

Friendship Networks and Delinquency: The Relative Nature of Peer Delinquency

Dana L. Haynie¹

Although acknowledging the importance of adolescent friendships in the etiology of delinquency, prior studies have yet to provide a detailed examination of the role of actual friendship networks in delinquency. Using data from the National Longitudinal Study of Adolescent Health (1995–1996), this study's incorporation of friendship networks allows for a more rigorous conceptualization and measurement of peer delinquency based on carefully defined networks of adolescent friendships. Findings illustrate that friendship networks are very heterogeneous in terms of members' participation in delinquent behavior with the majority of adolescents belonging to networks containing both delinquent and non-delinquent friends. In support of differential association's premise that delinquent behavior is influenced by the ratio of definitions favorable to those unfavorable to law violation (Sutherland, 1947), the proportion of delinquent friends in a respondent's network is most strongly associated with respondents' subsequent delinquency. This relative measure of peer delinquency is preferable to a measure of the absolute level of delinquency occurring by friends, the average delinquency committed by friends, or the absolute number of delinquent friends. Enmeshment in a friendship network where consensus about the appropriateness of delinquency is maximized (i.e., all friends are delinquent or non-delinquent) most effectively constrains the behaviors of network members to resemble the groups' behavior.

KEY WORDS: social networks; delinquency; measuring peer delinquency; differential association theory.

1. INTRODUCTION

An understanding of the relationship between peers and delinquency is at the heart of delinquency research. One of the most consistent findings in

¹Direct correspondences to Dana L. Haynie, Department of Sociology, The Ohio State University, 300 Bricker Hall, 190 N. Oval Mall, Columbus, OH 43210. This research was supported by grants from the National Institute of Justice and the National Science Foundation and is based on data from the Add Health project, a program designed by J. Richard Udry and Peter S. Bearman, and funded by the National Institute of Child Health and Human Development (grant HD31921). I am grateful for helpful comments received from Marvin Krohn, Steve Messner, Chris Knoester, and the anonymous reviewers who provided extensive comments on this paper.

the literature involves the association between friends' delinquent behavior and a respondent's own delinquency (Akers *et al.* 1979; Elliott *et al.*, 1985, 1989; Elliott and Menard, 1991, 1996; Jensen, 1972; Kandel, 1978; Krohn, 1974; Matsueda, 1982; Matsueda and Anderson, 1998; Matsueda and Heimer, 1987; Menard and Morse, 1984; Short, 1957; Voss, 1964). Adolescents who report that their friends are delinquent tend to report higher levels of delinquency than adolescents with fewer or no delinquent friends. Socialization theories, including differential association and social learning theory, generally interpret this finding in terms of a peer influence effect (Akers, 1998). Adolescents are exposed to pro-delinquent definitions and modeling of delinquent behavior when they have delinquent peers. This exposure in turn increases adolescents' likelihood of delinquency involvement. Although consideration of peer groups typically invoke discussion of the influence of delinquent or non-delinquent groups there is some evidence that peer groups are more heterogenous with both delinquent and non-delinquent members (Elliott and Menard, 1989). This mixed exposure to both delinquent and non-delinquent influences is central to Sutherland's differential association theory (1947) which suggests that individuals' intimate networks expose them to both delinquent and non-delinquent acquaintances and definitions and, therefore, shapes peer influence.

Since peers are believed to be the major socializing agent during adolescence it is important to empirically assess whether adolescents are typically located in homogenous friendship networks with all delinquent or non-delinquent members as suggested by critics of socialization theories ("birds of a feather flock together") or networks comprised of both delinquent and non-delinquent friends. The homogeneity of friends' delinquent behavior is important because it is indicative of the adolescent's exposure to delinquent behavior. When friendship networks contain access to both delinquent and non-delinquent friends, the network may be less effective in providing clear behavioral guidelines, cohesive norms, and consistent values regarding behavior expectations.

Using exceptionally detailed network data from the National Longitudinal Study of Adolescent Health, this is one of the first studies to map out the delinquent context of adolescent friendship networks. Because network methods are based on the premise that individual behaviors are shaped through the patterning of interpersonal relationships, they provide the ideal method to measure peer delinquency and examine the role of peer influence. The purpose of this study is threefold. Firstly, to gain a more accurate description of the delinquent behavioral patterns evident within networks, friendship networks incorporating complete social network data are examined. Secondly, using two waves of data, alternative measures of peer delinquency are compared to test whether the proportion of delinquent friends

or the absolute level of delinquency committed by friends has a stronger association with subsequent delinquent behavior. Lastly, other potentially important network characteristics (e.g., the sex and age composition of the networks, network cohesion, attachment to friends) are examined to determine whether they explain some of the peer-delinquency association. These are important, and, as yet unexamined issues that can provide insight into the dynamics behind the peer-delinquency association.

To place the role of peer behavior in context, Sutherland's theory of differential association is discussed below to highlight the connection between the behavioral composition of peer networks and Sutherland's emphasis on the ratio of definitions favorable to those unfavorable to law violation. Within this discussion, Granovetter's notion of embeddedness and Coleman's illustration of social capital are highlighted and shown to be congruent with Sutherland's thesis.

1.1. Background

Despite placing much emphasis on the role of peers in delinquency transmission,² surprisingly little is known about the structure of delinquent and non-delinquent friendship networks for adolescents (for work by developmental psychologists examining friendship networks of children and early-adolescents, see Dishion, 2000; Dishion and McCord, 1999; Dishion and Patterson, 1991). The lack of information on the nature of delinquent friendship networks is due partly to theories of adolescent delinquency focusing only on the existence of such networks (e.g., the application of differential association theory) or on a particular characteristic of the network such as attachment (e.g., social control theory) (Krohn and

²Interpretation of the peer-delinquency association remains controversial because it is not entirely clear whether the association reflects peer influence or self-selection. Advocates of the self-selection model (e.g., Gottfredson and Hirschi, 1990) argue that delinquent behavior precedes selection of delinquent friends (i.e., delinquent adolescents select other delinquent adolescents to befriend), whereas learning theories reverse the ordering and assume that non-delinquent adolescents are socialized into delinquency by their delinquent friends. At issue here is what comes first, an adolescent's delinquency or the delinquency of friends. A noteworthy study by Cairns and Cairns (1995) highlights both the selection process and resulting homophily (i.e., similarity of friends). The authors find that friendship similarity can be observed across many different dimensions—group members tend to be similar in terms of aggression, popularity, academic success, and even physical attractiveness. Their study indicates that the more characteristics two individuals have in common, the greater the probability that they will end up friends. While the findings suggest that friendship groups can form around almost any identifiable characteristic (the selection process), once the friendship occurs contagious reciprocity in behaviors result in greater similarities among group members (the socialization process). To provide a more conservative estimate of peer influence the current study includes a control for adolescents' prior delinquency.

Thornberry, 1993).³ This is a regrettable oversight since a prominent theory in criminology, differential association theory, emphasizes the role of personal networks in the transmission of attitudes and definitions favorable or unfavorable to delinquency (Sutherland, 1947). In fact, the network of peers in which adolescents are enmeshed appear to be particularly important in terms of facilitating or hindering criminal involvement.

Although never discussed in terms of embeddedness within social structures, there is evidence that Sutherland thought of the interconnections among individuals as generating a structure that had important implications for the transmission of delinquent behavior. For example, Sutherland believed that the intimate networks of relations connecting individuals provide the context where the techniques, motives, drives, and attitudes that facilitate crime and delinquency are learned. Moreover, Sutherland emphasized that individuals are more likely to adapt criminal definitions and engage in crime when their criminal contacts exceed their non-criminal contacts since the ratio of contacts affects the extent to which the individual is exposed to definitions and patterns favorable to delinquency. Because individuals are typically exposed to both delinquent and non-delinquent definitions and behaviors, it is the ratio of contacts that shapes peer influence and determines an individual's own delinquent involvement.

Despite original emphasis on the importance of exposure to definitions or attitudes favorable to law violation, prior research has consistently indicated that attitude transference is not the primary mechanism of differential associations. Instead, individuals appear more influenced by the behaviors of friends than they are by friends' attitudes towards crime (e.g., Jensen, 1972; Matsueda and Heimer, 1987; Warr and Stafford, 1991). Consistent with social learning explanations of peer influence, these findings suggest that imitation of friends' behaviors and direct reinforcement of behavior by friends are most important (Akers, 1985). When adolescents are located in friendship networks comprised of both delinquent and non-delinquent friends, the ratio of delinquent to non-delinquent behavioral patterns is still likely to be key since modeling and reinforcement of delinquent behavior will depend upon the proportion of delinquent friends one associates with.

Granovetter's (1985) work on social embeddedness can be viewed as expanding Sutherland's differential association principle with the notion that embeddedness in social structures (such as peer networks) acquire

³Krohn's work (1986, 1988, 1993) provides the notable exception to this statement as he is one of the first criminologists to advocate the use of a social network perspective. Unfortunately, criminologists have yet to follow through and use social network methods to examine the peer-delinquency association. More recent work in criminology has used network methods and data to examine network processes in neighborhoods that can account for neighborhood-level crime rates (e.g., Bellair, 1997; Sampson and Groves, 1989; Sampson, 1988).

additional influence beyond simple modeling mechanisms. When individuals are socially embedded in a network of relationships and maintenance of these relationships are important to network members, the network is able to generate trust, establish expectations for behaviors, and reinforce social norms. Because peer friendships are of central importance during adolescence and one of the more important developmental goals during this period is ensuring peer acceptance, peer networks should be especially effective at directing and constraining individual members' behaviors.

McCarthy and Hagan (1995) illustrate the relationship between embeddedness in peer networks and subsequent criminal involvement with their sample of street youth living in Toronto. This study is noteworthy because the authors argue that getting involved with crime, similar to getting a job, is a social phenomenon and embeddedness in social networks can either facilitate or hinder criminal involvement. This is attributable to the intimate connections with others who are criminal/delinquent that provide the context in which criminal behavior is learned and facilitated. McCarthy and Hagan's (1995) finding that adolescents living on the street were more likely to become involved in crime if they spent time with street accomplices who taught them criminal skills, provides evidence of the importance of criminal contacts in peer networks. This suggests that embeddedness in friendship networks may more easily facilitate delinquency if adolescents are enmeshed in a context where most or all friends are exhibiting behaviors favorable to crime/delinquency. These behaviors may include the teaching of skills conducive to delinquency, but more importantly, when behavioral patterns such as delinquency are reinforced by all members of the network, the friendship network will better be able to generate trust, establish expectations, and reinforce social norms that are favorable or unfavorable to delinquency.

