Neighborhood Influences on Adolescent Cigarette and Alcohol Use: Mediating Effects through Parent and Peer Behaviors*

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The influence of neighborhoods on adolescent behaviors has received increasing research attention. In the present study, we use structural equation models to specify pathways from neighborhoods to adolescent cigarette and alcohol use through parental closeness, parental monitoring, parent substance use, and peer substance use. We use a national sample with 959 adolescents 12 to 14 years of age whose residential addresses were matched with 1990 Census tracts to provide neighborhood characteristics. We found that for adolescent cigarette use low socioeconomic status (SES) neighborhoods were associated with increased parental monitoring, which was further associated with decreased adolescent cigarette use. For adolescent alcohol use, high SES neighborhoods were associated with increased parent drinking, which was further associated with increased adolescent alcohol use. Low SES neighborhoods were associated with increased parental monitoring and increased peer drinking, which were in turn associated with decreased and increased adolescent alcohol use, respectively.

Social science research on adolescent development has recognized the importance of examining adolescent behaviors in an ecological context. According to Bronfenbrenner’s ecological model (1979), adolescents are socialized in various social settings, including families, peer groups, schools, and neighborhoods (Bronfenbrenner 1979). These various social settings provide immediate socialization arenas that impact the developmental process. Bronfenbrenner’s ecological model further suggests that these social settings do not influence adolescents independently. Rather, the interrelations among multiple settings shape adolescent development and determine whether adolescents can successfully transition into adulthood. The purpose of this study is to enhance understanding of neighborhood influences on adolescent cigarette and alcohol use. Using Bronfenbrenner’s model as a guide, we hypothesize that neighborhoods influence adolescent cigarette and alcohol use both directly and indirectly, via parent and peer behaviors.

The importance of neighborhoods for adolescent development has gained considerable research attention in the past decade. This line of research emphasizes that variation in ado-
lescent behaviors are rooted in differential access to economic, organizational, and interpersonal resources available in different kinds of neighborhoods. As documented in Wilson's book (1987) *The Truly Disadvantaged*, adolescents experience poor health outcomes when they live in inner-city neighborhoods with high rates of poverty. Wilson's observations initiated interest in assessing the influence of neighborhoods on children's and adolescents' well-being across a range of outcomes including academic performance, teenage pregnancy, delinquency, and general problem behaviors (Brooks-Gunn et al. 1993; Brooks-Gunn, Duncan, and Aber 1997; Hogan and Kitagawa 1985; Simons et al. 1996; Stern and Smith 1995). Only limited attention has been paid, however, to understanding neighborhood influences on adolescent substance use, and the study findings are inconsistent (Abdelrahman et al. 1998; Allison et al. 1999; Brook, Nomura, and Cohen 1989; Case 1991; Crum, Lillicie-Blanton, and Anthony 1996; Darling and Steinberg 1997; Dembo et al. 1985; Elliott et al. 1996; Karvonen and Rimpela 1997; Simons et al. 1996; Simons et al. 1997). Some studies have found strong neighborhood effects; for instance, residing in disadvantaged neighborhoods increased the likelihood that adolescents were offered various kinds of substances (Crum et al. 1996) and that they developed heavy drinking patterns (Karvonen and Rimpela 1997). In other studies, neighborhoods were found to have limited impact compared with peer substance use (Abdelrahman et al. 1998) or to have no influence on adolescent substance use (Allison et al. 1999).

Most of the previous studies used direct effects models—whereby neighborhood, family, peer, and individual characteristics are simultaneously entered into the same regression model—to assess neighborhood impact on adolescent behaviors. However, it is also possible that neighborhoods influence adolescents indirectly through influencing the behaviors of family and peers, in which case neighborhood effects would be underestimated (Duncan, Connell, and Klebanov 1997; Robert 1999; Sampson, Morenoff, and Cannon-Rowley 2002). In order to assess indirect neighborhood effects on adolescent substance use, this study specifies pathways that link neighborhood characteristics to adolescent substance use through parent and peer behaviors. Parental closeness, parental monitoring, parent substance use, and peer substance use are hypothesized as media-

**MECHANISMS OF NEIGHBORHOOD INFLUENCES ON ADOLESCENT WELL-BEING**

Several mechanisms through which neighborhoods influence adolescent well-being have been proposed. Leventhal and Brooks-Gunn (2000) proposed a *parental relationships* mechanism, where parents act as gatekeepers who manage risks and opportunities for their children (Furstenberg 1993; Furstenberg et al. 1999). Neighborhoods may thus influence adolescent well-being through parental characteristics, parenting behaviors, home environments, and the availability of helping social networks. Parents living in disadvantaged neighborhoods may be more likely to have poor mental health, inadequate coping skills, and lower efficacy (Elder et al. 1995; Klebanov, Brooks-Gunn, and Duncan 1994; Leventhal and Brooks-Gunn 2000). These characteristics can create a home environment where few resources are available to adolescents and where parents may be more likely to use harsh controls and verbal aggression (Earls, McGuire, and Shay 1994). The lack of helping networks may further reduce the possibility that parents can lessen the stress associated with living in impoverished neighborhoods.

