A LONGITUDINAL EXAMINATION OF THE RELATIONSHIPS AMONG DISADVANTAGED NEIGHBORHOODS, SUPERVISION, PEER ASSOCIATIONS, AND PATTERNS OF ETHNIC MINORITY ADOLESCENT SUBSTANCE USE

by

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A DISSERTATION

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DISSERTATION ABSTRACT

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Title: A Longitudinal Examination of the Relationships Among Disadvantaged Neighborhoods, Supervision, Peer Associations, and Patterns of Ethnic Minority Adolescent Substance Use

The primary purpose of this study was to utilize an ecological-transactional theoretical framework and an existing longitudinal data set to examine the relationships among neighborhood context, family supervision, association with deviant peers, and patterns of substance use during adolescence. Participants included 821youth from the Longitudinal Cohort Study of the Project on Human Development in Chicago Neighborhoods (PHDCN) data set. Data include primary caregiver and youth self-report measures of adult supervision, peer associations, and substance use. Data also include community survey and systematic social observation measures of neighborhood social processes such as collective efficacy, social disorder and social capital, neighborhood disadvantage, policing, and perceived danger collected from 1994-2001 in the city of Chicago. Latent growth curve modeling analyses were used to answer the research questions. Study results were significant associations between neighborhood social processes and substance use. Contrary to previous findings, more positive neighborhood social processes were related to higher levels of substance use for females. For both the African American/Black and Hispanic/Latino groups, deviant peer associations were related to higher levels of substance use at age 12. For the Hispanic/Latino group, higher

neighborhood socioeconomic status was related to greater increases in substance use over time.

Study results suggest the continued importance of research to discover sex and ethnic variation in associations among contextual influences and adolescent substance use. The current study makes a significant contribution to extant literature by examining the influence of neighborhood social processes, deviant peer associations, and supervision on substance use trajectories. Including peers, parental, and neighborhood factors—in one model—provided a more comprehensive examination of how contextual influences impact the development of adolescent substance use. In addition, using a multilevel analysis with a diverse, longitudinal data set provided further insights into understanding ethnic and gender variation in the development of adolescents' substance use. Supplemental files include description of PHDCN scale items, HOME measure, Deviance of Peers measure, and items from the Substance Use Interview.

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DEDICATION

For my incredible parents, Robert and Beverly, who provided unwavering support and taught me the importance of education as a means of both personal liberation and the pursuit of social justice. For my loving partner, for his encouragement during this process.

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CHAPTER I

INTRODUCTION

Youth substance use remains a major health concern in the United States. Adolescence is a developmental period marked by a significant number of youth experimenting with alcohol, tobacco, and drug use. For example, using a nationally representative sample of 8th to 12th grade students, researchers found that 73% of 12th graders have tried alcohol (Johnston, O'Malley, Bachman & Schulenberg, 2007). Also according to the National Survey on Drug Use and Health (Substance Abuse and Mental Health Services Administration [SAMHA], 2011), 26.3 % or 10 million youths and young adults ages 12 to 20 years used illicit substances in the past year. While all substance use does not become problematic, using alcohol, tobacco and illicit drugs during childhood and adolescence has been associated with a variety of problem behaviors and increased risk for negative developmental outcomes. For instance, early substance use has been related to lower academic achievement, association with deviant peers, increased risk for sexual activity at an early age, and antisocial behaviors (Dishion & Owen, 2002; French & Dishion, 2003; McCluskey, Krohn, Lizotte, & Rodriguez, 2002). Substance use during adolescence has also been related to increased risk for psychological distress, affective and anxiety disorders, and substance abuse and dependence (Degenhardt & Hall, 2001).

Several ecological factors have been linked with the development of substance use during adolescence. Contextual factors such as parenting practices and monitoring (Deater-Deckard, Dodge, Bates, & Pettit, 1996; Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007; Hill, Bromell, Tyson, & Flint, 2007), deviant peer associations

(Barrera, Biglan, Ary, & Li, 2001; Dishion, Capaldi, Spracklen, & Li, 1995; Dishion & Owen, 2002; Dishion & Patterson, 2006; Patterson, Reid, & Dishion, 1992; Westling, Andrews, Hampson, & Peterson, 2008), neighborhood disadvantage (Beyers, Bates, Pettit, & Dodge, 2003; Brody et al., 2001; Elliott, et al., 1996; Leventhal & Brooks-Gunn, 2000; McLoyd, 1998; Pinderhughes, Nix, Foster, & Jones, 2001; Roosa et al., 2003) and collective efficacy and social disorder (Sampson, Morenoff, & Gannon-Rowley, 2002; Sampson, Radenbush, & Earls, 1997) have been shown to increase adolescents' risk for substance use. Despite the large empirical research base regarding adolescent substance use, several research gaps remain. First, to date, most researchers have used either ethnically homogeneous (primarily Caucasian) samples or focused on high-risk samples when investigating prevalence of substance use among individual ethnic minority groups. Scholars have devoted significantly less attention to examining trajectories and ecological factors contributing to patterns of substance use for ethnic minority adolescents (Lambert, Brown, Philipps, & Ialongo, 2004; Wallace, et al., 1999). Second, most research examining the influence of neighborhood disadvantage on youth development has focused on academic achievement, violence exposure, youth crime rates, association with deviant peers, and health outcomes (Elliott, et al., 1996; Leventhal & Brooks-Gunn, 2000; Sampson, 1997; Sampson & Groves, 1989; Sampson & Raudenbush, 2004). There are few studies that have examined how neighborhood processes influence patterns of ethnic minority adolescent substance use over time (Beauvais & Oetting, 2002; Wallace, et al., 1999), and based on an extensive literature review (i.e., search terms entered in PsychInfo: *neighborhood context*, *disadvantage*, *parental monitoring*, *peer associations*, and *minority youth substance use*), I was unable to find any published study that

simultaneously examined of the effect of neighborhood disadvantage, neighborhood social processes, family supervision, deviant peer associations, and ethnic minority adolescent substance use over time. Third, findings are mixed regarding the direct influence of socioeconomic status (SES) on substance use behaviors. Most recently, researchers have postulated that disadvantage influences individual behavior through neighborhood-level social processes (e.g., collective efficacy and social disorder) and indirectly through family and peer contexts. Little is known, however, about social processes that link neighborhood disadvantage and context, including socioeconomic status (SES), and adolescent substance use outcomes (Scheier, 2010). By understanding the interaction of contextual factors and which mechanisms impact risk and protective factors can help inform prevention and intervention efforts.

Study Purpose

This study was an examination of several ways neighborhood disadvantage influences substance use among youth during adolescence. Using an ecological-transactional model and an existing longitudinal data set, it examined the relationship among neighborhood disadvantage, family supervision, association with deviant peers, and patterns of substance use during adolescence. The study also investigates the variations of influence of neighborhood, family, and peers factors among different racial/ ethnic groups.

The purpose of this dissertation study was to contribute to the literature by (a) using an ecological-transactional theoretical framework and advanced statistical data analytic approaches to examine patterns of ethnic minority adolescents' substance use over time and (b) examining the contributions of neighborhood, family-level

mechanisms, and peer associations on patterns of substance use by ethnic minority adolescents. This study contributes to the existing research literature by utilizing a more comprehensive ecological-transactional model than what has been used previously to explore youth substance use over time. The study also employed the use of multilevel modeling techniques with a large existing data set to examine the influence of neighborhood, family, and peer processes on patterns of ethnic minority adolescent substance use. Using the current framework takes into account the developmental nature of substance use behaviors and allows for an examination of specific mechanisms of the social context and their influence on individual substance use outcomes. These contributions are important as information about the influence of the social context can help clinicians and researchers identify target areas for substance use prevention and intervention work. Further knowledge of social and contextual factors would also inform efforts to reduce risk and increase protective factors among communities, families, and adolescents.

Background

Adolescence is a developmental period when youth tend to experiment with alcohol, drugs, and other risky behaviors. According to Monitoring the Future [MTF] Study, in 2011, 41% of high school seniors reported using alcohol during the past 30 days. National research results also reported 48% of high school seniors, 35% of 10th graders, and 19% of 8th graders reported use of at least one substance in the past 30 days (Monitoring the Future [MTF] Johnston, O'Malley, Buchman & Schulenberg, 2011b; SAMHA, 2011). There are conflicting findings, however, regarding substance use prevalence rates across racial groups (Beauvis & Oetting, 2002; Johnston, O'Malley,

Buchman & Schulenberg, 2011a; Johnston, et al., 2011b; Wallace, et al., 2003). Overall, prevalence of substance use is generally lower for ethnic minority youth for most substances; yet by the end of adolescence, ethnic minority youth tend to exhibit higher rates of use in early adulthood, placing them at greater risk to develop substance use disorders and dependence than non-ethnic minority youth (Beauvis & Oetting, 2002; Catalano, et al., 1992; Wallace, et al., 1999; Wallace, et al., 2003).

Rates of Alcohol and Drug Use by Ethnic Minority Adolescents

Since the mid-1970s, nationwide survey data (e.g., National Survey of Household Drug Use [NSDUH] and Monitoring the Future [MFT],) have been collected regarding youth substance use (Johnston, O'Malley, Buchman & Schulenberg, 2011; SAMHA, 2011]. Although data collected for the past few years indicated a general decline in the use of both licit and illicit substances by youth, the amount of drug use remained significant. For example, in 2010, 19.2% of high school seniors, 13.6% of 10^{th} graders, and 7.1 % of 8^{th} graders reported use of cigarettes or smokeless tobacco in the previous month. In 2010, 34.8% of high school seniors, 27.5% of 10^{th} graders, and 13.7% of 8^{th} graders reported use of marijuana in the previous month. Survey data also revealed that 41.2% of high school seniors, 28.9% of 10^{th} graders, and 13.8% of 8^{th} graders reported alcohol use in the previous month. When illicit drug use was examined, 38.3% of high school seniors, 30.2% of 10^{th} graders, and 16% of 8^{th} graders reported use in the previous month (Johnston, O'Malley, Buchman & Schulenberg, 2011; SAMHA, 2011).

There are important sex differences in youth substance use (Johnston et al., 2007; Johnston, O'Malley, Buchman & Schulenberg, 2011b; Wallace et al., 2003). Sex

differences tend to become more significant as children get older. Boys, for example, tend to use illicit drugs more frequently and have higher rates of alcohol and marijuana use than girls. When looking at cigarette use, girls are as likely as boys to report daily smoking.

For both boys and girls, differences in drug use vary across racial and ethnic groups. For example, researchers have found that African American boys and girls have significantly lower rates of both licit and illicit substance use compared with White youth (Johnston, O'Malley, Bachman, & Schulenberg, 2011a; Johnston et al., 2011b; Schuman & Mayes, 2006; Wallace, et al., 1999; Wallace et al., 2003). Other researchers have found that Native American youth have the second highest rates of overall substance use after White youth (Beauvais, 1996; Boyd-Ball, 2003). Among Hispanic and Latino youth, researchers have found elevated rates of heavy alcohol consumption (Guilamo-Ramos, Johansson, Jaccard, & Turrisi, 2004). The focus of this dissertation study is on ethnic minority adolescent substance use and the identification of specific mechanisms of the social, family and peer contexts and their influence on individual substance use outcomes.

This dissertation study is organized as follows: Chapter II provides a summary of the literature in the fields of neighborhood disadvantage and adolescent alcohol and drug use. Both bodies of literature have used ecological and developmental approaches to examine correlates and predictors of substance use during adolescence. The chapter begins with a summary of the extant empirical research documenting the influence of both family and peer contexts on adolescent substance use, followed by a more in-depth review of research on the influence of neighborhood context on adolescent development,

and the theoretical foundation for this dissertation study. In Chapter III, the study research questions, methodology, and models are presented. In Chapters IV and V, results of data analysis and discussion of findings are presented.

CHAPTER II

LITERATURE REVIEW

In an attempt to explain group differences in substance use prevalence rates among adolescents, researchers have examined methodological issues in sampling, sex differences, variation between some racial and ethnic groups, and the effects of socioeconomic status (SES) (Beauvais & Oetting, 2002; Duncan, Duncan, & Strycker, 2002; Wallace, et al., 2003). In addition, researchers have investigated differences in frequency or quantity of drug use, variations in age of onset of use, and differences in risk and protective factors for various racial and ethnic groups (Beauvais & Oetting, 2002; Coley, Morris, & Hernandez, 2004; Duncan, Duncan, & Strycker, 2002). Researchers have found that although some of these aforementioned factors may affect the rates of substance use for certain racial and ethnic groups, additional research is critical to discover how and which mechanisms produce differences in adolescent rates of substance use over time.