Coleman's discussion of social capital (1988, 1990) also contributes to an understanding of the importance of peer networks for influencing individual behaviors. Social embeddedness is important, according to Coleman, because it serves as a resource that generates social capital consisting of obligations and expectations for behavior, as well as channeling information, norms, and sanctions. For adolescents, friendship networks are particular social contexts that are likely to generate social capital that fulfill adolescents' needs for social acceptance, personal identity, and sense of place in the adolescent peer hierarchy. While most discussions of social capital have focused on its ability to promote positive actions, McCarthy and Hagan argue that social capital need not foster only positive outcomes, but can also lead to negative outcomes such as crime and delinquency (1995). This is especially likely if adolescents are embedded in social networks that generate social capital that is used to facilitate delinquent involvement. If

all members of the networks are in agreement about the appropriateness of delinquency and engaged in delinquent behavior, the network will better be able to generate obligations and expectations that ensure that similar behavior is rewarded and facilitated by membership in the group.

In terms of adolescent delinquency and the peer-delinquency association, this framework suggests that contrary to the common-sense idea that adolescents become involved in crime/delinquency because of a lack of social and/or human capital (e.g., social control and social disorganization theory) or due to a impulsive personality trait (e.g., self-control theory), adolescents become delinquent if they are located in friendship networks that support and facilitate delinquency. Friendship networks that contain high proportions of delinquent members are likely to generate an environment supportive of delinquency. This context exposes adolescents to a high ratio of delinquent to non-delinquent behavioral patterns resulting in the generation of social capital within the friendship network that reinforces, supports, and facilitates delinquent behavior. As the proportion of *non-delinquent* friends increases, the social capital generated in the friendship network is likely to facilitate expectations, behaviors, and norms *less* conducive to delinquency. This suggests that in order to understand why peer associations lead to delinquency, the structure and composition of friendship networks must be incorporated into studies of adolescent behavior. It is this structure and composition that allow us to understand the type of expectations, obligations, and norms being generated.

1.2. Limitations of Prior Studies

Although studies of peer influence typically invoke considerations of peer groups and friendship networks, actual friendship networks have rarely been measured in the criminological literature. This means that much of the prior work examining the role of delinquent friends has been unable to incorporate the actual network structure in which peer influences are believed to operate, therefore, preventing the assessment of different dimensions of peer behaviors. The majority of prior studies have relied on survey data with randomly selected respondents questioned about their behavior and their perceptions of friends' behaviors.⁴ With this type of research, it is not possible to define the friendship network or identify specific members included in the group of "friends".

⁴A few studies examining self-projection issues have used sociometric data on respondents and their self-identified "best friend" (e.g., Aseltine, 1995; Kandel, 1978, 1996). While these studies have many advantages over studies that rely on respondent perceptions of friends' behaviors, they are only examining the influence of one friend and can not account for the total network exposure to deviant or prosocial norms and behaviors.

In addition to generating an undelineated friendship network, asking respondents to report on friends' delinquency increases the potential misrepresentation of friends' behaviors due to self-projection where respondents project their own delinquent behavior to those they consider friends (Jussim and Osgood, 1989).⁵ Termed the "influence of assumed similarity," research reveals that most people have a strong tendency to project their own attributes, including behaviors to others (Jussim and Osgood, 1989). In support of this "assumed similarity" a recent study by Aseltine (1995) examining the relationship between adolescent drug use and best friends' drug use finds that friends' use is a primary source of influence. However, estimates that relied upon respondent perceptions of friends' behaviors overestimated that influence. These findings suggest that by using adolescent perceptions of friends' behaviors, previous studies generate spuriously strong correlations between respondents' and friends' behavior. Therefore, it is not surprising that Aseltine (1995) finds that adolescents' report that their peer groups are more homogenous than they actually are. These findings emphasize the importance of incorporating friends' own reports of their behaviors into studies, rather than relying on potentially biased respondent perceptions.

Additionally, many prior measures of peer influence confound issues of relative peer delinquency (the ratio of delinquent to non-delinquent friends) and absolute peer delinquency (the number of delinquent acts committed by members). For example, researchers using the National Youth Survey, the most frequently used data for examination of delinquent peer influence, have access to a series of questions that ask the respondent to define the proportion of their friends' engaging in one particular delinquent act. The respondent can choose from an ordinal scale where 1 = none of their friends, to, 5 = all of their friends. Researchers then take the responses respondents provide about friends' participation in each delinquent act and tally them up creating a measure of peer delinquency that combines (and makes it impossible to separate) a dimension of delinquency frequency (the number of delinquent acts committed by friends) with the proportion of delinquent friends the respondent is exposed to.

1.3. The Present Study: Employing a Network Perspective

In contrast to past measurement strategies, a network perspective offers a more desirable measurement strategy whereby the friendship network is

⁵A notable exception to studies that have relied on respondent perceptions of friends' behavior is a study by Zhang and Messner (2000) that measure friends' behavior using respondents' parents perceptions of friends' behaviors. These authors find that parental reports and adolescent reports *do not* represent multiple indicators of a single concept and interpret this as indicating that adolescent-reported peer delinquency reflects (in large part) their own self-reported delinquency.

carefully mapped out, responses come directly from the friends' perspectives, and separation and comparison of the relative and absolute dimension of friends' delinquency is possible. The beginning point of network studies involves asking respondents both to describe their own behavior and to identify their friends. The second step involves locating and interviewing the friends, with the friends describing their own behavior and then identifying their friends, and so on. In a best case scenario (which the current studies data design strategy comes very close to), all adolescents and friends in the population of adolescents provide this information. This allows the links among friends to be established for the purpose of constructing analytical friendship networks with identifiable structural properties.

Because network methods are premised on the idea that the patterning of friendship ties structure the flow of information, social norms, and social support, incorporating the friendship context is important for the study of delinquency since these ties potentially provide linkages for the transmission of delinquent behavior (Ennett, Bailey, and Federman, 1999). These are the links through which differential associations are believed to occur. Despite advances in network methodologies that have pointed at the importance of social relations for understanding behavior (e.g., Bott, 1957; Coleman, 1961; Granovetter, 1973; Kapferer, 1969), most criminologists have not yet examined the different ways social networks influence adolescents' participation or nonparticipation in delinquency. This study's focus on the homogeneity of delinquent behavior within friendship networks and a comparison of a relative versus absolute dimension of peer behaviors is only possible with a network perspective.

In summary, the issue of relative versus absolute peer delinquency remains an important one ever since Sutherland (1947) emphasized that the ratio of definitions favorable to those unfavorable to law violation shapes the probability of delinquent behavior. Assuming that delinquent friends provide favorable definitions and modeling of delinquent behavior and non-delinquent friends provide unfavorable definitions and modeling of prosocial behavior, the proportion of delinquent friends may be more important than the frequency of delinquent acts committed by friends. For example, if adolescents have both non-delinquent and delinquent friends they may be less likely to interpret observed peer delinquency as favorable to law violations and/or receive fewer rewards for engaging in delinquency. At a minimum they are receiving less intense differential association than adolescents located in entirely delinquent networks. In contrast, adolescents located in entirely delinquent networks (where relative delinquency is maximized) engaging in high absolute levels of delinquency (i.e., delinquent members are committing many delinquent acts) should be most susceptible

to peer delinquency. In this situation, the patterning of friendship ties provides greater opportunity for social norms to develop supporting deviant definitions relative to those that would presumably support conformist definitions.

The current study expands on prior research in several ways. Firstly, the friendship network is defined more rigorously using network data on friendship nominations to link adolescents in a sample of schools. Rather than an abstract group of friends, the friendship network accurately reflects the adolescent's embeddedness within a particular set of social relations. This measurement strategy allows for an incorporation of the proportion of delinquent adolescents within the network as well as the absolute level of delinquency that those friends' report participating in. Additionally, two waves of data are analyzed with information on friendship networks and an adolescent's background characteristics (including delinquency) measured at wave one and the respondent's subsequent delinquency measured at wave two. This allows for a conservative test of the effects of peer influence (controlling for prior delinquency). Lastly, other potentially important network characteristics, such as network density, are examined to determine if they account for any part of the peer-delinquency association.

2. DATA AND MEASURES

Part of the reason why the effects of friendship networks on adolescents' delinquency have rarely been studied is because the requisite data have not been available. Understanding social networks' influence on adolescent delinquency requires detailed population-level data on the structure of friendship patterns within a school, for many different schools. Until very recently, the only data which approached these stringent requirements was Coleman's landmark study (1961) of social relationships among high school students in the 1960s. Fortunately, more recent data are now available.

This study utilizes data from the *National Longitudinal Adolescent Health Survey (Add Health)*, a nationally representative sample of adolescents in grades 7 through 12 nested within randomly selected schools in the United States in 1995–1996. The innovative design of this sample, particularly its emphasis on the effects of multiple contexts of adolescents' lives, allows for an examination of the causes of adolescent health and health behavior (including delinquency) that goes considerably beyond prior research.