Disadvantaged neighborhoods thus may limit parents' ability to manage neighborhood risks and opportunities for adolescent well-being (Sampson 1992). However, several qualitative studies suggest that those parents with more personal resources may adapt their parenting strategies to help adolescents in impoverished neighborhoods (Burton and Jarrett 2000; Furstenberg 1993; Furstenberg et al. 1999; Jarrett 1995). These parents maintained connections with churches, schools, and relatives outside the neighborhoods; restricted relationships with local neighbors who had problem behaviors; and stringently monitored adolescents' activities outside the home (Jarrett 1995).

Jencks and Mayer (1990) proposed four other neighborhood mechanisms that inform adolescent development. *Epidemic models* assume that problem behaviors are contagious and operate mainly through peer influences (Crane 1991). This mechanism posits that adolescents engage in problem behaviors because peers
living in the neighborhood also exhibit these behaviors. Collective socialization models suggest that adults in a neighborhood act as role models for children who are not their own. Institutional models emphasize the importance of local organizational or institutional resources. Poor neighborhoods featuring low sustainable local organizations may create an environment where families lack sufficient resources to facilitate adolescent development. Finally, relative deprivation models suggest that if people feel they cannot compete successfully they may create a deviant subculture to adapt psychologically to their environment.

The various theoretical mechanisms suggest that neighborhoods may influence adolescents through a range of various mediating paths including local organizational resources, informal social control, deviant peer groups, helping social networks, and parental characteristics. We focus on parent and peer behaviors, thus providing the opportunity to examine the mechanisms of parental relationships and epidemic models through which neighborhoods influence adolescent cigarette and alcohol use.

PARENTS AND PEERS AS MEDIATORS BETWEEN NEIGHBORHOODS AND ADOLESCENT BEHAVIORS

Few empirical studies have investigated parent and peer behaviors as mediators of neighborhood influences on adolescent behaviors. We review these studies separately under the headings of parental closeness, parental supervision and monitoring, parent substance use, and peer substance use.

Regarding parental closeness, Klebanov and colleagues (1994) found that residing in a neighborhood with a high proportion of low-income people reduced a mother’s warmth toward her children. This relationship held after taking into account family socioeconomic status (SES), mother’s mental health, mother’s behavioral coping, and social support. Brook and colleagues (1989) found that neighborhoods impacted adolescent drug involvement through adolescents’ affection for their parents. Specifically, when a neighborhood was rated as cohesive, safe, and a good place to live, adolescents reported higher affection toward their parents, and this affectionate relationship was further associated with lower levels of drug involvement (Brook et al. 1989). In contrast, Stern and Smith (1995) found that parent-child attachment was not a significant mediator between neighborhood characteristics and adolescent delinquency whereas parent-child involvement was. In neighborhoods with fewer social problems and higher resident satisfaction, parent-child involvement was increased, which in turn reduced adolescent delinquent behaviors.

Regarding parental supervision and monitoring, Hogan and Kitagawa (1985) found that parental control mediated neighborhood effects on teenage first pregnancy. Parents in high-risk neighborhoods tended to have difficulties supervising adolescent dating, which led to an increase in teenage pregnancy. Stern and Smith (1995) also reported a significant role for supervision. They found that disadvantaged neighborhoods contributed to adolescent delinquency indirectly through lower parental supervision and inconsistency of parental discipline. Simons and colleagues (1997) found that the characteristics of disadvantaged neighborhoods (i.e., low quality of schools and local medical organizations) led to ineffective parenting both directly and indirectly, through social support, mother’s mental health, and mother’s perception of negative life events. When including both parent-adolescent affective relationship and parental monitoring to measure the quality of parenting, low SES neighborhoods led to adolescent conduct problems indirectly through lowering the quality of parenting for male adolescents; however, the same result was not found for female adolescents (Simons et al. 1996; Simons et al. 1997).

No prior studies have addressed the mediating effects of parent substance use. However, prior studies have shown that living in impoverished neighborhoods increases the likelihood that parents experience various kinds of stress, which may lead them to use substances as a coping response (Garbarino and Sherman 1980). Adolescents may also learn to use substances by modeling parents (Bailey, Ennett, and Ringwalt 1993; Bandura 1986).

Compared to the studies focusing on the role of parent behaviors as mediators, fewer studies have examined the possible mediating effects of peer factors. Simons and colleagues (1996) reported that male adolescents who lived in low SES neighborhoods were more likely to associate with deviant peers, and having deviant peers was further associated with having conduct problems. Simons and colleagues (1996) also
found that deviant peers mediated the effects of
the proportion of single-parent families in a
neighborhood on female adolescents’ conduct
problems. Case (1991) also provided evidence
for the effects of neighborhood peer influence.
She found that adolescent behaviors, including
crime, drug use, church attendance, alcohol use,
and idleness, were influenced by the proportion
of peers who had the same behaviors in the same
neighborhood.