There are major similarities in trends of adolescent drug use that are important to consider. Beauvais and Oetting (2002) found that major changes in prevalence rates over time occurred for all racial/ethnic groups, and that levels of drug use across racial/ethnic groups were highly correlated. Moreover, authors found that despite changes in prevalence rates over time, differences between racial/ethnic groups essentially remained the same. These findings led Beauvais and Oetting to propose an analysis of variance model that posited two independent sources of variance in adolescent substance use: (a) factors common to adolescent culture that affect rates of substance use over time for all youth in the United States and (b) factors that are unique to each racial/ethnic group that

affect the base rate of drug use for that population. Some of the common factors discussed were temporal factors (e.g., historical attitudes about drug use, media messages, attitudes toward drug enforcement), location or region, socialization and developmental factors, and individual factors. These research findings highlight the need to examine the emergence of patterns of youth substance use and illuminate the relative influence of, and interaction between, multiple levels of a youth's ecology. The following section is a brief summary of the substantial empirical research and consistent findings regarding how family and peer contexts influence adolescent substance use.

Mechanisms in Family and Peer Contexts

Parents and families are important forces in the socialization of adolescents (Catalano & Hawkins 1996; Hill, Hawkins, Catalano, Abbott, & Guo, 2005; Peterson et al., 1994). Scholars have shown consistently that family management processes, which include parental supervision and monitoring of child behavior, the establishment of rules, and the parent-child relationship, are mechanisms by which parents and families influence youth behavior. For example, children and adolescents who engage in problem behaviors tend to come from family contexts with high levels of conflict, inconsistent punishment, poor monitoring by caregivers, and families that engage in negative or coercive interactions (Deater-Deckard, Dodge, Bates, & Pettit, 1996; Dishion & Owen, 2002; Dishion & Patterson, 2006; Hill, Bromell, Tyson, & Flint, 2007; Stormshak, Bierman, McMahon, Lengua, & Conduct Problems, Prevention Research, 2000). Conversely, positive family management practices (e.g., high levels of parental monitoring and supportive family relationships) often predict lower levels of youth

engagement in substance use and disruptive behaviors (Allison et al. 1999; Brody et al., 2001).

Previous research has also linked family management practices with association with deviant peers (Barrera, Biglan, Ary, & Li, 2001; Dishion & Patterson, 2006; Patterson, Reid, & Dishion, 1992). Family conflict, combined with poor supervision, encourages youth to seek out and bond with deviant peers. In addition, limited social skills, victimization, and rejection by peers are associated with affiliation with deviant peers (Patterson, Reid, & Dishion, 1992; Dishion & Andrews, 1995). In turn, affiliation with deviant peers has been consistently linked with increased risk and substance use (Barrera, et al., 2001; Dishion, Capaldi, Spracklen, & Li, 1995; Westling, Andrews, Hampson, & Peterson, 2008). Peers influence various antisocial behaviors through a socialization process that involves encouragement through normative behaviors that have been linked to predictors of initiation, increase, and maintenance of substance use (Henry, Slater, & Oetting, 2005). For example, Dishion and colleagues (Dishion, Spracklen, Andrews, & Patterson, 1996) found that delinquency training, interactions in dyads of adolescents engaged in rulebreaking, and deviant talk, predicted increases in self-reported delinquent behavior, even after controlling for prior levels of delinquency. Deviancy training has also been linked to increases in tobacco, marijuana, and alcohol use between the ages of 15 and 18.

With regard to ethnic minority adolescent substance use, researchers have found consistently that family management measures predict adolescent substance use across ethnic groups (Catalano, Morrison, Wells, Gillmore, Iritani, & Hakins, 1992; Chilcoate, Dishion, & Anthony, 1995; Patterson, 1992). Family management constructs linked most

consistently to adolescent substance use include monitoring or supervision, rule and boundary setting and discipline strategies (Baumrind, 1991; Brody et al., 2003; Chilcoat & Anthony, 1996; Stromshak et al., 2000; citation). The consistency of these research findings has led some scholars to conclude that the best predictive models of early adolescent substance use include measures of both parental monitoring and deviant peer affiliations and models including these measures can be used for different cultural and sex groups (Barrera, Castro, & Biglan, 1999; Catalano et al., 1992; Chilcoate, Dishion, & Anthony, 1995). The following section is an examination of those neighborhood contextual factors that increase ethnic minority adolescent substance use.

Neighborhood Context and Adolescent Risk

Seminal scholarly works such as Bronfenbrenner's (1979) *The Ecology of Human Development* and Wilson's (1987) *The Truly Disadvantaged,* emphasized the importance of examining person-context interactions for understanding human development and behavioral phenomenon (Caughy, O'Campo, & Brodsky, 1999; Leventhal & Brooks-Gunn, 2000; McLoyd, 1998). Bronfenbrenner's and Wilson's works were key for producing a general recognition that neighborhood clustering of poor families with little resources could result in an environment devoid of the "safety net" that community resources, basic physical safety, sense of community, stability, and collective socialization provide and that this environment could in turn negatively affect the developmental outcomes of the children growing up in these families (Boyle & Lipman, 2002; Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Furstenberg & Hughes, 1997; Leventhal & Brooks-Gunn, 2000; McLoyd, 1998; Pinderhughes, Nix, Foster, & Jones, 2001; Roosa et al., 2003).

Numerous researchers have found that neighborhood factors, including neighborhood disorganization, pervasive poverty among neighbors, lack of positive social opportunities, and criminal activity in the community predict problem behaviors among children and youth (Brook, Nomura, & Cohen 1989; Griffin et al., 1999; Hawkins, Catalano, & Miller, 1992; Leventhal and Brooks-Gunn 2000). Such neighborhood factors directly and indirectly affect parents' ability to manage the family environment, parenting skills, overall family functioning, youth deviant peer associations and problem behaviors (Hill & Herman-Stahl, 2002; Klebanov et al., 1994; Roosa et al., 2003).

Most recently, researchers have focused specifically on neighborhood *disadvantage* as a context that influences youth development (Leventhal & Brooks-Gunn, 2000). Disadvantage seeks to capture resource deprivation (Jargowsky, 1997; Massey, 1996; Wilson, 1987) and can generally be conceptualized as an environmental stressor that affects adolescent problem behaviors directly or acts to exacerbate the effects of risk factors. Disadvantaged and unstable neighborhoods have fewer resources, employment opportunities, formal and informal forms of social control and monitoring, and overall collective efficacy (Bursik & Webb, 1982; Elliott et al., 1996; Leventhal & Brooks-Gunn, 2000; Miles-Doan, 1998; Sampson & Groves, 1989; Sampson, Morenoff, & Gannon-Rowley, 2002; Sampson, Radenbush, & Earls, 1997; Wilson, 1987). Traditionally, researchers have used indicators of neighborhood disadvantage (e.g., crime rate, per capita income level, residential instability, unemployment rates, proportion of female-headed households, self-reported perceptions of neighborhood quality and danger, and percentage of college-educated residents) (Leventhal & Brooks-Gunn, 2000; Roosa et al.,

2003). Use of these indicators is linked to ecological theories of crime that posit that low economic status, ethnic heterogeneity, and residential and family instability lead to juvenile delinquency, including substance abuse (Greenberg, 1999; Massey, 1996; Shaw & McKay 1969; Wilson, 1987).

Empirical findings are mixed, however, regarding the effects of neighborhood contextual factors on adolescent substance use (Gardner, Barajas, & Brooks-Gunn, 2010; Lambert, Brown, Philipps, & Ialongo, 2004). Certain neighborhood factors (e.g., neighborhood deviance and danger) are shown to significantly affect youth substance use (Bowen & Bowen, 1999; Duncan, Duncan, & Strycker, 2002; Griffin et al., 1999; Nurco, Kinlock, & O'Grady, 1996), while other structural indicators of neighborhood disadvantage (e.g., resident stability) have no measured effect (Allison et al. 1999). Coulton, Korbin,and Su (1995) found that various community-level conditions, including impoverishment and residential instability, predicted drug trafficking and juvenile delinquency rates. Chuang , Ennett, Bauman, and Foshee (2005), however, found that low SES neighborhoods were associated with increased parental monitoring, which in turn decreased alcohol use among youth. High SES neighborhoods were associated with more parental drinking, which was associated with increased adolescent alcohol use. Also, De Souza Briggs (1998) compared adolescents who moved to middle-class neighborhoods to those who stayed in low-income neighborhoods and found that adolescents who remained in disadvantaged neighborhoods exhibited more signs of problem drinking and marijuana use.

The focus of this dissertation study was to add to the aforementioned extant literature by examining how neighborhood disadvantage influences substance use among

ethnic minority youth over time. In the following sections, I briefly summarize theoretical models that have been used to study the influence of neighborhood contexts, and then I describe the theoretical foundation of this dissertation study, a transactional model of neighborhood influence on ethnic minority substance use.

Theoretical Models of Neighborhood Disadvantage

There are five major theoretical models that scholars have used to investigate mechanisms by which neighborhood disadvantage directly and indirectly influences youth developmental outcomes (Boyle & Lipman, 2002; Jencks and Mayer, 1990; Leventhal & Brooks-Gunn, 2000; McLoyd, 1998; Pinderhughes, Nix, Foster, & Jones, 2001; Roosa et al., 2003). First, the *contagion (or epidemic) model* attributes the spread of problem behaviors (e.g., substance use and delinquency) to the influence of peers. This model theorizes that for children, there is a desire to conform to peer standards of behavior, and although there may be individual differences in susceptibility to these influences, there is an overall impact on the spread of problem behaviors.

Second, the *institutional model* focuses on resource availability, particularly the quality of neighborhood organizations/institutions (e.g., libraries, schools, and policing). In the institutional model, lack of access to neighborhood institutions like schools, childcare, access to medical care, social services, police, and recreational centers negatively impact child development.

Third, the *competition model* purports that in poor neighborhoods, residents must compete for scarce resources, which may lead to the erosion of collaboration and social bonds among community members.

Fourth, the *relative deprivation model* proposes an individual psychological explanation based on social comparison theory. That is, individuals judge themselves using comparisons to others around them—and for youth that involves primarily comparisons to peers, neighbors, and residents. According to this model, poorer individuals will hold a more favorable opinion of their status and abilities if they reside in impoverished areas or attend poor quality schools.

Finally, the *collective socialization model* puts at the forefront the influence of adults as role models. If youth in a neighborhood witness unemployed adults resorting to crime, drugs, "hanging out," or acting violently, the collective socialization model purports that youth will be more likely to engage in such behaviors. Further, the collective socialization model sees neighborhood behavior norms and adult willingness to monitor and enforce these norms as key stabilizing forces that help maintain order and reduce youth deviancy (Sampson, Radenbush, & Earls, 1997; Wilson, 1987).

Leventhal and Brooks-Gunn (2000) reviewed theoretical models and empirical research on neighborhoods and proposed a three part framework to conceptualize mechanisms at the community level that operate to impact human development. Researchers posited that neighborhoods influence individual behavior through a) the quantity and quality of institutional resources, b) the quality and quantity of relationships- both within family and between neighborhood residents, and c) collective efficacy- or the extent to which informal mechanisms exist at the neighborhood level to monitor behavior and guard against threats to the well-being of residents (Gardner, Barajas, & Brooks-Gunn, 2010; Sampson, Radenbush, & Earls, 1997). Sampson, Radenbush, & Earls (1997) further operationalized the construct and measurment of collective efficacy as containing

elements of social cohesion and social control. Social cohesion refers to the quailty of relationships, and mutual trust among residents while social control refers to the expectation and willingness of residents to intervene on behalf of children or act in the interst of the community good (Elliott, et al., 1996; Sampson, Morenoff, & Gannon-Rowley, 2002; Sampson, Radenbush, & Earls, 1997). Low collective efficacy is associated with higher levels of both physical disorder (i.e., abandoned buildings, graffiti, garbage or litter on the streets) and social disorder (i.e., drug trafficking, prostitution, adults arguing or fighting) (Sampson, Radenbush, 2004; Sampson, Radenbush, & Earls, 1997) which have been consistentlty linked with increased adolecent substance use (Choi, Harachi, & Catalano, 2006; Lambert, Brown, Philipps, & Ialongo, 2004; Latkin, Curry, Hua, & Davey, 2005; Wilson, Syme, Boyce, Battistich, & Selvin, 2005). Consistent with current theory and previous research, this study included multiple indicatiors of neighborhood context such as, collective efficacey, social capital, and percieved neighborhhod danger and violence.

A Transactional Model of Neighborhood Influence on Youth

An ecological transactional model of adolescent substance use was the theoretical foundation for this dissertation study. To address the limitations of previous theoretical models and research related to neighborhood context, Roosa et al. (2003) proposed a multidirectional, transactional model of neighborhood influences. As part of the transactional model, neighborhood quality and characteristics are filtered through individual experiences and perceptions of the neighborhood to impact and influence family and child behaviors, both of which are seen as impacting each other and overall child outcomes. Family and child behaviors, in turn, affect neighborhood processes and,

thus, the quality and characteristics of the neighborhood. An example of a transactional model applied to adolescent risk development is Dishion and Kavanagh's (2003) ecological transactional model.

Dishion and Kavanagh's (2003) model (see Figure 1) exemplifies a developmental model that takes into account person-context interactions and subjective experiences of neighborhood disadvantage. An ecological-transactional theoretical framework assumes that the impact of contextual factors may vary depending on the interaction between the youth's context and developmental stage. That is, examining the influence of multiple contexts on youth across multiple time points, and thus different periods of development, will provide insight into which ecological contexts and developmental time points are most salient for ethnic minority youth and their substance use. The use of the adolescent transition program (ATP) and the Family Checkup are examples of interventions utilizing an ecological and developmental approach (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). The ATP is a multilevel family intervention delivered within a school setting (Dishion & Kavanagh, 2003), and the ATP model links universal, selected, and indicated family interventions in a way that adapts the level of intervention to the needs and motivation of the family.

