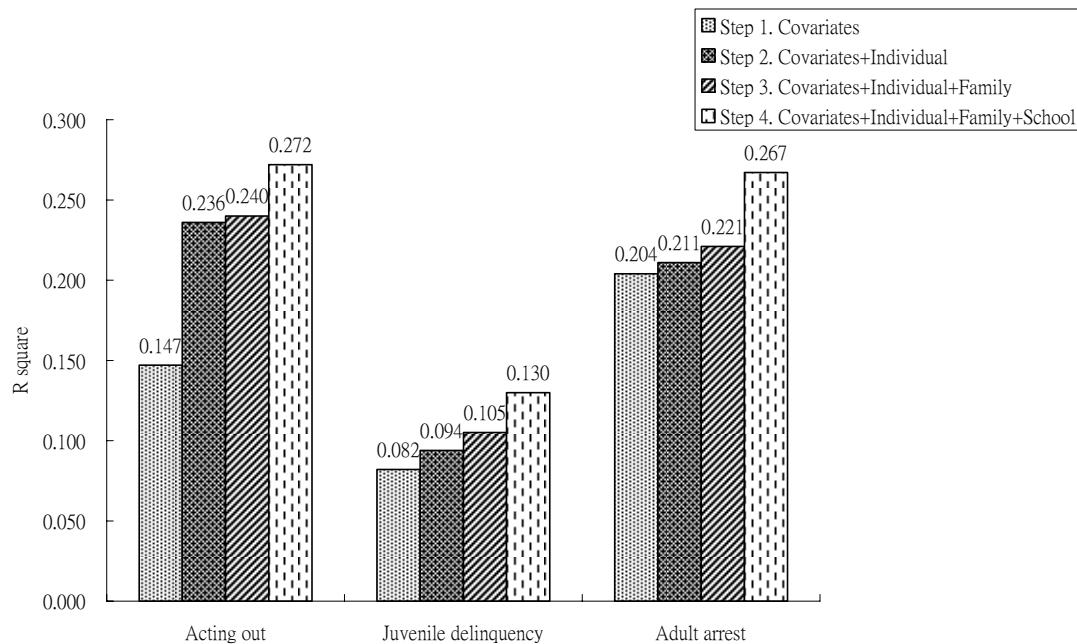


Figure 10. The variation of behavioral problems explained by individual, family, and school level factors for students with high-incidence disabilities (grades 1-6)

Summary for the Predictive Effects of Individual, Family, and School Level***Factors on Later Behavioral Problems***

Research question 2 examined whether individual, family, and school level factors predicted acting out, juvenile delinquency, and adult arrest. At the individual level, reading comprehension had no predictive effects on acting out, juvenile delinquency, and adult arrest with the exception of the reading comprehension/acting out association for the entire study sample and general education students in the analyses of the independent and combined relationships. Classroom adjustment was the most consistent and robust predictor associated with proximal and distal behavioral outcomes in the analyses of the independent and combined relationships. Classroom adjustment was associated with a decreased likelihood of being engaged in acting out, juvenile delinquency, and adult arrest for the entire study sample and for general education students. However, for subgroups of students with disabilities and students with grade retention only, classroom adjustment did not consistently predict each behavioral outcome. For students with high-incidence disabilities, the predictive effects of classroom adjustment were only found for acting out, but not for juvenile delinquency and adult arrest in the analyses of the independent and combined relationships.

At the family level, parent involvement was significantly associated with proximal and distal behavioral outcomes for the entire study sample in the analyses of the independent relationships. However, parent involvement was only predictive of acting out in the analyses of the combined relationships. In separate subgroup analyses, parent involvement was associated with proximal and distal behavioral for general education students in the analyses of the independent relationships, but the association did not exist

in the analyses of the combined relationships. Parent involvement had no predictive effects on proximal and distal behavioral outcomes for students with disabilities and students grade retention only. On the other hand, child maltreatment had no significant effects on acting out, but was predictive of juvenile delinquency and adult arrest for the entire study sample in the analyses of the independent and combined relationships, but the association did not hold while controlling interaction terms. Most linkages were not significant in separate subgroup analyses. The only significant child maltreatment/acting out association was found for students with later-identified disabilities.

At the school level, the CPC program participation/juvenile delinquency associations were only significant for the entire study sample and general education students in the analyses of the independent and combined relationships. Magnet school attendance had no proximal effect on acting out, but had a distal effect on juvenile delinquency and adult arrest for the entire study sample and general education students. School mobility was positively associated with adult arrest for the entire study sample and general education students in the analyses of the independent and combined relationships. In general, most school level factors were not predictive of acting out, juvenile delinquency, and adult arrest for students with disabilities and grade retention histories.

In separate subgroup analyses for high-incidence disabilities, the classroom adjustment/acting out association was the only significant relationship in the analyses of the independent and combined relationships. However, in the full model with the interaction terms of individual, family, and school level factors multiplies by high-incidence disabilities, the patterns of individual, family, and school level factors

related to each behavioral outcome were consistent when adding subtypes of disabilities and different interaction term pile-ups. Specifically, there was no evidence for the moderating effects of high-incidence disabilities on the relationships between individual, family, and school level factors on acting out, juvenile delinquency, and adult arrest. Findings suggested that students with high-incidence disabilities did not have differential patterns of individual, family, and school level factors on behavioral outcomes compared with the entire at-risk sample.

Due to the limited sample size and insufficient power in separate subgroup analyses for high-incidence disabilities, the predictive patterns of predictors and their relations to behavioral outcomes for the entire study sample could be employed to indicate possible predictive effects for students with high-incidence disabilities. Findings showed that the development of negative behavioral outcomes was determined by multifaceted factors. Distinct patterns of determinants were predictive of acting out, juvenile delinquency, and adult arrest at the individual, family, and school levels. Reading comprehension, classroom adjustment, and parent involvement were associated with the occurrence of acting out. Classroom adjustment, CPC program participation, child maltreatment, and magnet school attendance were related to juvenile delinquency. Classroom adjustment, magnet school attendance, and school mobility had impacts on adult arrest.

To summarize the relative importance of predictors for the entire study sample, the entry of individual level factors showed a significant increase in the explained variance in acting out, juvenile delinquency, and adult arrest. Family level factors appeared to be less important than school level factors for predicting behavioral outcomes. For students

with high-incidence disabilities, individual level factors explained more of the variance in acting out than family and school level factors. However, individual level factors were less important than school level factors in predicting juvenile delinquency and adult arrest.

Moderating Effects of Ecological Factors at the Family and School Levels on the Individual Level Factors-Behavioral Problems Associations

Individual level factors were the primary focus for this study. For each behavioral outcome, predictors at the individual, family, and school levels were all employed in the full models. In addition to the primary predictor variables, the moderating effects of ecological factors at the family and school levels were included to determine the degree to which the change in the relationships between individual level factors and behavioral outcomes was influenced by the moderating variables. Parent involvement and school mobility were investigated as primary moderators in the reading comprehension -behavioral problems associations and the classroom adjustment-behavioral problems associations.

Children who performed at a higher level in academic achievement and had higher classroom adjustment were hypothesized to respond differently to parent involvement and school mobility. For example, children with higher parent involvement might have higher academic performance than those with lower parent involvement. With the full model as the reference point, interaction terms (reading comprehension \times parent involvement, reading comprehension \times school mobility, classroom adjustment \times parent involvement, and classroom adjustment \times school mobility) were entered into the model to test for the moderating effects. The significance level to evaluate the interaction terms

was set at .01 (more stringent than the significant level for evaluating the main effects). Additionally, alternative model specifications, including interaction terms of individual, family, and school level factors by high-incidence disabilities as well as by grade retention only, were used to validate the patterns of individual, family, and school level factors on behavioral outcomes for students with high-incidence disabilities.

Moderating Effects in Subgroups with High-Incidence Disabilities

This research question narrowed the focus specifically to students with high-incidence disabilities in grades 1 through 6 and grades 1 through 12. Separate subgroup analyses were used to investigate the main effects and moderating effects for students with high-incidence disabilities in grades 1 through 6 and 1 through 12, respectively (see Table 26).

Acting out

In terms of the main effect, classroom adjustment was significantly associated with acting out for students with high-incidence disabilities in elementary grades, but not in grades 1 through 12. In terms of the moderating effects, there was no evidence of a hypothesized moderating effect for family or school level factors on the relationships between individual level factors and negative behavioral outcomes; that is, parent involvement or school mobility did not have a differential effect on the level of academic performance and classroom adjustment

Juvenile Delinquency

There were no main effects for individual, family, or school level factors predicting any behavioral outcomes for students with high-incidence disabilities in elementary grades. A significant main effect for child maltreatment was found for

students with high-incidence disabilities in grades 1 through 12. Interaction tests indicated that parent involvement and school mobility did not moderate the reading comprehension/juvenile delinquency association and the classroom adjustment/juvenile delinquency association.

Adult Arrest

No main effects were found for individual, family, or school level factors for students with high-incidence disabilities in elementary grades and grades 1 through 12. Additionally, the relationships between individual level factors and adult arrest did not vary as a function of parent involvement and school mobility. The reading comprehension/adult arrest association and the classroom adjustment/adult arrest association were consistent regardless of more or less parent involvement or school mobility.

To sum up, when including the moderators into the previous full models, the patterns of the main effects of individual, family, and school level factors on behavioral problems remained the same as the full model for students with high-incidence disabilities. Classroom adjustment was the only variable predicting acting out. No significant moderating effects were found and the magnitude of the relationships between individual, family, and school level factors and behavioral problems did not vary across the level of parent involvement and classroom adjustment.

Table 26. Marginal Effects of Individual, Family, and School Level Predictors Predicting Acting Out, Juvenile Delinquency, and Adult Arrest for High-Incidence Disabilities (Moderating Effects, Covariate-Adjusted Analyses)

Predictors	Acting out		Juvenile delinquency		Adult arrest	
	High-incidence (grades 1-6, N=119)	High-incidence (grades 1-12, N=157)	High-incidence (grades 1-6, N=119)	High-incidence (grades 1-12, N=157)	High-incidence (grades 1-6, N=119)	High-incidence (grades 1-12, N=157)
Individual level						
Reading comprehension	.008	.007	.006	.003	-.005	-.006
Classroom adjustment	-.073*	-.027	-.029	-.009	-.016	-.002
Family level						
Parent involvement in schools	-.006	-.030	.041	-.015	-.035	-.037
Any child maltreatment	.201	.303	.259	.308*	-.019	.056
School level						
Any CPC program participation	-.140	-.069	-.098	-.090	-.159	-.036
Any magnet school attendance	.528+	.052	.002	-.004	.291+	.171
School mobility	.019	-.044	.008	-.001	-.079	-.064
Number of years in special education placement	-.006	-.053	-.049	-.034	-.030	-.039
Any grade retention	.089	-.011	-.048	.008	-.092	-.087
Interaction terms						
Reading comprehension × Parent involvement in schools	-.001	-.005	-.004	-.004	.007+	.005
Reading comprehension × School mobility	.001	.002	-.006	-.001	-.000	-.000
Classroom adjustment × Parent involvement in schools	.042*	.032*	.023	.026+	-.027	-.004
Classroom adjustment × School mobility	.046+	.008	.046+	.027	-.023	-.010
Covariates						
Gender (female)	-.129	-.201+	-.216+	-.297**	-.621**	-.571**
Race/ethnicity (African-American)	-.178	.096	.124	.102	.470**	.403*
Family risk index	.055	.007	.040	.039	.037	.029
Low birthweight (<2,500gms)	.037	.205	.103	.026	-.088	-.111
Child welfare history	-.095	-.259*	.214	.063	.122	.140
Student word analysis	.000	.002	-.001	.004	.005	.006
Propensity score	-1.626*	-.661	-.688	-1.169+	-.201	-.429
Log likelihood	-39.188	-67.187	-64.016	-88.758	-54.420	-75.530
LRX ²	39.35	29.87	24.92	29.39	44.92	46.74
Prob> X ²	.006	.072	.205	.080	.001	.000
Pseudo R ²	.334	.182	.163	.142	.292	.236
Number of observation	94	126	114	152	114	152

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10).

