

Early adolescent alcohol use in context: How neighborhoods, parents, and peers impact youth

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Abstract

Developmental–ecological models are useful for integrating risk factors across multiple contexts and conceptualizing mediational pathways for adolescent alcohol use, yet these comprehensive models are rarely tested. This study used a developmental–ecological framework to investigate the influence of neighborhood, family, and peer contexts on alcohol use in early adolescence ($N = 387$). Results from a multi-informant longitudinal cross-lagged mediation path model suggested that high levels of neighborhood disadvantage were associated with high levels of alcohol use 2 years later via an indirect pathway that included exposure to delinquent peers and adolescent delinquency. Results also indicated that adolescent involvement with delinquent peers and alcohol use led to decrements in parenting, rather than being consequences of poor parenting. Overall, the study supported hypothesized relationships among key microsystems thought to influence adolescent alcohol use, and thus findings underscore the utility of developmental–ecological models of alcohol use.

Adolescent alcohol use remains a leading public health concern. Early alcohol use predicts escalation of use, regular substance use in adulthood, and a number of other negative consequences including higher rates of crime, increased rates of medical problems, and substance use disorders for some youth (Hingson, Edwards, Heeren, & Rosenbloom, 2009; Hingson, Heeren, Levenson, Jomanka, & Voas, 2002). Identifying risk factors associated with alcohol use in early adolescence, an age when initiation is typical (Johnston, O'Malley, Bachman, & Schulenberg, 2008), may help inform the development and refinement of intervention programs. To this end, researchers highlight developmental–ecological models (Bronfenbrenner, 1979) to identify risk factors across contexts and mediational pathways leading to adolescent alcohol use (e.g., Dodge et al., 2009). These models posit that neighborhood and family factors, along with delinquent peer affiliations and adolescent delinquency, have a cascading effect on the onset of alcohol use (Dodge et al., 2009). Thus, it is critical that empirical evaluations of pathways to adolescent alcohol use consider multiple levels of influence over time. Moreover, some influences may have bidirectional effects (Rankin & Quane, 2002). The goal of this study was to examine parenting and peer delinquency as mechanisms that might account for the association

between neighborhood risk factors and early adolescent alcohol use, and potential bidirectional influences among parenting, peer delinquency, adolescent delinquency, and alcohol use.

Neighborhoods, Parents, and Peers

Most developmental research distinguishes two broad features of neighborhoods. *Neighborhood structure* encompasses compositional characteristics of the community (e.g., racial composition and median income) whereas *neighborhood social processes* refer to a community's social organization (e.g., social cohesion; Chung & Steinberg, 2006; Gardner, Barajas, & Brooks-Gunn, 2010; Mrug & Windle, 2009; Sampson, Morenoff, & Gannon-Rowley, 2002). Both have been shown to impact the development of externalizing problems in adolescents (Mrug & Windle, 2009). Leventhal and Brooks-Gunn (2000) posited that social processes might have a more proximal impact on adolescent behaviors, acting as a mechanism through which disadvantaged neighborhoods operate. Residents within disadvantaged neighborhoods are less likely to intervene to help reduce substance use within the community if they mistrust or fear other residents (Sampson et al., 2002). However, neighborhood effects on adolescents are often small, and there has been increasing interest in examining mechanisms through which neighborhoods impact adolescent behaviors (e.g., Murry, Berkel, Gaylord-Harden, Copeland-Linder, & Nation, 2011). Two frameworks have been proposed for understanding indirect effects of neighborhoods on problem behaviors: the *relationships and ties* and the *norms and collective efficacy* models, and both have garnered empirical support (Leventhal & Brooks-Gunn, 2004).

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The relationships and ties model, based on family stress theories (McLoyd, 1990), posits that the link between neighborhood risk and adolescent delinquency is partly mediated by parenting. Parental control and warmth are considered to be broad parenting dimensions that are important for effective socialization of youth (e.g., Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2006). Parental control reflects behaviors toward the adolescent to shape behavior deemed acceptable to the parents, including discipline and setting rules regarding adolescent behavior (e.g., Barnes et al., 2006). In contrast, parental warmth reflects behaviors toward the child that promote messages that they are loved such as praising and spending time together (Barnes et al., 2006). Both parental control and warmth are viewed as positive parenting behaviors (Smetana, Crean, & Daddis, 2002). The stress of living in a disadvantaged neighborhood has been found to disrupt family functioning and compromise parenting, and low levels of positive parenting mediate neighborhood effects on adolescent delinquency, including alcohol use (e.g., Barnes, Reifman, Farrell, & Dintcheff, 2000; Rankin & Quane, 2002). Taken together, neighborhood social processes and the relationship and ties models suggest that neighborhood disadvantage is likely to lead to decrements in positive parenting via low neighborhood cohesion. In turn, decrements in parenting practices are likely to predict adolescent delinquency and alcohol use.

The norms and collective efficacy model (Leventhal & Brooks-Gunn, 2004) posits that neighborhoods impact adolescent outcomes depending on the effectiveness of community institutions, residents, and parents to monitor and control behavior. A lack of structured community organizations (e.g., social clubs or volunteer opportunities) may weaken bonds to prosocial others and activities, thus increasing opportunities to interact with deviant others (Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996). In addition, poor monitoring on behalf of parents and residents promotes delinquent behavior by increasing unsupervised time in the community. Hence, poor parenting is thought to exert its primary influence through allowing delinquent behaviors and involvement with delinquent peers (Dishion, Capaldi, Spracklen, & Li, 1995). Negative peer influences are thought to operate largely because of a lack of neighborhood and parenting resources to regulate peer group behavior (Dishion et al., 1995). Affiliation with deviant peers is conceptualized as a proximal influence that promotes alcohol use (Chuang, Ennett, Bauman, & Foshee, 2005). Delinquent peers likely provide support and opportunities to engage in alcohol use, increase the perception that drinking is normative, socially reinforce use, and shape attitudes toward alcohol use (e.g., Prinstein & Wang, 2005).