Adolescents were included in the Add Health study based on a multi-stage cluster sampling design that drew on a sampling frame derived from a list of high schools in the United States (i.e., the Quality Education Database). Schools were stratified by region, urbanicity, school type, ethnic mix,

and size.⁶ The data currently consist of two waves of data: an in-school and in-home survey conducted in 1995 (response rate 78.9%), followed by a second in-home survey conducted in 1996 (response rate 88.2%). The in-school survey was administered to all students (present on the day of administration) and involved a brief series of demographic questions as well as questions eliciting friendship nominations from school rosters. The in-home survey was administered to a smaller random sample of adolescents selected from school rosters and involved a longer series of questions including items concerning delinquency involvement.⁷

Because of Add Health's interest in social networks, there were 12 schools from which all enrolled students were selected for the in-home interviews (two very large and ten small schools). The twelve schools have various characteristics including location in rural and urban areas, designation as public and private schools, and differing degrees of ethnic heterogeneity (one of the large schools is predominately white and the other large school is ethnically heterogeneous). In-home interviews with *all* students from these schools were attempted in these locations (rather than smaller random samples as was the case in all other schools). These interviews make up the saturation sample because in these saturated field settings, complete social network data were collected for all of the in-home respondents ($N = 3702$). This study draws on the wave-1 (conducted in 1995) and wave-2 (conducted in 1996) saturated sample since these data provide complete network information on adolescents including reports of friends' delinquency from the actual friends comprising the network.

Preliminary analyses of possible selection effects in the probability of respondents being in the saturation sample versus the full sample of schools indicated that individuals' characteristics (e.g., delinquency status, sex, race, age) do not affect the probability; however, a few school characteristics do. Respondents from small schools are more likely to be in the saturation sample. Therefore, the saturation sample, while representative of the typical adolescent, may under-represent adolescents from larger schools. Although Heckman (1979) has proposed a correction for sampling problems that treats selection bias as specification error in the substantive model, a study by Stolzenberg and Relles (1990) suggests that under certain conditions (which are unobserved), Heckman's correction worsens parameter estimates. Therefore, corrections for possible selection bias are not included in

⁶For additional information on the data design see the "Research Design" section of the website at <http://www.cpc.unc.edu/projects/addhealth/design.html>.

⁷Similar to other school surveys, this data design cannot capture adolescents who are frequently absent from school (though the in-home interviews attempt to remedy this), those who have dropped out of school, and those who have been expelled from school. Therefore, the most chronically delinquent adolescents may be under represented in this sample.

the present analyses. The final sample is comprised of 2606 respondents who provided complete network information and were interviewed in both waves of the saturation sample.

To tie all of the students together in the schools, each student was asked to nominate up to five of their closest female and five of their closest male friends (for a maximum of ten friends) during the in-school survey.⁸ They identified their friends by name from school rosters and entered a corresponding identification number (to maintain confidentiality). Because each student in the school was interviewed, global networks (i.e., school networks connecting all students in the school) are recreated. The behaviors of friends nominated by the respondent, as well as those friends who nominate the respondent, are matched to the respondent's record, allowing a unique opportunity to assess the actual effect of friends' behaviors.

There are three potential limitations of the network data used in this study. First, since network data on the delinquency of all students in the school is measured in only 12 schools, the results are not necessarily generalizable to all adolescents attending schools in the U.S. For comparison purposes, the complete sample of schools (125 schools) did contain information on all friends' participation in minor deviant activities including getting into physical fights, skipping school without an excuse, getting drunk, and smoking cigarettes. Although these are admittedly minor activities (and hence not the focus of the current paper) it is possible to compare the results using friends' participation in these minor activities for the more representative sample to the results obtained in the smaller saturation sample when friends' participation in more serious activities are incorporated (see description of peer delinquency measures below). Results from these preliminary analyses using the full sample of schools closely approximate the results presented in this study using the saturation sample and suggest that sample selectivity is not driving these findings. Moreover, the ability to examine detailed social networks of friendship patterns in 12 schools provides a unique opportunity to examine the characteristics of friendships that place adolescents at greater or less risk of delinquency and provide potentially important insight into the peer-delinquency association.

A second limitations of the study is that adolescents were limited to ten friendship nominations which may constrain the number of choices they would have made without a nomination limitation, therefore, placing an

⁸Friendships of a "romantic nature" are not included in the friendship networks. Due to the sensitive nature of the information collected for all romantic relationships in the Add Health this data can only be accessed on the premises of the Chapel Hill research center. Nonetheless, since romantic relationships are likely to introduce different dynamics and likely serve as powerful sources of influence, future research should examine and compare these types of adolescent relationships to friendship relationships.

artificial boundary on the friendship networks. However, examination of the data indicate that most students do not use all of the choices available to them (the mean number of friends nominated is 5.7), therefore, it is unlikely that the design severely distorts the actual number of friendship choices made by each student. Additionally, if students rank their friends (with first friend nominated being the closest and the tenth friend being less close than choices 1 through 9), the friends which are not nominated will not be as important to the respondent as those which were (Moody, 1999). This suggests that if any friendships were omitted it is likely to be the less important (or less close) friendships.

The last limitation is that adolescents' friendships outside of school are not captured in the friendship networks measured in the study. This suggests that the friendship networks may be incomplete. However, because adolescents are allowed to nominate friends outside of school as some of their 10 choices, it is possible to measure how common out-of-school friendships are (although demographic and behavioral characteristics for the out-of-school nominated friends are not available). Examining the data reveal that nominating out-of-school friends is relatively uncommon and, therefore, less likely to jeopardize the validity of the findings. Of the 5.7 friends typically nominated, 1.35 are not located in the school.⁹ This corresponds to other research indicating that most adolescent friendships are between adolescents in the same school (Blythe, Hill, and Thiel, 1982; Coleman, 1961), suggesting that schools form natural boundaries for adolescent social networks.

2.1. Dependent Variable

To assess an adolescent's involvement in delinquent behavior, a delinquency index is created based on responses to a series of 14 delinquency questions collected using lap-top computers in the respondent's home. This method of data collection allowed respondents to maintain their anonymity by listening to pre-recorded questions concerning participation in different delinquent activities and then entering their responses directly into the computer, thereby minimizing response effects (Bearman, Jones, and Udry, 1997). The 14 delinquency items incorporated into the index are listed in Table I, ranging from relatively minor misbehavior (e.g., shoplifting) to serious misbehavior (e.g., burglary, selling drugs, shot/stabbed someone).¹⁰ The particular questions ask students to report how often in the past 12 months

⁹Out-of-school nominations do not significantly differ between delinquent and non-delinquent adolescents (1.4 vs 1.3).

¹⁰All analyses were additionally carried out with separate property and violence delinquency indices serving as dependent variables. Findings from these additional analyses closely dovetail those presented here for the overall delinquency index.

Table I. Frequency Distribution for the Delinquency Items Incorporated into the Delinquency Index

Delinquency item	Did <i>Not</i> commit the act	Did commit the act
	%	%
Pain graffiti	92.7	7.3
Shoplift	81.0	19.0
Steal worth < \$50	84.5	15.5
Steal worth > \$50	94.4	5.6
Damage property	86.6	13.4
Steal/borrow car w/o permission	90.7	9.3
Burglarize property	95.8	4.2
Sell drugs	92.1	7.9
In serious fight	79.9	20.1
In group fight	81.3	18.7
Seriously injure someone	91.8	8.2
Pulled knife/gun on someone	94.9	5.1
Use/threaten w/weapon	96.2	3.8
Shot/stabbed someone	97.8	2.2
Overall <i>N</i> = 2,636		

they have participated in these activities. Each response indicates whether the respondent participated in the act (coded 1) or did not participate (coded 0).

Following common procedures used to measure self-report delinquency, a delinquency index is created based on responses to the various delinquency items. With Cronbach alpha of 0.82, these delinquency items have considerable internal consistency. The average delinquency levels for respondents is 1.39 (range from 0–14), although there is considerable variation around this mean. Appendix A provides the correlation table, means, and standard deviations for all variables included in the analyses.

2.2. Peer Delinquency

Before measuring peer delinquency it is necessary to define each respondent’s friendship network. Using the network nomination data collected during the in-school data phase, adolescents’ friendship networks are defined as including all of the adolescents the respondent identifies as close friends, as well as all of those adolescents in the school who nominate the respondent as a close friend (i.e., the send and receive network). With this clearly delineated network it is possible to measure both the proportion of delinquent friends in the network as well as the overall level of delinquency committed by friends.

To calculate the proportion of delinquent friends in the network, a network member is defined as a delinquent if he/she has committed at least

one of the 14 delinquency acts (see Table I).¹¹ This allows the number of delinquent members to the number of total members in the network to be calculated, yielding the proportion of delinquent friends (not including the respondent) in the network. This is the indicator of relative peer delinquency (i.e., the number of delinquent friends relative to the number of non-delinquent friends). Appendix A indicates that on average, a respondent's network is comprised of 59 percent delinquent members; however, there is considerable variation around this mean (st.dev. = 0.37).

To capture the absolute level of delinquency occurring in the network, the delinquency index is calculated for each network member and summed across all members. This produces the absolute delinquency level occurring among friends in the respondent's network. Appendix A indicates that on average, respondents' friends all together are committing about 11 delinquent acts. Additionally, Appendix A presents the bivariate correlations between these two measures of peer delinquency and a respondent's delinquency at wave 2. Although both measures of peer delinquency are moderately correlated with self-reported delinquency, the slightly stronger bivariate association is between the absolute level of peer delinquency and a respondent's later reported delinquency ($r = 0.38$ vs $r = 0.33$ for the proportion of delinquent friends).¹²

2.3. Other Network Characteristics and Friendship Indicators

In addition to peer delinquency, several other risk-enhancing or risk-protecting network factors are examined to ensure that the effect of peer delinquency is not due to these other network characteristics. Because Osgood and colleagues (1996) find that unsupervised time spent with peers is conducive to delinquency, friend involvement is assessed. Friend involvement is measured as an index of involvement with all identified friends. For each nominated friend, the respondent is asked whether he/she went to the friend's house after school, hung out with the friend after school, spent time with the friend on the weekend, talked about a problem with the friend, or talked on the telephone with the friend. Responses for these series of questions about each friend were summed yielding an additive index of friend involvement.

¹¹Although this is a strict definition of a "delinquent friend" it is consistent with the distributional properties for the delinquency index that indicates that a majority of adolescents do not participate in any delinquency (41%), of those that do participate in delinquency, the most common value is 1 indicating minor participation in delinquency (33% of delinquents commit only one delinquent act and about 5% of delinquents commit more than 5 acts).

¹²Additionally, I create two alternative measures of peer delinquency—the absolute number of delinquent friends and the average level of delinquency occurring in the network. In analyses not presented (available upon request), these two measures produced results very similar to results found for the measure of absolute frequency of delinquency occurring in the network.