CONCEPTUAL MODEL

The study’s conceptual model is shown in
Figure 1. The neighborhood characteristics pre-
sented in the model include low neighborhood
SES, high neighborhood SES, residential mobi-
licity, immigrant concentration, white and black
racial composition, and Hispanic concentration.
Low neighborhood SES, residential mobility,
and immigrant concentration have been identi-
cified as the three structural variables charac-
terizing disadvantaged neighborhoods (Sampson
and Groves 1989; Sampson, Raudenbush, and
Earls 1997; Shaw and McKay 1969). High
neighborhood SES and low neighborhood SES
are included as separate characteristics because
they may represent different sources of influ-
ences that could be obscured if a single index
was used (Brooks-Gunn et al. 1993; Brooks-
Gunn, Duncan, Leventhal, and Aber 1997). The
presence of low SES neighbors is relevant to the
epidemic models, which suggest the contagious
influences of deviant peers on adolescents.
The lack of high SES neighbors is relevant to
the collective socialization models, which
suggest that adolescents lack role models for
learning about conventional values and behav-
iors. Brooks-Gunn et al. (1993) found, for
example, that the positive influences of high
SES neighbors and not the negative influences
of low SES neighbors matter to adolescents. In
that study, the presence of high SES neighbors
positively influenced childhood IQ and nega-
ively influenced teenage births and school-
leaving, even after controlling for family SES.

In addition to the above characteristics, minor-
ity concentration has been used as an indicator
disadvantaged neighborhoods. Because the
proportion of whites and the proportion of blacks
are highly correlated ($R = -.90$), we used these
two items to represent a single domain, white
and black racial composition. The inclusion of
the proportion of Hispanics also shows the
uneven distribution of resources across neigh-
borhoods. Because the geographic concentra-
tion of Hispanics is poorly correlated with the

FIGURE 1. The Conceptual Model for Neighborhood Influences on Adolescent Cigarette and Alcohol
Use

Note: Neighborhood characteristics include the following: low socioeconomic status, high socioeco-

nomic status, residential mobility, immigrant concentration, white and black racial composition, and

Hispanic concentration.
geographic concentration of whites and blacks (−.29 and −.03, respectively), we treated the proportion of Hispanics as a separate neighborhood domain: Hispanic concentration.

We expect that disadvantaged neighborhoods, as represented through these characteristics, may increase adolescent substance use, net of individual demographic characteristics, through reducing parental closeness and monitoring and through increasing parent substance use. The three family mediating paths represent the mechanisms of parental relationships. According to these mechanisms, the stress associated with living in impoverished neighborhoods can cause parents to reduce affection toward their children, the time they spend with them, and their energy for monitoring them, and it may even prompt parents to use substances to cope with the stressful environment (Klebanov et al. 1994; Leventhal and Brooks-Gunn 2000; Simons et al. 1996; Simons et al. 1997). In addition, parents may lower their expectations for their children and provide less supervision because of the modeling effects of other parents who live in the same neighborhood (Wilson 1991). Beside the mediating effects of these parent characteristics, we expect disadvantaged neighborhoods may increase adolescent substance use through increased peer substance use; this follows the mechanism described in the epidemic models (Case 1991).

Our conceptual model also proposes that parents may exert their influence on adolescents through establishing a foundation for adolescent affiliation with drug-using or non-drug-using peers. Studies have shown that low parent-adolescent bonding, low parental supervision and monitoring, and high parent substance use may increase adolescent substance use indirectly through peer substance use (Hoffmann 1993; Kandel 1996; Patterson and Dishion 1985).

Neighborhoods may influence adolescents through other neighborhood characteristics such as informal social control, the quality of local organizations, and the presence of helping social networks (Elliott et al. 1996; Sampson et al. 1997; Simcha-Fagan and Schwartz 1986). These various mediating mechanisms, which were not measured by this study, represent the direct path from neighborhood characteristics to adolescent cigarette and alcohol use.

The above specification shows the potential causal directions from neighborhoods to parents, peers, and adolescents. However, another competing explanation should be considered. Any relationship between neighborhood characteristics and adolescent substance use may be the result of differential selection of adolescents into neighborhoods rather than the result of neighborhood influences (Tienda 1991). For example, adolescents who use substances may be more likely to move into impoverished neighborhoods or be forced to stay there due to economic considerations. If so, adolescent substance use is not an outcome of neighborhood influence. The best approach for addressing selection bias would be through an experimental study design with random assignment of families to different types of neighborhoods, that approach is not practical, however (Katz, Kling, and Lieberman 2001; Ludwig, Duncan, and Hirschfield 2001; Rosenbaum and Harris 2001; Rosenbaum 1995).

We addressed selection bias by including baseline adolescent substance use in the model, which allows us to estimate change in adolescent substance use after neighborhood contexts are measured. Selection bias could also exist in the relationship between neighborhoods and parent substance use. We could not control this bias, however, because there was insufficient variation in parent substance use between baseline and the follow-up surveys to include baseline parent substance use in the model.