In sum, the relationship and ties model and the norms and collective efficacy model both suggest that neighborhood social processes may be more proximal predictors of parenting and peer delinquency compared to neighborhood disadvantage. In turn, parents and peers may have more proximal effects on adolescent alcohol use compared to neighborhoods. Moreover, affiliation with delinquent peers likely mediates the relationship between parenting and adolescent problem

behaviors. Although recent studies have examined the role of both parents and peers as mediators of neighborhood effects (Chung & Steinberg, 2006; Mrug & Windle, 2009), few have empirically tested the mediating role of both microsystems in the same prospective model. This is particularly surprising given that these two perspectives are meant to be complementary (Chung & Steinberg, 2006) and acknowledge that both peers and parents play a role in the initiation and maintenance of problem behaviors during adolescence.

Reciprocal Influences

Adolescent behavior is thought to be reciprocally associated with parenting and peer behavior. We use the terms reciprocal and bidirectional interchangeably to refer to a process whereby adolescent-driven behaviors and behaviors from others in the adolescent's environment (e.g., parents and peers) both influence and are influenced by each other. Though it is important to assess bidirectional influences when examining developmental contextual factors, empirical work that does so remains scarce (Reitz, Dekovic, & Meijer, 2006). One of the most prominent theories involving parent-child transactions leading to problem behavior is Patterson's (1986) coercion theory, which posits a negative reinforcement mechanism to account for the reciprocal association between problem behavior and inept parenting. Such a process is thought to escalate problem behavior and lead to parents becoming disenfranchised from parenting. The few longitudinal studies that have examined bidirectional effects of parenting practices on adolescent behavior problems have produced contradictory findings. Some studies support reciprocal associations between externalizing problems and parenting (e.g., Hipwell et al., 2008). In contrast, other studies have found support for the role of adolescent behavior predicting parenting behaviors, but not the reverse (Fite, Colder, Lochman, & Wells, 2006; Kerr & Stattin, 2003), or have reported no cross-lagged effects between a child's antisocial behavior and parenting (Vuchinich, Bank, & Patterson, 1992). Furthermore, studies examining reciprocal effects of adolescent behaviors and parenting demonstrate stronger bidirectional effects for substance use with parenting than for delinquency (Stice & Barrera, 1995). It is suggested that adolescents who are more entrenched in problem behaviors and those engaging in less normative deviant behaviors, such as early-onset alcohol use, may be particularly likely to have a negative impact on the parent-child relationship (Jang & Smith, 1997).

To our knowledge, prior research has not considered the role neighborhood characteristics and potential reciprocal effects of social context have on delinquency and alcohol use separately. This omission is surprising given that associations have been found between neighborhood characteristics and parenting, delinquent peer involvement, and externalizing behaviors (e.g., Brody et al., 2001; Mrug & Windle, 2009; Rankin & Quane, 2002). Guided by conceptual frameworks for understanding indirect effects of neighborhoods on problem

behaviors, this study examines whether disadvantaged neighborhoods lead to inept parenting and selection of delinquent peers through neighborhood social processes consistent with the relationship and ties model, or whether delinquent peers are more available in disadvantaged neighborhoods, leading to socialization effects from peers consistent with the norms and collective efficacy model. We extend the literature by examining reciprocal effects between parenting and adolescent behavior (both delinquency and alcohol use). Reciprocal models have also been applied to associations between adolescent and peer behavior in the form of selection (adolescents choose to affiliate with peers based on similarity) and socialization (peers socialize behavior via reinforcement and modeling) processes. The current study assesses whether adolescents select delinquent peers based on similar predilections to engage in delinquency and alcohol use, or whether friendships with delinquent peers lead to problem behaviors. Evidence supports both selection and socialization with respect to externalizing behavior and substance use (Mercken, Candel, Willems, & de Vries, 2009). Thus, it is important to consider bidirectional associations as implied by selection and socialization effects involving delinquent peer relationships.

Current Study

The present study investigates the potential influence of contextual factors longitudinally within a developmental–ecological model of risk for alcohol use starting in early adolescence (ages 11–13). Integrating distal and proximal risk factors across contexts is useful for organizing this vast literature and shows promise for understanding pathways to adolescent alcohol use, yet empirically testing these models has proven daunting. Failure to do so may yield oversimplified findings that misrepresent causal pathways. Research moving beyond testing circumscribed models (e.g., peer influence or family risk models) is critical.

Although studies have examined developmental models that integrate dynamic relations across multiple social systems for understanding adolescent alcohol use (e.g., Chuang et al., 2005; Dodge et al., 2009), few have considered the role of neighborhoods in longitudinal bidirectional models. The first aim of the current study was to fill a gap in the literature

by testing a model that includes neighborhood-, parent-, peer-, and individual-level factors in the development of early adolescent alcohol use. In this model, we prospectively test mechanisms through which neighborhood disadvantage may impact alcohol use indirectly via neighborhood cohesion, parenting, and affiliation with delinquent peers as mediators using a multi-informant design. Neighborhood disadvantage was hypothesized to be negatively associated with neighborhood cohesion, which in turn was expected to be positively associated with positive parenting. Positive parenting was hypothesized to be negatively associated with peer delinquency and subsequent alcohol use.

The second aim was to consider bidirectional associations between parenting, adolescent behavior problems, and peer delinquency on alcohol use that are often discussed but rarely tested (e.g., adolescent behavior predicting parenting; Reitz et al., 2006). Accounting for reciprocal associations is likely to provide a more comprehensive understanding of the indirect pathways from neighborhood disadvantage to subsequent adolescent alcohol use. Given support for reciprocal effects, bidirectional associations between parenting and adolescent behavior problems were tested. It was hypothesized that there would be more evidence of reciprocal effects between parenting and adolescent alcohol use compared to general delinquent behaviors. This is consistent with studies demonstrating full reciprocal associations between substance use and parenting but limited evidence for reciprocal effects for delinquency (Stice & Barrera, 1995). To our knowledge, this will be the first study to examine comprehensive mediation pathways from neighborhood disadvantage on adolescent substance use behaviors by considering general delinquency and alcohol use separately as they relate to parenting in a bidirectional relationship.