Researchers who have used ecological transactional models to examine trajectories of adolescent risk behavior have found youth who exhibit problem behavior during the middle school years often begin substance use and increase their interaction with deviant peers, which in turn leads to academic failure and continued substance use and antisocial behavior in high school (Dishion & Owen, 2002).

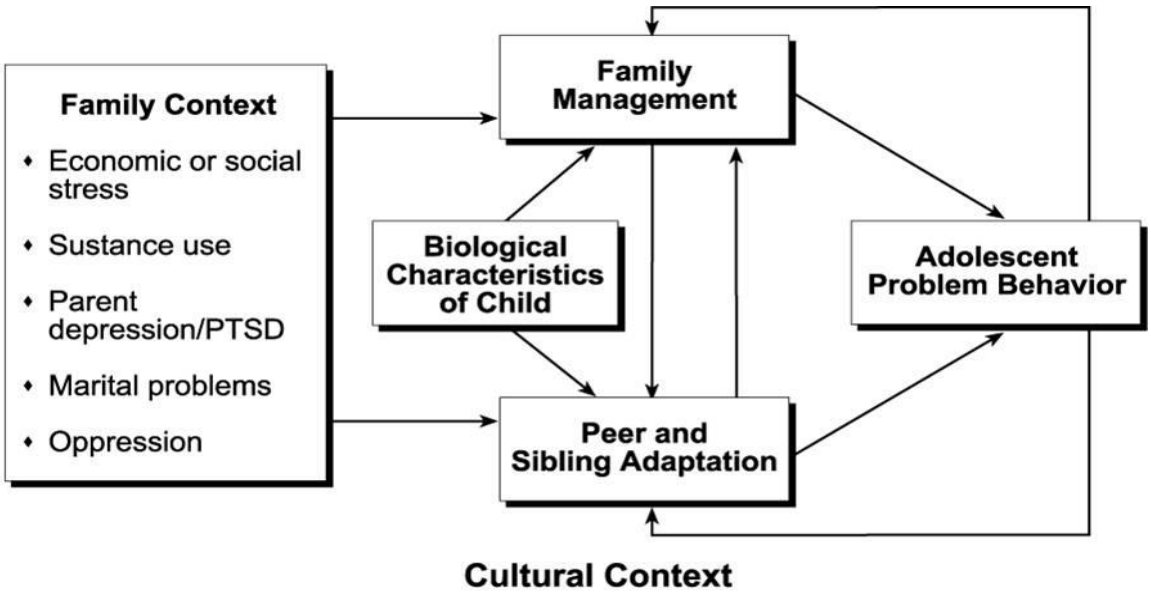

Figure 1. Ecological transactional model. Adapted from *Intervening in adolescent problem behavior: A family-centered approach*, by T. J. Dishion and K. Kavanagh, 2003. Copyright 2003 by Guilford.

Deficits in parental management and poor family relationships are key predictors of problem behavior, the maintenance of problem behavior (Dishion & McMahon, 1998; Dishion, Nelson, & Kavanagh, 2003; Spoth, Kavanagh, & Dishion, 2002; Stormshak et al., 2000). Scholars have shown consistently that family management processes, which include parental supervision and monitoring of child behavior, the establishment of rules, and the parent-child relationship, are mechanisms by which parents and families influence youth behavior. The ecological transaction model allows for more in-depth examination of the influence of neighborhood, family, and peer processes on patterns of ethnic minority adolescent substance use. Using the current framework takes into account the developmental nature of substance use behaviors and allows for an examination of specific mechanisms of the social context and their influence on individual substance use

outcomes. This theoretical framework, therefore, served as the foundation for study research questions and hypotheses.

Study Purpose and Research Questions

The purpose of this study was to use an ecological-transactional framework and an existing data set to examine patterns of ethnic minority adolescent substance use over time, and to explore the relationships between family management factors, neighborhood context, and deviant peer associations that may influence youth substance use (see Figure 2). The research questions and hypotheses examined with this study were:

Research question 1a: What is the relationship between neighborhood context and substance use at age 12 (Time 1)? Hypothesis 1a: Greater neighborhood disadvantage (i.e., SES and social processes) will be related to greater substance use at age 12.

Research question 1b: What is the relationship between neighborhood context and the change in substance use across adolescence time, T_1 (age 12)-T_3 (age 18)? Hypothesis 1b: Greater neighborhood disadvantage (i.e., SES and social processes) at age 12 will be related to a larger increase in substance use until age 18.

Research question 2a: What is the relationship between adult supervision and the average substance use at age 12 (Time 1)? Hypothesis 2a: Less adult supervision will be related to greater average substance use at age 12?

Research question 2b: What is the relationship between adult supervision and the change in substance across time, T_1 (age 12)-T_3 (age 18)? Hypothesis 2b: Less adult supervision at age 12 will be related to a larger increase in substance use until age 18, T_1 (age 12)- T_3 (age 18).

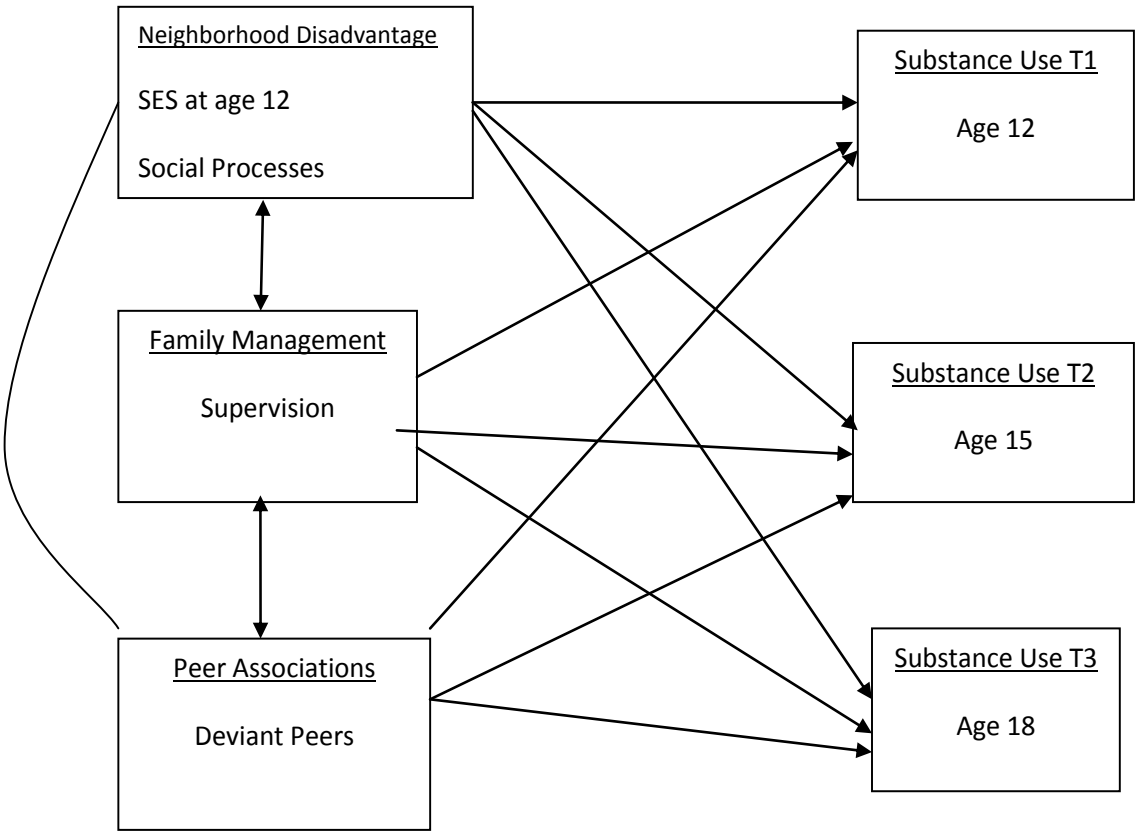

Figure 2. Conceptual model of neighborhood effects on adolescent substance use. Adapted from De La Rosa et al., 2003.

Research question 3a: What is the relationship between deviant peer associations and the average substance use at age 12 (Time 1)? Hypothesis 3a: More deviant peer associations will be related to greater substance use at age 12.

Research question 3b: What is the relationship between deviant peer associations and the change in substance across time, T_1 (age 12)- T_3 (age 18)? Hypothesis 3b: More deviant peer associations at age 12 will be related to a larger increase in substance use until age 18.

Research question 4a: Are there any moderating—or interaction—relations between deviant peer associations, adult supervision, and neighborhood context that influence average substance use at age 12?

Research question 4b: Are there any moderating—or interaction—relations between deviant peer associations, supervision, and neighborhood context that influence the trajectory of substance use change across time, T_1 (age 12)- T_3 (age 18)?

Research question 5: Do the proposed model relationships, as outlined in Figure 2 and described in hypotheses 1a-3b, vary by sex?

Research question 6: Do the proposed model relationships, as outlined in Figure 2 and described in hypotheses 1a-3b, vary by ethnic group (e.g., African American/Black, Hispanic/Latino, and White)?

CHAPTER III

METHODS

Participants

The data used for this research study were from the Project on Human Development in Chicago Neighborhoods (PHDCN) (Earls & Buka, 1997; Sampson, 1997; Sampson, Raudenbush, & Earls, 1997). The PHDCN is a series of large-scale, interdisciplinary studies of how families, schools, and neighborhoods affect child and adolescent development. The PHDCN design consisted of several components including a Community Survey, Systematic Social Observation study, and a Longitudinal Cohort Study. Access for data was obtained through the Inter-University Consortium for Political and Social Research (ICPSR), the University of Michigan's Survey Research Center, and was used with the approval of the National Archive of Criminal Justice Data staff.

A subset of the PHDCN data for the Longitudinal Cohort Study was used (Earls & Buka, 1997; Sampson, 1997; Sampson et al., 1997). For this dissertation study, participants in the 12-year-old cohort for whom data were available at the wave 3 follow-up (N = 821) were analyzed. Children within 6 months of the birthday that qualified them for the sample were selected for inclusion in the corresponding age cohort. This subsample used for the present dissertation study included 48.8% male participants and an ethnic composition of 37.2% African American/Black, 45.2% Hispanic/Latino,13.9% European American, and 3.6% Other ethnic group participants. Participant household and parent demographics can be found in Table 1. Table 2 displays the mean use of cigarettes, alcohol and marijuana for study participants.

Table 1

Participant Household and Parent Demographics

Measures	Sample (N =821)	African American (N = 298)	European American (N = 111)	Latino/ Hispanic (N = 362)
M (SD) Household size	5.33 (1.98)	5.08 (2.26)	4.73 (1.48)	5.76 (1.83)
M (SD) # of years at current address	6.27 (7.04)	7.05 (8.54)	7.41 (6.00)	5.19 (5.77)
Parent education				
% < High school	23.1	4.0	3.6	48.0
% Some high school	22.7	26.3	19.8	20.2
% Finished high school	13.2	12.5	22.5	11.4
% > High school	32.1	49.2	32.4	15.8
% Bachelor's degree or more	8.9	8.1	21.6	4.7
Parent marital status				
% Married	56.2	34.7	73.6	68.2
% Single	33.2	55.2	18.2	20.1
% Partnered	10.6	10.1	8.2	11.7
Parent employment status				
% Currently employed	61.5	64.6	69.4	56.3
% Unemployed < 5 years	14.6	14.1	18.9	13.7
% Unemployed > 5 years	23.9	21.3	11.7	30.0
Household income				
% < $10,000	20.5	28.5	4.6	16.9
% $10,000-$39,000	54.6	49.4	37.1	67.4
% > $40,000	24.9	22.1	58.3	15.7

Note. Participants who selected another race/ethnicity (3.7 % of sample) included in full sample description.

Measures

Neighborhood Context

Disadvantage. Disadvantage refers to a scale of economic disadvantage influenced by poverty, family status, age, employment, and race. For the current study, two types of disadvantage—neighborhood socioeconomic status (SES) and social

processes—were measured. The SES variable was calculated via principal components (PC) analysis by PHDCN researchers. It included a set of variables typically used as measures of SES (e.g., salary, education, and employment history) (Raudenbush & Sampson, 1999). The second PC was designed to capture social processes beyond typical measures of SES. Neighborhood level constructs (e.g., collective efficacy, social disorder, social capital, and perceptions of neighborhood safety) have been associated with multiple problem behaviors in youth (Sampson, Raudenbush, & Earls, 1997). Seven candidate measures were selected: (a) social cohesion, (b) social control, (c) social disorder, (d) social capital, (e) perceived neighborhood danger, (f) perceived violence, and (g) policing in the neighborhood (Sampson, Raudenbush, & Earls, 1997; Sampson et al., 1997). A summary of model variables and measures for the current study can be found in Table 2.