METHOD

Data

The data come from a study designed to determine whether a family-directed intervention, called Family Matters, consisting of mailed booklets and follow-up telephone calls from health educators, prevented adolescent tobacco and alcohol use (Bauman et al. 2002; Bauman et al. 2001). To identify adolescents age 12 to 14 and their parents living throughout the contiguous United States, 63,811 telephone numbers were generated by random-digit dialing. Of those numbers, 2,395 were estimated to be households having an eligible parent-adolescent pair; 1,316 parent-adolescent pairs completed baseline telephone interviews, yielding a response rate of 55 percent. The denominator for our response rate (N = 2,395) is the sum of (1) the number of telephone numbers with one or more adolescents 12 to 14 years of age as determined by interview with an adult at that number and (2) an estimate of the number of telephone numbers with one or more adolescents 12 to
14 years of age when no person at that number was interviewed. This latter number was estimated by multiplying the proportion of telephone numbers with one or more adolescents among all telephone numbers at which an adult was interviewed by the number of telephone numbers where no adult was reached. Although this estimate likely contains bias, it is the best estimate available; had we excluded from the denominator all telephone numbers never reached by the interviewer, the response rate would have been substantially exaggerated.

Family Matters was implemented from July 1996 to September 1997. Parent-adolescent pairs were matched by date of baseline interviews and randomized to receive the program or serve as a control. Parents and adolescents were interviewed by phone calls at baseline and at 3 and 12 months after the program pair completed the program (follow-up one and follow-up two). To help assure privacy for the adolescents, the interviewer verified the privacy of the adolescent before beginning the interview and rescheduled the phone call if necessary. Seventy-nine percent of the baseline adolescents finished the follow-up two interviews. This research uses the responses of those adolescents who completed all three interviews (N = 1,014 cases) and whose addresses could be matched to Census tracts (N = 1,280 cases), which generated 959 cases in the final sample (72.9 percent of the baseline sample). Including three waves of data allows us to detect temporal effects, whereby parent and peer behaviors were measured after the neighborhood characteristics and before adolescent substance use. The final sample was 78.6 percent white, 9.6 percent black, 7.4 percent Hispanic, and 4.5 percent other race/ethnicity. Age ranged from 12 to 14. Nearly half of the sample was male (49.1 percent). Regarding mother's education, 36.2 percent graduated from high school or less, 33.8 percent had some college education, and 30 percent graduated from college. Regarding father's education, 37.1 percent graduated from high school or less, 26.8 percent had some college education, and 36.1 percent graduated from college.

Sample Assessment

We assessed attrition bias by comparing demographic and substance use characteristics for the full baseline sample and the reduced study sample, and we assessed the representativeness of the study sample by comparing demographic characteristics to adolescents age 12 to 14 nationally using 1990 Census data (Table 1). The attrition analyses showed that adolescents lost to follow-up were more likely not to be white, to have parents who were not college graduates, and to have initiated smoking. However, the distributions of the study sample were similar to the total baseline sample because those differences were not larger and because most cases in the baseline sample were in the analyzed sample. Our study sample was generally similar to the U.S. population based on Census data, except that our sample generated a higher proportion of white adolescents and adolescents whose parents were college graduates. We also compared our study sample on alcohol and tobacco use with adolescents about the same age in two other national studies (Bearman, Jones, and Udry 1997; Johnston, O'Malley, and Bachman 1998). In general, there were more adolescents who used alcohol and fewer adolescents who used cigarettes in our study than in the other national studies. It is impossible to know whether our sample is different because of differences in wording questions, sample design, and data collection procedures between our study and these studies or because of inaccurate response or sampling (Bauman et al. 2002). Our sample of adolescents may be less likely to report cigarette use because the data were collected by telephone.

Measurement

Neighborhood characteristics. Neighborhood characteristics were developed using 1990 Census tract data. Census tracts are small geographical units created by the U.S. Census Bureau for studying neighborhoods; they typically comprise about 4,000 people. We did not treat each neighborhood domain as a latent construct with its indicators. Instead, we used factor scores of indicators for each neighborhood domain and treated the factor scores as exogenous variables in our conceptual model because neighborhood indicators are highly skewed.

Low neighborhood SES was measured by three indicators: the proportion of residents whose family income was less than $12,500, the proportion of males who were jobless, and the proportion of residents who were under the poverty line (Cronbach α = .78). High neighborhood SES was measured by three indicators:
the proportion of residents whose family income was more than $75,000, the proportion of residents who had professional or managerial occupations, and the proportion of residents who had more than 12 years of education (Cronbach α = .87). We followed Coulton and colleagues’ suggestion (1996) for the cut points of family income for low SES neighborhood and high SES. Low SES neighborhood was defined by the federally defined poverty threshold, which was set at $12,674 for a family of four in 1989; high SES neighborhood was defined as the top 12 percent of the family income distribution, the threshold for which was about $75,000 in 1990 Census data (Coulton et al. 1996). Residential mobility was measured by the proportion of residents who lived in the same house in 1985 and the proportion of households that were occupied by the owners for more than 10 years. Immigrant concentration was measured by the proportion of residents who were foreign born and the proportion of households where no resident could speak fluent English. White and black racial composition was measured by the proportion of residents who were white and the proportion of residents who were black. A higher value on the factor score represents a neighborhood with a higher proportion of blacks and a lower proportion of whites. Hispanic concentration was measured by the proportion of residents who were Hispanic.