Given support for models of peer selection and socialization, these were also tested. It was hypothesized that there would be support for both peer selection and socialization processes. This will be indicated by adolescent rule breaking and alcohol use predicting subsequent peer delinquency (selection) as well as peer delinquency predicting subsequent adolescent rule breaking and alcohol use (socialization). In sum, the current study conceptualizes the development of alcohol use as a result of bidirectional influences among par-

Table 1. Hypothesized direction of direct effects in proposed path model

Predictors	Outcomes				
	Neigh. Cohesion	Rule Breaking	Positive Parenting	Peer Delinquency	Alcohol Use
Neigh. disadvantage	–	0	–	+	0
Neigh. cohesion	+	0	+	–	0
Rule breaking	0	+	–	+	+
Positive parenting	0	–	+	–	–
Peer delinquency	0	+	–	+	+
Alcohol use	0	+	–	+	+

Note: Neigh., neighborhood; +, hypothesized positive associations; –, hypothesized negative associations; 0, no association expected.

ents, peers, and the adolescent. Additional predicted associations from our proposed path model are presented in Table 1.

Method

Participants

Participants were taken from a three-wave longitudinal study examining behavior problems on substance use initiation. Participants were recruited utilizing a random-digit-dial sample of listed and unlisted telephone numbers generated for Erie County, New York. Erie County is a large geographical area that encompasses mostly urban and suburban areas, but also some rural areas. US Census Bureau (2012) reports suggest that Erie County has a high concentration of White persons (80.0%), average rates of persons living below the poverty level (14.0%), and high rates of residential stability (i.e., percentile living in the same house for 1 year or longer = 86.8%).

Adolescents were eligible at recruitment if they were between the ages of 11 and 12, and did not have any language or physical disabilities that would preclude them from understanding or completing the assessment. The sample included 387 families (a caregiver and child from each). The participa-

tion rate was 52.4%, which is well within the range of population-based studies requiring extended and extensive levels of subject involvement (Galea & Tracy, 2007). Sample demographic information is presented in Table 2. Given the eligibility criteria, it would be inappropriate to compare this sample to overall demographic characteristics of Erie County, New York. Accordingly, demographic information for a subpopulation of Erie County, New York, corresponding to the population from whence the sample came (i.e., families with children ages 10–14) is also presented. Demographic characteristics are largely comparable to that of Erie County, New York, with the exception that the sample was more highly educated and included more married couples.

Total attrition for the study was 7% (29/387). One difference emerged between families who did and did not complete the Time 2 (T₂) assessment (14/387), such that families who did not complete the T₂ assessment endorsed lower levels of positive parenting practices at Time 1 (T₁), $F(1) = 5.84, p < .05$, Cohen $d = 0.55$. There were no significant differences across all other study variables and demographic characteristics (gender, age, family income, marital status, neighborhood characteristics, peer delinquency, and adolescent rule breaking and alcohol use). Comparison of families who did not complete the Time

Table 2. Sample and community characteristics in Time 1

	Sample ($n = 387$)	ACS 2005–2007 ^a
Adolescents		
Female	55.0%	47.9%
Mean age (<i>SD</i>)	12.10 (0.59)	
Age range	11–3	10–14
Race (%)		
White	83.1	79.8
Black	9.1	13.1
Hispanic	2.1	3.7
Asian	1.0	1.9
Other	4.7	1.5
Caregivers		
Education (%)		
Some high school	2.9	12.5
High school graduate	14.2	31.2
Technical school or some college	24.7	28.5
College graduate	38.2	15.6
Graduate or professional school	20.0	12.1
Family characteristics		
Median annual family income	\$70,000	\$60,453
Range of annual family income	\$1,500–\$500,000	
Families receiving public assistance income	6.2%	5.7%
Family composition (%)		
Two parent	76.0	48.5
Divorced/separated	12.1	9.4
Single parent/never married	9.8	33.9
Other	2.1	11.8

^aUS Census Bureau: American Community Survey 2005–2007; generated by Alan Delmerico using American FactFinder (<http://factfinder.census.gov>), June 4, 2009.

3 (T₃) assessment (24/387) with those who did suggested no differences across all study variables and demographic characteristics. The low level of attrition and few differences between those who were retained and those who dropped out suggest that missing data likely had a minimal impact on study findings. The mean age for adolescents at T₂ and T₃ was 13 years (range = 12–14) and 14 years (range = 13–16), respectively.

Procedure

The larger study was described to parents and adolescents as an investigation of the transition into adolescence. Interviews were conducted at a university research laboratory. Before the interview, the caregiver was asked to give consent and the adolescent was asked to provide assent. The child and caregiver were then taken to separate rooms to enhance privacy. All questionnaires were read aloud, and responses were entered directly into a computer to minimize random responding and missing data. To increase confidentiality during adolescent interviews, questions deemed “sensitive” (i.e., alcohol use and peer delinquency) were read aloud by the interviewer, but answers were inputted into the computer by the adolescent. Each interview took approximately 2.5 hr to complete. Interview procedures were the same at each wave. The T₂ and T₃ assessments typically occurred on the year anniversary of the previous assessment. Families were compensated \$75, \$85, and \$125 for their participation at each respective wave.

Measures

Neighborhood disadvantage. Neighborhood disadvantage was assessed at baseline using census tract information. Census tracts are useful because they incorporate descriptive information regarding defining neighborhood features and offer a good approximation of social and economic data available from the US Census Bureau (Estabrooks, Lee, & Gyurcsik, 2003). A composite index using a principal components analysis was derived based on: proportion of families living below poverty, proportion receiving public assistance, median family income, female-headed households living below poverty with children ages 0–17, and children living below the poverty level ages 0–17. Variables were first converted to *z* scores and then summed. High scores indicated greater neighborhood disadvantage ($\alpha = 0.96$).

Neighborhood cohesion. Neighborhood cohesion was assessed using items adapted from the Los Angeles Family and Neighborhood Survey (Lara-Cinisomo & Pebley, 2003). Parental perceptions regarding neighborhood cohesion were measured during the first two waves with 10 items (e.g., “This is a close-knit neighborhood that is cohesive and unified”). High values on this measure indicate greater neighborhood cohesion. The internal consistency (T₁ $\alpha = 0.91$, T₂ $\alpha = 0.92$) was good for this measure.