PC socioeconomic status (SES). For the current study, the PC SES comprised a composite variable of PHDCN indicators, including salary, job prestige or socioeconomic index (SEI) score, and education, typically used as measures of socioeconomic status. *Salary* was calculated using household income. The salary scale included seven levels and ranged in dollar amounts from $2,500 or less a year to $55,000 or more a year. *SEI* was calculated by summing the highest SEI scores reported for the job of the primary caregiver and the job of his/her partner (Nakao & Treas, 1994). *Education* was calculated by summing the highest level of education—measured in years—completed for the primary caregiver and the highest level of education level of his/her partner.

Table 2

Model Variables and Measures

Model Variables	Measures	Data Sources
Neighborhood disadvantage	1. *SES PC* a. Household income b. SEI c. Education level	PHDCN community survey
	2. *Social Processes PC* a. Collective Efficacy i. Social cohesion ii. Social control b. Social disorder c. Social capital d. Perceived neighborhood danger e. Policing in the neighborhood	PHDCN community survey
Family Management	*Supervision* scale (Home Observation for Measurement of the Environment, HOME), (Bradley et al., 2000; Caldwell & Bradley, 1984).	PHDCN Longitudinal Cohort Study
Peer Associations	*Deviance of peers (DOP*), (Huizinga, Esbenson, & Weihar, 1991).	PHDCN Longitudinal Cohort Study
Substance Use	*Substance use interview* (SUI), wave 1, 2, & 3, (World Health Organization, 1990)	PHDCN Longitudinal Cohort Study

PC social processes. *Collective efficacy*. Data from the Community Survey and SSO study were used to measure collective efficacy (Sampson , 1997; Sampson & Raudenbush, 1999). Consistent with previous studies, the concept of collective efficacy consisted of two five-item scales that measured (a) social cohesion and (b) social control (Raudenbush & Sampson, 1999; Sampson & Raudenbush, 2004). The social cohesion scale measured the relationships among neighbors. Participants were asked to respond to statements such as, “This is a close-knit neighborhood” and “People in the neighborhood

can be trusted," with responses ranging from "strongly agree" (5) to "strongly disagree" (1), along a 5-point scale. Responses were summed with higher scores indicating more social cohesion. The social control scale measured respondents' perceptions of neighborhood problems (e.g., litter, graffiti, and substance use) as well as their normative beliefs regarding problematic behaviors by neighborhood youth. Participants were asked to respond to statements such as, "Neighbors would do something if a group of neighborhood children skip school and hang out on the street corner" with responses ranging from "strongly agree" (5) to "strongly disagree" (1), along a 5-point scale. Responses were summed with higher scores indicating more social control.

Social disorder. Data from the Community Survey and SSO study were used to measure disorder efficacy (Sampson , 1997; Sampson & Raudenbush, 1999). Consistently used in large-scale studies of neighborhood functioning, the social disorder scale is 6 items that charted indicators of both physical and social disorder (e.g., the presence or absence of adults loitering or congregating, public intoxication, garbage or litter on the streets or sidewalks, graffiti, adults fighting or arguing in a hostile manner, selling drugs, and street prostitution) (Raudenbush & Sampson, 1999; Sampson & Raudenbush, 2004). Participants were asked to respond to questions such as, "How much of a problem is litter, broken glass or trash on sidewalk streets?" and "How much of a problem is people selling or using drugs?" with responses from "not a problem" (1) to "a big problem" (3) along a 3-point scale. Responses were summed with higher scores indicating more social disorder in the neighborhood.

Social capital. Social capital was derived from a 5-item scale consistently used in large-scale studies of neighborhood functioning (Raudenbush & Sampson, 1999;

Sampson & Raudenbush, 1999). The scale assessed relationships between adults and children in the neighborhood. Participants were asked to respond to statements such as, "There are adults in this neighborhood that children can look up to" and " Parents in the neighborhood know their children's friends," with responses ranging from "strongly agree" (5) to "strongly disagree" (1), along a 5-point scale. Responses were summed with higher scores indicating more social capital in the neighborhood.

Perceived neighborhood danger. Perceived neighborhood danger was derived from three items previously used in large-scale studies of neighborhood functioning (Raudenbush & Sampson, 1999; Sampson & Raudenbush, 1999). These items were used to capture residents' perceptions of safety in the neighborhood. Participants were asked to respond to statements such as, "There are areas in this neighborhood where everyone knows not to go/trouble is expected" and "You are taking a big chance if you walk in this neighborhood alone after dark," with responses ranging from "strongly agree" (5) to "strongly disagree" (1) along a 5-point scale. Responses were summed with higher scores indicating more perceived danger in the neighborhood.

Perceived violence. Perceived violence was derived from five items previously used in large-scale studies of neighborhood functioning (Raudenbush & Sampson, 1999). Items asked about incidents and frequency of crime and violence in the neighborhood. Participants were asked to respond to questions such as, "During the past 6 months, how often was there a fight in the neighborhood in which a weapon was used?" and "How often is there a robbery/mugging?" with responses ranging from "never" (1) to "often" (4), along a 4-point scale. Responses were summed with higher scores indicating more perceived violence in the neighborhood.

Policing in the neighborhood. Policing in the neighborhood was derived from six items consistently used in large-scale studies of neighborhood functioning (Raudenbush & Sampson, 1999) that describe perceptions of the effectiveness of law enforcement and responsiveness to crime and violence in the neighborhood. Participants were asked to respond to statements such as, "Police do a good job in responding to people in the neighborhood after being victims of crime" and "Police are not able to maintain order on streets and sidewalks in the neighborhood," with responses ranging from "strongly agree" (5) to "strongly disagree" (1), along a 5-point scale. Participants were also asked, "How much of a problem is police not patrolling the area or responding to calls from the area?" and "How much of a problem is excessive use of force by police?" Items were reverse coded with responses ranging from "a big problem" (1) to "not a problem" (3). Responses were summed with higher scores indicating perceptions of higher levels of policing, or safety in the neighborhood.

Family Management

Adult supervision. Data from the Longitudinal Cohort Study was used to measure supervision. Responses from the participant's primary caregiver on the Home Observation for Measurement of the Environment (HOME) measure were used (Bradley et al., 2000; Caldwell & Bradley, 1984). Items from the HOME measure have been previously used in large-scale studies of parenting behaviors and youth development with reliability estimates for the scales ranging from .50 to .91 (Bradley et al., 2000; Caldwell & Bradley, 1984; Gibson, Sullivan, Jones, & Piquero, 2010; Leventhal, Selner-O'Hagan, Brooks-Gunn, Bingenheimer, & Earls, 2004). The HOME instrument was administered as a semi-structured interview in which the primary caregiver was asked about daily

routines, other activities, and ways that the home environment was structured to accommodate the child's needs. The supervision scale is a 24-item subscale—on the HOME measure—that assessed the level and frequency of adult supervision and monitoring the participant received. Primary caregivers self-reported on how they directly and indirectly monitored their children. The primary caregiver was asked to respond to statements such as, "subject has a curfew on school nights" and "subject is at a supervised place after school". All items were coded "no" (0) or " yes" (1). Responses were summed with higher scores indicating more supervision. Reliability analysis was used to assess the scale properties in the present sample. Alpha reliability was acceptable (i.e., alpha = .70; average inter-item correlation = .10).

Peer Associations

Deviant peers. The Deviance of Peers (DOP) measure from the PHDCN Longitudinal Cohort Study was used to assess association with peers. The full version of DOP was a 36-item, self-report interview previously used in large-scale studies of neighborhood crime and youth delinquency with reliability estimates for the subscales range from .77 to .86 (Huizinga et al., 1991; Sampson et al., 1997). Researchers used the measure to obtain information about peer involvement in conventional and delinquent activities. In the PHDCN study, a reduced set of 24 items was used. The DOP included questions regarding the age and sex of peers involved in particular behaviors (e.g., skipping school and getting in trouble at home in the past year). The measure also asked about the number of friends exhibiting positive behaviors (e.g., involvement in school/community activities, getting along well with teachers, and being a good student). Responses ranged from "none" of my friends (1) to "all" of my friends (3) along a

3-point scale. DOP items also gathered information about peer pressure to use drugs and/or alcohol in the past year with questions such as, “How often have the people you spend time with asked you to go drinking?” and “How often have the people you spend time with said you have to get drunk/high to have a good time?” Response options were on a 4-point scale: never (1), once/twice (2), several times (3), or often (4). Responses were summed with higher scores indicating more deviant peer associations. In the current study, alpha reliability was acceptable (alpha = .86; = average inter-item correlation=.20).

Adolescent Substance Use

The Substance Use Interview (SUI) from the Longitudinal Cohort Study was used to measure youth substance use. The SUI was a self-report measure, adapted from the *Composite International Diagnostic Interview (CIDI),* that inquired about the types of substances adolescents used and their patterns of use (e.g., quantity and frequency) (World Health Organization, 1990). Data collected include the subject's reported use of various substances (e.g., tobacco, alcohol, marijuana, cocaine, crack cocaine, inhalants, hallucinogens, heroin, methamphetamines, barbiturates, tranquilizers, amphetamines, steroids, and intravenous drugs). The response format for this variable was a 9-point scale ranging from 1 = never to 9 = greater or equal to 200. Reliability estimates for the *Composite International Diagnostic Interview (CIDI)* ranged from .87 to .74. For the current study, substance use for participants at baseline (i.e., age 12) and at two subsequent time points (i.e., ages 15 and 18) were examined. Overall substance use was captured with three variables that asked participants to report the “number of days of use in the last year.” This question was asked for cigarettes, alcohol, and marijuana. The response format for this variable was a 9-point scale ranging from 1 = never to

9 = greater or equal to 200. The three substance use variables were then averaged to create a single substance use variable. This substance use variable was the primary dependent variable used when exploring substance use across time (i.e., ages 15 and 18) in the LGM models.

Procedures

The PHDCN neighborhood study was conducted from 1995-1996 (Earls & Buka, 1997; Sampson, 1997; Sampson et al., 1997). Chicago was first divided into 343 neighborhoods of about 8,000 residents, composed of contiguous census tracts. Then 25 to 50 residents of each neighborhood were surveyed about neighborhood conditions and about their attitudes, yielding 8,782 surveys. Research teams also systematically observed and recorded conditions of physical and social disorder on each side of every street block in 80 neighborhoods, yielding approximately 27,000 observations. The longitudinal study of youth was launched at the same time in 80 neighborhoods, which were chosen to vary in both racial and ethnic composition and socioeconomic conditions. With enough youth from enough neighborhoods, researchers can examine children who have similar demographic characteristics but who live in very different neighborhoods, as well as youth who are not similar but who live in similar neighborhoods. The researchers enrolled 6,212 participants from 7 age cohorts (i.e., 0, 3, 6, 9, 12, 15, and 18). Three waves of data collection were conducted. Each wave consisted of an interview with each youth—who was at least 6 years old—and an interview with a primary caregiver for youth younger than 18. Interviews were conducted about 2.5 years apart. This design, in which multiple age cohorts are studied over overlapping ages, is referred to as an *accelerated longitudinal* design because an age range—in this case, from 0 to about 25

years—can be studied in much less time than in a standard longitudinal study. For the current dissertation study, wave 1, 2, and 3 data for the 12-year-old cohort was examined.

Data Sources

Community survey. The Community Survey (Earls & Buka, 1997) was conducted from 1994-1995 and consisted of household interviews with a random sample of 8,782 Chicago residents ages 18 years and over from all 343 neighborhood clusters. The Community Survey measured the structural conditions and organization of neighborhoods in Chicago with respect to the dynamic structure of the local community, the neighborhood organizational and political structures, cultural values, informal and formal social control, and social cohesion. The Community Survey also gathered information from residents about perceptions of neighborhoods in which they lived. Data collection consisted of a household interview of residents, ages 18 years and older, to assess key neighborhood dimensions. Variables included measures of the best and worst aspects of living in Chicago, how long residents had lived in a particular neighborhood, and characteristics of their neighborhood including types of social service agencies available. Other community variables measured were the relationships among neighbors and respondents' perceptions of neighborhood problems (e.g., litter, graffiti, drinking, drugs, and excessive use of force by police). Respondents were also asked about their normative beliefs regarding violence, money, and various children's behaviors.

Systematic social observation (SSO) study. Systematic social observation (SSO) is a standardized approach for directly observing the physical, social, and economic characteristics of neighborhoods, one block at a time (Raudenbush & Sampson, 1999). The main objective of the SSO was to measure the effects of neighborhood

characteristics on young people's development, specifically the variables associated with youth violence. Neighborhood-level variables that influenced youth problem behavior (e.g., social disorder, physical disorder, perceived neighborhood danger, social cohesion, and social control) were measured. Consistent with previous research, signs of physical disorder included the presence or absence of garbage or litter on the streets or sidewalks, empty beer bottles visible in the street, graffiti, abandoned cars, condoms, or needles/syringes on the sidewalks. Indicators of social disorder included presence or absence of adults loitering or congregating, public intoxication, peer groups with gang indicators, adults fighting or arguing in a hostile manner, selling drugs, and street prostitution. SSO data were collected in 1995 using observations from 80 of the 343 Chicago neighborhood clusters, comprising more than 23,000 blocks. These observations were coded to assess neighborhood characteristics (e.g., land use, housing, litter, graffiti, and social interactions) (Kinlock, & O'Grady, 1996; Raudenbush & Sampson, 1999).