Interaction Tests for the Effects of the Presence/Absence of High-Incidence***Disabilities on the Relationships***

In addition to separate subgroup analyses, interaction tests for the data from the entire study sample were used to determine whether a differential effect existed and indicated the possible effects for high-incidence disabilities. Alternative predictor models including disability status and interaction terms (individual, family, and school level factors multiplied by high incidence disabilities and grade retention only) for the base model were used to predict acting out, juvenile delinquency, and adult arrest (see Tables 27, 28, & 29).

Acting out

As shown in Table 27, when including moderators into the full models, the patterns of individual, family, and school level factors for acting out remained. Reading comprehension, classroom adjustment, and parent involvement were associated with acting out for the entire study sample. No significant interaction terms were found in the model. That is, parent involvement and school mobility did not moderate the reading comprehension/acting out association and the classroom adjustment/acting out association. The patterns of the predictive effects remained regardless of controlling for disability status and the interaction terms of individual, family, and school level factors by multiplied high-incidence disabilities and grade retention only.

Juvenile Delinquency

When including moderators into the full models, classroom adjustment, child maltreatment, and CPC program participation were associated with juvenile delinquency for the entire study sample (see Table 28). No significant interaction terms were found in

the model. In other words, parent involvement and school mobility did not moderate the reading comprehension/juvenile delinquency association and classroom adjustment/juvenile delinquency association. The patterns of the predictive effects remained despite controlling for disability status and the interaction terms of individual, family, and school level factors multiplied by high-incidence disabilities and grade retention only.

Adult Arrest

As shown in Table 29, when including moderators into the full models, the patterns of individual, family, and school level factors predicting adult arrest remained. Classroom adjustment, magnet school attendance, and school mobility were associated with adult arrest for the entire study sample. However, no significant interaction terms were found in the model. That is, the reading comprehension/adult arrest association and classroom adjustment/adult arrest association did not vary across the level of parent involvement and school mobility. Additionally, the findings indicated that the significant patterns of individual, family, and school level factors predicting adult arrest remained regardless of controlling for disability status and the interaction terms of individual, family, and school level factors multiplied by high-incidence disabilities and grade retention only.

Table 27. Marginal Effects of Individual, Family, and School Level Predictors Predicting Acting Out
 (Moderating Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-6)

Predictors	Full model	Model A	Model B	Model C
Disability status				
Students with high incidence disabilities (grades 1-6)	.037	.025	.022	
Students with other disabilities (grades 1-6)	.008	.012	-.005	
Later-identified students (after grade 6)	.143	.162+	.124	
Students with grade retention histories only ^c	.014	.552		
General education students w/o special education & grade retention ^{a,b}				-.014
Individual, family, & school level				
Reading comprehension	.003*	.003*	.003*	.003*
Classroom adjustment	-.033**	-.033**	-.032**	-.033**
Parent involvement in schools	-.019*	-.020*	-.020*	-.020*
Any Child maltreatment	.052	.045	.052	.045
Any CPC program participation	-.030	-.026	-.026	-.026
Any magnet school attendance	.006	.013	-.004	.013
School mobility	-.005	-.003	-.003	-.003
Number of years in special education placement	-.003	-.002	.175	-.002
Any Grade retention	-.032	-.038	-.043	-.038
Interaction terms				
Reading comprehension × Parent involvement in schools	-.001	-.000	-.001	-.000
Reading comprehension × School mobility	.001	.001	.001	.001
Classroom adjustment × Parent involvement in schools	.003	.003	.003	.003
Classroom adjustment × School mobility	.002	.002	.003	.002
Hi16 × Reading comprehension	.002	.001	.001	.001
Hi16 × Classroom adjustment	-.023	-.019	-.020	
Hi16 × Parent involvement in schools	.022	.010	.021	
Hi16 × Any child maltreatment	.043	.029	.039	
Hi16 × Any CPC program participation	-.152	-.159	-.144	
Hi16 × Any magnet school attendance	.224	.197	.216	
Hi16 × School mobility	.005	.022	.012	
Hi16 × Number of years in special education placement	-.029	-.032	-.028	
Hi16 × Any grade retention	-.043	-.040	-.038	
Grade retention only × Reading comprehension				-.000
Grade retention only × Classroom adjustment				-.036
Grade retention only × Parent involvement in schools				-.022
Grade retention only × Any child maltreatment				-.066
Grade retention only × Any CPC program participation				-.055
Grade retention only × Any magnet school attendance				-.103
Grade retention only × School mobility				-.174
Grade retention only × Any grade retention				-.007
Covariates				
Gender (female)	-.074**	-.064**	-.064**	-.064**
Race/ethnicity (African-American)	.031	.031	.025	.031
Family risk index	.007	.005	.005	.005
Low birthweight (<2,500gms)	-.003	-.002	.004	-.002
Child welfare history	.021	.024	.029	.024
Student word analysis	-.000	-.000	-.000	-.000
Propensity score	-.023	-.004	-.010	-.004
Log likelihood	-417.738	-412.975	-408.954	-412.975
LRX ²	145.12	154.73	162.77	154.73
Prob>X ²	.000	.000	.000	.000
Pseudo R ²	.148	.158	.166	.158
Number of observation	1042	1042	1042	1042

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C.

Table 28. Marginal Effects of Individual, Family, and School Level Predictors Predicting Juvenile Delinquency (Moderating Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-6)

Predictors	Full model	Model A	Model B	Model C
Disability status				
Students with high incidence disabilities (grades 1-6)	.234	.248+	.235	
Students with other disabilities (grades 1-6)	.024	.030	.025	
Later-identified students (after grade 6)	.125	.112	.127	
Students with grade retention histories only ^c	-.001	.288		
General education students w/o special education & grade retention ^{a,b}				.001
Individual, family, & school level				
Reading comprehension	.000	.000	.000	.000
Classroom adjustment	-.011**	-.010*	-.010*	-.010*
Parent involvement in schools	-.011	-.015+	-.014	-.015+
Any Child maltreatment	.121*	.108+	.103+	.108+
Any CPC program participation	-.051*	-.055*	-.057*	-.055*
Any magnet school attendance	-.057+	-.063+	-.059+	-.063+
School mobility	-.012	-.013	-.011	-.013
Number of years in special education placement	.009	.002	-.135	.002
Any Grade retention	-.000	.003	.003	.003
Interaction terms				
Reading comprehension × Parent involvement in schools	-.001+	-.001	---	-.001
Reading comprehension × School mobility	.001	.001	.000	.000
Classroom adjustment × Parent involvement in schools	.003	.004	.004	.004
Classroom adjustment × School mobility	-.007+	-.007+	-.008*	-.007+
Hi16 × Reading comprehension	.003	.003	.003	
Hi16 × Classroom adjustment	-.009	-.008	-.009	
Hi16 × Parent involvement in schools	.064	.070	.064	
Hi16 × Any child maltreatment	.054	.079	.054	
Hi16 × Any CPC program participation	-.090	-.065	-.090	
Hi16 × Any magnet school attendance	.084	.109	.084	
Hi16 × School mobility	-.003	.009	-.003	
Hi16 × Number of years in special education placement	-.052	-.052	-.052	
Hi16 × Any grade retention	-.087	-.103	-.087	
Grade retention only × Reading comprehension		-.005		
Grade retention only × Classroom adjustment		.009		
Grade retention only × Parent involvement in schools		.029		
Grade retention only × Any child maltreatment		.088		
Grade retention only × Any CPC program participation		.076		
Grade retention only × Any magnet school attendance		.142		
Grade retention only × School mobility		.022		
Grade retention only × Any grade retention		-.050		
Covariates				
Gender (female)	-.232**	-.233**	-.237**	-.233**
Race/ethnicity (African-American)	.027	.029	.024	.029
Family risk index	.028**	.027**	.027**	.027**
Low birthweight (<2,500gms)	-.015	-.016	-.023	-.016
Child welfare history	.035	.036	.034	.036
Student word analysis	---	.000	.000	.000
Propensity score	-.192	-.179	-.169	-.179
Log likelihood	-561.026	-554.828	-550.349	-554.828
LRX ²	245.50	257.90	266.86	257.90
Prob>X ²	.000	.000	.000	.000
Pseudo R ²	.180	.189	.195	.189
Number of observation	1350	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C. “---” variable is dropped because of collinearity or predicting failure perfectly.

Table 29. Marginal Effects of Individual, Family, and School Level Predictors Predicting Adult Arrest
(Moderating Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-6)

Predictors	Full model	Model A	Model B	Model C
Disability status				
Students with high incidence disabilities (grades 1-6)	.075	.109	.068	
Students with other disabilities (grades 1-6)	.003	.027	-.004	
Later-identified students (after grade 6)	.169+	.231*	.162	
Students with grade retention histories only ^c	.007	.113		
General education students w/o special education & grade retention ^{a,b}				-.007
Individual, family, & school level				
Reading comprehension	-.000	.000	-.000	.000
Classroom adjustment	-.022**	-.022**	-.022**	-.022**
Parent involvement in schools	-.015	-.015	-.016	-.015
Any Child maltreatment	.119+	.108	.108	.108
Any CPC program participation	.012	.013	.012	.013
Any magnet school attendance	-.103*	-.098*	-.105*	-.098*
School mobility	.033*	.035*	.036*	.035*
Number of years in special education placement	-.005	.003	-.095	.003
Any Grade retention	-.047	-.041	-.095	-.041
Interaction terms				
Reading comprehension × Parent involvement in schools	-.000	-.000	-.000	-.000
Reading comprehension × School mobility	.000	.001	-.000	.001
Classroom adjustment × Parent involvement in schools	.002	.002	.001	.002
Classroom adjustment × School mobility	-.001	-.003	-.004	-.003
Hi16 × Reading comprehension		-.004	-.003	-.004
Hi16 × Classroom adjustment		.006	.003	.006
Hi16 × Parent involvement in schools		-.017	-.018	-.017
Hi16 × Any child maltreatment		-.042	-.026	---
Hi16 × Any CPC program participation		-.152	-.142	-.152
Hi16 × Any magnet school attendance		.396	.374+	---
Hi16 × School mobility		-.063	-.093	-.063
Hi16 × Number of years in special education placement		-.027	-.034	-.027
Hi16 × Any grade retention		-.143	-.022	-.143
Grade retention only × Reading comprehension			---	
Grade retention only × Classroom adjustment			-.012	
Grade retention only × Parent involvement in schools			-.008	
Grade retention only × Any child maltreatment			.051	
Grade retention only × Any CPC program participation			.020	
Grade retention only × Any magnet school attendance			-.056	
Grade retention only × School mobility			-.061	
Grade retention only × Any grade retention			.281+	
Covariates				
Gender (female)	-.405**	-.405**	-.394**	-.405**
Race/ethnicity (African-American)	.057	.049	.044	.049
Family risk index	.019*	.018+	.017+	.018+
Low birthweight (<2,500gms)	-.017	-.016	-.020	-.016
Child welfare history	.133+	.136+	.128	.136+
Student word analysis	.001	.001	.001	.001
Propensity score	.276	.301	.306	.301
Log likelihood	-741.883	-735.091	-731.480	-735.091
LRX ²	354.93	368.52	375.74	368.52
Prob>X ²	.000	.000	.000	.000
Pseudo R ²	.193	.200	.204	.200
Number of observation	1350	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C. “---” variable is dropped because of collinearity or predicting failure perfectly.