**Parent and peer behaviors.** Measures of parent and peer behaviors were developed from the follow-up one interviews. We used follow-up one interviews to ensure that the parent and peer mediators were measured before adolescent follow-up two substance use and after neighborhood characteristics and adolescent demographic characteristics. With one exception, the parent and peer measures were based on adolescent reports. Parent alcohol and tobacco use were based on parent reports; if the parent report was missing, we substituted the adolescent report. All parent characteristics were created by averaging reports about fathers and mothers. Parental closeness measured attachment, involvement, and child-centeredness in the parent-adolescent relationship. Four indicators measured this concept: (1) “How often does your mother (father) kiss or hug you?” (2) “How close do you feel toward her (him)?” (3) “Does your mother (father) spend time just talking with you?” and (4) “Does your mother

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<th>TABLE 1. Comparison of Social Demographic Characteristics of Baseline Sample, Study Sample, Excluded Sample, and U.S. Population</th>
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<tr>
<td><strong>Age</strong></td>
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<sup>a</sup> Cases excluded from analysis because of missing data at follow-up or because they could not be matched with Census data.

<sup>b</sup> U.S. population age 12–14 except for mother’s education, which is for women age 30–49 (N = 36,960,105), and for father’s education, which is for men age 30–49 (N = 36,504,048).
(father) do fun things with you together?” with responses ranging from “very much/very often” to “not at all” along a four-point scale (Cronbach α = .82). Higher values indicated greater closeness. Parental monitoring was defined as parental knowledge of and awareness about a child's location and activities. Four indicators measured this concept: (1) “Does your mother (father) try to know what you do with your free time?” (2) “Does your mother (father) try to know where you are most afternoons after school?” (3) “Does your mother (father) really know what you do with your free time?” and (4) “Does your mother (father) really know where you are most afternoons after school?” with responses ranging from “always” to “not at all” along a four-point scale (Cronbach α = .83). Higher values represent higher monitoring. Parental closeness and parental monitoring were the only two latent constructs with multiple indicators in the conceptual model. Parent smoking was measured by asking the parent: “On the average, about how many cigarettes do you (other parent) now smoke in a day?” with responses ranging from “more than a pack a day” to “no cigarettes” along a five-point scale. Parent drinking was measured by asking the parent: “On the average, about how much alcohol do you (other parent) now drink in a day?” with responses ranging from “four or more drinks a day” to “none at all” along a five-point scale. For both smoking and drinking measures, higher values indicated heavier substance use. After taking the average of reports about mothers and fathers, parent smoking and parent drinking were recoded as dichotomized variables, with 0 = does not smoke/drink, and 1 = does smoke/drink in a day, due to the highly skewed distribution. Peer smoking and peer drinking were measured by asking adolescents to indicate separately how many of their three best friends smoke or drink. Peer smoking and peer drinking were recoded as 0 = none have tried smoking/drinking, and 1 = one or more friends have tried smoking/drinking.

Adolescent cigarette and alcohol use. Adolescent cigarette and alcohol use was developed from the baseline and follow-up two interviews. The interviewer read possible responses to questions about adolescent smoking and drinking, with instructions for the adolescent to respond with “stop” after hearing the appropriate response. Hence, the adolescent never could be heard admitting tobacco or alcohol use in the home. Adolescent cigarette use was measured by the question: “How much have you ever smoked cigarettes in your life?” Adolescents’ responses ranged from “none at all, not even a puff,” to “more than 20 whole cigarettes” along a five-point scale. Adolescent alcohol use was measured by the question: “How much alcohol have you ever had in your life?” Adolescents’ responses ranged from “none at all, not even a sip” to “more than 20 whole drinks.” For both measures, higher values represented heavier use. Because adolescent cigarette and alcohol use were highly skewed, they were recoded as 0 = no use of cigarette/alcohol and 1 = use of cigarette/alcohol.

Control variables. Five control variables developed from baseline data were included in the analysis. These variables were adolescents’ age, gender, race/ethnicity, parents’ education, and treatment condition. Age, gender, and race/ethnicity were based on adolescent reports, and parents’ education was based on parent reports. Gender was coded as 0 = female and 1 = male. Race/ethnicity was measured by four categories: white, black, Hispanic, and other race/ethnicity. We created three dummy coded variables and used white as the reference group. Parents’ education, an indicator of household SES, was the average of mother’s and father’s education. The variable was recoded as a three-point scale, including graduated from high school or less, some college education, and college graduate. Treatment condition was measured by identifying whether the adolescent belonged to the experimental group or control group. The experimental group was coded as 1 and the control group was coded as 0.