The longitudinal cohort study. The Longitudinal Cohort Study was a series of coordinated longitudinal studies that followed more than 6,000 randomly selected children, adolescents, young adults, and their primary caregivers over time. The Longitudinal Cohort Study used an accelerated, longitudinal design with seven cohorts separated by 3-year intervals. The age cohorts included birth (0), 3, 6, 9, 12, 15, and 18 years. Participants were drawn from 80 neighborhood clusters (NCs) and selected through in-person screening of dwelling units within the identified communities. Data were collected at three points in time: 1994-1997, 1997-1999, and 2000-2001. The seven randomly selected cohorts of children, adolescents, young adults, and their primary caregivers were followed over a period of 7 years to study changes in their personal

characteristics and the changing circumstances of their lives. Numerous measures were administered to respondents to gauge various aspects of human development, including individual differences, as well as family, peer, and school influences. For example, some questions assessed impulse control and sensation-seeking traits, cognitive and language development, leisure activities, delinquency and substance abuse, friends' activities, self-perception, attitudes, and values. Caregivers were also interviewed about family structure, parent characteristics, parent-child relationships, parent discipline styles, family mental health, and family history of criminal behavior and drug use.

For the current study, wave 1, 2, and 3 data for the 12-year-old cohort was examined. It is generally acknowledged that correlates and predictors of adolescent problem behavior can be found in preadolescent ages. The focus of the current study is substance use; therefore, consistent with previous research, my examination of the development of youth substance use follows participants as they develop from early through late adolescence. Supplemental files include description of PHDCN scale items, HOME measure, Deviance of Peers measure, and items from the Substance Use Interview.

CHAPTER IV

RESULTS

This chapter presents the results from preliminary study analyses, measurement model analyses, and main study analyses. In the preliminary analysis section, statistical assumptions and methods for addressing missing data are presented. Next, scale development and analysis results are summarized. Latent growth curve modeling (LGM) was used to test the primary research questions.

Preliminary Analyses

Statistical Assumptions

Structural equation modeling (SEM) techniques assume multivariate normality and the absence of severe outliers (Raudenbush & Bryk, 2002; Tabachnik & Fidell, 2005). Non-normal distributions and outliers can result in biased model parameters and inaccurate significance tests. Examination of the univariate distributions revealed severe skewness for the substance use variables. This was to be expected, given the relatively low substance use across the sample, particularly at age 12. Given this skewness, natural logarithm (LN) transformations were applied to the substance variables. In addition, maximum likelihood with robust standard errors was used when estimating the LGM models. Significance tests conducted with robust standard errors do not rely on assumptions of multivariate normality, thus limiting the negative impact of the skewed distributions (Muthén & Muthén, 2011). Another assumption of SEM includes the absence of multicollinearity (i.e., no correlations between variables approaching $r = 1$). There were no correlations between study variables high enough to warrant concern.

Missing Data

At baseline (i.e., age 12), missing data were minimal for substance use variables (i.e., cigs last year = 2.4%, alcohol last year = 2.3%, and marijuana last year = 3.3%). Missing data were also minimal for the neighborhood context principal components at age 12 (discussed below; neighborhood SES = 2.7% and neighborhood social processes = 1.9% were missing). There were more missing data for the Adult Supervision (i.e., 24 items; 8.3% missing at least one item) and Deviant Peers (i.e., 26 items; 23% missing at least one item) scales at age 12. Data were missing due primarily to participants missing a few items within the larger scale. For the substance use variables, however, across time there was an expected loss of data due to attrition. At time 2 measurement (i.e., age 15), the proportion of missing data jumped to approximately 17% (cigs last year = 17.1%, alcohol last year = 17.2%, and marijuana last year = 17.8%). At time 3 measurement (i.e., age 18), the proportion of missing data jumped to approximately 31% (cigs last year = 30.7%, alcohol last year = 30.8%, and marijuana last year = 30.9%).

The simplest solution for dealing with missing data is to use complete cases only (i.e., removing participants with any missing data) (Little & Rubin, 2002). Complete-case analysis is not advisable, however, because large amounts of the available data are lost when examining all of the time points simultaneously in latent growth models (LGMs). Thus, missing data were handled using full information maximum likelihood (FIML) estimation that is enabled in MPLUS software version 3.13. The total sample size used for present study analyses was N = 817.

Measurement Analysis

For the current study, two types of disadvantage—neighborhood socioeconomic status (SES) and social processes—were examined. Principle component (PC) analysis was used to generate two types of participant disadvantage scores that would represent neighborhood context: socioeconomic status (SES) and social process. The first PC (SES) was calculated by PHDCN researchers included in the dataset. This PC included a set of variables typically used as measures of SES (e.g., salary, education, employment). The second PC was designed to capture social processes beyond just typical measures of SES. Seven candidate measures were selected: (a) perceived neighborhood danger, (b) social cohesion, (c) policing in the neighborhood, (d) social disorder, (e) social control, (f) perceived violence, and (g) social capital. Scores for subjects were aggregated at the neighborhood level (N=80). Table 3 shows the correlations between neighborhood social process variables. Principal components analysis was used to assess whether this set of variables could be combined into a single coherent component (or factor), social processes.

A single component was extracted, accounting for 75.44% of the variance in the original variables (i.e., eigenvalue = 5.28). All of the subsequent components had eigenvalues less than 1 and were discarded. The communalities and component loadings are shown in Table 4. Communalities show the percentage of variance in each item that is accounted for in the component structure (e.g., .86 = 86%), while the component loadings show how strongly each variable loads onto the component, similar to factor loadings.

Table 3

Pearson Correlations Between Neighborhood Social Process Variables

	[a]Danger	[b]Cohesion	[c]Policing	[d]Disorder	[e]Control	[f]Violence	[g]Capital
Danger	1.00						
Cohesion	-.82**	1.00					
Policing	-.85**	.79**	1.00				
Disorder	.83**	-.65**	-.89**	1.00			
Control	-.76**	.79**	.74**	-.67**	1.00		
Violence	.77**	-.70**	-.78**	.88**	-.65**	1.00	
Capital	-.62**	.83**	.55**	-.40**	.71**	-.41**	1.00
Mean	3.20	3.34	2.62	1.86	3.87	1.97	3.53
SD	.48	.29	.28	.34	.34	.36	.27
Min	1.95	2.73	2.10	1.19	3.02	1.33	2.86
Max	3.97	4.21	3.30	2.44	4.68	2.90	4.36
Observed N	805.00	805.00	805.00	805.00	805.00	805.00	805.00

Note. *$p < .05$, **$p < .01$. Score ranges: a=1.95-3.97, b= 2.73-4.21, c= 2.10-3.29, d= 1.19-2.43, e= 3.02-4.68, f= 1.33-2.90, g= 2.86-4.36.

Table 4

Communalities and Component Loadings for Neighborhood Social Processes

	Communalities	Component Loadings
Danger	.86	-.93
Cohesion	.84	.92
Policing	.80	.90
Disorder	.76	-.87
Control	.76	.87
Violence	.72	-.85
Capital	.54	.73

Given the single component, principle component scores were generated for each individual in the sample, and these scores were used in subsequent latent growth curve modeling (LGM) analyses.

Main Study Analyses

The study hypotheses were tested with a latent growth curve model. Latent growth curve modeling (LGM) has several advantages over traditional MANOVA or multi-level modeling approaches for studying change over time. Some advantages include using the same variable as both a dependent and independent variable, the ability to fully control the specification of the error structure in the model, and the option of including time-invariant as well as time-varying covariates (Duncan, Duncan & Strycker, 2006).

In step 1, the average substance use variables at each time point were used to estimate the trajectory of substance use across time. This procedure yields a shape (i.e., nonlinear shape in the model below) corresponding to the rate of change of substance use over time, as well as an intercept (i.e., constant) that corresponds to the baseline level of substance use in the sample (i.e., age 12 substance use). The primary goal of this step was to determine the appropriate functional shape of the trajectory across time as indicated by a good fit between the model and the observed data. Many goodness of fit indices, including the chi-square statistic, the comparative fit index, and the root mean square error of approximation, were used to determine how well the data fit the specified model (Duncan, Duncan & Strycker, 2006). Table 5 describes study participants' average use of cigarettes, alcohol and marijuana.

In step 2, time invariant predictors in the model (i.e., neighborhood context, supervision, and deviant peers) were added to determine their ability to predict both the intercept and the trajectory across time. It is in this step that hypotheses 1a-3b were tested explicitly.

Table 5

Participant Substance Use

Substance	African American (N = 298)		European American (N = 111)		Latino/ Hispanic (N = 362)	
	M	SD	*M*	SD	*M*	SD
Cigarette use						
$Time_1$ (age 12)	0.03	0.20	0.09	0.31	0.04	0.22
$Time_2$ (age 15)	0.11	0.36	0.39	0.68	0.24	0.50
$Time_3$ (age 18)	0.30	0.63	0.76	0.88	0.42	0.72
Alcohol use						
$Time_1$ (age 12)	0.04	0.22	0.06	0.25	0.05	0.21
$Time_2$ (age 15)	0.10	0.26	0.28	0.52	0.21	0.46
$Time_3$ (age 18)	0.39	0.57	0.71	0.65	0.56	0.63
Marijuana use						
$Time_1$ (age 12)	0.01	0.12	0.02	0.11	0.23	0.18
$Time_2$ (age 15)	0.05	0.26	0.09	0.36	0.07	0.31
$Time_3$ (age 18)	0.29	0.61	0.35	0.66	0.29	0.59
Average substance use						
$Time_1$ (age 12)	0.03	0.14	0.06	0.17	0.03	0.17
$Time_2$ (age 15)	0.08	0.22	0.26	0.41	0.17	0.34
$Time_3$ (age 18)	0.33	0.50	0.61	0.58	0.42	0.53

Note. Participant response measured on 9-point scale indicating number of times substance was used where 1 = never, 2 = 1-2, 3 = 3-5, 4 =6-11, 5 = 12-24, 6 = 25-50, 7 = 51-99, 8 = 100-199, and 9 = greater or equal to 200 uses.

In step 3, interaction terms were added to the model to test for potential moderating effects. Centered predictor and moderator terms were multiplied to get the interaction term—the method recommended by Frazier, Tix, and Barron (2004)—to minimize problems with multicollinearity and to facilitate interpretation of interaction

effects. All of the pairwise interaction terms between the predictors were tested separately in an exploratory fashion.

In step 4, a multi-group LGM was specified to explore any differences in the pattern of effects between males and females. In step 5, a multi-group LGM was specified to explore any differences in the pattern of effects between ethnic groups (i.e., African American/Black, Hispanic/Latino, and White).

Assessing the Functional Slope of Substance Use Across Time

Table 6 shows the correlations between the variables used in the LGM. In the first modeling step, the trajectory of substance use across time was examined in a latent growth curve model. A linear function was fit to the data resulting in the following fit indices: χ^2 (2, N = 808) = 40.37, $p < .0001$, CFI = 0.74, and RMSEA = 0.15. The model fit was not adequate by the CFI (good fit > .90) or RMSEA (good fit < .08), and the chi-square test was significant indicating a significant deviation between the model and the data. Thus, an unconstrained shape was fit to the data to capture any nonlinearity in substance use across time. The nonlinear function was estimated by fixing two contrast weights while estimating the third weight to maximize fit. The unconstrained shape model resulted in the following indices of fit: χ^2 (1, N = 808) = 1.0, $p = .76$, CFI = 1.00, and RMSEA < 0.0001. The model provided a very good fit to the data. Table 7 shows the parameter estimates for the unconstrained LGM.

The factor loadings on the shape factor can be used to interpret the shape of the nonlinear trajectory across time. These loadings reveal a monotonic increasing trajectory of substance use across time with a larger difference between ages 15-18 (i.e., 0.61 to

2.00) than between ages 12-15 (i.e., 0.00 to 0.61). Approximately 86%, 39%, and 80% of the variation in observed substance use variables at each successive time point, respectively, was accounted for by the LGM. The baseline substance use mean (i.e., Intercept) was significantly different from 0, $Mi = 0.04$, $t = 6.53$, as was the shape mean, $Ms = 0.20$, $t = 17.61$. The significant shape mean indicates that the increase in substance use from ages 12-18 was greater than what would be expected by chance alone. In addition, both the intercept and shape variances were significantly different from 0, $Vi = 0.02$, $t = 2.95$, $Vs = 0.06$, $t = 6.97$. This result indicates that individuals vary significantly in their baseline substance use and growth trajectory across time. This significant variation justifies the search for predictors that can explain this variation. In the next step of the analysis, I explored whether this variation can be explained by several time-invariant predictors in the models that follow.

Latent Growth Curve Models with Time Invariant Predictors

Research Questions 1-4

To address hypotheses 1a-3b, measures of neighborhood disadvantage, family supervision, and peer associations were added as time invariant predictors of substance use. A summary of these research questions and hypotheses follows.