Alternative Analysis for Age Specifications

Subsequent analyses were conducted for testing whether the patterns were consistent between students with high-incidence disabilities in grades 1 through 6 and in grades 1 through 12. Appendices 13, 14, and 15 present alternative age-specific models which examined the patterns of acting out, juvenile delinquency, and adult arrest for students with high-incidence disabilities in grades 1 through 12. The patterns of main effects for individual, family, and school level factors for predicting acting out, juvenile delinquency, and adult arrest were equivalent between students with high-incidence disabilities in elementary grades and grades 1 through 12. The patterns of the interaction terms for high-incidence disabilities in elementary grades were identical to high-incidence disabilities in grades 1 through 12.

Summary for the Moderating Effects on the Individual Level Factors-Behavioral Problems Associations

Overall, the main effects were robust for acting out, juvenile delinquency, and adult arrest regardless of controlling interaction terms and age specifications. The classroom adjustment/acting out association was only found for students with high-incidence disabilities in elementary grades in separate subgroup analyses. In the interaction tests, high-incidence disabilities did not moderate the relationships between individual, family, and school level factors and behavioral outcomes. The interaction tests helped to validate the patterns of behavioral outcomes for high-incidence disabilities and increased the power to detect predictive effects. Furthermore, in terms of the moderating effects of selected family and school level factors, parent involvement and school mobility did not moderate the main-effect association between individual

factors and acting out, juvenile delinquency, and adult arrest. The relationships of individual factors to behavioral outcomes were not conditional on family and school level variables such as parent involvement and school mobility. There was no evidence of the hypothesized moderating effects of family and school level factors on the relationships between individual level factors and the involvement of negative behavioral outcomes. In other words, family and school level factors did not have a differential effect on levels of academic performance or classroom adjustment.

CHAPTER 5

DISCUSSION

This study investigated the predictors of behavioral problems for students with high-incidence disabilities. The research addressed different manifestations of behavioral problems including acting out in middle childhood, juvenile delinquency in late adolescence, and adult arrest in early adulthood. In this chapter, major contributions, major findings of the main effects and the moderating effects, limitations of the study, and implications for practice and future research are discussed.

Major Contributions

This study has several contributions to improve our understanding of the development of behavioral problems for students with high-incidence disabilities and to provide information for intervention practices and policy decisions.

Robust Findings with Longitudinal Data

This study used prospective, longitudinal data to test the development of negative behavioral outcomes for students with disabilities. Early child and family characteristics as well as individual, family and school experience were collected prospectively, which increased the spectrum of variables that might determine the development of behavioral outcomes (Redden, Mulvihill, Wallander, & Hovinga, 2000). Covariate measures were collected at ages 0-5. Predictor variables were primarily collected in elementary grades, prior to behavioral problems. Behavioral problems were systematically collected over a long period by age 26. The temporal sequence in the framework of this study provided more valid information to infer possible causal relationships between predictor variables and outcome variables. However, it is always possible that there were extraneous

variables which were not measured or controlled. Any inferences should be considered as correlational instead of causal in principle.

Investigation of the Main Effects and Moderating Effects

This is one of the first studies to examine the main and moderating effects of predictors on age-specific manifestations of behavioral problems at different developmental stages for students with high-incidence disabilities. In addition to the association between disability status and behavioral problems, this study identified the patterns of behavioral problems for students with high-incidence disabilities on the basis of the ecological framework integrating risk and protective factors at the individual, family, and school levels. This study further probed moderators at the family and school levels and examined whether the relationships between individual level factors and behavioral problems varied by the level of parent involvement and school mobility. The understanding of the relative influences of the individual and ecological contexts provided by this study can help researchers, practitioners, and policy makers consider relevant components of program design from an ecological risk/protective perspective.

Disability status and behavioral problems. This study examined the relationships between disability status, high-incidence disabilities in particular, and different manifestations of negative behavioral outcomes. Disability status is directly linked to elevated rates of problem behavior into adulthood. The predictive value of adult crime is new and especially significant. Moreover, students with high-incidence disabilities have significantly increased risk of problem behaviors into adulthood. These also are new findings and reflect the special challenges of schools and families in meeting children's educational and social needs. These findings warrant higher levels of confidence than

previous studies because of the prospective longitudinal data and an extensive set of control variables.

Examinations of alterable predictors. In addition to early child and family risk characteristics (i.e., gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student word analysis), the current study investigated alterable predictors in childhood such as reading comprehension, classroom adjustment, parent involvement, child maltreatment, CPC program participation, magnet school attendance, school mobility, the number of years in special education, and grade retention. The effects of alterable predictors may provide researchers and practitioners with guidance for designing more targeted intervention.

Investigation of differential patterns for high-incidence disabilities. To date, most comparable studies in special education have methodological problems including small sample sizes and the lack of the comparison group. This study investigated the predictive patterns of behavioral problems for the entire sample. The predictive patterns of behavioral problems for students with high-incidence disabilities were also investigated in separate subgroup analyses. Due to the relatively small sample size and the lack of statistical power in separate subgroup analyses, statistical tests of interaction for the data from the entire study sample were further applied as an alternative and appropriate approach to validate whether the patterns of the relationships varied by high-incidence disabilities. The interaction tests increase the power to detect statistically significant differences and make reliable interpretations about predictive effects. Findings showed that the patterns of association between childhood predictors and behavioral problems did not vary or differentiate by the presence/absence of high-incidence disabilities.

These results found in this study provide a better identification of whether these are differential patterns of effects on behavioral problems for high-incidence disabilities, which may further help tailor interventions for behavioral problems.

Investigation of the influence of combinations of factors. Regarding the limitations of risk research, little is known about the influence of combinations of risk or protective factors on subsequent outcomes for a given group (Redden et al., 2000). This study examined the independent relationships and the combined relationships between multifaceted factors and behavioral problems. Distinct predictive patterns were found for each behavioral problem. This study also examined the relative importance of individual, family, and school level factors. For the entire study sample, individual level factors contributed more to acting out, juvenile delinquency, and adult arrest than family and school level factors. For high-incidence disabilities, individual level factors contributed more to acting out than to juvenile delinquency and adult arrest which were more influenced by family and school level factors. These findings are new in special education research. While the pattern of predictors was generally the same for students with high-incidence disabilities and for the entire study sample, school and family level factors were stronger determinants of delinquency and adult crime for students with high-incidence disabilities.

Investigation of the influence of moderators. Specifying how ecological factors interact with individual level factors to generate behavioral problems may help refine the design of prevention and intervention programs. Moderating effects can provide further information for researchers, practitioners, and policy makers about the main effects of individual level factors on behavioral problems. The moderation analyses used in this

study examined the main effects combined with the moderating effects of ecological factors influencing the relationships between individual level factors and behavioral outcomes. The level of parent involvement and school mobility did not influence the direction and/or magnitude of the relationships between individual level factors and behavioral problems.

Reliable and unbiased estimated effects. In addition to unadjusted analyses, covariate-adjusted analyses and robustness tests which controlled for comprehensive background characteristics related to the outcome variables were applied in this study to increase statistical power and to achieve more reliable and unbiased estimated effects on outcome variables. Moreover, application of propensity scores improved the predictive power to investigate the patterns of outcome measures. The current findings indicated that propensity scores given the covariates were independent of each behavioral outcome measure, thus the attrition was not confounded.

Summary of Major Findings

The main-effect findings indicated that the presence of disabilities was associated with a heightened risk of behavioral problems. Students with high-incidence disabilities were more likely than general education students to be engaged in acting out, juvenile delinquency, and adult crime. Additionally, behavioral problems were predicted by distinct patterns of determinants at the individual, family, and school levels. In general, high-incidence disabilities and the combination of early child and family risks (gender and family risk index), individual level factors (reading comprehension and classroom adjustment), family level factors (parent involvement and child maltreatment), and school level factors (CPC program participation, magnet school attendance, and school

mobility) were associated with behavioral problems. Importantly, interaction tests validated consistent predictive patterns of behavioral problems between students with/without high-incidence disabilities. Last, no significant moderating effects were found to change the direction and/or the magnitude of the associations between individual level factors and behavioral problems. The direction and magnitude of the hypothesized relations between individual level factors and behavioral problems did not vary by the level of parent involvement and/or school mobility.

Association between High-Incidence Disabilities and Behavioral Problems

This study investigated the main-effect association between disability status and later behavioral problems. Students identified with disabilities had a greater likelihood of acting out (effect size, .23), juvenile delinquency (effect size, .37), and adult arrest (effect size, .25) than non-disabled students when gender, race/ethnicity, family risk index, low birthweight, child welfare history, and student word analysis were statistically controlled for. When controlling for student school readiness in alternative model specifications, the main effect remained consistent, suggesting that it was not likely to be influenced by an alternative variable. This relation between disability status and later behavioral problems is consistent with previous findings. Students identified with disabilities are more likely to have poor proximal and distal outcomes in educational and behavioral domains than non-disabled students (Affleck et al., 1990; Blackorby & Wagner, 1996; Bryant et al., 1995; Doren et al., 1996; Frank et al., 1995; Wagner, 1995; Wagner et al., 1992; Wagner et al., 2005). Overall, the current results imply that the presence of disabilities, in and of itself, is a risk factor predicting acting out, juvenile delinquency, and adult arrest.