Since social control theory assumes that attachment to friends reduces delinquency regardless of friends' delinquency (e.g., Hirschi, 1969), attachment to friends is assessed. Attachment to friends is measured as the average response from the entire network to the following question, "how much do you feel that your friends care about you?" Responses were coded from 1 (not at all) to 5 (very much). All network members' responses were summed and divided by the number of individuals in the network.

Because males have higher rates of delinquency and age is consistently related to crime and delinquency, a measure of the proportion of male friends in the network, as well as the average age of friends are calculated. The proportion of male friends is measured as the number of male friends in the network divided by the total number of network members. The average age of friends is measured by summing each network member's age (in years) and dividing by the number of individuals in the network.

Network density has been identified in the literature as a potential correlate of delinquency (e.g., Krohn, 1986; Haynie, 2001), therefore a measure of the density of ties among network members is also considered. Specifically, density is measured as the number of ties present in the friendship network divided by the number of possible ties (if everyone in the network was connected to each other). A network's density would be completely maximized if every member had ties to every other member (i.e., everyone was friends with everyone in the network) and at a minimum if others in the network were only connected to the respondent (i.e., respondents' friends were not friends with each other). Density is an ideal measure of social cohesion since the more closely connected all adolescents in the friendship networks are, the better able the network is to convey clear normative expectations for behavior.

Lastly, to control for adolescents less integrated into the school networks, a dichotomous measure of whether the respondent is lacking all ties to others in the school (i.e., is an isolate) as well as a continuous measure of the number of ties sent to friends outside of the school are calculated.

2.4. Additional Control Variables

In addition, variables consistently associated with delinquency in prior criminological research are controlled in this study. These control variables are demographic factors including: gender (with male the reference category), race (with Non-Hispanic White the reference category compared to African American and to a category capturing all other races), and age of the respondent. Indicators of family background are controlled including two measures of social class: a dichotomous measure of receipt of public assistance (1 = yes) and a measure of parent's highest education level (ranging from 0 = no formal education, to, 9 = post college graduate studies).

Family structure is assessed with a dichotomous variable indicating whether the adolescent lived in a two-parent family (1 = yes). Lastly, social bonds, in addition to friend attachment, are controlled. These include a measure of attachment to parents (measured as an index combining responses to the following questions: “how close do you feel to your mother/father” and “how much do you think [your mother/father] cares about you”?), the adolescent’s grade point average (based on grades earned during the past year in Math, Science, English, and History), and the respondent’s attachment to school (measured as an index combining responses to the following questions: “do you feel close to people at your school,” “do you feel like you are part of your school,” and “are you happy to be at your school”).

3. ANALYSIS AND FINDINGS

To understand the role of friendship networks and how they relate to involvement in delinquency, the analysis precedes in three steps. I begin by graphing network relations in two small schools to gain a preliminary sense of the structure of network relationships among delinquent and non-delinquent adolescents. Adolescents are next classified into one of three types of friendship networks based on the homogeneity of their friendship networks: a non-delinquent network (i.e., all friends are not delinquent), a mixed network (i.e., respondent has both delinquent and non-delinquent friends), and a delinquent network (i.e., all friends are delinquent). This classification scheme examines whether adolescents differ in their delinquency and background characteristics depending upon the level of behavioral similarity in their friendship networks. Lastly, multivariate analyses assess peer delinquency and examine the role of other potentially important network characteristics to determine if they explain any part of the influence normally attributed to delinquent peers.

3.1. Descriptive Analyses

To gain a sense of the structures of friendship relationships, visual depictions of the friendship network in two small schools are examined.¹³ Although these two visual depictions of friendship networks are not necessarily generalizable to all schools, they provide preliminary evidence assessing whether delinquent adolescents tend to cluster together or whether friendship networks incorporate both non-delinquent and delinquent adolescents. The visual depictions make use of sociograms for the friendship

¹³Smaller schools were chosen for the visual depictions since the larger the school becomes, the more difficult it becomes to visually assess relationships.

networks within the school, where each point in the plot represents an adolescent and the lines connecting points represent the existence of a friendship nomination between them. Because the network information is directional, arrows indicate which way the friendship relationship is flowing (i.e., who nominated who as a friend). The sociograms were constructed using Krackplot software and a multidimensional scaling (MDS) procedure was used to display the patterning of relations, allowing the subgroup cleavages within the school to be examined (Krackhardt, Blythe, and McGrath, 1995). The delinquency status of respondents is represented by boxes around the adolescents with a box indicating that the respondent had participated in at least 1 delinquent activity (out of the possible 14 activities) during the past years (non-delinquents are not enclosed by boxes). Fictional names are assigned to each adolescent so that students' positions in the school can be described.

Figure 1 visually depicts friendship relationships in a small private school with an average delinquency rate ("School A"). While this school shows evidence of some clustering of delinquents, particularly in the upper left-hand corner (around "Jack"), there also appears to be many mixed groups incorporating both delinquent and non-delinquent friends. What appears to be less common than the purely delinquent groups and the mixed groups are groups of entirely non-delinquent adolescents. "Ashton" viewed

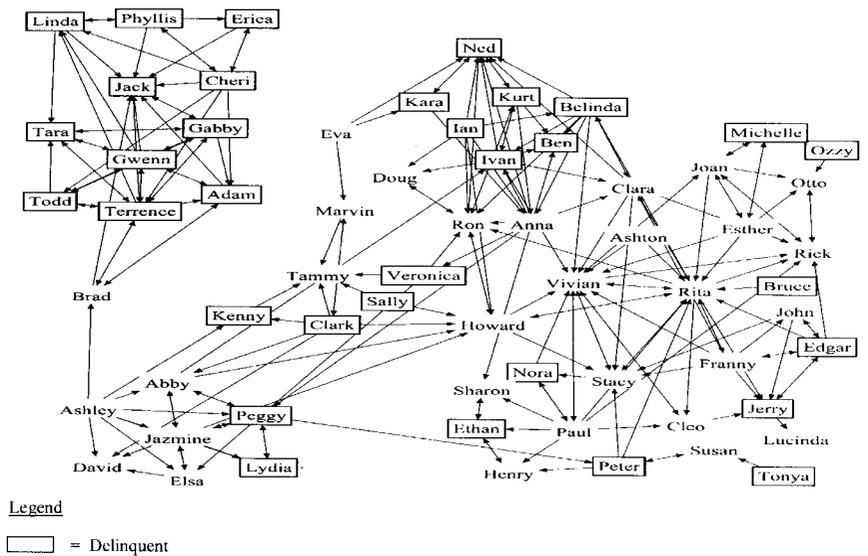


Fig. 1. Sociogram of network relations between delinquent and non-delinquent adolescents (School A).

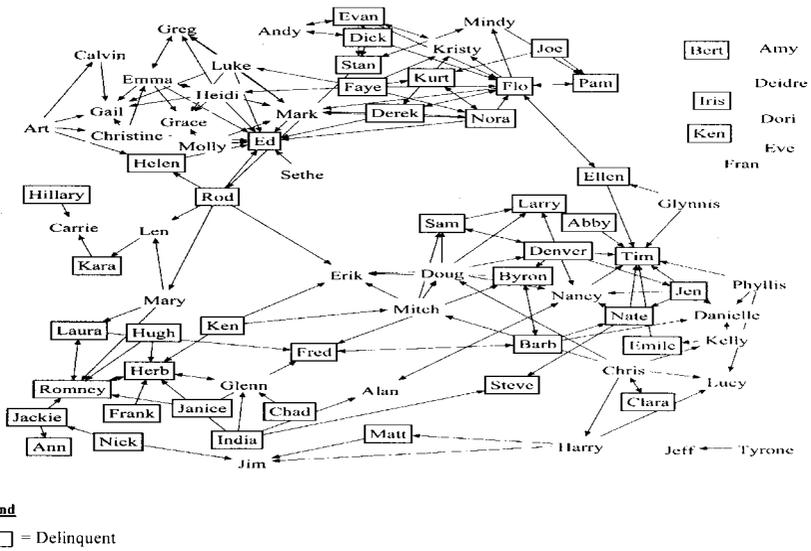


Fig. 2. Sociogram of network relations between delinquent and non-delinquent adolescents (School B).

in the right-side of the figure is one of the few adolescents with an entirely non-delinquent network in this school.

Figure 2 displays another sociogram of the network structure in a small public school (“School B”) with a higher than average delinquency rate. Similar to Fig. 1, there appears to be more evidence of mixed peer groups comprised of a mixing of non-delinquent and delinquent adolescents. Because delinquency is more common in this school, the unusual adolescents appear to be those that do not participate in delinquency. With that said, there are a few adolescents in this school located in an entirely non-delinquent network (see “Calvin,” “Gail,” and “Grace” in the upper left-hand corner). In contrast to “School A,” this school also reveals evidence of several adolescents without any friendship ties to other students in the school. These students are isolates (although they may have friendship ties outside of the school) and because the peer delinquency measures will not apply to them (since they have no friends in the school) it will be important to control for their status in the multivariate analyses. Additional visual examination of the remaining ten schools (results not presented) shows similar evidence that most commonly, friendship networks contain both delinquent and non-delinquent friends, with the least common pattern consisting of entirely non-delinquent friendship networks.

Table II. Frequency Distribution of Types of Friendship Networks

Type of network	Frequency	Percent
No delinquent friends	421	15.97
Mixed group (Both delinquent and non-delinquent friends)	1,472	55.84
All delinquent friends	743	28.19
Total	<i>N</i> = 2,636	100.00

This preliminary descriptive evidence suggests that considerations of peer groups as entirely delinquent or non-delinquent may be misleading. The sociograms presented here suggest that more often, adolescents belong to friendship networks that have mixed behavioral profiles which presumably provide both pro- and anti-delinquent definitions and motivations for delinquency. To begin to quantify these visual depictions and generalize to a more representative sample of schools, the information on the delinquency status of friends for the entire sample of schools is used to determine the percentage of adolescents located in entirely delinquent networks, entirely non-delinquent networks, or mixed networks.