Positive parenting. Research suggests that parenting practices as reported by the child have a stronger impact on future

psychosocial development and may be less biased than parent report (Kuppens, Grietens, Onghena, & Michiels, 2009). As such, parenting as reported by adolescents was assessed using the Parenting Style Inventory (Darling & Toyokawa, 1997). Demandingness (e.g., “My parent expects me to follow family rules”) and responsiveness (e.g., “My parent spends time just talking to me”) were assessed using five items for each scale on a Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) during the first two waves. Given the moderate correlation between subscales ($r = .36$, $p < .001$), scales were combined to form a composite index of positive parenting to minimize model complexity¹ and consistent with other studies examining parenting on adolescent behavior (e.g., Mrug & Windle, 2009). High scores indicate more positive parenting (T₁ $\alpha = 0.69$, T₂ $\alpha = 0.72$).

Rule breaking. Self-reported delinquency at T₁ and T₂ was assessed using the rule breaking subscale of the Youth Self Report (Achenbach & Rescorla, 2001). Items assess behavior in the past 6 months such as breaking rules, lying, stealing, and truancy using a Likert scale (0 = *not true*, 2 = *very true*). For this study, substance use items were omitted. Items were summed to create a scale score for each wave ($\alpha = 0.71$ and 0.75, respectively).

Peer delinquency. Adolescents reported on perceived delinquency within their peer group (i.e., their three closest friends) during the first two waves of the study using 14 items from Fergusson, Woodward, and Horwood (1999). The dichotomously scored (no/yes) items (e.g., theft, school truancy, and substance use) were summed to create a scale score. Internal consistency ($\alpha = 0.78$ and 0.81, respectively) was adequate at both time points.

Alcohol use. Lifetime alcohol use was assessed using a dichotomous (no/yes) item from the National Youth Survey (Elliott & Huizinga, 1983) during T₁. During the first wave of the study, 16 (4.2%) adolescents reported having used alcohol without parental permission in their lifetime. Quantity and frequency of alcohol use in the past year at T₂ and T₃ were assessed with fill in the blank questions. At T₂, 83 (22%) adolescents reported having used alcohol in the past year, and 120 (33%) reported having used in the past year during T₃. A quantity by frequency index of drinking was created to represent total drinks in the past year at T₂ and T₃. Distributions of quantity by frequency scores were skewed (11.9 to 19.2). Accordingly, a 4-point ordinal variable was created (0 = *no use*, 1 = *greater than 0 but ≤1 standard drink*, 2 = *greater than 1 standard drink but ≤4 standard drinks*, 3 = *greater than four standard drinks per occasion*). These

1. Separate analyses were also run for parental demandingness and responsiveness. The results were largely consistent across parenting dimensions and with the combined composite. Accordingly, given model complexity, the combined composite was used for the main analyses.

rates of use are comparable to prevalence rates for this developmental period (e.g., Simons-Morton, 2004).

Family socioeconomic status (SES) and marital status. Research supports a strong association between family SES and marital status with neighborhood disadvantage and parenting (Rankin & Quane, 2002). Thus, it is important to include family SES and marital status as statistical controls. We computed a composite family SES (family income, parent education, and public assistance income) and marital status (dichotomously coded not married vs. married) variable. Both were included as statistical control variables along with other demographic characteristics (i.e., adolescent age, race, and sex) in our analysis.

Data analytic plan

A cross-lagged mediation path model² was tested using Mplus 6.1 (Muthén & Muthén, 1998–2010). Given that the outcome was ordinal, the robust weighted least squares estimation procedure was used to accommodate the alcohol use outcome variable (Brown, 2006). The full information maximum likelihood estimation was used to handle missing values. This approach has been demonstrated to provide unbiased estimates when data are missing at random and performs better than other common approaches for handling missing data (Enders & Bandalos, 2001). An advantage of using a prospective design was that it established temporal precedence between the mediator and the outcome, a key criteria for establishing mediation (Kraemer, Kiernan, Essex, & Kupfer, 2008). Asymmetric confidence intervals computed in RMediation were used to test proposed mediated effects (Tofighi & MacKinnon, 2011).

The model was analyzed with neighborhood disadvantage at T₁ predicting positive parenting, peer delinquency, adolescent rule breaking, low neighborhood cohesion, and alcohol use at T₁ and T₂. Paths between positive parenting, peer delinquency, adolescent rule breaking, low neighborhood cohesion, and alcohol use at T₁ and T₂ were examined to test stability and bidirectional effects. The T₂ effects of positive parenting, peer delinquency, adolescent rule breaking, low neighborhood cohesion, and alcohol use on T₃ alcohol use were also examined. Covariances between endogenous variables assessed at the same time point were estimated. Adolescent age, race, sex, family SES, and marital status were also included as exogenous covariates; covariances between exogenous variables

2. Our data included a small number of observations clustered within census tracks (86% had five or fewer observations). Raudenbush and Sampson (1999) suggest that within-neighborhood samples of fewer than 20 individuals are likely to yield unreliable measures of neighborhood-level constructs. Moreover, preliminary multilevel linear modeling analyses suggested that the amount of variance accounted for by the clustering effect was minimal (0.00–0.03). The small number of observations within clusters and the small clustering effects suggest that individual-level analysis was appropriate for these data, and therefore, multilevel analysis was not considered further.

were estimated. Multiple group path models were also run to examine potential differences across boys and girls.