Analysis Plan

The study’s conceptual model was represented by a set of structural equations. Because the data are from a randomly selected national sample with only one adolescent per neighborhood, there is no dependence across observations within each neighborhood. Because of this sampling scheme, the conceptual model can be represented by regression models or structural equations (Duncan et al. 1997; Duncan and Raudenbush 1999). Mplus was used as the statistical modeling program because of its special capabilities with categorical outcomes (Muthén and Muthén 1998). The weighted least squares method with robust standard errors and mean-adjusted chi-square test statistic (WLSM) was
used as the estimator. Because the model contains both categorical and continuous variables, the correlation matrix estimated from these variables is unlikely to behave like ordinary sample moments (Jöreskog and Söbom 1996). The WLSM must be used instead of the maximum likelihood method or generalized least squares method.

Correlation coefficients were calculated for all bivariate associations between variables. Neighborhood characteristics that were not correlated with any of the mediators or outcome variables were excluded from subsequent analyses. Estimation of the structural equation model was conducted separately for adolescent cigarette and alcohol use. A number of paths were added or trimmed based on theoretical or empirical significance in order to achieve a better model fit. The model fits were evaluated by the chi-square measure, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). The chi-square measure tests the hypothesis that the covariance matrix predicted by the model is equal to the population covariance matrix of the observed variables. The chi-square test is sensitive to the number of cases so that a large sample increases the chances that the chi-square test is significant (Kline 1998). Therefore, other fit indices were included for evaluating the fit of the models to the data. The CFI shows the proportional improvement of the overall fit of the model relative to a null model in which all the variables are uncorrelated. The CFI has a maximum value of 1.0, with higher value indicating a better fit. The RMSEA is the residual between the predicted and observed covariance matrix. A smaller value of this measure indicates a better fit. If the fit is perfect, then RMSEA equals zero (Kline 1998).

RESULTS

Bivariate Correlations

The correlation matrix for main study variables is presented in Table 2. As expected, high neighborhood SES was negatively correlated with parent smoking (−.14), peer smoking (−.10), and adolescent smoking (−.08). Low neighborhood SES was positively correlated with parent smoking (.08). While the above correlations are consistent with the hypothesized relationships, some other correlations are contrary to the predictions. For example, high neighborhood SES was positively associated with parent drinking (.16). Low neighborhood SES was negatively associated with parent drinking (−.14) and adolescent drinking (−.11), and it was positively associated with parental monitoring and closeness. White and black racial composition (neighborhoods with higher proportions of blacks and lower proportions of whites) was negatively correlated with parent drinking, peer drinking, adolescent smoking, and adolescent drinking. Residential mobility, immigrant concentration, and Hispanic concentration were not correlated with any mediating or outcome variable. Therefore, these three neighborhood domains were excluded from further analyses.

Structural Equation Models

The fits of the initial models of cigarette use and alcohol use were poor (cigarette: chi-square (110) = 3,727, CFI = .66, RMSEA = .18; alcohol: chi-square (116) = 3,897, CFI = .66, RMSEA = .18). To improve model fit, we allowed correlated residuals between parental closeness and parental monitoring because they both represent aspects of the parent-adolescent relationship. In addition, we added a path from baseline adolescent substance use to peer substance use because adolescents who use substances are more likely to select friends who also use substances (Bauman and Ennett 1996).

After adding the two paths, the model fits were substantially improved (cigarette: chi-square (108) = 764, CFI = .93, RMSEA = .08; alcohol: chi-square (114) = 561, CFI = .96, RMSEA = .06). In the initial models, both parental closeness and monitoring were significantly associated with adolescent cigarette and alcohol use. However, after adding the correlated residuals between parental closeness and parental monitoring, parental monitoring remained a significant predictor of adolescent substance use but parental closeness did not.

In order to reduce the complexity of the models, we trimmed the models when standardized structural coefficients were less than .05. This criterion was chosen to retain significant paths and maintain the integrity of the models. The fits of the trimmed models were improved slightly (cigarette: chi-square (127) = 610, CFI = .95, RMSEA = .05; alcohol: chi-square (134) = 454, CFI = .97, RMSEA = .05). Although the chi-squares were significant,
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*p < .05

Note: SES = socioeconomic status; adol. = adolescent.
this likely is due to the large sample size (N = 959). In addition, because other fit indicators suggested an acceptable level of fit, we accepted the trimmed models as the final models.

For the measurement model of cigarette use, the standardized regression coefficients showed a moderately strong relationship between each latent concept and its indicators. The standardized regression coefficients between parental closeness and its indicators range from .62 to .83. The standardized regression coefficients between parental monitoring and its indicators range from .76 to .85. The same pattern of relationships between parental closeness, parental monitoring, and their indicators were also found in the model of alcohol use.