Table II presents the breakdown and substantiates the evidence presented in the visual depictions of the sociograms. The majority of adolescents (56%) belong to a mixed network comprised of both delinquent and non-delinquent friends. The next most common network structure is groupings of entirely delinquent friends (28%), followed by the least common structure of entirely non-delinquent groupings (16%).¹⁴ These preliminary results hint at the normative nature of delinquency during adolescence, and, if peer influence operates, suggest that although the majority of adolescents are at risk of delinquency involvement (especially the 28% enmeshed in entirely delinquent networks), a large proportion of networks offer counterweighing influences.

To examine whether adolescents' level of delinquency involvement and other background characteristics vary according to the proportion of delinquent friends in their networks, Table III presents descriptive characteristics by type of friendship network (i.e., no delinquent friends, mixed network,

¹⁴These findings dovetail somewhat with earlier non-network based research by Elliott and Menard (1991, 1996) that found that most adolescents belong to mixed peer groups (labeled prosocial by Elliott and Menard since the groups are predominately non-delinquent) in early and late adolescence. In middle adolescence, the authors report that mixed and delinquent peer groups were most common. Because results presented in this study are based on only two waves of data, it is not possible to determine whether delinquent peer groups identified on the basis of network data change across adolescence. This is an interesting issue that is worthy of future study.

Table III. Means (Percent) and std. deviations by Different Types of Friendship Networks

	No delinquent friends		Mixed network		All delinquent friends	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
<i>Peer Delinquency Variables</i>						
Delinquency w2	0.48	1.19	1.24*	2.06	2.22*	2.71
Delinquency w1	0.13	0.71	1.65*	2.33	3.56*	2.78
Prop. delinq. friends	0.00	0.00	0.54*	0.24	1.00*	0.00
Friends absolute delinq.	0.00	0.00	12.65*	12.98	14.94*	14.86
<i>Peer Network Variables</i>						
Involvement w/friends	9.66	8.46	13.54*	9.02	11.34*	9.40
Attachment to friends	4.19	0.84	4.29	0.77	4.09*	0.84
Prop. male friends	0.49	0.25	0.51*	0.19	0.54*	0.22
Average age friends	14.88	1.46	15.24*	1.22	15.15*	1.28
Network density	0.20	0.12	0.22*	0.11	0.17*	0.11
Number ties sent outside of school	1.14	1.82	1.22	1.97	1.39	2.37
<i>Control Variables</i>						
Age	15.55	1.68	15.74*	1.49	15.78*	1.44
Female	0.46	N.A.	0.41	N.A.	0.28*	N.A.
Black	0.16	N.A.	0.12*	N.A.	0.18	N.A.
Other race	0.27	N.A.	0.36*	N.A.	0.40*	N.A.
Two-parent family	0.59	N.A.	0.58	N.A.	0.48*	N.A.
Receipt public assistance	0.04	N.A.	0.05	N.A.	0.07*	N.A.
Parent's education	5.88	2.05	6.05	2.07	5.64	2.12
Grade point average	2.88	0.76	2.81	0.76	2.42*	0.77
School attachment	3.81	0.86	3.87	0.80	3.57*	0.89
Parent attachment	4.63	0.68	4.58	0.64	4.44*	0.84

N.A. = not applicable (percent reported).

*Indicates significant difference compared to networks with *no delinquent friends*.

all delinquent friends). Results indicate that in terms of delinquency involvement, adolescents located in entirely delinquent networks report a substantially higher average level of involvement ($w1$ delinquency = 3.6, $w2$ = 2.2) followed by adolescents in mixed networks ($w1$ = 1.65, $w2$ = 1.24), with adolescents in non-delinquent networks reporting the lowest levels of delinquency ($w1$ = 0.13, $w2$ = 0.48).

Table III also includes mean levels of other network properties by type of friendship network. As expected, the absolute delinquency level of friends varies considerably across network type. In mixed networks, the typical adolescent has friends participating in 12.7 delinquent activities vs 14.9 activities for respondents with all delinquent friends. In regard to other network characteristics, adolescents in mixed networks report greater involvement

with friends. There are smaller differences across the network types for attachment to friends, the proportion of male friends, average age of friends, and network density (although the last three network characteristics differ significantly for adolescents with delinquent friends compared to adolescents with no delinquent friends).

In terms of the control variables, females and adolescents from two-parent families are more likely to belong to non-delinquent networks than delinquent networks. Adolescents with families receiving public assistance are more likely to belong to all-delinquent networks (compared to non-delinquent networks), as are adolescents with lower grade point averages, and lower school and parent attachment. Since many of these control variables can be conceived of in terms of risk factors, adolescents located in entirely delinquent networks appear to have greater risk of delinquency above and beyond the effect of their friends' behaviors. Possibly the peer influence effect is a spurious result of these background factors and self-selection into a delinquent peer network. The next set of analyses address this issue.

In summary, remembering that the strength of these data lie in the fact that friends' delinquency is measured directly via the responses of friends themselves and, secondly, that the friendship networks have been carefully mapped based on the actual network patterns of friendships within schools, the descriptive evidence suggests that adolescents with more delinquent friends are participating in higher levels of delinquency. However, adolescents in entirely delinquent networks also have more background factors that are known to increase risks of delinquency. To assess whether peer behaviors are associated with delinquency net of these background factors and prior delinquency, multivariate analyses are employed to examine the relative importance of peer delinquency.

3.2. Multivariate Analyses

Determining the proper modeling procedure for the analyses requires an examination of the distribution of the delinquency index. While the mean value of the overall delinquency index is 1.4, the distribution of the variable is far from normal. Inspection of the frequency distribution for the delinquency index finds that the most common value is zero (41% of the respondents fall here), indicating that many adolescents report no delinquency involvement. Additionally, a minority of respondents report involvement in a large number of delinquent activities (5% report participating in five or more acts and 1% report participating in ten or more). Due to a large number of zeros and a large positive skew in the distribution, the normality assumption of OLS cannot be approximated with a mathematical transformation. Therefore,

negative binomial regressions, designed to handle dependent variables with distributions incorporating many zero values and large positive skews, are used in the analyses that follow.

The negative binomial model differs from poisson regression by the addition of a residual variance parameter that captures overdispersion in the dependent variable (which occurs when the standard deviation is greater than the mean). This random component, therefore, accounts for unexplained variation among cases reflecting differences associated with unobserved predictors (Gardner, Mulvey, and Shaw, 1995). Designed for dependent variables that are counts of events, negative binomial models utilize a distribution that characterizes the probability of observing any discrete number of events given an underlying mean count of events (Osgood, 1999). In the negative binomial regression model, $u_i = \exp(n_i)$, which indicates that a one-unit increase in X_{ij} multiplies the expected delinquency index by a factor of $\exp(B_j)$, and conversely, a one-unit decrease divides the expected index by the same amount (Gardner, Mulvey, and Shaw, 1995).

Because standard negative binomial models assume that regression coefficients are fixed between groups and that error terms are not correlated, these models are inadequate for complex sampling designs where individuals are nested within a larger macro unit (here schools) (Goldstein, 1987; Lee and Bryk, 1989; Raudenbush and Bryk, 1986). Due to the clustering of the data and the correlated error structure, statistical techniques that can correct for design effects and unequal probability of selection are necessary to achieve unbiased parameter estimates (Chantala and Tabor, 1999). Additionally, since dispersion or unexplained variation in individual outcomes is likely to vary across schools because of unidentified school specific reasons (e.g., school delinquency rate, student-teacher ratio, school size, region of the country) a random-effects overdispersion model is used in all analyses. This type of random effects model allows dispersion to vary randomly from school to school. The software package STATA is used for all analyses which allows incorporation of the survey design characteristics into the computational formulas.¹⁵

Table IV presents results from the negative binomial regression of network characteristics on delinquency involvement. The table displays four models: models 1-2 compare two different aspects of peer delinquency, the proportion of delinquent friends (model 1) and the absolute delinquency level of friends in the network (model 2). Model 3 incorporates both dimensions of peer delinquency and model 4 adds other properties of the friendship networks that may be associated with delinquency.

¹⁵The Stata procedure, `xtnbreg`, was used in all multivariate analyses.

Table IV. Negative Binomial Regression Results Predicting Adolescent Delinquency at Wave II (Standard errors in parentheses are adjusted for school clustering)

<i>Variables</i>	Model 1	Model 2	Model 3	Model 4
Intercept	1.92***(0.39)	2.51***(0.38)	2.13***(0.43)	3.18***(0.54)
Prior delinquency	0.21***(0.01)	0.22***(0.01)	0.23***(0.02)	0.24***(0.01)
<i>Peer delinquency variables</i>				
Proportion delinq. friends	0.71***(0.07)		0.45***(0.11)	0.35***(0.10)
Friends absolute delinq.		0.01*(0.00)	-0.01(0.01)	-0.01(0.01)
<i>Peer Network Variables</i>				
Involvement w/friends				0.01**(0.01)
Attachment to friends				0.04(0.04)
Prop. male friends				0.20(0.26)
Average age friends				-0.15**(0.05)
Network density				-0.78*(0.37)
Isolate				-0.09(0.09)
# Nominations outside school				-0.01(0.01)
<i>Control variables</i>				
Age	-0.12***(0.02)	-0.12***(0.02)	-0.13***(0.02)	-0.05(0.05)
Female	-0.30***(0.07)	-0.31***(0.06)	-0.32***(0.06)	-0.29***(0.09)
Black	0.21*(0.10)	0.30***(0.09)	0.26***(0.09)	0.26**(0.09)
Other race	0.06(0.08)	0.09(0.08)	0.10(0.07)	0.14(0.10)
Two-parent family	0.03(0.05)	0.03(0.05)	0.03(0.05)	0.05(0.11)
Receipt public assistance	0.07(0.07)	0.09(0.07)	0.08(0.07)	0.09(0.08)
Parent's education	-0.00(0.02)	-0.00(0.02)	-0.01(0.02)	-0.01(0.02)
Grade point average	-0.20***(0.03)	-0.23***(0.03)	-0.22***(0.02)	-0.22***(0.03)
School attachment	-0.04(0.03)	-0.03(0.03)	-0.02(0.03)	-0.00(0.03)
Parent attachment	-0.03(0.03)	-0.04(0.03)	-0.04(0.03)	-0.09*(0.04)
Dispersion parameter	1.04***(0.11)	1.09***(0.11)	1.02***(0.11)	0.95***(0.07)
Log likelihood	-3614.76	-3635.24	-3605.50	-2291.08

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Beginning with model 1, results indicate that the proportion of delinquent friends in the adolescent's friendship network is strongly associated with delinquency, controlling for prior delinquency. Specifically, an entirely delinquent network (i.e., the proportion of delinquent friends = 1) is associated with a doubling ($\exp(0.71)$) in a respondent's own delinquency (compared to respondents in entirely non-delinquent networks). Respondents in networks that are comprised of half delinquent members (proportion of delinquent friends = 0.5) have a predicted 43% increase in their own delinquency ($100 * \exp[(0.5)(0.71) - 1]$) compared to adolescents in non-delinquent networks. The strength of this relationship while controlling for prior delinquency provides initial support for differential association's premise that

friendship networks are a crucial component of the influence process.¹⁶ Moreover, the relative measure of peer delinquency performs well in the model indicating that non-delinquent friends can balance out delinquent members in the friendship network and vice versa.