Specifically, a primary purpose of this study was to examine prospectively whether students identified with high-incidence disabilities were more likely to have behavioral problems than non-disabled students at different developmental timepoints. The group contrast analyses further examined group differences between students with high-incidence disabilities and general education students on behavioral problems. The presence of high-incidence disabilities was associated with a greater likelihood of being involved in acting out, juvenile delinquency, and adult arrest compared to general education students, regardless of the covariates mentioned above. The group differences are consistent with prior studies. Students with mild disabilities had poorer social skills and adaptive behavior and exhibited more behavior problems compared to non-disabled students (Gresham & MacMillan, 1997; Gresham et al., 1987). Children with LD exhibited significant behavioral deficits or delinquent and criminal behavior compared to non-disabled students (Bender & Smith, 1990; Blackorby & Wagner, 1996; Broder et al., 1981; Bryant et al., 1995; Keilitz & Dunivant, 1987; McConaughy & Ritter, 1986). Likewise, students with ED also exhibited relatively high externalizing problem behavior (Epstein et al., 1985; Kauffman et al., 1987; Lane, 2004; Lane & Wehby, 2002; Nelson et al., 2003; Wagner, 1995; Wehby et al., 2003) and had higher arrest and incarceration rates compared to non-disabled students (Carson et al., 1995; Doren et al., 1996; Frank et al., 1995; Kauffman, 2001; Landrum et al., 2003; Malmgren et al., 1998; Osher et al., 2003; U.S. Department of Education, 2001; Wagner et al., 1992). Group differences between students with high-incidence disabilities and general education students found in this study suggest that research needs to identify specific predictors related to later behavioral problems for students with high-incidence disabilities and

whether the predictive patterns of behavioral problems for students with high-incidence disabilities are identical with general education students.

This study also provided an indirect opportunity to explore the issue regarding early identification and intervention for students with disabilities as a way to improve student behavioral problems. Students identified with disabilities after grade 7 (86.4% high-incidence disabilities) had a higher likelihood of acting out, juvenile delinquency, and adult arrest relative to students identified with high-incidence disabilities before grade 7 and other subgroups of students. As Jonson-Reid et al. (2001) reported, the onset of ED services was related to the occurrence of arrest and incarceration; there was an increased incidence of arrest and incarceration for students with late identification and late onset of special education placement service. It appeared that the needs of students with ED might not be identified or detected soon enough before their involvement with delinquent and criminal behavior. The current result implies that early identification and intervention for students with high-incidence disabilities is important to reduce the likelihood of subsequent behavioral problems.

Predictive Effects of Individual, Family and School Level Factors

Few studies have tried to disentangle the relationship between high-incidence disabilities and behavioral problems. To better understand the individual and contextual influences on behavioral problems, the linkage between individual, family, and school level factors and behavioral problems were assessed for students with high-incidence disabilities. As found in this study, the interaction tests showed that no differential predictive patterns for behavioral problems existed with the presence/absence of high-incidence disabilities. The predictive effects of childhood variables at the

individual, family, and school levels on subsequent acting out, juvenile delinquency, and adult arrest did not vary by the presence/absence of high-incidence disabilities. The predictive patterns of behavioral problems for high-incidence disabilities were identical to those for the entire study sample. Evidence has shown that behavioral problems are complexly determined by multifaceted factors in various domains such as individual, family, and school (Hawkins et al., 1992; Keogh & Weisner, 1993; Loeber & Hay, 1997; Patterson et al., 1989). Consistent with previous research, heterogeneous predictors related to the developmental manifestations of behavioral problems were further identified in this study. Gender, reading comprehension, classroom adjustment, and parent involvement played the primary role in children's acting out in school settings. Gender, family risk index, classroom adjustment, child maltreatment, CPC program participation, and magnet school attendance were primary precursors of juvenile delinquency. Gender, family risk index, classroom adjustment, magnet school attendance, and school mobility were primary predictors of adult arrest.

Being male has been shown to predict antisocial behavior including conduct problems in childhood (Kazdin, 1987), juvenile delinquency (Doren et al., 1996; Elliott et al., 1985), and adult crime (Federal Bureau of Investigation, 1989). Consistent with prior studies, the current results found that being male was a strong risk factor predicting acting out, juvenile delinquency, and adult arrest for the entire study sample and specifically for high-incidence disabilities. Even though being male appears to be a strong and robust factor consistently predicting acting out, juvenile delinquency, and adult arrest in this study, obviously it is not an alterable predictor and is not amenable to practical prevention and intervention in schools.

It is necessary to investigate alterable predictors related to the development of behavioral problems for developing prevention and intervention programs. As found in this study, at the individual level, classroom adjustment was a strong predictor for different manifestations of behavioral problems. At the family level, parent involvement had effects on the proximal, short-term behavioral problems (i.e., acting out). The effects of child maltreatment were discernable for distal behavioral outcomes such as delinquency in adolescence. School level factors (i.e., CPC program participation, magnet school attendance, school mobility) were associated with later delinquent and criminal behavior in adolescence and adulthood. In each of these categories, the variables are in principle amenable to alteration or accommodation. Findings within each level were discussed as follows.

Individual level. For individual level factors, consistent findings have shown that academic difficulties are one of the most important risk factors for the development of antisocial behavior (Broder et al., 1981; Cullinan et al., 1992; Fessler et al., 1991; Hawkins et al., 1988; Hinshaw, 1992a; Hinshaw et al., 1993; Lane, 1980; Loeber & Farrington, 2000; Luebke, et al., 1989; Maguin & Loeber, 1996; Patterson et al., 1989; Rutherford et al., 1985; Winters, 1997; Zimmerman et al., 1981). Prior studies also have found a significant association between poor academic performance, particularly reading difficulties, and the development of problem behavior for students with ED (Coutinho, 1986; Doren et al., 1996; Kauffman et al., 1987). The results in this study did not replicate prior findings, and no evidence of significant association between reading comprehension and behavioral problems was found above and beyond the contributions of other predictors and covariates. The non-significant association between reading

comprehension and juvenile delinquency as well as adult arrest might be due to the complicated relationships with classroom adjustment and other family and school level factors, which might have overpowered the effects of reading comprehension. For example, Tremblay et al. (1992) found no academic difficulties/delinquency association when controlling early disruptive behavior.

Social competence has been considered to be an integral part of the development of problem behavior in prior research. Negative attributions as well as poor problem-solving abilities and social skills were correlated with child conduct problems (Webster-Stratton & Lindsay, 1999). Social skill deficits were found to be correlated with antisocial and delinquent behavior (Dishion et al., 1983; Sørlie et al., 2008). Otherwise, social competence was associated with lower levels of depression, anxiety, delinquency, and antisocial behavior (Gresham & Elliott, 1990). For students with disabilities, classroom adaptive behavior (e.g., following directions and persistence in completing tasks) was associated with fewer disciplinary incidents at school, but classroom maladaptive behavior was associated with more disciplinary incidents (Blackorby et al., 2007). Good problem-solving abilities and interpersonal skills were associated with better behavioral outcomes for high-risk adolescents with aggression and ED (Vance et al., 2002). Consistent with previous findings, the current study found a solid and robust association between classroom adjustment and behavioral problems. Classroom adjustment was consistently associated with lower rates of acting out, juvenile delinquency, and adult arrest.

Family level. According to the current results, in the analyses of the independent relationships, parent involvement was associated with lower rates of acting out, juvenile

delinquency, and adult arrest. In the analysis of the combined relationships, parent involvement appeared to be linked with acting out, but the impact did not persist for juvenile delinquency or adult arrest. Disrupted parenting practices, inconsistent and harsh discipline and the lack of parent supervision were risk factors predictive of subsequent delinquent and criminal behavior (Loeber & Dishion, 1983; Patterson, 1986; Patterson et al., 1989). Poor parenting practices formed a base for early problem behavior and also had cumulative and long-term effects on the development of antisocial behavior in adolescence and adulthood (Farrington, 1978; Loeber & Stouthamer-Loeber, 1986; Patterson, 1982). Negative parent-child relationships in childhood were risk factors associated with negative behavior outcomes for students with ED (Vance et al., 2002). In this study, parent involvement in school activities, as measured by teacher rating, did not predict juvenile delinquency or adult arrest above and beyond other predictors. The inconsistent results might be due to the specific measure used, which relied on teacher rating instead of parent self-report. There might be measurement bias because of the different informants. In addition, the relation between family factors and behavioral problems included only parent involvement in school activities, not parent influence in the home setting. Data on parenting practices, parent-child relationships, or parent supervision in home settings were not collected. Therefore, the relationship between parent involvement rated by teacher and later behavioral problems might be not clearly discernable due to the lack of complementary measures of parent involvement.

Child maltreatment was associated with an increased likelihood of juvenile delinquency and adult arrest in the analyses of independent relationships; child maltreatment was associated with only juvenile delinquency in the analysis of the

combined relationships. The current results are similar to previous findings that child neglect/abuse was associated with a highlighted risk of subsequent delinquent and criminal offenses (Farrington, 1998; McCord et al., 2001; Silverman et al., 1996; Vega et al., 1993).

In addition to family level factors in elementary grades, family dynamics at home, such as the composite family risk index in early childhood (ages 0-3), showed a significant influence on subsequent juvenile delinquency and a marginally significant impact on adult arrest, suggesting early family risk index contributed to juvenile delinquency and adult arrest. These results are consistent with previous studies. Prior evidence has shown that early family adversity is a risk factor for the development of problematic behavioral outcomes. Several aspects of family could be early risk factors in child development, such as low-income (Wagner et al., 2003), single-parent households (McHale et al., 2003; Tremblay et al., 1997), poorly educated or unemployed parents (McHale et al., 2003), as well as teenage mother and family size (Farrington, 1998; McCord et al., 2001), all of which were associated with highlighted risks of subsequent delinquency and criminal offenses.

School level. This study did not find significant associations between school level factors and acting out. A predictive effect was found for CPC program participation and the occurrence of juvenile delinquency. CPC program participation was associated with a decreased likelihood of juvenile delinquency, similar to previous findings. Prior studies indicated that early intervention for at-risk children and youth were associated with a decreased likelihood of being engaged in juvenile delinquency (Reynolds, Chang, & Temple, 1998; Reynolds, Temple, Robertson, & Mann, 2001). CPC program

participation was not associated with a decrease of adult arrest in this study, however.

Further research will be necessary to examine whether CPC program participation is associated with the frequency, severity, or variety of adult crime.

Magnet school attendance was associated with a decreased likelihood of juvenile delinquency and adult arrest regardless of the analyses of the independent and combined relationships as well as alternative model specification in this study. These findings are consistent with previous studies. Evidence has shown that the academic quality of schools is associated with the level of school crime and violence (Verdugo & Schneider, 1999). Research in school climate demonstrated that providing opportunities for students to achieve mastery level, to facilitate academic performance, and to accommodate weakness in academic and behavioral deficits decreased the likelihood of being engaged in antisocial behavior (Glasser, 1998; McEvoy & Welker, 2000). Low-achieving performance and high rates of disruptive behavior were frequent in poorly performing schools (McEvoy & Welker, 2000)

Previous studies found that unstable learning settings influenced student academic difficulties and negative behavioral problems (Demie, 2002; Marder et al., 2003). Students experiencing school moves had greater adjustment difficulties or higher school dropout from high schools for students with ED (Tobin & Sugai, 1999). Students dropping out from schools were more likely to be arrested than students who did not drop out (Doren et al., 1996). As found in this study, school mobility had significant predictive effects on adult arrest, suggesting that academic and social instability in school contexts may be associated with increased rates of adult arrest. Nevertheless, school mobility was not associated with acting out or juvenile delinquency. School

mobility may be related to other variables such as poor student-teacher relationships, peer relationships, low academic performance, or school dropout, which impact the development of problem behavior. The indirect effects need to be investigated to understand the pathways between school mobility and the development of behavioral problems.