Table 6

Pearson Correlations Between Variables Used in LGM

	Mean	SD	Ave Use T_1	Ave Use T_2	Ave Use T_3	SES	Social Process	Supervision	Deviant Peers
Ave use T_1	1.07	.40	1.00						
Ave use T_2	1.33	.83	.38**	1.00					
Ave use T_3	2.00	1.52	. 24**	. 45**	1.00				
Neighborhood SES	.16	1.38	-.02	.05	.06	1.00			
Neighborhood Social Process	0.00	1.00	.04	.12**	.09*	.43**	1.00		
Supervision	21.4	2.55	-.16**	-.10*	-.12**	.16**	.07	1.00	
Deviant Peers	34.5	5.71	.37**	.15**	.17**	-.08*	-.07	-.06	1
Min			1.00	1.00	1.00	-2.95	-2.12	6.00	26
Max			8.00	9.00	9.00	3.52	2.42	24.00	62
Observed N			793.00	674.00	566.00	799.00	805.00	753.00	632

Note. $*p < .05$, $**p < .01$.

Table 7

Parameter Estimates From the Unconstrained LGM

Measures	Estimate	*SE*	*t*-value
Factor Loadings			
Shape by Time 1 (Age 12)	0.00	—	—
Shape by Time 2 (Age 15)	0.61	.060	10.70*
Shape by Time 3 (Age 18)	2.00	—	—
Intercept and Shape Means			
Intercept	0.04	0.006	6.53*
Shape	0.20	0.01	17.61*
Intercept and Shape Variances			
Intercept	0.02	0.007	2.95*
Shape	0.06	0.008	6.97*
Correlations			
Intercept with Shape	0.00	—	—

Note. $*p < 0.05$.

Research question 1a: What is the relationship between neighborhood disadvantage and the average substance use at age 12? *Hypothesis 1a*: Greater neighborhood disadvantage (SES and social processes) will be related to greater average substance use at age 12.

Research question 1b: What is the relationship between neighborhood context and the change in substance across time? *Hypothesis 1b*: Greater neighborhood disadvantage (SES and social processes) at age 12 will be related to a larger increase in average substance use across time (i.e., ages 12, 15, and 18).

***Research question 2a*:** What is the relationship between supervision and the average substance use at age 12? *Hypothesis 2a*: Less supervision will be related to greater average substance use at age 12.

Research question 2b: What is the relationship between supervision and the change in substance use across time? *Hypothesis 2b*: Poorer supervision at age 12 will be related to greater increase in substance use across time (i.e., ages 12, 15, and 18).

Research question 3a: What is the relationship between deviant peer associations and the average substance use at age 12? *Hypothesis 3a*: More deviant peer associations will be related to greater average substance use at age 12.

Research question 3b: What is the relationship between deviant peer associations and the change in substance use across time? *Hypothesis 3b*: More deviant peer associations at age 12 will be related to steeper increase in substance use across time (i.e., ages 12, 15, and 18).

Figure 3 shows the LGM with time-invariant predictors. Fitting the LGM with time-invariant predictors resulted in the following fit indices: $\chi^2(5, N = 813) = 2.14$, $p = .83$, CFI = 1.00, and RMSEA < .001. The model provided a very good fit to the data. The current model accounted for 17% of the variance in baseline levels of participants' substance use and 3% of the change in participants' substance use. Table 8 shows the parameter estimates for each of the time-invariant predictors on both the intercept and shape. Having more deviant peers, less supervision, and greater negative social process neighborhood factors resulted in greater substance use at baseline (i.e., age 12). Neighborhood SES was not significantly related to baseline substance use status after controlling for the other predictors. Of the four predictors, only family supervision was a significant predictor of the shape across time. Supervision had a negative relationship to the change in participants' substance use. For each standard deviation increase in supervision, there would be a .13 standard deviation decrease in the change of substance

use. In other words, greater supervision at age 12 resulted in a less steep increase in substance use between ages 12 and 18.

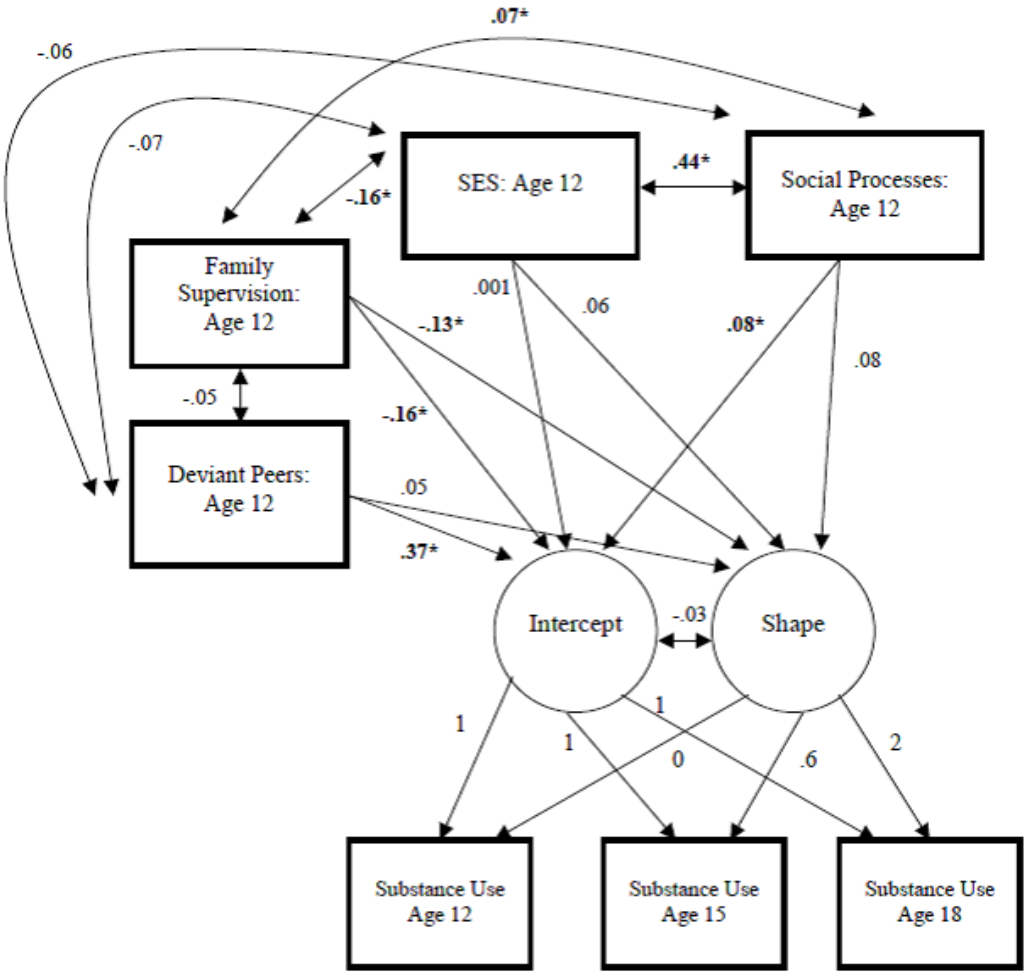

Figure 3. LGM with time invariant predictors.
* p <. 05.

I was also interested in whether there were any significant interactions between predictors that could account for variance in the intercept or shape factors (i.e., exploratory research question 4). That is, are there any moderating—or interaction—relations between deviant peer associations, supervision, and neighborhood context that influence average substance use at age 12 or the trajectory of change across

time (i.e., ages 12, 15, and 18)? Each interaction between each predictor and each other was added in separate model runs. None of the interactions were found to be significant predictors.

Table 8

Parameter Estimates From LGM With Time Invariant Predictors

Parameters	Estimate	Standard Estimate	*SE*	*t*-value
Peers → Intercept	0.010	0.370	0.003	3.69*
Family → Intercept	-0.009	-0.160	0.004	2.11*
SES → Intercept	<.001	0.001	0.004	0.05
Social Process → Intercept	0.010	0.080	0.005	2.30*
Peers → Shape	0.002	0.050	0.002	0.82
Family → Shape	-0.010	-0.130	0.005	-2.41*
SES → Shape	0.010	0.060	0.009	1.15
Social Process → Shape	0.020	0.080	0.010	1.50
Intercept ↔ Shape	-0.001	-0.030	0.002	0.46
SES ↔Social Proc	0.600	0.440	0.050	12.16*
Family ↔Peers	-.700	-0.050	0.720	-0.98
Family ↔SES	0.570	-0.160	-0.120	4.73*
Family ↔Social Proc	0.180	0.070	0.090	1.99*
Peers ↔SES	-0.570	-0.070	0.300	-1.90
Peers ↔ Social	-0.360	-0.060	0.050	-1.77

Note: $*p < 0.05$.

Variation of Latent Growth Curve Models by Sex

Research Question 5. To address Research Question 5, multi-group LGM was used to explore whether the time-invariant predictor model estimated above varied by participant sex. The standard approach used in multiple group analysis is to begin with a fully unconstrained model (i.e., one that applies no constraints that parameters are equal across groups). If this model fits well, then parameter constraints are added in successive models to identify where the groups differ. The first model tested was a fully unconstrained model. This fully unconstrained model provided a very poor fit to the data, χ^2 (11, N = 802) = 139.14, $p < .001$, CFI = .63, and RMSEA = .17, and resulted in negative residual variances suggesting problems finding a solution. As expected, all models with parameter constraints added also resulted in negative residuals suggesting estimation problems. Next, we estimated the LGM separately for each group to examine fit statistics and parameter estimates.

For females, the model fit the data very well: χ^2 (4, N = 412) = 1.23, $p = .87$, CFI = 1.00, and RMSEA < .001. For females, the current model accounted for 20% of the variance in baseline levels of participants' substance use and 9% of the change in participants' substance use. Table 9 shows the parameter estimates for the female only model. A similar nonlinear increasing trend in substance use was observed across time, with a larger increase between ages 15 to 18 (i.e., loadings: .73 to 2.0) than between ages 12 to 15 (i.e., loadings: 0 to .73). More deviant peers at age 12 related to greater substance use at age 12. There was also a nearly significant effect of the social processes component of neighborhood context on the intercept. For each standard deviation increase in neighborhood social processes, there would be a .28 standard deviation

increase in the change of substance use. That is, positive scores on the social processes component were related to females' greater substance use at age 12, and also related to a steeper increase in females' substance use across time.

Table 9

Parameter Estimates Female Only LGM With Time Invariant Predictors

Parameters	Estimate	Standard Estimate	*SE*	*t*-value
Peers → Intercept	0.010	0.44	0.004	2.800*
Family → Intercept	-0.002	-0.03	0.003	-0.510
SES → Intercept	0.003	0.03	0.004	0.700
Social Process → Intercept	0.010	-0.09	0.006	1.932
Peers → Shape	0.003	0.10	0.003	1.210
Family → Shape	-0.002	-0.03	0.005	-0.410
SES → Shape	0.004	0.03	0.009	0.420
Social Process → Shape	0.050	0.28	0.010	3.720*
Intercept ↔ Shape	0.001	0.06	0.003	0.540
SES ↔ Social Proc	0.590	0.42	0.070	8.570*
Family ↔ Peers	-0.210	-0.02	0.830	-0.250
Family ↔ SES	0.470	0.14	0.160	2.910*
Family ↔ Social Proc	0.060	0.03	0.120	0.540
Peers ↔ SES	-0.430	-0.06	0.380	-1.130
Peers ↔ Social	-0.450	-0.08	0.290	-1.560

Note. $*p < 0.05$.

For males, the model fit the data very well: χ^2 (4, N = 393) = 3.98, p = .41, CFI = 1.00, and RMSEA < .001. Table 10 shows the parameter estimates for the male only model.

Table 10

Parameter Estimates Male Only LGM With Time Invariant Predictors

Parameters	Estimate	Standard Estimate	*SE*	*t*-value
Peers → Intercept	0.009	0.32	0.003	2.48*
Family → Intercept	-0.020	-0.28	0.007	2.30*
SES → Intercept	-0.002	-0.02	0.006	-0.37
Social Process → Intercept	0.010	0.07	0.008	1.50
Peers → Shape	0.001	-0.01	0.004	-0.11
Family → Shape	-0.019	-0.16	0.008	-2.19*
SES → Shape	0.010	0.06	0.020	0.87
Social Process → Shape	-0.010	-0.05	0.020	-0.71
Intercept ↔Shape	-0.005	-0.11	0.006	-0.82
SES ↔Social Proc	0.590	0.43	0.070	8.25*
Family ↔Peers	-0.910	-0.06	1.130	-0.81
Family ↔SES	0.660	0.18	0.170	3.82*
Family ↔Social Proc	0.270	0.11	0.140	1.96*
Peers ↔SES	-0.730	-0.09	0.450	-1.63
Peers ↔Social	-0.270	-0.05	0.290	-0.95

Note. *p < 0.05.

For males, the current model accounted for 19% of the variance in males' baseline levels of substance use and 3% of the change in males' substance use. A similar nonlinear increasing trend in substance use was observed across time, with a larger increase between ages 15 to 18 (i.e., loadings: .53 to 2.0) than between ages 12 to 15 (i.e., loadings: 0 to .53). For males, less adult supervision and more deviant peers were associated with greater substance use at age 12. Supervision was related negatively to the change in participants' substance use. For each standard deviation increase in supervision, there would be a .16 standard deviation decrease in the change of substance use. In other words, less adult supervision was related to a steeper increase in males' substance use across time.