Model 2 examines a different dimension of peer delinquency, the absolute level of delinquency that friends are committing. Results indicate that although the absolute delinquency level of friends is positively associated with a respondent's delinquency, the relationship is very small and only marginally significant. Each delinquent act committed by friends is associated with a 1% increase in a respondent's delinquency. Comparing the magnitude and significance of the two measures of peer delinquency (as well as differences in model fit) suggest that the proportion of delinquent friends is the most important aspect of the peer-delinquency association, supporting the use of a relative measure of peer delinquency over an absolute measure.

Although comparisons of models 1–2 indicate that the proportion of delinquent friends are most important in terms of peer influence, it is important to examine whether peer delinquency has both absolute and relative effects. Therefore, model 3 examines the independent effect of each measure of peer delinquency controlling for the other. Results suggest that once the proportion of delinquent friends are accounted for, the absolute level of peer delinquency is unassociated with a respondent's delinquency. Moreover, despite some attenuation, the relationship between the proportion of delinquent friends and self-reported delinquency remains large and significant. Specifically, adolescents located in entirely delinquent networks have a 57% increase in delinquency ($\exp(0.45)$) compared to adolescents in entirely non-delinquent networks. Adolescents located in networks that are half delinquent and half non-delinquent have a 25% increase in delinquency compared to adolescents in non-delinquent networks.

The last issue to be addressed in model 4 is whether other characteristics of the friendship network are associated with delinquency and can account for any of the association evident between peer delinquency and a respondent's delinquency. Most importantly, this model indicates that even after accounting for the different dimensions of peer friendships and the demographic composition of the network, the proportion of delinquent friends remains a strong predictor of delinquency. Therefore, it is possible to conclude that the proportion of delinquent friends is associated with

¹⁶To ensure that it is the proportion of delinquent friends that matters and not simply the number of delinquent friends, model 1 was re-examined using this alternative measure of peer delinquency. Results, available from the author, indicate that the number of delinquent friends has a positive effect ($b = 0.05^{***}$), however, the number of non-delinquent friends has a negative effect ($b = -0.06^{***}$). Therefore, the relative measure which incorporates these confounding effects is the preferred approach.

subsequent delinquency above and beyond that of prior delinquency, self-projection, and other characteristics of the friendship networks. These results provide support for the idea that the ratio of delinquent to non-delinquent associates is a more important correlate of subsequent delinquency than the overall number of delinquent acts committed by friends. Enmeshment in more homogenous networks better facilitates stronger associations between friends' and respondent's behaviors.

Besides accounting for some of the peer-delinquency effect (comparing the magnitude of the coefficient for proportion of delinquent friends in model 3 to model 4), the characteristics of friendship networks reveal some intriguing insights. While involvement with friends increase delinquency, the relationship is relatively weak. Additionally, attachment to friends and the proportion of male friends in the network are not associated with delinquency, whereas, having older friends, and having a more cohesive network (i.e., a more dense network) reduce delinquency involvement. Additionally, model 4 reveals that adolescents isolated from networks within the schools and adolescents with ties outside of the school are no more or less likely to participate in delinquency. Although most of the attributes of friendship networks are significant, the magnitude of the effects remain small, especially in comparison to the robust and large effect of the proportion of delinquent friends.¹⁷

In summary, these results indicate that peer behaviors are a very important aspect of delinquency involvement. Moreover, the proportion of delinquent friends appears to drive the peer-delinquency relationship, not the absolute level of delinquent acts committed by friends. This finding dovetails nicely with earlier results indicating that most adolescents report involvement in friendship networks containing both delinquent and non-delinquent youth. This suggests that in friendship networks, the reinforcement received for delinquency, and norms supporting delinquency, are mixed for the majority of adolescents having both delinquent and non-delinquent friendships.

4. CONCLUSION

In this study, the peer-delinquency association was explored guided by the premise that a more complete understanding of peer influence requires

¹⁷To determine if any of these network characteristics moderated the peer-delinquency effect, interaction terms were created and examined. Results from these analyses revealed no significant interactions with the exception of network density. Adolescents in very dense networks were more influenced by peers' delinquent behavior than adolescents in less-dense networks (see Haynie, 2001).

a detailed examination of the characteristics of friendship networks. Although few adolescents report participation in many delinquent activities, a significant proportion of adolescents report participation in at least one delinquent activity, with a minority of adolescents reporting high levels of delinquent involvement. Similarly, the majority of adolescents have at least some delinquent friends in their peer networks. By incorporating a social network approach, this project contributes to research and theory on peer influence and the transmission of delinquency via friendship networks. After carefully specifying the peer network based on sociometric data, accounting for prior delinquency, omitting self-projection bias, and controlling for other potentially important characteristics of friendship networks (including involvement with friends, age of friends, and the cohesion in the network), the proportion of delinquent friends exerted a strong positive effect on a respondent's own delinquency involvement.

Despite social control theory's assertions, projection and prior delinquency involvement can not explain all of the peer influence effects that occur in friendship networks. But this is not to say that self-selection and self-projection do not play a part. Clearly they do, as many studies have convincingly indicated (e.g., Cairns and Cairns, 1995; Elliott and Menard, 1991; Kandel, 1978, 1996; Krohn *et al.*, 1996; Matsueda and Anderson, 1998). The important point this study makes is that one way to account for these potentially biasing effects is to use a network design where friendship networks are carefully defined and friends self-report their own delinquent behaviors. Additionally, it is necessary to control for prior delinquency to account for the possibility of self-selection into delinquent peer networks.¹⁸

The relevance of delinquent peers for youth's later involvement in delinquency is consistent with differential association and social learning explanations for behavior that suggest adolescents follow the behavioral examples of significant others. Additionally, this project indicates that the proportion of delinquent friends is the most important aspect of peer influence. It is not the absolute level of delinquency that is occurring in networks that is crucial, but rather the homogeneity of peer influences in the network. What appears to matter is whether there are adolescents who offer different motivations and behavioral patterns for network members to follow. This finding supports Sutherland's (1947) premise that the ratio of definitions favorable to those unfavorable to law violations is key to understanding

¹⁸Even with longitudinal data on delinquency involvement this study is not ideally suited to test arguments of selection vs socialization. The ideal data design would incorporate longitudinal measures of friendship networks that allow researchers to trace changes in network composition over time. This would allow a more definitive determination of whether delinquent behavior precedes selection into friendship networks or whether incorporation into peer networks occurs prior to delinquency involvement.

why adolescents engage in delinquency. This also suggests that one reason the proportion of delinquent friends matters most is that a relative measure of peer delinquency corresponds closely to Granovetter's (1985) and Coleman's (1988, 1990) idea of embeddedness within a social context where consensus about the appropriateness (or inappropriateness) of delinquency is maximized. As the proportion of delinquent friends in the network increases the network is best able to effectively constrain the behaviors of network members to resemble the groups' behavior. This social character of delinquency is highlighted with the network perspective employed in this study.

In contrast to findings from gang studies and Hirshi's (1969) assertion that "birds of a feather flock together," this study finds that peer networks are much more heterogenous in terms of exposure to delinquent friends. Although there is some evidence that delinquents cluster together, most adolescents in this sample of schools had both delinquent and non-delinquent friends in their networks of close acquaintances. This finding is at odds with Hirschi's assertion that self-selection is responsible for the peer-delinquency association since the assumption is that there are clearly delineated delinquent or non-delinquent networks that adolescents choose to join. Clearly, the social landscape of high schools is more complex and adolescents end up in particular friendship networks for a variety of reasons (see Cairns and Cairns, 1995 for a discussion of this point). Regardless, of how they enter a network, most adolescents are exposed to both delinquent and non-delinquent patterns and the ratio of these patterns influences their own behavior.

Additionally, by controlling for prior delinquency this study provides additional evidence that self-selection is not entirely responsible for the peer-delinquency association. Recall that critics of socialization arguments argue that the observed peer-delinquency association is not due to peer influence, but rather to self-selection into delinquent peer networks based on prior behavioral dispositions. Although this study finds strong associations between peer delinquency and subsequent involvement in delinquency it does not include a measure of early childhood problem behaviors or a measure of "self-control" that could explain both delinquency involvement and peer associations. Since Gottfredson and Hirshi's (1990) discussion of self-control assumes that these personality traits are associated with many types of behaviors including prior and subsequent delinquency and peer associations, incorporating a measure of prior delinquency should capture the driving force of this variable. The fact that peer associations remain significantly associated with delinquency after the effect of prior delinquency has been partialled out suggests that enmeshment in peer networks are providing, at a minimum, a supportive environment conducive to delinquency involvement. To complicate the selection argument further, even if initial selection is viewed as the critical process, it remains unclear whether the

initial selection is due to the attraction for peers similar to oneself because of a personality trait (e.g., low self-control) or to structural forces that reduce freedom of movement in the social network, and thus predetermine the networks to which one is exposed (Cairns and Cairns, 1995). Parental influences over friendship choices, school tracking, and parent's selection of neighborhood residence are good examples of other agencies that determines, in part, the selection of peers similar to oneself.