The association between the number of years in special education placement and later behavioral problems was not significant. The number of years in special education placement was examined to determine the effectiveness of the educational services to defer or reduce the likelihood of subsequent acting out, juvenile delinquency and adult arrest. However, the non-significant associations suggested that longer special education placement was not associated with less involvement in acting out, juvenile delinquency or adult arrest. The goals of special education services are to improve educational outcomes, reduce behavioral difficulties, and facilitate school success for students identified with disabilities. There are no data on the quality of special education placement; therefore, the impact of the quality of special education placement services on later behavioral problems is uncertain. The influence of quality of special education placement services on student behavioral problems needs to be addressed in the future research.

Similarly, the current study found no relationships between grade retention and behavioral problems regardless of the analyses of the independent and combined relationship as well as alternative model specifications. Evidence has shown that grade retention and truancy are associated with antisocial behavior (McCord et al., 2001). The current results are not consistent with previous findings. The impact of grade retention

on behavioral problems might be overpowered by other variables at the individual, family, and school levels.

Relative importance of predictors at the individual, family, and school levels. After the independent and combined relationships between individual, family, and school level factors and behavioral problems were identified, the relative importance of these predictors was considered. For the entire study sample, it appears that individual level factors in elementary grades contributed to explain the variance in acting out, juvenile delinquency, and adult arrest to a greater degree than family and school level factors. On the other hand, particularly for students with high-incidence disabilities, individual level factors explained more of the variance in acting out but school and family level factors accounted for more of the variance in juvenile delinquency and adult arrest for students with high-incidence disabilities.

Moderating Effects of Ecological/Contextual Predictors at the Family and School Levels

This study examined whether the predictive patterns of individual level factors on behavioral problems varied by the level of parent involvement and school mobility. While including the moderating effects in the full model, the current results showed that the patterns of the main effects of individual level factors on behavioral problems were consistent. No interaction effects for parent involvement or school mobility were found. The relationships between individual level factors and acting out, juvenile delinquency, and adult arrest did not change as a function of the level of parent involvement or school mobility. There were no differential effects of reading comprehension on behavioral outcomes for groups with higher or lower levels of parent involvement or school mobility. Similarly, there were no differential effects of classroom adjustment on

behavioral problems for groups with higher or lower levels of parent involvement or school mobility. There is a lack of research on the moderating effects of parent involvement and school mobility on the relationships between individual level factors and behavioral outcomes. Through the investigation of the moderating effects, the current study provided further information about group differences in relation to individual level factors and behavioral outcomes.

Limitations of the Study

Limited Analysis of Relevant Mechanisms

Individual characteristics and experience within family and school contexts may be interrelated and influence subsequent behavioral outcomes. These intertwined relations among these predictors may influence the variations of behavioral problems for students with high-incidence disabilities at different time points. However, the causal relationship remains unclear due to the possible influence of confounding variables. Evidence of causality can be obtained by more sophisticated analyses controlling confounding variables and ruling out plausible alternative explanations. Probing moderating/mediating effects is one approach to promote better understanding of relevant processes and mechanisms for the development of negative behavioral outcomes. Although the current study examined the moderating effects of parent involvement and school mobility on the relationships between individual factors and negative behavioral outcomes, possible alternatives which were not ruled out might pose validity threats to the analyses.

Limited Indicators of Outcome Measures

The diversity of outcome variables was limited. The outcome variables were

dichotomous variables which indicated any occurrence of acting out, juvenile delinquency, and adult arrest. However, there were several alternative outcome variables which could have been used to validate the robustness of the current results. For example, the indicators for acting out, juvenile delinquency, and adult arrest could be based on severity (e.g., felony or conviction arrest), frequency (e.g., one or more times, two or more times), and variety of delinquency or crime (e.g., drug, property, or violent). Because of the limits in the selected outcome variables, this study could not examine whether the developmental patterns of social behavior problems varied by how they were defined or measured.

Generalizability

The generalizability of the current results to other areas or populations was limited because the study sample was specifically drawn from one school district and the same cohort of low-income children. Using the existing dataset from the CLS, the sample was representative of at-risk children in low-income area in Chicago, who attended early childhood intervention programs. The current results may not be generalized to students living in rural areas because the participants lived in impoverished urban areas. Furthermore, most of the sample was predominantly African-American. Therefore, generalizability of the research results to other race/ethnicity groups is limited.

Implications for Practice, Policy, and Future Research

This study addressed problematic behavioral outcomes of importance and great concern to policy makers and practitioners. A better understanding of predictors for acting out, juvenile delinquency, and adult arrest should assist researchers, educators, and policymakers to develop and facilitate appropriate services. This study has several

critical implications for practice (e.g., assessment and identification practices, school intervention and remedial services), policy decisions, and future research.

Implications for Practice

Understanding the associations between risk/protective factors and behavioral problems is critical for accurate identification, assessment, and intervention for students with high-incidence disabilities. Identifying characteristics of children and youth that are associated with later behavioral problems can help to determine intervention targets. However, the availability of adequate assessment methods to identify risk and protective factors related to behavioral problems is currently limited. Consequently, there is a need to design more comprehensive assessments to screen the precursors of problem behavior and make interventions responsive to risk factors. The current results found distinct predictors related to acting out, juvenile delinquency, and adult arrest in an ecological framework. These predictors associated with behavioral problems included early child and family risks (gender and family risk index), individual factors (reading comprehension and classroom adjustment), family factors (parent involvement and child maltreatment), and school factors (CPC program participation, magnet school attendance, and school mobility). Researcher and practitioners need to implement appropriate screening methods based on these variables to target students who might be at risk for later behavioral problems.

The presence of disabilities was a risk factor for the development of acting out, juvenile delinquency, and adult arrest. Findings indicated that later identified students in grades 7 through 12 (84.7% high-incidence disabilities) had a greater likelihood of being involved in problematic behavioral outcomes compared to students identified with

high-incidence disabilities in elementary grades and other subgroups. One of the goals in special education is to defer or decrease the likelihood of problematic behavioral outcomes. The timing of the identification and intervention for the onset and progression of behavioral problems is a critical issue. Students with behavioral deficits should be identified prior to the onset of serious problem behavior and receive intervention to weaken the progression of behavioral problems in a timely manner.

Research on identifying risk and protective factors can provide valuable information to guide and develop effective and empirically-tested strategies. Effective intervention focuses not only on eliminating risk factors, but also on maximizing protective factors for behavioral problems (Kazdin, 1997). Risk and protective factors associated with behavioral problems represent feasible intervention targets. For example, early child and family risks (e.g., gender and family risk index), child maltreatment, and school mobility were risk factors associated with behavioral problems. On the other hand, classroom adjustment, parent involvement, CPC program participation, and magnet school attendance were protective factors which reduced the likelihood of behavioral problems. The current results suggest the needs for educational or social services to develop strategies to attenuate risk factors and facilitate protective factors in the development of behavioral problems.

Single-component interventions addressing only one single risk factor are not likely to be effective for meeting the complex needs of students. Poor long-term outcomes in single-component intervention have been identified (Kazdin, 1993; Patterson et al., 1989). For example, receiving social skills training might improve classroom maladjustment and might lead to the decreased likelihood of later antisocial

behavior. However, there are no clear and definitive conclusions related to the effects of social skills training (Skaret & Wilgosh, 1989). Due to the influences of individual, family, and school, effective intervention practices should be multifaceted programs which are supported by multidisciplinary team including educators, parents, and other support personnel in schools and communities. Hawkins et al. (1992) suggested that multi-component interventions are more effective than interventions focusing on a single factor or context to alter and modify the influence of various ecological domains. Such approaches are not merely modifying characteristics of children but are altering child-environment interactions (e.g., family, school, or peer group dynamics) (Bloomquist & Schnell, 2002).

It is necessary to build a school-wide behavior support system which consists of a continuum of positive behavioral support to address the needs of all students. A three-tiered continuum of school-wide instructional and positive behavior support includes primary prevention (school-/classroom-wide systems for all students, staff, and settings), secondary prevention (specialized group systems for students with at-risk behavior), and tertiary prevention (specialized individualized systems for students with high-risk behavior). Since no differential patterns were found for high-incidence disabilities based on the interaction tests, no differential program components may be required for students with high-incidence disabilities. However, because of the association between disability status and behavioral problems, students with LD and ED should be targeted for intensive and indicated individualized intervention.

Policy Decisions

Research identifying risk and protective factors associated with behavioral

problems among subtypes of students (i.e., high-incidence disabilities) can be informative for determining a federal research agenda and funding priorities in terms of evidence-based programs. The association between disability status and negative behavioral outcomes has implications for policy decisions. The timing of the identification and intervention for the onset and progression of behavioral problems is a critical issue. The current findings indicated that students with later-identified disabilities after elementary grades (84.7% high-incidence disabilities) had a greater likelihood of being involved in behavioral problems compared to high-incidence disabilities in elementary grades and other subgroups. Findings suggested that early screening or intervention for children with disabilities in school systems might reduce the likelihood of greater acting out, juvenile delinquency, and adult arrest and indirectly decrease social costs.

Increased awareness of negative behavioral outcomes of students with high-incidence disabilities may provide an opportunity for building a supportive environment. Understanding the relationship between the presence/absence of disabilities and delinquent and criminal behavior would and should likely inform criminal justice policy and practice. A disproportionate number of youth in the correctional system have disabilities and mental health issues. Addressing the needs of children and youth with disabilities who are at risk for delinquent or criminal behavior or who have already entered into the correctional system and providing adequate treatment for offenders with disabilities are important issues. Students entering the correctional system remain eligible for special education and other educational services. Adequate educational service and placement for students with disabilities should be

provided in the correctional system. Integrated programs should be developed between school and the juvenile justice system to help students rehabilitate and transit into the mainstream of school contexts (McHale et al., 2003). Support for high school completion, transition planning, and career preparation are necessary for helping students transit to employment and enhance social interaction in community life. Inter-agency coordination among educational system, justice system, and communities is necessary for transition success (McHale et al., 2003).

Future Research

The longitudinal study is one approach to explore the potential causality between predictors and antisocial behavior (Farrington, Ohlin, & Wilson, 1986). However, analyses in the current study were insufficient to disentangle the complexity of the causal mechanisms underlying the developmental pathways of behavioral problems. Given the interactions and transactions among individual, social, familial, and behavioral variables, further research needs to examine mediating effects to understand the developmental pathways leading to acting out, juvenile delinquency, and adult crime. Transactional models involving specific interactive linkages among multiple levels of variables over time (e.g., demographic characteristic, psychobiological, familial, peer-related, wider social contexts) should be examined. The challenge is to derive models with sufficient rigor and complexity to handle the diversity of factors. Structural equation models have been used to test such relationships.