Figure 2 presents the standardized structural coefficients for the relations among neighborhood characteristics, parent behaviors, peer cigarette use, and adolescent cigarette use. The bold lines represent significant relationships at a level of .05. Standardized coefficients for all variables are presented in Table 3. Our results indicate that low neighborhood SES had an indirect effect on adolescent cigarette use through parental monitoring. Contrary to predictions, low neighborhood SES was associated with increased monitoring (.10), which in turn was associated with decreased adolescent cigarette use (−.14). While low neighborhood SES was significantly related to parental monitoring, high neighborhood SES and white and black racial composition were not significantly related to any mediating or outcome factor. Peer smoking was significantly related to baseline adolescent smoking (.36), parental monitoring (−.27), and parent smoking (.17). Peer smoking (.28) and parent smoking (.10) both were positively associated with adolescent cigarette use.

Figure 3 presents the standardized structural coefficients for the relations among neighborhood characteristics, parent behaviors, peer alcohol use, and adolescent alcohol use. Standardized coefficients for all variables are presented in Table 4. Compared to the pattern of relationships for adolescent cigarette use, the model of adolescent alcohol use was slightly different in that more significant paths existed between neighborhood characteristics and parent and peer characteristics. Figure 3 shows that low neighborhood SES had an indirect effect on adolescent alcohol use through both parental monitoring and peer drinking. Low neighborhood SES was associated with increased parental monitoring (0.09) and the possibility that adolescents had drinking friends (0.12). Parental monitoring (−.11) and peer drinking (0.23), then,
were associated with decreased and increased adolescent alcohol use, respectively. High neighborhood SES had an indirect effect on adolescent alcohol use through parent drinking. Contrary to predictions, high neighborhood SES was associated with increased parent alcohol use (.16), which in turn was associated with increased adolescent alcohol use (.21). White and black racial composition was not associated with any mediating or outcome factor. Peer drinking was directly influenced by adolescent baseline drinking (.36) and parental monitoring (−.40). However, unlike the model of adolescent cigarette use, peer drinking was not predicted by parent alcohol use.

### TABLE 3. Standardized Parameter Estimates of Model of Adolescent Cigarette Use

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\(^* p < .05\)

*Note: SES = socioeconomic status; edu. = education.
\(^a\) Some college education/graduated from high school or less.
\(^b\) College graduate/graduated from high school or less.
\(^c\) White is the reference for the dummy race measurement.

### FIGURE 3. Model of Neighborhood Influences on Adolescent Alcohol Use

![Diagram showing the model of neighborhood influences on adolescent alcohol use](image-url)

*Note: *p < .05; SES = socioeconomic status.*
### TABLE 4. Standardized Parameter Estimates of Model of Adolescent Alcohol Use

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<th></th>
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*p < .05

Note: SES = socioeconomic status; edu. = education.

a Some college education/graduated from high school or less.
b College graduate/graduated from high school or less.
c White is the reference for the dummy race measurement.

### DISCUSSION

The results partially support our hypotheses that parent behaviors and peer substance use act as mediators between neighborhood characteristics and adolescent substance use. As expected, disadvantaged neighborhoods are associated with increased peer drinking, which are further associated with increased adolescent drinking. However, in contrast with the findings of prior studies, low neighborhood SES was associated with increased parental monitoring, and high neighborhood SES was associated with increased parent drinking. Parental monitoring and parent drinking were further associated with decreased and increased adolescent substance use, respectively.

Prior studies suggest that living in poor neighborhoods leads to decreased parental supervision and monitoring (Hogan and Kitagawa 1985; Simons et al. 1996; Simons et al. 1997; Stern and Smith 1995). Our findings do not indicate this to be the case in our data. An explanation may come from differences in parenting strategies employed by parents living in low SES and high SES neighborhoods. Some ethnographic studies have suggested that parents in low SES neighborhoods use stringent parenting strategies, such as confining adolescents to the household and chaperoning adolescents on their daily rounds in the neighborhood, in order to protect them (Burton and Jarrett 2000; Furstenberg 1993; Furstenberg et al. 1999). Although some have agreed that stringent parenting strategies may be harmful to adolescent development, other studies have shown that such strategies may be beneficial or, at least, not harmful to adolescents if they occur in impoverished neighborhoods (Burton and Jarrett 2000; Simons et al. 2002). This may be because stringent parenting strategies are necessary to keep adolescents away from dangerous neighborhood activities, such as violence or illicit drug vending. This phenomenon may partially explain our findings that low SES neighborhoods witnessed increased parental monitoring. However, future research needs to clarify what kinds of parental monitoring strategies are employed by parents in low SES neighborhoods and both the benefits and risks to adolescent well-being.