Results

Table 3 provides the descriptive statistics for all study variables. Of particular interest, marital status and family SES, though distinct, had largely similar associations with study variables. For example, high SES families and two-parent (married) families resided in less disadvantaged neighborhoods with higher levels of cohesion at both time points. Higher SES and being from a two-parent family was also associated with lower levels of adolescent rule breaking and peer delinquency at T₂. Adolescents from two-parent families also reported higher levels of positive parenting. Neighborhood disadvantage was positively correlated to being a minority, adolescent rule breaking at T₂, and peer delinquency. Neighborhood disadvantage was also negatively correlated to neighborhood cohesion across time points. Neighborhood cohesion at T₁ was negatively correlated to rule breaking and positively correlated to positive parenting at T₂. Neighborhood cohesion at T₂ was positively correlated with positive parenting at T₂. Adolescent rule breaking was positively correlated with peer delinquency and alcohol use, and negatively correlated to positive parenting across time points. Peer delinquency was positively correlated with alcohol use and negatively correlated to positive parenting across time points. Positive parenting was negatively correlated with alcohol use at T₁ and T₃.

The proposed path model provided a good fit to the data, $\chi^2(36) = 60.95$ ($p < .01$, root mean square error of approximation = 0.04, comparative fit index = 0.99, Tucker–Lewis index = 0.95) and accounted for 45.9% of the variance in alcohol use at T₃ (see Figure 1 for standardized path coefficients). Accordingly, no post hoc model fitting was done. No significant sex differences were found in the full model using multiple group analysis, and therefore, the overall sample was used in the final model. Although not depicted in the figure, there were some effects of demographic control variables. Girls reported less rule breaking (-0.28 , $p < .001$) and peer delinquency (-0.17 , $p < .001$) at T₁ compared to boys. Minority adolescents reported more positive parenting (0.15 , $p < .05$) at T₁ compared to White adolescents. Adolescents from two-parent families reported lower levels of peer delinquency (-0.18 , $p < .001$), alcohol use (-0.20 , $p < .05$), and more positive parenting (0.17 , $p < .01$) at T₁ compared to adolescents from other family structures (e.g., single or widowed parents). Family SES was positively associated with neighborhood cohesion at T₁ (0.19 , $p < .001$). Age was positively associated with rule breaking (0.09 , $p < .01$), peer delinquency (0.12 , $p < .01$), and alcohol use (0.39 , $p < .001$) at T₁. As expected, all stability effects of repeated measures were statistically significant (see Figure 1).

Neighborhood disadvantage was associated with high levels of T₁ peer delinquency and T₂ adolescent rule breaking and peer delinquency. Neighborhood cohesion at T₁ was a significant predictor of positive parenting at T₂. High levels of

Table 3. Means, standard deviations, and correlations for study variables

	Mean	SD	Correlations															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Time 1																		
1. Age	12.09	0.59	—															
2. Sex	0.55	0.50	0.04	—														
3. Race	0.17	0.37	-0.01	0.02	—													
4. Marital status	0.76	0.43	-0.01	0.07	-0.39	—												
5. Family SES	-0.01	0.77	0.04	-0.03	-0.29	0.46	—											
6. N. disadvantage	-1.74	3.79	-0.08	0.05	0.54	-0.39	-0.36	—										
7. N. cohesion	3.98	0.62	0.09	0.01	-0.22	0.26	0.33	-0.36	—									
8. Rule breaking	1.45	1.78	0.05	-0.27	-0.05	-0.07	-0.02	0.01	-0.07	—								
9. Parenting	4.17	0.44	-0.06	0.07	0.09	0.11	0.09	0.05	0.06	-0.23	—							
10. Peer delinq.	0.77	1.61	0.09	-0.15	0.14	-0.22	-0.09	0.18	-0.08	0.45	-0.13	—						
11. Alcohol use	0.04	0.20	0.14	-0.05	-0.02	-0.07	-0.04	-0.02	0.02	0.29	-0.16	0.36	—					
Time 2																		
12. N. cohesion	4.00	0.61	0.00	-0.02	-0.17	0.20	0.23	-0.32	0.73	-0.07	0.03	-0.06	0.03	—				
13. Rule breaking	1.73	1.95	0.09	-0.23	0.07	-0.18	-0.13	0.10	-0.11	0.67	-0.19	0.43	0.15	-0.09	—			
14. Parenting	4.18	0.43	-0.15	0.12	0.03	0.16	0.04	-0.02	0.13	-0.28	0.61	-0.26	-0.16	0.14	-0.30	—		
15. Peer delinq.	1.45	2.24	0.14	-0.12	0.13	-0.22	-0.12	0.10	-0.00	0.30	-0.16	0.43	0.30	-0.01	0.42	-0.26	—	
16. Alcohol use	0.22	0.42	0.16	0.02	0.09	-0.02	0.04	0.03	0.01	0.13	-0.04	0.18	0.25	0.00	0.20	-0.10	0.34	—
Time 3																		
17. Alcohol use	0.33	0.47	0.21	0.02	0.01	-0.17	-0.05	-0.01	-0.03	0.20	-0.11	0.21	0.25	0.00	0.25	-0.16	0.37	0.36

Note: SES, socioeconomic status; N., neighborhood; Delinq., delinquency; sex 0 = boys, 1 = girls; race 0 = White, 1 = minority; marital status 0 = not married, 1 = married. Bold values represent significant ($p < .05$) associations.