This study examined the distinct patterns of predictors related to different manifestations of behavioral problems; however, development trajectories were not examined. Even though the manifestations varied, considerable continuity was

embedded among the changes of deviant behaviors over time (Loeber, 1990). Early problem behavior was associated with the risk of subsequent antisocial behavior in childhood, adolescence, and adulthood (Bongers et al., 2004; Campbell, 1990; Conroy & Brown, 2004; Elliott et al., 1985; Farrington, 1998; Hawkins et al., 1992; Kellam et al., 1998; Rabiner et al., 2000; White et al., 1994). Prior research has indicated that approximately half of the antisocial children in the study samples continue to be involved in delinquent acts, and nearly half to three quarters of delinquent adolescents continue to commit adult offenses (Blumstein, Cohen, & Farrington, 1988; Farrington, 1987). The current study did not examine how early manifestations were associated with subsequent manifestations and the paths and the progression of the development of deviant behavior. Preliminary findings indicated significant correlations from .21 to .39 among acting out, juvenile delinquency, and adult arrest. Future research needs to examine factors related to the developmental pathways of antisocial behavior to help break the antisocial process.

The influence of multiple factors from individual and contextual settings on the development of problematic behavioral outcomes may vary across the life course (Tremblay & LeMarquand, 2001). Most data on individual, family, and school factors were collected in elementary grades in this study. The factors measured in elementary grades might not have long-term effects associated with juvenile delinquency and adult arrest. Future research needs to collect longitudinal data on variables at multiple time points to determine whether these effects affect the emergence and progression of behavioral problems during the specific developmental period or across the life span. Future research also needs to examine the developmental threshold after which the

influence of specific variables decreases. For example, factors proximal to juvenile delinquency and adult arrest such as deviant peer affiliations or neighborhood characteristics appear to influence delinquent behavior in adolescence. Otherwise, family influence had less influence on juvenile delinquency than deviant peer affiliations, which indicates a shift from family to peer influence (Dishion et al., 1991).

A greater understanding of specific individual, family, and school level factors that directly or indirectly operate or interact with each other and contribute to or prevent the development of behavioral problems is needed. Research should diversify the types of measures for predictor and outcome variables. For example, for family influence, instead of or in addition to using parent involvement in school activities, family factors such as family conflict, inconsistent disciplinary, poor parent supervision and management, and poor parenting could be included as variables. For negative behavioral outcomes, age of onset, frequency, severity, or variety of behavioral problems could be considered alternative outcomes. The relationship between predictors and behavioral problems might vary by indicators of behavioral outcomes. Future research needs to examine the predictors of frequency, severity, and type of behavioral problems during childhood, adolescence, and adulthood.

Conclusion

The purpose of this study was to examine the influence of disability status and multifaceted factors in childhood on acting out in middle childhood, juvenile delinquency in late adolescence, and adult arrest in early childhood. A developmental, ecological framework was applied to understand the influence of individual, family, and school factors on later behavioral problems. Findings indicated that the presence of

disabilities was a risk factor for the development of behavioral problems. Children and youth with high-incidence disabilities had higher rates of negative behavioral outcomes including acting out, juvenile delinquency, and adult arrest than general education students. Findings indicated that acting out, juvenile delinquency, and adult arrest were related to multiple factors in different domains. In addition to early child and family risk (gender and family risk index), the existence of high-incidence disabilities and the combination of individual factors (reading comprehension, classroom adjustment), family factors (parent involvement and child maltreatment), and school factors (CPC program participation, magnet school attendance, and school mobility) were associated with negative behavioral outcomes. No significant moderating effects were found to change the direction and/or magnitude of the relationships between individual level factors (e.g., classroom adjustment and reading comprehension) and behavioral problems.

We need to know more about the vulnerability and needs of students with high-incidence disabilities in prevention research, in particular the relationships between disabilities and later behavioral problems such as acting out, juvenile delinquency, and adult arrest. Understanding the influence of ecological factors on negative behavioral outcomes should help researchers and practitioners develop and test effective prevention and intervention practices to prevent behavioral problems for students with high-incidence disabilities. The components of the services should focus on various contexts including individual, family, and school from an ecological risk/protective perspective to alter the developmental liabilities of students with high-incidence disabilities.

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APPENDICES

Appendix 1. Marginal Effects of Disability Status Predicting Acting Out, Juvenile Delinquency, and Adult Arrest for Primary Study Sample (Robustness Test)

	Acting Out		Juvenile Delinquency		Adult Arrest	
	Model A	Model B	Model C	Model D	Model E	Model F
Predictors						
Students with disabilities (grades 1-12)	.079*		.098**		.091*	
Students with disabilities (grades 1-6)		.048		.075*		.055
Covariates						
Gender (female)	-.113**	-.121**	-.251**	-.257**	-.429**	-.435**
Race/ethnicity (African-American)	.073*	.076*	.039	.042	.106+	.110*
Family risk index	.014+	.014+	.033**	.033**	.030**	.031**
Low birthweight (<2,500gms)	.008	.008	-.004	-.006	-.005	-.006
Child welfare history	-.007	-.004	.063	.066	.162*	.163*
Student word analysis	-.001	-.001	-.001	-.002+	-.001	-.001
Student school readiness	-.004*	-.004*	.000	.000	-.002	-.002
Propensity score	-.146	-.155	-.184	-.189	.074	.067
Log likelihood	-464.717	-466.717	-589.619	-592.314	-778.440	-780.221
LR χ^2	62.87	58.87	208.34	202.95	310.64	307.08
Prob> X^2	.000	.000	.000	.000	.000	.000
Pseudo R^2	.063	.059	.150	.146	166	.164
Number of observation	1056	1056	1370	1370	1370	1370

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).
+significant at .10 level (two tailed, p<.10).

Appendix 2. Unadjusted Means of Behavioral Outcomes for Subtypes of Students

Groups with different status (up to age 12)	Students with high incidence disabilities (grades 1-6)	Students with other disabilities (grades 1-6)	Later-identified students (after grade 6)	Students with grade retention only	General education students w/o special education & grade retention
Behavioral outcomes	N=119	N=73	N=44	N=250	N=884
Acting out (ages 12-13, %)	32.3	21.4	42.9	21.5	13.3
Juvenile delinquency (by age 18, %)	39.5	26.0	50.0	26.4	14.3
Adult arrest (by age 26, %)	61.3	49.3	77.3	50.8	35.2

Appendix 3. Unadjusted Means of Behavioral Outcomes for Subtypes of Students

Groups with different status (up to age 12)	Students with high incidence disabilities (grades 1-12)	Students with other disabilities (grades 1-12)	Students with grade retention only	General education students w/o special education & grade retention
Behavioral outcomes	N=157	N=79	N=250	N=884
Acting out (age 12-13, %)	35.9	20.3	21.5	13.3
Juvenile delinquency (by age 18, %)	42.0	27.9	26.4	14.3
Adult arrest (by age 26, %)	65.6	50.6	50.8	35.2

Appendix 4. Marginal Effects of Group Contrast of Subtypes of Students Predicting Acting out, Juvenile Delinquency, and Adult Arrest (Robustness Analyses)

Predictors	Behavioral outcomes	Acting out (ages 12-13)	Juvenile Delinquency (by age 18)	Adult Arrest (by age 26)
Subgroups				
Students with high incidence disabilities (grades 1-6)	.105*	.149**	.120*	
Students with other disabilities (grades 1-6)	.030	.052	.034	
Later-identified students (after grade 6)	.181*	.183*	.229**	
Students with grade retention histories only	.034	.051+	.052	
General education students w/o special education & grade retention (reference group)				
Covariates				
Gender (female)	-.106**	-.243**	-.422**	
Race/ethnicity (African-American)	.069+	.035	.102+	
Family risk index	.013	.031**	.029**	
Low birthweight (<2,500gms)	.010	-.005	-.006	
Child welfare history	-.005	.063	.165*	
Student word analysis	.000	-.001	-.001	
Student school readiness	-.004*	.000	-.002	
Propensity score	-.134	-.178	.073	
Log likelihood	-462.844	-586.662	-775.901	
LRX ²	66.61	214.25	315.72	
Prob>X ²	.000	.000	.000	
Pseudo R ²	.067	.154	.169	
Number of observation	1056	1370	1370	

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).
+significant at .10 level (two tailed, p<.10).

Appendix 5. Marginal Effects of Group Contrast of Subtypes of Students Predicting Acting out, Juvenile Delinquency, and Adult Arrest (Alternative Age Specifications)

Predictors	Behavioral outcomes	Acting out (ages 12-13)	Juvenile Delinquency (by age 18)	Adult Arrest (by age 26)
Subgroups				
Students with high-incidence disabilities (grades 1- 12)	.148**	.148**	.148**	
Students with other disabilities (grades 1-12)	.029	.068	.053	
Students with grade retention histories only	.046	.050	.055	
General education students w/o special education & grade retention (reference group)				
Covariates				
Gender (female)	-.107**	-.244**	-.423**	
Race/ethnicity (African-American)	.057	.037	.098+	
Family risk index	.014+	.031**	.030**	
Low birthweight (<2,500gms)	.014	-.006	-.005	
Child welfare history	.007	.063	.167*	
Student word analysis	-.001	-.001	-.001	
Propensity score	-.103	-.182	.081	
Log likelihood	-465.194	-587.294	-777.262	
LRX ²	61.91	212.99	313.00	
Prob> X ²	.000	.000	.000	
Pseudo R ²	.062	.154	.167	
Number of observation	1056	1370	1370	

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10).

Appendix 6. Marginal Effects of Individual, Family, and School Level Factors Predicting Acting Out for High-Incidence Disabilities (Independent Effects, Covariate-Adjusted Analyses)

Predictors	Model A – individual level factors		Model B – family level factors		Model C – school level factors	
	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)
Predictors						
Individual level						
Reading comprehension	.010+	.006				
Classroom adjustment	-.074**	-.035+				
Family level						
Parent involvement in schools			-.029		-.031	
Any child maltreatment				.175		.213
School level						
Any CPC program participation					-.190+	-.105
Any magnet school attendance					.370	.132
School mobility					-.050	-.074+
Number of years in special education placement					-.008	-.029
Any grade retention					.117	-.010
Covariates						
Gender (female)	-.182+	-.227*	-.264**	-.270**	-.297**	-.263**
Race/ethnicity (African-American)	-.049	.158	-.068	.131	-.069	.122
Family risk index	.059+	.028	.042	.014	.061+	.015
Low birthweight (<2,500gms)	.038	.117	.087	.167	.095	.163
Child welfare history	-.160	-.254*	-.197	-.259*	-.206	-.255*
Student word analysis	.000	.002	.003	.004	.004	.003
Propensity score	-1.760*	-1.038*	-1.750*	-1.069*	-1.908*	-.853+
Log likelihood	-46.157	-73.804	-50.838	-74.641	-48.343	-72.698
LRX ²	28.46	19.58	19.10	17.90	21.04	18.85
Prob>X ²	.001	.021	.024	.036	.050	.092
Pseudo R ²	.236	.117	.158	.107	.179	.115
Number of observation	96	128	96	128	94	126

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10).