The inconsistency of our findings with prior studies may also be the result of differences in sample characteristics. In contrast with prior studies where the samples represented high-risk adolescents, our study used a randomly selected sample of adolescents from the general population (Hogan and Kitagawa 1985; Simons et al. 1996; Simons et al. 1997; Stern and Smith 1995). Parents who completed this study were more likely than the U.S. population to be white and highly educated and were less likely to be single parents (Bauman et al. 2002). These characteristics suggest that our sample of parents may have been more likely to have access to resources conducive to effective parenting. In this context, neighborhoods with a higher proportion of low SES residents may not decrease parental monitoring but rather increase parents’ attempts to protect their children from dangerous neighborhood environments.
We found that living in high SES neighborhoods increased the chances that parents used alcohol, which was contrary to our expectations. The neighborhood literature suggests that neighborhood disorganization contributes to the prevalence of delinquency and other social problems including problem drinking (Wilson 1987). However, we did not assess problem drinking by parent, so we are unable to examine whether the findings would have differed with other indicators of alcohol use. It is possible that high SES neighborhoods may have a higher rate of parents who use alcohol but a lower rate of parents with problem drinking behaviors, such as binge drinking and drunk driving. White-collar households, for example, have been shown to be the main consumers of wine (Fuller 1995). Hence, it is not surprising to see a pattern that large proportions of parents living in high SES neighborhoods have used alcohol.

As expected from the epidemic models of substance use, we found that low neighborhood SES increased the likelihood of adolescents having drinking friends (Jencks and Mayer 1990). The epidemic models assume that problem behaviors are contagious and propagated mainly through peer influences. Although we did not directly measure the concentration of peer substance use in a neighborhood, we showed that the presence of low SES neighbors was significantly associated with drinking friends. This finding is consistent with the findings of Simons et al. (1996), who found that male adolescents who lived in low SES neighborhoods were more likely to report having deviant peers; having deviant peers was further associated in the study with more conduct problems, including substance use.

The findings presented in this article should be considered in view of the following limitations. First, we did not have longitudinal neighborhood measurements, which may generate selection bias. Any relationship between neighborhood characteristics and individual behaviors could be due to the nonrandom selection of individuals into neighborhoods and not because of neighborhood influences (Tienda 1991). To address selection bias, we included baseline adolescent substance use in the analysis, which allowed us to detect the net change in substance use after neighborhood characteristics were measured. However, selection bias could also exist in the relationships between neighborhood characteristics and parental behaviors and peer substance use. Similarly, the significant relationships between low neighborhood SES and both peer drinking and parental monitoring and between high neighborhood SES and parental drinking could be due to some unmeasured individual characteristics, which would lead to biased estimates of the neighborhood effects. Thus, the relationships found between neighborhood characteristics and parental and peer factors should perhaps be more cautiously interpreted as associations rather than as evidence of neighborhood influence.

Second, and related to the previous point, our findings are subject to shared reporter bias whereby the associations between adolescent’s own behaviors and peer behaviors may be falsely inflated because of the correlated errors since the measures are all from the same respondent. Adolescents are likely to project their own behaviors onto their friends, thus inflating the association between adolescent substance use and peer substance use (Bauman and Ennett 1996).

Third, the study did not measure all social and physical aspects of neighborhoods, such as informal social control, social networks, concentration of alcohol outlets, and availability of social service agencies. We only measured demographic aspects of neighborhoods by using 1990 Census tract data. Therefore, several potential neighborhood effects on adolescent cigarette and alcohol use could not be examined, such as institutional effects. Prior studies have been criticized for exclusive reliance on Census tracts or zip codes as proxies for neighborhoods (Furstenberg and Hughes 1997; Gephart 1997; Leventhal and Brooks-Gunn 2000). Solely relying on Census data to measure neighborhoods not only gives an incomplete picture of neighborhood context but also may obscure the mechanisms through which neighborhood effects can be transmitted (Furstenberg and Hughes 1997). Future research needs to improve neighborhood measurements by assessing multiple aspects of neighborhoods including social, physical, and demographical characteristics.

Fourth, we did not measure the length of time that families had spent in their neighborhoods and thus the extent of their exposure to the neighborhood environment. It is possible that some families had recently moved into the neighborhood, but others may have lived in their neighborhoods for more than 10 years. Due to this limitation, the estimation of neighborhood effects might be compromised if different families had various lengths of stay in a neigh-
Neighborhood Influences on Smoking and Drinking

Our study findings can only be interpreted under the assumption that families had been exposed to the neighborhood environment. We were unable to determine whether changes in behaviors were due to cumulative neighborhood effects (Tienda 1991).

Finally, although our sample retention percent (72.9 percent) is comparable to other longitudinal studies of adolescent drug prevention (Hansen, Tobler, and Graham 1990), our sample suffered from attrition bias. Adolescents that were lost to follow-up were more likely to be nonwhite, to have parents who were not college graduates, and to have initiated smoking; these findings also are similar to those of other longitudinal studies. Nonetheless, attrition bias may limit the generalizability of our findings.

These limitations aside, this study demonstrates the importance of examining the interrelationships of influences among different social settings on adolescent behaviors, as suggested by Bronfenbrenner’s ecological model. Our findings suggest that neighborhoods can influence adolescents through parent and peer factors. Parental relationships, which have received little attention in prior studies, provide a main mechanism through which neighborhoods influence adolescent cigarette and alcohol use. By increasing parental monitoring, parents were able to protect their children from substance use behaviors in disadvantaged neighborhoods. Future neighborhood research is needed to identify the kinds of monitoring strategies employed by parents in disadvantaged neighborhoods and to examine whether adolescents benefit from these strategies.

REFERENCES


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