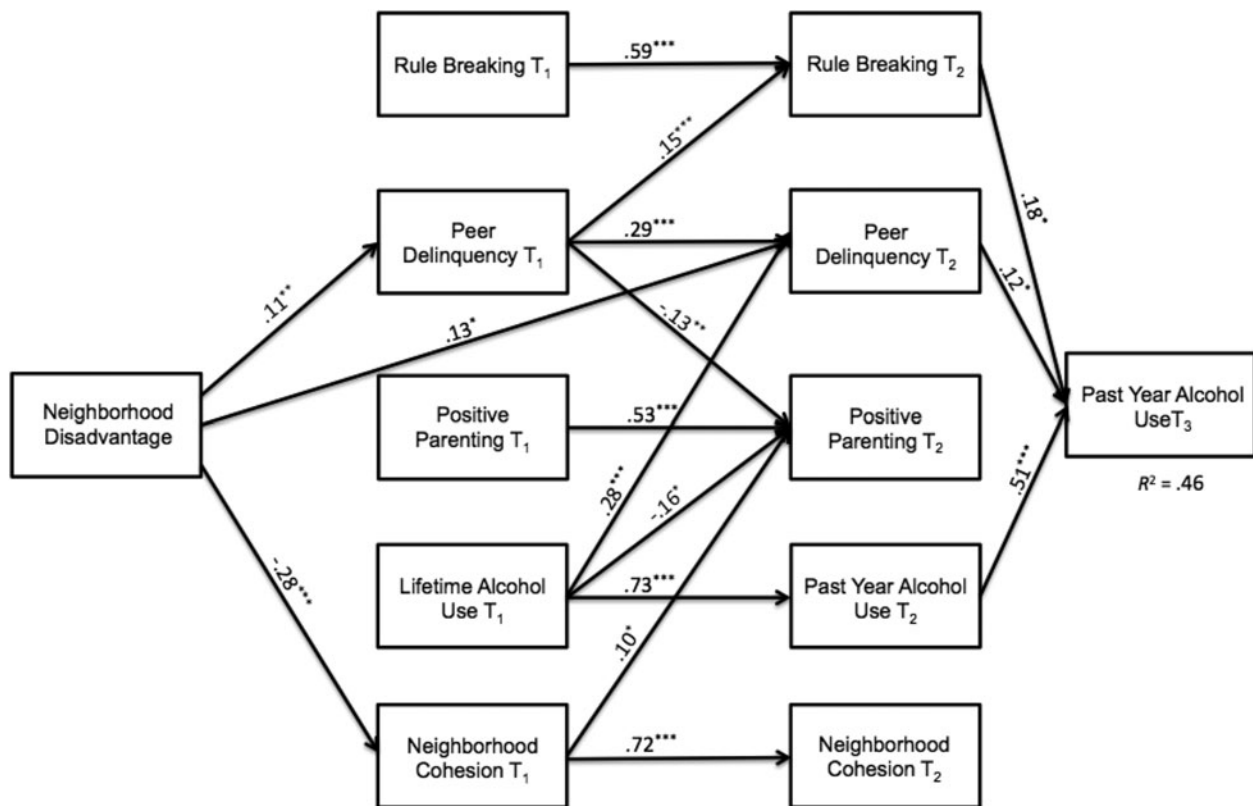


Figure 1. Estimated standardized path coefficients. T₁, Time 1; T₂, Time 2; T₃, Time 3. Model fit: $\chi^2(36) = 60.95$ ($p < .01$, root mean square error of approximation = 0.04, comparative fit index = 0.99, Tucker–Lewis index = 0.95). Only significant paths are presented: * $p < .05$, ** $p < .01$, *** $p < .001$. Paths from covariates (i.e., age, sex, race, marital status, and family socioeconomic status) and covariances (i.e., between exogenous variables and between within-time endogenous variables) were estimated, but they are not depicted to simplify the presentation of the results.

peer delinquency at T₁ were associated with high levels of adolescent rule breaking and with low levels of positive parenting at T₂. Counter to hypotheses, positive parenting did not predict peer delinquency, adolescent rule breaking, or alcohol use. Lifetime alcohol use at T₁ was a significant predictor of high levels of peer delinquency and low levels of positive parenting at T₂. As predicted, adolescent rule breaking and peer delinquency at T₂ prospectively predicted greater alcohol use at T₃.

Based on the significant path coefficients in our model, we tested five proposed mediational pathways. As recommended by MacKinnon (2008; Tofighi & MacKinnon, 2011), indirect effects were tested using Rmediation and unstandardized path coefficients. First, the indirect effect from neighborhood disadvantage to adolescent rule breaking at T₂ through peer delinquency at T₁ was statistically significant (estimate = 0.02, $p < .05$, 95% confidence interval = 0.003–0.03). In terms of the percent variance, 15.5% of the total effect of neighborhood disadvantage on adolescent rule-breaking behavior at T₂ operated through peer delinquency at T₁. Second, the indirect effect in the subsequent pathway from peer delinquency at T₁ to alcohol use at T₃ through adolescent rule breaking at T₂ was also statistically significant (estimate = 0.03, $p < .05$, 95% confidence interval = 0.004–0.05). Third, the indirect effect from neighborhood disadvantage to positive parenting at T₂ through peer delinquency at T₁ was statistically signif-

icant (estimate = -0.01 , $p < .05$, 95% confidence interval = -0.03 to -0.002). Fourth, the indirect effect from neighborhood disadvantage to positive parenting at T₂ operating through neighborhood cohesion was statistically significant (estimate = -0.03 , $p < .05$, 95% confidence interval = -0.06 to -0.006). Given that the indirect and direct effects have opposite signs in these two paths to positive parenting, absolute values of the quantities were taken before computing the proportion mediated by T₁ peer delinquency and neighborhood cohesion, respectively; a procedure recommended by Alwin and Hauser (1975 as cited in MacKinnon, 2008). Accordingly, 37.8% of the total effect of neighborhood disadvantage to positive parenting at T₂ operated through peer delinquency at T₁, and 56.6% of the total effect operated through neighborhood cohesion at T₁. Fifth, although there was evidence for one additional key path in the proposed mediational pathway between neighborhood disadvantage and alcohol use at T₃ via peer delinquency at T₂, this indirect effect was not significant (estimate = 0.02, *ns*, 95% confidence interval = -0.001 to 0.04).

Discussion

Theoretical accounts of adolescent alcohol use highlight the importance of developmental–ecological and bidirectional

models to identify risk factors across contexts and potential mechanisms through which they operate (e.g., Chuang et al., 2005; Reitz et al., 2006). Yet conceptual models integrating sociocultural risk and protective factors across contexts are rarely tested. Failure to test integrative models has likely yielded misrepresentations of the causes of adolescent alcohol use, and research moving beyond testing circumscribed models (e.g., peer influence or family risk models) is critical. This study sought to investigate the influence of neighborhood, family, and peer contexts on early adolescent alcohol use using a multi-informant longitudinal cross-lagged design.