Appendix 7. Marginal Effects of Individual, Family, and School Level Factors Predicting Juvenile Delinquency for High-Incidence Disabilities (Independent Effects, Covariate-Adjusted Analyses)

Predictors	Model A – individual level factors		Model B – family level factors		Model C – school level factors	
	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)
Predictors						
Individual level						
Reading comprehension	.008	.004				
Classroom adjustment	-.023	-.014				
Family level						
Parent involvement in schools			.016	-.017		
Any child maltreatment			.169	.208		
School level						
Any CPC program participation					-.142	-.121
Any magnet school attendance					.044	.061
School mobility					-.029	-.015
Number of years in special education placement					-.054	-.026
Any grade retention					-.065	-.012
Covariates						
Gender (female)	-.241*	-.299**	-.269**	-.307**	-.290**	-.310**
Race/ethnicity (African-American)	.159	.149	.145	.120	.162	.150
Family risk index	.060+	.053+	.061+	.054+	.058	.055+
Low birthweight (<2,500gms)	.074	-.029	.089	-.002	.036	-.034
Child welfare history	.182	.055	.258	.143	.215	.107
Student word analysis	-.002	.002	.002	.004	.001	.004
Propensity score	-.435	-.685	-.724	-.858+	-1.216+	-1.368*
Log likelihood	-70.194	-95.810	-72.560	-96.872	-69.414	-94.775
LRX ²	14.54	17.46	14.56	19.91	18.82	21.90
Prob>X ²	.104	.042	.104	.019	.093	.039
Pseudo R ²	.094	.084	.091	.093	.119	.104
Number of observation	116	154	119	157	117	155

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10).

Appendix 8. Marginal Effects of Individual, Family, and School Level Factors Predicting Adult Arrest for High-Incidence Disabilities (Independent Effects, Covariate-Adjusted Analyses)

Predictors	Model A – individual level factors		Model B – family level factors		Model C – school level factors	
	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)
Predictors						
Individual level						
Reading comprehension	-.003	-.002				
Classroom adjustment	-.017	-.004				
Family level						
Parent involvement in schools			-.048	-.031		
Any child maltreatment			.168	.148		
School level						
Any CPC program participation					-.146	-.037
Any magnet school attendance					.231	.163
School mobility					-.048	-.055
Number of years in special education placement					-.034	-.025
Any grade retention					-.075	-.056
Covariates						
Gender (female)	-.505**	-.492**	-.517**	-.492**	-.575**	-.539**
Race/ethnicity (African-American)	.504**	.449**	.461**	.420**	.484**	.407*
Family risk index	.028	.030	.025	.027	.039	.040
Low birthweight (<2,500gms)	-.058	-.119	-.010	-.079	-.044	-.085
Child welfare history	.097	.115	.173	.174	.197	.195
Student word analysis	.004	.006	.004	.005	.003	.004
Propensity score	-.029	-.451	-.090	-.426	.174	-.411
Log likelihood	-61.461	-82.050	-61.773	-81.998	-58.409	-78.901
LR χ^2	32.89	35.44	35.24	38.10	40.00	42.60
Prob> X^2	.000	.000	.000	.000	.000	.000
Pseudo R^2	.211	.178	.222	.189	.255	.213
Number of observation	116	154	119	157	117	156

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10).

Appendix 9. Marginal Effects of Individual, Family, and School Level Factors Predicting Acting Out, Juvenile Delinquency, and Adult Arrest for High-Incidence Disabilities (Combined Effects, Covariate-Adjusted Analyses)

Predictors	Acting out		Juvenile delinquency		Adult arrest	
	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)	High-incidence disabilities (grades 1-6, N=119)	High-incidence disabilities (grades 1-12, N=157)
Predictors						
Individual level						
Reading comprehension	.009	.006	.004	.002	-.005	-.005
Classroom adjustment	-.077**	-.034+	-.028	-.014	-.014	-.003
Family level						
Parent involvement in schools	-.001	-.039	.023	-.021	-.016	-.019
Any child maltreatment	.179	.261	.183	.296*	.050	.081
School level						
Any CPC program participation	-.164	-.077	-.128	-.112	-.136	-.033
Any magnet school attendance	.503+	.146	.052	.048	.255	.168
School mobility	-.017	-.069	-.016	-.015	-.034	-.050
Number of years in special education placement	-.003	-.043	-.047	-.032	-.037	-.034
Any grade retention	.105	.011	-.041	.013	-.124	-.094
Covariates						
Gender (female)	-.213*	-.222*	-.271**	-.320**	-.575**	-.552**
Race/ethnicity (African-American)	-.099	.104	.169	.130	.473**	.403*
Family risk index	.063+	.007	.047	.037	.029	.028
Low birthweight (<2,500gms)	.097	.188	.044	-.002	-.045	-.084
Child welfare history	-.150	-.231+	.184	.064	.119	.138
Student word analysis	.002	.002	.000	.004	.004	.006
Propensity score	-1.868*	-.811+	-.946	-1.243*	.234	-.400
Log likelihood	-42.869	-69.314	-66.539	-90.782	-56.386	-77.013
LRX ²	31.99	25.61	19.87	25.35	40.99	43.77
Prob>X ²	.010	.060	.226	.064	.001	.000
Pseudo R ²	.272	.156	.130	.123	.267	.221
Number of observation	94	126	114	152	114	152

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10)

Appendix 10. Marginal Effects of Individual, Family, and School Level Factors Predicting Acting Out
 (Combined Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-12)

Predictors	Acting out (ages 12-13)		
	Model A	Model B	Model C
Disability status			
Students with high incidence disabilities (grades 1-12)	.208*	.209*	.212+
Students with other disabilities (grades 1-12)	-.055	-.045	-.053
Students with grade retention histories only ^c	-.003	.339	
General education students w/o special education & grade retention ^{a,b}			.003
Individual level			
Reading comprehension	.004**	.003*	.004**
Classroom adjustment	-.034**	-.033**	-.034**
Family level			
Parent involvement in schools	-.020*	-.020*	-.020*
Any Child maltreatment	.051	.057	.051
School level			
Any CPC program participation	-.032	-.031	-.032
Any magnet school attendance	.001	-.019	.001
School mobility	-.010	-.010	-.010
Number of years in special education placement	.012	.015	.012
Any Grade retention	-.028	-.045	-.028
Interaction terms			
Hi112 × Reading comprehension	.005	.005	.005
Hi112 × Classroom adjustment	-.006	-.006	-.006
Hi112 × Parent involvement in schools	-.019	-.028	-.020
Hi112 × Any child maltreatment	.151	.128	.152
Hi112 × Any CPC program participation	-.045	-.063	-.045
Hi112 × Any magnet school attendance	.077	.050	.077
Hi112 × School mobility	-.055	-.059	-.055
Hi112 × Number of years in special education placement	-.067	-.069	-.067
Hi112 × Any grade retention	-.040	-.017	-.040
Grade retention only × Reading comprehension		.000	
Grade retention only × Classroom adjustment		-.029	
Grade retention only × Parent involvement in schools		-.090+	
Grade retention only × Any child maltreatment		-.068	
Grade retention only × Any CPC program participation		-.043	
Grade retention only × Any magnet school attendance		-.095	
Grade retention only × School mobility		-.038	
Grade retention only × Any grade retention		.018	
Covariates			
Gender (female)	-.069**	-.068**	-.069**
Race/ethnicity (African-American)	.029	.023	.029
Family risk index	.006	.006	.006
Low birthweight (<2,500gms)	.005	.009	.005
Child welfare history	.021	.022	.021
Student word analysis	-.000	.000	-.000
Propensity score	.021	.014	.021
Log likelihood	-413.646	-410.664	-413.646
LRX ²	153.39	159.35	153.39
Prob>X ²	.000	.000	.000
Pseudo R ²	.156	.163	.156
Number of observation	1042	1042	1042

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C.

Appendix 11. Marginal Effects of Individual, Family, and School Level Factors Predicting Juvenile Delinquency (Combined Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-12)

Predictors	Juvenile delinquency (by age 18)		
	Model A	Model B	Model C
Disability status			
Students with high incidence disabilities (grades 1-12)	.200*	.201*	.184+
Students with other disabilities (grades 1-12)	.086	.089	.073
Students with grade retention histories only ^c	.011	.189	
General education students w/o special education & grade retention ^{a,b}			-.011
Individual level			
Reading comprehension	.001	.001	.001
Classroom adjustment	-.012**	-.012**	-.012**
Family level			
Parent involvement in schools	-.014	-.013	-.014
Any Child maltreatment	.105+	.101+	.105+
School level			
Any CPC program participation	-.051*	-.054*	-.051*
Any magnet school attendance	-.064*	-.057	-.064*
School mobility	-.005	-.000	-.005
Number of years in special education placement	-.012	-.014	-.012
Any Grade retention	-.007	-.001	-.007
Interaction terms			
Hi112 × Reading comprehension	.004	.003	.004
Hi112 × Classroom adjustment	-.003	-.001	-.003
Hi112 × Parent involvement in schools	-.011	-.011	-.010
Hi112 × Any child maltreatment	.163	.184	.162
Hi112 × Any CPC program participation	-.034	-.010	-.033
Hi112 × Any magnet school attendance	.119	.156	.119
Hi112 × School mobility	-.012	-.023	-.012
Hi112 × Number of years in special education placement	-.018	-.016	-.018
Hi112 × Any grade retention	-.000	-.023	-.000
Grade retention only × Reading comprehension		-.004	
Grade retention only × Classroom adjustment		.007	
Grade retention only × Parent involvement in schools		-.007	
Grade retention only × Any child maltreatment		.083	
Grade retention only × Any CPC program participation		.076	
Grade retention only × Any magnet school attendance		.144	
Grade retention only × School mobility		-.045	
Grade retention only × Any grade retention		-.051	
Covariates			
Gender (female)	-.229**	-.234**	-.229**
Race/ethnicity (African-American)	.019	.015	.019
Family risk index	.027**	.026**	.027**
Low birthweight (<2,500gms)	-.009	-.014	-.009**
Child welfare history	.041	.038	.041
Student word analysis	.000	.000	.000
Propensity score	-.171	-.159	-.171
Log likelihood	-559.516	-556.139	-559.516
LRX ²	248.52	255.28	248.52
Prob>X ²	.000	.000	.000
Pseudo R ²	.181	.187	.181
Number of observation	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05). +significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B. ^c-reference group in model C.