Moreover, instead of arguing that a personality trait or peer associations solely account for delinquency involvement, the Social Interactional model (e.g., Dishion and Patterson, 1991; Dishion *et al.*, 1995; Patterson *et al.*, 1989; Thornberry, 1987; Thornberry *et al.*, 1994) suggests that both a personal antisocial trait and exposure to deviant peers contribute together to delinquency. In particular, the model suggests that the two factors interact such that exposure to delinquent peers magnifies the link between antisocial personal disposition and delinquency (Dishion *et al.*, 1995) or a antisocial personal disposition moderates the strength of the peer-delinquency association (Vitaro *et al.*, 1997). Although the current study is unable to test these propositions due to a lack of information on adolescent personality traits (e.g., a measure of self-control or antisocial behavioral disposition), the finding that both peer delinquency and prior delinquency are strongly associated with subsequent delinquency provides some evidence supportive of the Social Interactional model. Clearly, future research should continue to investigate these important issues.

Overall, this studies finding that peers influence delinquent behavior is somewhat reassuring since it suggests that increasing the number of non-delinquent members in the network, without changing the behavior of the delinquent members, will reduce an adolescent's own delinquency. This may not be as difficult to do (and is definitely more optimistic than the implications of self-control theory) since most adolescents already belong to mixed friendship networks comprised of both delinquent and non-delinquent peers. However, before naively suggesting that delinquent peer influence will be reduced by incorporating additional non-delinquent friends, further research needs to consider and investigate the potential impact on the non-delinquent friends introduced into the network. Building bridges connecting delinquent adolescents to non-delinquent adolescents may be helpful to the delinquent adolescents but potentially damaging to the non-delinquent youth.

This study's findings should also be interpreted in light of the following limitations. Because networks are constantly changing, the snapshot portrayal of the friendship networks captured in these analyses may present a picture more static than is realistic. For example, the finding that most adolescents have friendship networks comprised of both delinquent and

non-delinquent peers may be overemphasized if the networks are in a transition from all delinquent to all non-delinquent or vice versa. Some evidence for this comes from dynamic analyses that followed friendship networks over time and suggest that three distinct processes occur which make the networks homogenous (Cohen, 1977; Kandel, 1978, 1996). Individuals select friends who have similar behavior to themselves, once the friendship is formed influence occurs which increases similarity, and individuals select out of networks when their behaviors no longer coincide with the group's behavior. To capture this dynamic process, data which re-examines friendship networks over several short time intervals is necessary. Additionally, there is some evidence that friendship networks and peer influence change throughout adolescence (Elliott and Menard, 1991, 1996; Thornberry, 1987). This issue also requires assessing friendship network composition across adolescence.

Relatedly, because this study uses a measure of the respondent's prior delinquency rather than incorporating characteristics of their prior network structure to account for potentially biasing selection effects it may overemphasize the role of selection relative to socialization by peers. In other words, the effect found for a respondent's prior delinquency may actually be attributed to both selection and peer influence from an earlier time period. Addressing this causality issue precisely requires panel information on the network structure of adolescents over relatively short periods of time. Unfortunately, even the Add Health study can not incorporate such detailed network data.

This study also does not address the relative severity of the acts of delinquency involved in different networks. Future research should examine whether networks vary in the severity of the delinquent activities engaged in and address whether the severity of the acts has a stronger impact on delinquent behavior than either the frequency of peer delinquency or the proportion of delinquent peers.

Lastly, while this network approach to adolescent delinquency revealed insights about the peer-delinquency association, it is unable to identify the precise causal mechanisms underlying the peer-delinquency association. That is, is the effect of delinquent peers arising from social capital generated in the group (e.g., Granovetter 1985 and Coleman, 1988), the modeling of group processes (e.g., Akers 1985 and Warr and Stafford, 1991), deterrence factors (e.g., Eder, 1985; Best, 1983; Messerschmidt, 2000), opportunity (e.g., Osgood *et al.* 1996), a mixture of these mechanisms, or some other, as yet undiscovered phenomenon? Questions concerning the mechanisms underlying the peer-delinquency association may best be addressed by ethnographic work of group processes similar to studies conducted by Eder (1985), Best (1983) and Messerschmidt (2000).

Despite these limitations, the present study's results show that the approach of identifying and examining peer social networks provides a coherent and promising framework for investigating a variety of ways that social relationships might be associated with adolescent delinquency (and other adolescent behaviors). Because the peer-delinquency association is central to many delinquency theories, network research is especially helpful. The network framework used in this study places emphasis on the social connections among adolescents that goes considerably beyond that of prior research which viewed individuals as essentially separate from their social structure. Instead, this study convincingly demonstrates the need for a network reformulation of the peer-delinquency association which incorporates characteristics of the friendship networks in which adolescents are enmeshed.

Several directions for future research are suggested by this study. Although this study highlights the important context of adolescent friendships, future research would benefit greatly by incorporating multiple dimensions of potential influence. In particular, the delinquency involvement of other key individuals in youth's networks such as romantic partners, siblings, parents, and neighbors may add to our understanding of the influence process. Since this study highlights the importance of competing prosocial and deviant friendships, it is likely that these other influential persons could tilt the ratio of definitions favorable vs unfavorable to delinquency involvement. Incorporating these multiple contexts of adolescent lives would also increase our understanding of the relative risk factors that adolescents face and potentially provide avenues towards reducing these risk factors.

Although it was beyond the scope of this paper, future research should also consider whether and how peer influence varies by gender and race. Based on studies of homophily in friendship choice and the evidence that race is one of the most salient characteristics on which friendships form (e.g., Graham and Cohen, 1997; Hallinan and Teixeira, 1987), we might expect to find that African-American youth are more likely to be found in mixed networks where definitions towards delinquency are mixed. However, there is also evidence that African-Americans may be less influenced by their peers than is the case for non-Hispanic white youth (Giordano, Cenkovich, and DeMaris, 1993). In terms of gender, research suggests that although girls place more emphasis on close friendships incorporating intimacy and closeness than do boys (Berndt, 1992; Bukowski *et al.*, 1994; Giordano *et al.*, 1986; Steffensmeier and Allen, 1996) there is some evidence that boys are more susceptible to peer influence (e.g. Giordano *et al.*, 1986). Unfortunately, most of this research has been limited to reliance on respondent

perceptions of friendships and has not relied on detailed social network data. Such an examination would strengthen the literature.

Another avenue for future research involves incorporating the school and neighborhood context to better understand how social environments make unique contributions to the levels and severity of delinquency found among individuals and in their networks. Neighborhood and school environment are especially likely to determine the exposure adolescents have to prosocial or delinquent others. Additionally, school factors such as school size, school disciplinary practices, school climate, school resources, and school policies such as tracking are likely to produce environments more or less favorable to delinquency involvement and/or to place delinquent youth in closer proximity to other delinquent youth. Recent research by Welsh and colleagues (1999, 2000) and Denise Gottfredson and colleagues (1991, 1996) has been particularly important in revealing the school characteristics that are associated with school delinquency and violence. Future research should continue along this avenue with more explicit attention given to the ways that neighborhoods and schools shape adolescent friendship networks, which in turn provide the contexts where peer influence appears to flourish.

In summary, description and analysis of the friendship networks of adolescents provides a unique insight into their social worlds. Typically these social worlds include both pro- and anti-delinquent influences. That is, most adolescents belong to friendship networks comprised of both delinquent and non-delinquent peers, and in terms of peer influence, the proportion of delinquent friends most influences delinquency, not the absolute level of delinquency committed by friends. The task for policy makers, therefore, is not necessarily to remove delinquent individuals from adolescent networks, but to build bridges connecting adolescents to non-delinquent others including peers, parents, neighbors, and community leaders. Interventions which foster associations with pro-social others should have the greatest potential for success since these associations can tilt the balance of definitions received towards favoring the inappropriateness of delinquency. The implications of network strategies for adolescent delinquency are intriguing and numerous and are consistent with the current emphasis on the significance of social contexts (e.g., neighborhood, school, family) for providing deeper understanding of adolescent behavior.

APPENDIX A. CORRELATION MATRIX AND

	1	2	3	4	5	6	7	8
1. Delinquency Index W2	1.00							
2. Delinquency Index W1	0.56	1.00						
3. Proportion delinquent friends	0.33	0.56	1.00					
4. Absolute delinquency friends	0.38	0.55	0.49	1.00				
5. Network friend involvement	0.08	0.11	0.08	0.11	1.00			
6. Network friend attachment	-0.02	-0.05	-0.06	-0.04	0.14	1.00		
7. Proport. male friends in network	0.09	0.09	0.09	0.10	-0.09	-0.09	1.00	
8. Network average age friends	-0.04	0.05	0.07	0.08	0.14	0.04	0.01	1.00
9. Network density	-0.06	-0.09	-0.11	-0.13	0.13	0.04	-0.06	-0.37
10. # Nominations outside school	0.02	0.04	0.02	0.04	0.26	0.03	-0.09	0.03
11. Isolate (no friends)	0.06	0.11	0.06	0.10	-0.30	-0.05	0.06	0.10
12. Female	-0.15	-0.19	-0.13	-0.17	0.15	0.12	-0.32	-0.01
13. Black	0.00	-0.02	0.03	-0.04	-0.10	-0.07	0.00	-0.08
14. Other race	0.08	0.13	0.10	0.17	-0.04	-0.05	-0.03	0.36
15. Age	-0.01	0.06	0.05	0.08	0.09	-0.02	0.04	0.45
16. Receipt public assistance	0.02	0.00	0.05	0.03	-0.02	-0.03	-0.03	-0.07
17. Parent's education	-0.03	-0.04	-0.06	-0.08	0.02	0.06	-0.00	-0.13
18. Two-parent family	-0.07	-0.08	-0.08	-0.08	0.06	0.02	-0.03	-0.01
19. School attachment	-0.09	-0.17	-0.14	-0.16	0.01	0.15	-0.05	-0.10
20. Grade point average	-0.20	-0.27	-0.25	-0.30	-0.01	0.06	-0.11	-0.14
21. Parent attachment	-0.06	-0.12	-0.10	-0.12	-0.02	0.06	0.00	-0.15
Mean	1.39	1.96	0.59	11.32	9.03	4.20	0.52	15.17
Std. deviation	2.24	2.57	0.37	13.48	7.08	0.52	0.22	1.28