Direct and indirect effects of neighborhood characteristics

Consistent with hypotheses, neighborhood disadvantage and cohesion had weak direct effects on adolescent delinquency and alcohol use. Neighborhood effects are viewed as becoming stronger with age, as youth spend less time at home and more time with peers in the community (Murry et al., 2011). Developmental research suggests that in early adolescence neighborhood effects are more distal and thus have weak direct effects on behaviors, especially when proximal socialization factors (e.g., peers) are taken into account. Our results suggest that the effects of neighborhood disadvantage on adolescent problem behaviors were largely mediated by affiliation with deviant peers. Neighborhood disadvantage was associated with greater peer delinquency at T_1 , which in turn predicted more adolescent rule breaking at T_2 . Furthermore, high levels of adolescent rule breaking at T_2 predicted subsequent alcohol use at T_3 . This is largely consistent with the norms and collective efficacy model (Leventhal & Brooks-Gunn, 2004), whereby disadvantaged neighborhoods characterized by a lack of social resources and control networks result in low consensus regarding standards expected for residents (Brody et al., 2001). A consequence of the lack of these resources is thought to increase access to delinquent peers in unsupervised settings and subsequently more opportunities to engage in delinquent behaviors. Our findings also align with cascade models (Dodge et al., 2009), which highlight the progression from neighborhood factors, to peer deviance and adolescent externalizing behaviors, leading to substance use.

There was evidence indicating that neighborhood cohesion at T_1 and peer delinquency at T_1 mediated the association between neighborhood disadvantage and positive parenting at T_2 . Neighborhood disadvantage may compromise parenting through deterioration of social norms and shared ideals among neighborhood residents (i.e., cohesion; Chung & Steinberg, 2006; Rankin & Quane, 2002). Furthermore, the relationship and ties model suggests that the added stress of living in disadvantaged neighborhoods likely disrupts family functioning, thus compromising positive parenting practices. However, contrary to our expectations, positive parenting did not mediate neighborhood effects on alcohol use and there was minimal evidence of positive parenting as a predictor of adolescent problem behavior. This was surprising given research suggest-

ing that low levels of parental warmth and control increase the risk of delinquent behaviors, including alcohol use, in adolescents (e.g., Barnes et al., 2000; Rankin & Quane, 2002).

Although theory and research suggest that parenting practices are important precursors to deviancy and alcohol use (e.g., Barnes et al., 2000), there is evidence that parent-child relationship quality plays a critical role in adolescent deviance. For example, Kerr, Stattin, and Burk (2010) demonstrated that neither parental monitoring nor solicitation (i.e., active efforts of parents to track their adolescent) predicted changes in delinquency across time. In contrast, youth disclosure to parents predicted engagement in delinquent behavior 2 years later. Disclosure likely reflects the quality of the parent-child relationship (Kerr et al., 2010) rather than parenting practices, and may be a better predictor of deviance and alcohol use. Thus, child disclosure to parents and quality of the parent-child relationship, rather than parental control and warmth, may be an important family-level correlate of early adolescent drinking.

Overall, neighborhood cohesion was a weaker predictor in the model compared to neighborhood disadvantage. This was not expected and may be a function of our use of parent reports of neighborhood cohesion. Research comparing census-based neighborhood characteristics with subjective reports from parents and youth (e.g., Brody et al., 2001) suggest that children's appraisal of neighborhood characteristics are more highly correlated with census data than are parent perceptions of neighborhood risk. Furthermore, there is evidence that census data and children's appraisals of neighborhood predicted affiliation with deviant peers, whereas parent appraisals of neighborhoods did not (Brody et al., 2001). There may be important differences in how caregivers and children experience their neighborhoods, differences in exposure to specific areas, and youth experiences may have a stronger influence on youth behavior (Brody et al., 2001). Stronger effects from adolescent report compared to parent report may also reflect possible bias due to common method variance (Byrnes, Chen, Miller, & Maguin, 2007; Chung & Steinberg, 2006). Future research assessing both parent and child neighborhood perceptions may be important in providing a more comprehensive understanding of the links between neighborhood characteristics and adolescent alcohol use.

Reciprocal effects

Parenting. Although parenting is viewed as an important mechanism of socializing children, the relationship between child behavior and parenting is complex. Some research suggests that parents influence child behavior (Chuang et al., 2005), while others suggest that children impact parenting (e.g., Fite et al., 2006; Kerr & Stattin, 2003). Our findings offered support for the latter. Delinquent peer affiliation and adolescent alcohol use at T_1 predicted low levels of positive parenting at T_2 . One account for this direction of effects is that when youth associate with delinquent peers or initiate alcohol use, parent-child communication declines (Dishion,

Poulin, & Medici Skaggs, 2000), and this may undermine parents' efforts to socialize their child (Patrick, Snyder, Schrepferman, & Snyder, 2005). Kerr and Stattin (2003) found that adolescent delinquency including alcohol use predicted decreases in parental control, emotional support, and encouragement from parents over time, while these same parenting behaviors did not predict adolescent deviance.

It may also be important to keep in mind the age of our sample when considering child behavior effects on parenting. Bidirectional associations between parents and children are likely to change over time (Jang & Smith, 1997). Parents tend to supervise their children less and tend to have less of an impact on child behaviors as children transition into adolescence. At the same time, the transition to adolescence is marked by a significant shift in the power dynamic from parent to child (Jang & Smith, 1997). This shift coincides with a period when adolescents are seeking increased autonomy from parents and are highly influenced by peers (Laird, Pettit, Bates, & Dodge, 2003). Thus, it is not surprising that in our early adolescent sample, youth tend to have a stronger impact on parenting and that peers have a stronger impact compared to parents.