Appendix 12. Marginal Effects of Individual, Family, and School Level Factors Predicting Adult Arrest
(Combined Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-12)

Predictors	Adult arrest (by age 26)		
	Model A	Model B	Model C
Disability status			
Students with high incidence disabilities (grades 1-12)	.192+	.218*	.232+
Students with other disabilities (grades 1-12)	.048	.088	.089
Students with grade retention histories only ^c	-.040	.139	
General education students w/o special education & grade retention ^{a,b}			.040
Individual level			
Reading comprehension	.000	.000	.000
Classroom adjustment	-.021**	-.021**	-.021**
Family level			
Parent involvement in schools	-.014	-.015	-.014
Any Child maltreatment	.107	.107	.107
School level			
Any CPC program participation	.012	.011	.012
Any magnet school attendance	-.096+	-.101*	-.096+
School mobility	.037*	.041**	.037*
Number of years in special education placement	-.017	-.015	-.017
Any Grade retention	.003	-.052	.003
Interaction terms			
Hi112 × Reading comprehension	-.003	-.002	-.002
Hi112 × Classroom adjustment	.018	.015	.018
Hi112 × Parent involvement in schools	-.021	-.022	-.020
Hi112 × Any child maltreatment	-.019	-.005	-.022
Hi112 × Any CPC program participation	-.055	---	-.054
Hi112 × Any magnet school attendance	.307+	.293	.299+
Hi112 × School mobility	-.084+	-.101*	-.083+
Hi112 × Number of years in special education placement	-.025	-.027	-.024
Hi112 × Any grade retention	-.147	-.041	-.145
Grade retention only × Reading comprehension		---	
Grade retention only × Classroom adjustment		-.013	
Grade retention only × Parent involvement in schools		-.013	
Grade retention only × Any child maltreatment		.047	
Grade retention only × Any CPC program participation		.032	
Grade retention only × Any magnet school attendance		-.065	
Grade retention only × School mobility		---	
Grade retention only × Any grade retention		.215	
Covariates			
Gender (female)	-.409**	-.402**	-.409**
Race/ethnicity (African-American)	.048	.043	.048
Family risk index	.018+	.017+	.018+
Low birthweight (<2,500gms)	-.012	-.016	-.012
Child welfare history	.138+	.133+	.138+
Student word analysis	.001	.001	.001
Propensity score	.324	.350	.324
Log likelihood	-735.344	-732.293	-735.344
LRX ²	368.01	374.11	368.01
Prob>X ²	.000	.000	.000
Pseudo R ²	.200	.204	.200
Number of observation	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C. “---” variable is dropped because of collinearity or predicting failure perfectly.

Appendix 13. Marginal Effects of Individual, Family, and School Level Predictors Predicting Acting Out
(Moderating Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-12)

Predictors	Model A	Model B	Model C
Disability status			
Students with high incidence disabilities (grades 1-12)	.203+	.185+	.208
Students with other disabilities (grades 1-12)	-.051	-.043	-.048
Students with grade retention histories only ^c	-.003	.556	
General education students w/o special education & grade retention ^{a,b}			.003
Individual, family, & school level			
Reading comprehension	.004*	.003*	.004*
Classroom adjustment	-.034**	-.035**	-.034**
Parent involvement in schools	-.020+	-.021*	-.020+
Any Child maltreatment	.052	.058	.052
Any CPC program participation	-.033	-.035	-.033
Any magnet school attendance	.006	-.011	.006
School mobility	-.005	-.006	-.005
Number of years in special education placement	.011	.133	.011
Any Grade retention	-.025	-.028	-.025
Interaction terms			
Reading comprehension × Parent involvement in schools	-.001	-.001	-.001
Reading comprehension × School mobility	.001	.001	.001
Classroom adjustment × Parent involvement in schools	.003	.003	.003
Classroom adjustment × School mobility	.001	.002	.001
Hi112 × Reading comprehension	.004	.004	.004
Hi112 × Classroom adjustment	-.006	-.004	-.006
Hi112 × Parent involvement in schools	-.010	.011	-.010
Hi112 × Any child maltreatment	.142	.126	.143
Hi112 × Any CPC program participation	-.049	-.062	-.050
Hi112 × Any magnet school attendance	.084	.055	.084
Hi112 × School mobility	-.089	-.090	-.090
Hi112 × Number of years in special education placement	-.067	-.068	-.067
Hi112 × Any grade retention	-.047	-.058	-.047
Grade retention only × Reading comprehension		-.000	
Grade retention only × Classroom adjustment		-.028	
Grade retention only × Parent involvement in schools		-.015	
Grade retention only × Any child maltreatment		-.066	
Grade retention only × Any CPC program participation		-.038	
Grade retention only × Any magnet school attendance		-.106	
Grade retention only × School mobility		-.113	
Grade retention only × Any grade retention		-.027	
Covariates			
Gender (female)	-.069**	-.070**	-.069**
Race/ethnicity (African-American)	.031	.024	.031
Family risk index	.006	.006	.006
Low birthweight (<2,500gms)	.003	.011	.003
Child welfare history	.024	.029	.024
Student word analysis	-.000	-.000	-.000
Propensity score	.017	.012	.017
Log likelihood	-413.038	-409.099	-413.038
LRX ²	154.61	162.49	154.61
Prob>X ²	.000	.000	.000
Pseudo R ²	.158	.166	.158
Number of observation	1042	1042	1042

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).
+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.
^c-reference group in model C.

Appendix 14. Marginal Effects of Individual, Family, and School Level Predictors Predicting Juvenile Delinquency (Moderating Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-12)

Predictors	Model A	Model B	Model C
Disability status			
Students with high incidence disabilities (grades 1-12)	.206*	.206*	.201+
Students with other disabilities (grades 1-12)	.090	.090	.085
Students with grade retention histories only ^c	.004	.293	
General education students w/o special education & grade retention ^{a,b}			-.004
Individual, family, & school level			
Reading comprehension	.000	.000	.000
Classroom adjustment	-.010*	-.010*	-.010*
Parent involvement in schools	-.013	-.012	-.013
Any Child maltreatment	.109+	.105+	.109+
Any CPC program participation	-.056*	-.060*	-.056*
Any magnet school attendance	-.060+	-.055	-.060+
School mobility	-.013	-.011	-.013
Number of years in special education placement	-.012	-.160	-.012
Any Grade retention	.001	.015	.001
Interaction terms			
Reading comprehension × Parent involvement in schools	-.001+	-.002+	-.001+
Reading comprehension × School mobility	.001	.000	.001
Classroom adjustment × Parent involvement in schools	.003	.004	.003
Classroom adjustment × School mobility	-.007+	-.008*	-.007+
Hi112 × Reading comprehension	.004	.004	.004
Hi112 × Classroom adjustment	.002	.004	.002
Hi112 × Parent involvement in schools	.021	.028	.020
Hi112 × Any child maltreatment	.153	.190	.152
Hi112 × Any CPC program participation	-.039	-.006	-.039
Hi112 × Any magnet school attendance	.102	.129	.102
Hi112 × School mobility	.006	.018	.006
Hi112 × Number of years in special education placement	-.017	-.014	---
Hi112 × Any grade retention	-.024	-.060	-.024
Grade retention only × Reading comprehension		-.004	
Grade retention only × Classroom adjustment		.011	
Grade retention only × Parent involvement in schools		.043	
Grade retention only × Any child maltreatment		.100	
Grade retention only × Any CPC program participation		.086	
Grade retention only × Any magnet school attendance		.143	
Grade retention only × School mobility		.026	
Grade retention only × Any grade retention		-.066	
Covariates			
Gender (female)	-.231**	-.238**	-.231**
Race/ethnicity (African-American)	.024	.018	.024
Family risk index	.028**	.028**	.028**
Low birthweight (<2,500gms)	-.011	-.016	-.011
Child welfare history	.039	.034	.039
Student word analysis	.000	.000	.000
Propensity score	-.188	-.177	-.188
Log likelihood	-555.903	-551.090	-555.903
L _R X ²	255.75	265.38	255.75
Prob>X ²	.000	.000	.000
Pseudo R ²	.187	.194	.187
Number of observation	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).

+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.

^c-reference group in model C. “---“ variable is dropped because of collinearity or predicting failure.

Appendix 15. Marginal Effects of Individual, Family, and School Level Predictors Predicting Adult Arrest
(Moderating Effects, Interaction Test for Effects of High-Incidence Disabilities, Grades 1-12)

Predictors	Model A	Model B	Model C
Disability status			
Students with high incidence disabilities (grades 1-12)	.202+	.233*	.246*
Students with other disabilities (grades 1-12)	.049	.091	.093
Students with grade retention histories only ^c	-.044	.095	
General education students w/o special education & grade retention ^{a,b}			.044
Individual, family, & school level			
Reading comprehension	.000	-.000	.000
Classroom adjustment	-.021**	-.021**	-.021**
Parent involvement in schools	-.014	-.014	-.014
Any Child maltreatment	.109+	.111	.109+
Any CPC program participation	.010	.010	.010
Any magnet school attendance	-.099*	-.107*	-.099*
School mobility	.034*	.036*	.034*
Number of years in special education placement	-.018	-.241+	-.018
Any Grade retention	.003	-.054	.003
Interaction terms			
Reading comprehension × Parent involvement in schools	-.000	-.000	-.000
Reading comprehension × School mobility	-.000	-.001	-.000
Classroom adjustment × Parent involvement in schools	.002	.002	.002
Classroom adjustment × School mobility	-.004	-.005	-.004
Hi112 × Reading comprehension	-.003	-.002	-.002
Hi112 × Classroom adjustment	.020	.017	.020
Hi112 × Parent involvement in schools	-.016	-.018	-.014
Hi112 × Any child maltreatment	-.023	.000	-.026
Hi112 × Any CPC program participation	-.054	---	-.052
Hi112 × Any magnet school attendance	.295	.274	.287+
Hi112 × School mobility	-.097*	-.140**	-.097*
Hi112 × Number of years in special education placement	-.024	-.025	-.023
Hi112 × Any grade retention	-.148	-.028	-.145
Grade retention only × Reading comprehension		-.000	
Grade retention only × Classroom adjustment		-.011	
Grade retention only × Parent involvement in schools		-.009	
Grade retention only × Any child maltreatment		.056	
Grade retention only × Any CPC program participation		.029	
Grade retention only × Any magnet school attendance		-.051	
Grade retention only × School mobility		-.085	
Grade retention only × Any grade retention		.239	
Covariates			
Gender (female)	-.409**	-.402**	-.409**
Race/ethnicity (African-American)	.051	.045	.051
Family risk index	.018+	.018+	.018+
Low birthweight (<2,500gms)	-.012	-.016	-.012
Child welfare history	.134+	.122	.134+
Student word analysis	.001	.001	.001
Propensity score	.311	.330	.311
Log likelihood	-734.744	-730.491	-734.744
LRX ²	369.21	377.72	369.21
Prob>X ²	.000	.000	.000
Pseudo R ²	.201	.205	.201
Number of observation	1350	1350	1350

Note. ** significant at .01 level (two tailed, p<.01). * significant at .05 level (two tailed, p<.05).
+significant at .10 level (two tailed, p<.10). ^a-reference group in model A. ^b-reference group in model B.
^c-reference group in model C. “---“ variable is dropped because of collinearity or predicting failure.