Variation of Latent Growth Curve Models By Ethnic/Racial Group

Research Question 6: To address Research Question 6, multi-group LGM was used to explore whether the time-invariant LGM fit varied by ethnic group. That is, do the proposed model relationships between neighborhood disadvantage, family supervision, and peer associations vary by ethnic group (i.e., African American/Black, Hispanic/Latino, and White)?

The sample size for only three ethnic/racial groups was adequate to compare: Hispanic/Latino (n = 362), Black (n = 298), and White (n = 111). As above, the fully unconstrained model provided a very poor fit to the data, χ^2 (16, N = 768) = 136.03, $p <$ .001, CFI = .50, and RMSEA = .17, and resulted in negative residual variances suggesting problems finding a solution. As expected, estimation problems occurred when testing models with parameter constraints added as well. Next, I estimated the LGM separately for each group to examine fit statistics and parameter estimates.

For the Hispanic/Latino group, the model fit the data very well: χ^2 (4, N = 362) = 1.77, p = .77, CFI = 1.00, and RMSEA < .001. A similar nonlinear increasing trend in substance use was observed across time, with a larger increase between ages 15 to 18 (i.e., loadings: .73 to 2.0) than between ages 12 to 15 (i.e., loadings: 0 to .73). Table 11 shows the parameter estimates for the Hispanic/Latino only model. For Hispanic/Latino youth, the current model accounted for 22% of the variance in baseline levels of substance use and 3% of the change in Hispanic/Latino participants' substance use. More deviant peer associations were related to greater substance use at age 12. Higher scores on the SES principal component were related to greater increases in substance use across time. For each standard deviation increase in SES, there would be a .16 standard deviation increase in the change of substance use. That is, higher neighborhood SES was related to greater increases in substance use for Hispanic/Latino participants.

For the African American/Black group, the model fit the data very well: χ^2 (4, N = 298) = 3.20, p = .52, CFI = 1.00, and RMSEA < .001. Table 12 shows the parameter estimates for the African American/Black only model. A similar nonlinear increasing trend in substance use was observed across time, with a larger increase between ages 15 to 18 (i.e., loadings: .34 to 2.0) than between ages 12 to 15 (i.e., loadings: 0 to .34). For African-American youth, the current model accounted for 23% of the variance in baseline levels of their substance use and 7% of the change in African-American youth's substance use. In sum, more deviant peers associations were related to greater substance use at age 12.

Table 11

Parameter Estimates Hispanic/Latino Only LGM With Time Invariant Predictors

Parameters	Estimate	Standard Estimate	*SE*	*t*-value
Peers → Intercept	0.01	0.42	0.005	2.54*
Family → Intercept	-0.01	-0.20	0.006	-1.83
SES → Intercept	-0.01	-0.007	0.006	-0.16
Social Process → Intercept	0.001	0.005	0.008	0.13
Peers → Shape	0.001	0.03	0.004	0.35
Family → Shape	-0.005	-0.06	0.006	-0.85
SES → Shape	0.03	0.16	0.02	2.06*
Social Process → Shape	0.007	0.03	0.02	0.36
Intercept ↔Shape	-0.003	-0.07	0.004	-0.75
SES ↔Social Proc	0.36	0.34	0.07	5.51*
Family ↔Peers	-0.27	-0.02	1.29	-0.21
Family ↔SES	-0.46	-0.14	0.16	2.90*
Family ↔Social Proc	-0.02	-0.01	1.15	-0.14
Peers ↔SES	0.41	0.06	0.38	1.09
Peers ↔Social	0.13	0.02	0.26	0.49

Note. $*p < 0.05$.

None of the predictors reached significance on the slope. In other words, for African American/Black participants, none of the predictors were significantly related to greater increases in substance use across time.

Table 12

Parameter Estimates Black Only LGM With Time Invariant Predictors

Parameters	Estimate	Std. Estimate	*SE*	*t*-value
Peers → Intercept	0.007	0.46	0.003	2.39*
Family → Intercept	-0.004	-0.09	0.005	-0.73
SES → Intercept	0.002	0.03	0.007	0.27
Social Process → Intercept	0.007	0.08	0.007	1.13
Peers → Shape	0.001	0.06	0.003	0.44
Family → Shape	-0.010	-0.18	0.010	-1.18
SES → Shape	-0.020	-0.14	0.020	-1.00
Social Process → Shape	0.020	0.13	0.020	0.91
Intercept ↔Shape	0.003	0.23	0.005	0.57
SES ↔Social Proc	0.420	0.37	0.060	6.63*
Family ↔Peers	-1.150	-0.10	0.910	-1.27
Family ↔SES	0.270	0.11	0.150	1.79
Family ↔Social Proc	0.160	0.09	0.110	1.52
Peers ↔SES	-1.430	-0.19	0.480	-2.98*
Peers ↔Social	-0.390	-0.08	0.330	-1.18

*$p < 0.05$.

For the White group, the model resulted in negative residual variances suggesting problems finding a solution. Testing a simple LGM without the time-invariant predictors resulted in the same problems. This issue may be due to the relatively low rates of

substance use reported by this group throughout the study period, which is exacerbated by the smaller sample size (i.e., n = 111).

Summary of Findings

Results from this study suggest that having more deviant peer associations, less adult supervision, and a neighborhood context with greater negative social processes at age 12 resulted in adolescents' greater substance use at baseline (i.e., age 12). Neighborhood SES was not significantly related to baseline substance use status after controlling for the other predictors. Of the four predictors, only adult supervision was a significant predictor of the shape across time. Greater supervision at age 12 resulted in a less steep increase in substance use between ages 12 and 18.

For both females and males, a similar nonlinear increasing trend in substance use was observed across time, with a larger increase between ages 15 to 18 than between ages 12 to 15. For females in the sample, more deviant peers at age 12 associated with greater substance use at age 12. There was also a nearly significant effect of the social processes component of neighborhood context on the intercept. In other words, more positive scores on the social processes component were related to greater substance use for females at age 12, and related to a steeper increase in females' substance use across time. For males, more deviant peers were associated with greater substance use at age 12. In addition, less supervision was related to greater substance use at age 12 as well as a steeper increase in substance use across time.

For the African American/Black and Hispanic/Latino groups, the models fit the data very well. A similar nonlinear increasing trend in substance use was observed across time, with a larger increase between ages 15 to 18 than between ages 12 to 15. For the

African American/Black group, more deviant peer associations were related to greater substance use at age 12. None of the predictors reached significance on the shape factor. For the Hispanic/Latino group, more deviant peer associations were related to greater substance use at age 12. Also, higher scores on the SES principal component were related to greater increases in substance use across time. For the White group, the model resulted in negative residual variances suggesting problems finding a solution. This issue may be due to the relatively low rates of substance use in this group—throughout the study period—which is exacerbated by the small sample size.

CHAPTER V

DISCUSSION

The primary purpose of this study was to utilize an ecological-transactional theoretical framework and an existing longitudinal data set to examine the relationship among neighborhood context, family supervision, association with deviant peers, and patterns of substance use during adolescence. Generally, study results support previous findings of the influence of adult supervision and association with deviant peers on adolescent substance use. Findings also indicated factors that influence adolescents' substance use over time varied by sex and ethnic group. Lastly, the study yielded unexpected and unique findings about the influence of neighborhood social processes and contextual factors on individual substance use.

The current study tested the hypothesis that greater neighborhood disadvantage (i.e., SES and social processes), greater association with deviant peers, and less adult supervision would be related to higher levels of substance use at age 12 and a greater increase in substance use between ages 12 and 18. Results support extant research on the influence of adult supervision and association with deviant peers on adolescents' substance use (Barrera, Biglan, Ary, & Li, 2001; Brody & Ge, 2001; Dishion & Stormshak, 2007; Dishion & McMahon, 1998). In the current study, having more deviant peer associations, and less supervision, resulted in greater substance use at baseline (i.e., age 12) among the sample as a whole. Of the hypothesized four predictors, only supervision was a significant predictor of the change in substance use. For males, greater supervision at age 12 resulted in a less steep increase in substance use between ages 12 and 18 when controlling for neighborhood and peer factors. These findings are in line

with extant literature on family and peer factors that both directly and indirectly influence individual substance use outcomes (Cleveland, Gibbons, Gerrard, Pomery, & Brody, 2005; Dishion, Nelson, & Kavanagh, 2003; Dishion & Stormshak, 2007) These results confirmed my hypothesis and are consistent with previous research findings about the importance of peer associations and supervision (Barrera, Biglan, Ary, & Li, 2001; Chuang, Ennett, Bauman, & Foshee, 2005; Cleveland et al., 2005; Westling, Andrews, Hampson, & Peterson, 2008) on risk and protective factors in adolescent substance use.

Study results revealed an increasing trajectory of substance use across time with a larger difference of use between ages 15-18 than between 12-15. These findings are consistent with substance use prevalence rates, which often escalate over the course of adolescence then typically peak during late adolescence and early adulthood (Johnston, O'Malley, Bachman, & Schulenberg, 2011; Wallace, et al., 2003). For both males and females, association with deviant peers related to higher levels of substance use at age 12. These results support previous findings about the influence of deviant peers on individual substance use (Dishion, Capaldi, Spracklen, & Li, 1995; Dishion & Patterson, 2006; Westling et al., 2008). Generally, researchers have found that at earlier ages, family factors (e.g., the parenting style, parent-child relationship, and monitoring) have a larger influence on individual outcomes than do peers. There are several longitudinal studies that have demonstrated a relationship between association with deviant peers and substance use (Barrera et al., 2001; Dishion et al., 1995; Dishion et al., 1996; Westling et al., 2008). Related studies have also shown that association with deviant peers increases the probability of initiating or maintaining substance use habits (Dishion & Owen, 2002; Li et al., 2002) during adolescence. Researchers have demonstrated that predictions for

problem behaviors associated with deviant peers are strongest for younger children. The present dissertaiton study supports assertions that at an early age, affiliation with deviant peers remains predictive of higher levels of substance use, even when controlling for neighborhood- and family-level factors.

For both the African American/Black and Hispanic/Latino groups, deviant peer associations were related to higher levels of substance use at age 12. This finding is consistent with previous studies that demonstrated the influence of deviant peer association on overall substance use was similar across European, Hispanic, and Native American adolescents (Barrera et al., 2001; Chung & Steinberg, 2006). Thus, although general peer influences for ethnic minority youth may be mediated by greater family cohesion and parental monitoring found in Hispanic and African American families (Barrea & Reese, 1993; Catalano et al., 1992), affiliation with deviant peers has similar effects on substance use outcomes (Hahm et al., 2004; Lim, Stormshak & Falkenstein, 2011).

For males, less supervision predicted greater substance use at age 12 and was also negatively related to substance use across time. That is, for males in the study, higher levels of supervision predicted less steep increase in substance use from ages 12-18. These findings are consistent with current theory and research that suggest adult supervision and monitoring plays an important role in preventing and reducing risk of myriad of adolescent externalizing behaviors, including substance use (Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2006; Brody et al., 2001; Dishion & Patterson, 2006; Dishion & Stormshak, 2007; Stormshak et al., 2000). Previous results have linked monitoring and supervision to outcomes related to delinquency, school achievement, and

prevention of substance use. Previous studies have found that parental behaviors influence whether children affiliate with deviant peers. For example, consistent with social interaction theory (Dishion, 1990; Patterson, Reid & Dishion, 1992), existing conflict in the home—combined with inadequate monitoring and poor discipline by primary caregivers—promotes bonding with deviant peers, which in turn increases risk for substance use (Chuang et al., 2005; Dishion & Owen, 2002; Patterson, Reid & Dishion, 1992). Conversely, parenting styles—characterized by high levels of warmth/engagement and parenting practices that include monitoring/supervision—reduce adolescent risk for substance use (Dishion & Owen, 2002; Dishion et al., 2003; Dishion & Stormshak, 2007; Chester, 2007).

Although many of the current study results confirm previous findings about links between neighborhood, family, and peer context on substance use, the impact of a specific factor on the increase of substance use varied by sex and ethnic group. The following sex and ethnic differences were found: (a) neighborhood social processes were related to high levels of substance use for female participants, but were not significantly related to substance use outcomes for males; (b) neighborhood SES was significantly related to change in substance use for Hispanic/Latino adolescents, but not among African American/Black youth; and (c) less supervision resulted in greater increases in substance use for males when controlling for neighborhood and peer factors. In the following sections, I discuss these sex and ethnic group differences in predictors of adolescent substance use.