It is important to note that although peer delinquency and adolescent alcohol use influenced parenting practices, adolescent rule breaking did not. Most research on bidirectional effects of parenting and adolescent behaviors have combined delinquent behaviors and alcohol use to reflect antisocial behavior or deviancy (e.g., Kerr & Stattin, 2003); our study separated these two domains to examine their unique effects. Other work that has examined the unique reciprocal effects of adolescent delinquency and substance use on parenting demonstrates full reciprocal associations between substance use and parenting, and limited support for full reciprocal associations for externalizing behaviors (Stice & Barrera, 1995); namely, there was only evidence that externalizing behaviors predicted subsequent parenting practices but not the reverse. Adolescent externalizing behaviors and substance use were not assessed in the same model (Stice & Barrera, 1995). Although adolescent rule-breaking behaviors were negatively correlated with parenting practices in our sample, it may be that when examining both problem behaviors in the same model, adolescent alcohol use is a stronger predictor of parenting practices. The age of our sample during T₁ is consistent with the larger literature's definition of early-onset drinking (i.e., use at age 14 or younger; Donovan & Molina, 2011). Research suggests that early-onset drinking is indicative of severe behavior problems and associated with problematic outcomes later in adolescence, including physical aggression, dropping out of school, risky sexual behavior, illicit drug use, substance use disorders, and alcohol- and drug-related motor vehicle crashes (Hingson et al., 2002, 2009). As such, little unique variance might have existed for adolescent rule breaking on parenting above and beyond alcohol use.

Peer delinquency. As expected, there was support for both adolescents being influenced by (socialization) and selecting to affiliate with (selection) delinquent peers. High levels of

peer delinquency at T₁ predicted adolescent rule breaking at T₂, and rule breaking at T₂ predicted subsequent alcohol use at T₃. Similarly, peer delinquency predicted alcohol use directly, but only during the last wave of the study. Stability of alcohol use across T₁ and T₂ was high (standardized estimate = 0.73, $p < .001$), suggesting little change in alcohol use across the first two waves of the study. High stability may have resulted in limited prediction of alcohol use at T₂. These findings are consistent with research suggesting that youth may learn problem behaviors through exposure to delinquent peers (Dishion et al., 1995). There is considerable evidence that youth tend to select peers with proclivities similar to themselves because similarity provides opportunities for validation and reinforcement (Byrne & Griffitt, 1973; Mercken et al., 2009). Adolescents engaging in alcohol use may select into deviant peer groups because they offer acceptance of alcohol use.

Limitations and future directions

Although this study provided an important advancement in understanding three key contexts thought to be central to adolescent alcohol use in a comprehensive prospective mediational model, some limitations should be noted. Findings should not be generalized beyond the age characterized in this sample. Early adolescence is a period when peer influence is particularly salient (e.g., Dodge et al., 2009). In contrast, early adolescents may have less direct exposure to their neighborhoods compared to those in late adolescence. Accordingly, future studies should extend this model to later ages, and perhaps consider age as a moderator. In addition, alcohol use is usually light in early adolescence. It is important not to generalize these findings to other stages of use such as regular or problematic drinking. Future studies should consider how these social contexts impact other stages of alcohol use. Findings should not be generalized to samples with different demographic characteristics. Although our sample reflected characteristics of the county from which it was selected, it was largely White. Peer influence (e.g., Gibbons et al., 2010) and parenting practices (Lansford, Deater-Deckard, Dodge, Bates, & Pettit, 2004) may operate differently across racial and ethnic groups. Findings may also not generalize to other communities. Neighborhood characteristics are not universal; rather, they are embedded in sociocultural, historical, and geographical contexts (Mrug & Windle, 2009). Our sample was drawn from a region with low levels of ethnic heterogeneity and residential instability. Other studies have focused on regions with higher levels of ethnic heterogeneity, poverty, and residential instability such as Philadelphia and Chicago (e.g., Chung & Steinberg, 2006). It is important to keep such variability in social ecology in consideration.

Another limitation is that a majority of variables used in this study were based on youth self-report. This may increase shared-method variance and may bias findings (Chung & Steinberg, 2006). Although youth perception of peer and parenting behaviors is particularly meaningful during this developmental period (Kuppens et al., 2009), it will be important

to replicate these findings across additional reporters and methods of assessment. Finally, we focused on positive parenting (a combination of demandingness and responsiveness), and other parenting behaviors may operate differently in predicting alcohol use in adolescence. For example, alcohol-specific socialization practices such as having clear rules and consequences for drinking alcohol, and the quality of the parent–child relationship may be more germane to adolescent alcohol use than are general parenting practices (e.g., Kerr et al., 2010; Strandberg & Bodin, 2011). An important direction for future research is to examine potential differences in the relationship between disadvantaged neighborhoods and alcohol-specific parenting or the quality of the parent–child relationship versus general parenting practices.

Despite these limitations, this study builds from the extant literature by examining how parents and peers operate together to transmit neighborhood risk. Developmental–ecological models have utility in organizing this vast literature and show promise for understanding causal and reciprocal pathways to adolescent alcohol use. Failure to consider integrative models may offer an incomplete picture of the effects neighborhood disadvantage has on adolescent behaviors. Furthermore, studies examining joint effects rarely account for reciprocal effects, despite recognition of the importance of bidirectional models, and tend to focus on at-risk samples with concurrent designs (e.g., Chung & Steinberg, 2006; Mrug & Windle, 2009), limiting conclusions on the direction of mediational effects. Our study addresses these limitations and tests a longitudinal developmental model. Findings are

consistent with literature suggesting that peer delinquency impacts adolescent alcohol use. More novel is our finding that disadvantaged neighborhoods may promote affiliation with delinquent peers, and this may be a crucial mechanism by which neighborhoods impact adolescent alcohol use. Communities may organize opportunities for adolescents to spend time with peers in supervised settings either in school or in organized community contexts to minimize risk factors. Structured after-school programs for youth developed to address the potential risks posed by the lack of adult supervision such as the Positive Youth Development Collaborative (Tebes et al., 2007) and the Friendly PEERSuasion program (Smith & Kennedy, 1991) have demonstrated promising results. Participants enrolled in these programs demonstrated less favorable attitudes toward alcohol and drugs, were more likely to view substances as harmful, and reported reduced incidence of substance use compared to those in the control group. These programs may be profitably targeted for youth in disadvantaged communities. The finding of less effective parenting as a response to adolescent alcohol use and peer delinquency suggests the need to refine intervention models to account for the putative influence of adolescents on parents. In addition to increasing structure, consistency, and involvement with children, parent-training programs should also address how to respond to a child's alcohol use initiation and delinquent peer affiliation. These methods may help curtail disenfranchisement of parents as youth engage in problem behaviors and may help prevent adolescent alcohol use.

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