Neighborhood, Peer, and Parental Influences across Sex Groups

One unexpected finding was that for females, more positive scores on the neighborhood social processes component were related to greater substance use at age 12 and steeper increases in substance use. These results diverge from previous studies that have found associations between measures of social disorder, collective efficacy, and adolescent substance use (Choi, Harachi, & Catalano, 2006; Gardner, Barajas, & Brooks-Gunn, 2010; Lambert, Brown, Philipps, & Ialongo, 2004). Previous research has suggested that youth in neighborhoods with low SES, higher levels of social disorder, and lower levels of collective efficacy are at greater risk for substance use. The mechanisms by which low neighborhood SES can influence adolescent alcohol use include lack of community resources and activities, poor social control, lack of adult role models and supervision, and environmental stress (Sampson, Morenoff, & Gannon-Rowley, 2002; Trim & Chassin, 2008). Neighborhood social processes (e.g., collective efficacy, social capital, and social disorder) influence individual level outcomes through their impact on (a) the quality of family relationships, (b) the amount and quality of relationships between neighborhood residents, and (c) the amount of social mechanisms to monitor the behavior of residents and guard against threats to their health and safety (Leventhal & Brooks-Gunn, 2000). In this study, findings suggest that for females, neighborhood social processes positively influence substance use. In other words, more positive neighborhood social processes were related to higher levels of substance use. One possible explanation may be in the nature of relationships and cohesion in specific neighborhoods. For example, although there may be a sense of cohesion in an at-risk neighborhood, girls are at a greater risk because they were associating with more deviant peers, or are were more

involved in at-risk family environments. There has been some evidence of neighborhoods in which strong networks and dense social ties have a paradoxical effect on the social control, particularly as it relates to homicide, drug and gang – related crime (Browning & Dietz, 2004; Morenoff et al., 1999; Pattillo-Mcoy, 1999). Although not available in this study, measures that capture neighborhood - level beliefs related to various types of substance use would allow further investigation. Future research that highlights the nature and specifics of collective norms and beliefs related to substance use would be needed.

Unlike previous investigations, however, no significant relationship between deviant peer associations and an increase in substance use was found for either sex. There are a few possible reasons this finding diverges from previous research. It is possible that for some participants, having deviant peers and higher levels of substance use at an early age may result in increased contact and monitoring by adults through disciplinary action. Youth engaging in problem behavior, for example, may come to the attention of adults (e.g., teachers, police, and truancy officers) who would then notify parents (Roosa et al., 2003; Sampson, Raudenbush, & Earls, 1997; Sampson et al., 1997). The increased attention may result in increased monitoring of behavior by caregivers or other institutional agents. Increased supervision would then attenuate the effect of association with deviant peers. The extant literature has identified positive parenting practices (e.g., monitoring, limit setting, and supervision) as effective for reducing a variety of problem behaviors, including substance use (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). In other words, supervision attenuates the effects of association with peers and the subsequent influence on individual use. There is some support for this hypothesis in the

current study. For male participants, both association with deviant peers and adult supervision were related to substance use at age 12. Only supervision, however, was predictive of change in substance use for males by age 18. Although not confirmed in the current study, parental supervision may moderate adolescents' association with deviant peers, which in turn may reduce adolescents' drug use.

Neighborhood, Peer, and Parental Influences across Racial/Ethnic Groups

For the African American/Black and Hispanic/Latino groups, the models fit the data very well. A similar nonlinear increasing trend in substance use was observed across time, with a larger increase between ages 15 to 18 than between ages 12 to 15. For the African American/ Black group, more deviant peers associations were related to greater substance use at age 12. None of the hypothesized predictors, however, had a significant influence on the increase in substance use. For the Hispanic/Latino group, more deviant peer associations were related to greater substance use at age 12. Also, higher neighborhood SES was positively related to greater increases in substance use for Hispanic/Latino youth across time. This finding is contrary to my hypothesis that lower neighborhood SES would be related to greater increases in substance use for Hispanic/Latino youth.

A few studies reported similar empirical findings. Chuang et al. (2005), for example, found that high neighborhood SES was indirectly related to greater adolescent alcohol use through parental alcohol use. That is, parental alcohol use mediated neighborhood influence on youth alcohol use. Measures of parental substance use were not included in the current study, but would be important for further investigation. In their study on neighborhood SES, parental alcoholism, and adolescent alcohol use, Trim

and Chassin (2008) found that for non-children of alcoholics (COAs) youth, living in neighborhoods with higher SES was predictive of greater increases in alcohol use. Researchers have posited that in more affluent neighborhoods, parents may not provide close monitoring or supervision for youth, assuming the neighborhood context is safe. Fauth, Leventhal, and Brooks-Gunn (2007), for example, found that 15-18 year olds who moved to higher SES neighborhoods reported more substance use than those who remained in the lower SES neighborhood. The study also found a decrease in supervision among caregivers who moved to higher SES neighborhoods. Lastly, it is also possible that Hispanic/Latino youth, in this study, had peers with higher levels of substance use. Some research has suggested higher levels of substance use among peers may be more prevalent in affluent neighborhoods. The study data shows significant association with deviant peers at age 12. Although not all substance using peers are deviant, deviant peers have been linked with higher levels of drug use. It is possible that Hispanic/Latino youth, in this study, were already at increased risk for substance use.

For African Americans/Blacks, neighborhood social processes and SES were not significantly related to substance use. There are a few possibilities for this finding. First, it is possible that for youth, in this study, overall rate of use was low. Previous studies have reported that ethnic minority adolescents tend to have lower rates of substance use and that African American youth begin to use substances later than White youth (Johnston, et al., 2007; Lambert et al., 2004). Second, previous research has identified protective factors (e.g., religiosity, family ties and parenting, and racial or ethnic identity), which have been linked to delayed initiation and decreased risk of substance use (Corneille & Belgrave, 2007). In the current study, caregiver levels of supervision

were examined, but other measures of the parent-child relationship and family cohesion were not available. Future research on substance use and African American/Black youth would include measures of religiosity, additional measures of family context, and ethnic identity.

For the White group, the model resulted in negative residual variances suggesting problems finding a solution. This issue may be due to the relatively low rates of substance use in this group throughout the study period, which is exacerbated by the small sample size.

With exception of the Hispanic/Latino group, neighborhood SES did not have a significant effect on participant substance use. There may be a few reasons I did not find expected results. First, measurement of SES in this study may not have been inclusive enough to capture true effects. Previous studies have operationalized SES using multiple census level factors not used in this study. These factors have included measures of neighborhood stability, percentage of neighborhood residents living below the poverty line, percentage of single parent households, percentage of residents receiving public assistance, and percentage of male residents that are unemployed (Chung & Steinberg, 2006; Sampson, Morenoff, & Gannon-Rowley, 2002; Trim, & Chassin, 2008).

Second, in the current study, SES level indicators used in the model were time invariant. Including neighborhood indicators—collected at multiple time points—may yield more robust relationships. The lack of significant findings might indicate that neighborhood-level mechanisms that influence substance use outcomes are either not present or are mediated by family- and peer-level factors. In early adolescence, protective

factors (e.g., monitoring by caregivers; participation in activities; and supervision by other adults, such as teachers and coaches) are more likely to occur.

Research and Clinical Implications

The current study employs use of multilevel analysis to examine neighborhood, family, and peer influences on substance use trajectories during adolescence. Study results highlight the need for further investigation of mechanisms of neighborhood social processes (e.g., collective efficacy, social disorder, and social capital) to discover how they impact the substance use of youth in the community. This study found direct associations between neighborhood social processes and substance use. Contrary to previous findings, more positive neighborhood social processes were related to higher levels of substance use for females. These results suggest the continued importance of research to discover sex and ethnic variation in associations among contextual influences and adolescent substance use. Future research on substance use and African American/Black youth would include measures of religiosity, additional measures of family context, and ethnic identity. Future research on substance use and Hispanic/Latino youth would include measures of religiosity, additional measures of family context, and ethnic identity.

There are several clinical implications from study results. First, results indicate substance use prevention and intervention efforts may need to target different aspects of risk or protective contextual factors for adolescents from different ethnic groups. As such, it is paramount to conduct a comprehensive ecological assessment with adolescents and their families to determine the appropriate level of intervention and treatment activities. For example, the EcoFit model, developed by Dishion and Stormshak (2007) provides a

framework for clinicians to assess ecological factors such as, parent-child relationship, parenting behaviors, peer factors, and academic functioning, which influence the development and maintenance of problem behavior. Consistent with ecological theories of development the model includes a comprehensive assessment of youth function across developmental domains and contexts via the Family Check-Up (FCU). The FCU is an empirically validated intervention that has been shown effective in reducing risk factors such as family conflict, the growth of problem behavior, enhancing parenting skills and reducing substance use in middle school (Dishion, Kavanagh, Schneiger, Nelson, & Kaufman, 2002; Dishion & Stormshak, 2007; Stormshak & Dishion, 2002. Using an ecologically-based assessment approach such as FCU allows clinicians to identify unique risk and protective factors for individual youth across various contexts. The FCU collects data through a clinical interview, youth and caregiver self-reports, collateral information from teachers and school records and direct observation (Dishion & Stormshak, 2007; Stormshak & Dishion, 2002). The use of multiagent, multimethod data reports allows clinicians to accurately assess youths' functioning across developmental contexts and identify strengths and targets for intervention (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007; Stormshak & Dishion, 2002). The FCU includes information regarding ethnic identity, racial socialization and acculturation, which maybe salient for ethnic minority youth (Stormshak & Dishion, 2009; Yasui & Dishion, 2007). The information gathered allows clinicians to provided tailored interventions that are culturally sensitive, evidence-based, and developmentally appropriate (Stormshak & Dishion, 2009; Yasui & Dishion, 2007).

Second, study results highlight continued importance of targeting prevention or reduction of association with deviant peers. This study supports assertions that at an early age, affiliation with deviant peers remains predictive of higher levels of substance use, even when controlling for neighborhood- and family-level factors.

Study Strengths and Limitations

The current study makes a significant contribution to extant literature in several aspects. This study is the first to examine influence of neighborhood social processes, deviant peer associations, and supervision on substance use trajectories. Including peers, parental, and neighborhood factors—in one model—provided a more comprehensive examination of how contextual influences impact the development of adolescent substance use. In addition, using a multilevel analysis with a diverse, longitudinal data set provided further insights into understanding ethnic and gender variation in the development of adolescents' substance use.

This study had a number of limitations. First, PHDCN participants were all recruited from a large, urban area in the Midwest and their experiences may not generalize to other adolescents in different parts of the country due to different regional, cultural, or contextual factors. Second, family- and peer-level data were self-reported, either by the primary caregiver or by adolescents. It is possible that caregivers did not accurately report supervision and monitoring behaviors. It is also possible that youth, too, may either exaggerate or minimize the association with deviant peers or the use of substances, which may result in common method variance. Future research could replicate findings using alternate sources of information (e.g., observational ratings of parent-child supervision). The PHDCN data sources for neighborhood level variables

used in this study, for example, employed better and more comprehensive methods for measuring community characteristics. Researchers used data collection methods (e.g., neighborhood surveys from nonparticipating residents and systematic social observations) to provide information about neighborhood social processes that is based on independent sources, reducing the threats to measurement that are associated with the use of participant ratings (Sampson et al., 2002).

Notable limitations to the current study include measurement of neighborhood social processes. The scores used to create this composite variable were at the neighborhood level, and not the individual level. Consequently, using a variable at the neighborhood level may have resulted in disaggregation bias, which reduces variability at the individual level for this one variable. Future research should take the multi-level nature of this variable into account and use a multilevel analysis, such as hierarchal linear model (HLM), to further examine contextual influences on youth substance use. An additional study limitation was the use of principle components analysis, versus factor analysis, to construct the neighborhood social processes variable. Brown (2009) recommends using factor analysis when theoretical ideas about relationships between variables exist. Use of factor analysis allows a researcher to test a theoretical model of latent constructs causing observed variables (Brown, 2009; Fabrigar, Wegener, MacCallum, & Strahan, 1999). Factor analysis also may be used to identify the structure underlying such variables and to estimate scores to measure latent factors themselves. To remain consistent with previous variables, calculated by PHDCN researchers, however, principle components analyses was used to construct neighborhood disadvantage scores used in this study. Another limitation of the current study related to attrition. As is

common with longitudinal studies, missing data due to item nonresponse and attrition were present in the current study. Little's missing completely at random (MCAR) test indicated that missing items were not missing completely at random, which may suggest attrition bias. It is possible that participants with frequent substance use or more deviant peers may have dropped out of the study over time, which in turn, may have led to an underrepresentation of substance use in the study sample. Although beyond the scope of the current study, future research would include analyses to correct for potential bias due to attrition.

Finally, the multi-group LGM that included White adolescents, and would have allowed comparison between ethnic groups, did not render a solution. This may be due to the relatively low levels of substance use by White adolescents in the study, or the small sample size. In future research, I would develop competing models of adolescent substance use and test them with a new, ethnically diverse sample.

Though this investigation had its limitations, it also makes a useful contribution to the current research on adolescent development by examining the role of neighborhood, family, and peer factors in substance use behaviors among a longitudinal, ethnically diverse sample of youth and their families. The current sample size provided adequate power for multivariate modeling and investigation of variation in ethnic and sex groups which highlighted meaningful differences about the influence of neighborhood contextual variables on substance use for females and Hispanic/Latino youth. A unique contribution was the inclusion of neighborhood social processes in the context of supervision, and deviant peer influence on adolescent substance use trajectories.

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