REFERENCES

- Akers, R. (1985). *Deviant Behavior: A Social Learning Approach*, Wadsworth, Belmont, CA.
- Akers, R. (1998). *Social Learning and Social Structure, A General Theory of Crime and Deviance*, Northeastern University Press, Boston.
- Akers, R. L., Krohn, M., Lonza-Kaduce, L., and Radosevich, M. (1979). Social learning and deviant behavior: A specific test of a general theory. *American Sociological Review* V44: 636-655.
- Aseltine Jr., Robert. (1995). A reconsideration of parental and peer influences on adolescent deviance. *J. Health and Social Behavior* V36: 103-121.
- Bearman, P. S., Jones, J., and Udry, J. R. (1997). *The National Longitudinal Study of Adolescent Health: Research Design*. URL:<http://www.cpc.unc.edu/projects/addhealth/design.html>
- Bellair, P. E. (1997). Social interaction and community crime: Examining the importance of neighbor networks. *Criminology* V35: 677-704.
- Berndt, T. J. (1992). Friendship and friends' influence in adolescence. *Current Directions in Psychological Science* V1: 156-159.
- Best, R. (1983). *We've All Got Scars*, Indiana University Press, Bloomington.
- Blythe, D. A., Hill, J. P., and Thiel, K. S. (1982). Early adolescent's significant others: Grade and gender differences in perceived relationships with familial and nonfamilial adults. *J. Youth and Adolescence* V11: 425-445.
- Bott, E. (1957). *Family and Social Networks*, Tavistock, London.

MEANS OF VARIABLES INCLUDED IN ANALYSES

9	10	11	12	13	14	15	16	17	18	19	20	21
1.00												
-0.16	1.00											
-0.33	0.07	1.00										
0.06	0.14	-0.11	1.00									
-0.14	0.12	0.18	0.04	1.00								
-0.23	0.06	0.08	-0.03	-0.31	1.00							
-0.37	0.03	0.12	-0.09	-0.06	0.29	1.00						
-0.01	0.04	-0.01	0.04	0.03	-0.00	-0.04	1.00					
0.13	0.03	-0.04	-0.00	0.13	-0.27	-0.17	-0.15	1.00				
0.09	-0.04	-0.11	0.30	-0.13	-0.01	-0.05	0.11	0.07	1.00			
0.20	-0.10	-0.07	0.04	-0.06	-0.03	-0.11	0.01	0.04	0.11	1.00		
0.21	0.03	-0.12	0.14	-0.04	-0.10	-0.21	-0.08	0.24	0.14	0.20	1.00	
0.11	0.00	-0.03	-0.02	0.02	-0.03	-0.19	-0.03	0.06	0.08	0.21	0.11	1.00
0.20	1.25	0.11	0.38	0.15	0.35	15.73	0.05	5.90	0.55	3.78	2.72	4.55
0.12	2.07	0.37	0.49	0.35	0.48	1.51	0.23	2.08	0.50	0.84	0.78	0.70

Bukowski, W., Hoza, B., and Boivin, M. (1994). Measuring friendship quality during pre- and early-adolescence. *J. Social and Personal Relationships* V11: 471–484.

Cairns and Cairns. (1995). *Lifelines and Risk: Pathways of Youth in Our Time*, Cambridge University Press, NY, NY.

Chantala, K., and Tabor, J. (1999). Strategies to perform a design-based analysis using the add health data. URL: <http://www.cpc.unc.edu/projects/addhealth/strategies/design.html>

Cohen, J. M. (1977). Sources of peer group homogeneity. *Sociology of Education* V50: 227–241.

Coleman, J. (1961). *The Adolescent Society: The Social Life of the Teenager and Its Impact on Education*, The Free Press of America.

Coleman, J. (1988). Social capital in the creation of human capital. *Am. J. Sociol.* V94: 95–120.

Coleman, J. (1990). *Foundations of Social Theory*, Harvard University, Cambridge, MA.

Dishion, T. (2000). Cross-setting consistency in early adolescent psychopathology: Deviant friendships and problem behaviors. *J. Personality* V68: 1109–1127.

Dishion, T., Capaldi, D., Spracklen, K., and Li, E. (1995). Peer ecology of male adolescent drug use. *Development and Psychopathology* V7: 803–824.

Dishion, T., and McCord, J. (1999). When interventions harm. *American Psychologist* V54: 755–765.

Dishion, T., and Patterson, G. R. (1991). Family, school, and behavioral antecedents to early adolescent involvement with antisocial peers. *Developmental Psychology* V27: 172–181.

- Eder, D. (1985). The cycle of popularity: Interpersonal relations among female adolescents. *Sociology of Education* V58 (July): 154–165.
- Elliott, D., Huizinga, D., and Ageton, S. (1985). *Explaining Delinquency and Drug Use*, Sage: Beverly Hills, CA.
- Elliott, D., Huizinga, D., and Menard, S. (1989). *Multiple Problem Youth: Delinquency, Substance Use, and Mental Health Problems*, Springer-Verlag, NY.
- Elliott, D., and Menard, S. (1991). *Delinquent Friends and Delinquent Behavior: Temporal and Developmental Patterns*, The Institute of Behavioral Science, University of Colorado, CO.
- Elliott, D., and Menard, S. (1996). Delinquent friends and delinquent behavior: Temporal and developmental patterns. In Hawkins, J. D. (ed.), *Delinquency and Crime: Current Theories*. Cambridge University Press, Cambridge, England.
- Ennett, S., Bailey, S., and Federman, B. (1999). Social network characteristics associated with risky behaviors among runaway and homeless youth. *J. Health and Social Behavior* V40: 63–78.
- Gardner, W., Mulvey, E. P., and Shaw, E. C. (1995). Regression analyses of counts and rates: Poisson, overdispersed poisson, and negative binomial models. *Psychological Bulletin* V118(3): 392–404.
- Giordano, P., Cernkovich, S., and Pugh, M. (1986). Friendships and delinquency. *Am. J. Sociol.* V91: 1170–1202.
- Giordano, P., Cernkovich, S., and Demaris, A. (1993). The Family and Peer Relations of Black Adolescents. *Journal of Marriage and the Family* V55: 277–288.
- Goldstein, H. (1987). *Multilevel Models in Education and Social Research*, Oxford University Press, London.
- Gottfredson, D., and Gottfredson, G. D. (1996). A multimodel school-based prevention demonstration. *J. Adolescent Research* V11: 97–116.
- Gottfredson, D., and McNeil, R. (1991). Social area influences in delinquency: A multilevel analysis. *J. Research in Crime and Delinquency* V28: 197–234.
- Gottfredson, M. R., and Hirschi, T. (1990). *A General Theory of Crime*, Stanford University Press, Stanford, CA.
- Graham, J. A., and Cohen, R. (1997). Race and sex as factors in children's sociometric ratings and friendship choices. *Social Development* V6: 353–370.
- Granovetter, M. (1973). The strength of weak ties. *Am. J. Sociol.* V81: 1287–1303.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *Am. J. Sociol.* V91: 481–510.
- Hallinan, M. T., and Teixeira, R. A. (1987). Student's interracial friendships: Individual characteristics, structural effects, and racial differences. *Am. J. Educ.* V95: 563–583.
- Haynie, D. L. (2001). Delinquent peers revisited: A network approach for understanding adolescent delinquency. *Am. J. Sociol.* V106: 1013–1057.
- Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica* 45: 153–161.
- Hirschi, T. (1969). *Causes of Delinquency*, University of CA Press, Berkeley, CA.
- Jensen, G. F. (1972). Parents, peers and delinquency action: A test of the differential association perspective. *Am. J. Sociol.* V78: 562–575.
- Jussim, L., and Osgood, D. W. (1989). Influence and similarity among friends: An integrated model applied to incarcerated adolescents. *Social Psychology Quarterly* V52(2): 98–112.
- Kandel, D. B. (1978). Homophily, selection, and socialization in adolescent friendships. *Am. J. Sociol.* V84: 427–436.
- Kandel, D. B. (1996). The parental and peer contexts of adolescent deviance: An algebra of interpersonal influences. *J. Drug Use* V26: 289–316.
- Kapferer, B. (1969). Normas and the manipulation of relationships in a work context. In Mitchell, J. (ed.), *Social Networks in Urban Settings*, Manchester University Press, Manchester, England.

- Krackhardt, D., Blythe, J., and McGrath, C. (1995). KrackPlot: An improved network drawing program. *Connections* V17: 53–55.
- Krohn, M. D. (1974). An investigation of the effect of parental and peer associations on marijuana use: An empirical test of differential association theory. In Riedel, M. and Thornberry, T. P. (eds.), *Crime and Delinquency: Dimensions of Deviance* (pp. 75–87). Praeger, NY, NY.
- Krohn, M. D. (1986). The web of conformity: A network approach to the explanation of delinquent behavior. *Social Problems* V33: 601–613.
- Krohn, M., Massey, J. L., and Zielinski, M. (1988). Role overlap, network multiplexity, and adolescent deviant behavior. *Social Psychology Quarterly* V51(4): 346–356.
- Krohn, M., and Thornberry, T. (1993). Network theory: A model for understanding drug abuse among African-American and Hispanic youth. In De La Rosa, M. R. and Juan-Luis Recio, A. (eds.) *Drug Abuse Among Minority Youth: Advances in Research and Methodology*. NIDA Research Monograph 130, U.S. Department of Health and Human Services.
- Krohn, M., Lizotte, A. J., Thornberry, T. P., Smith, C., and McDowall, D. (1996). Reciprocal causal relationships among drug use, peers, and beliefs: A five-wave panel model. *Journal of Drug Issues* V26: 405–428.
- Lee, V. E., and Bryk, A. S. (1989). A multilevel model of the social distribution of High School achievement. *Sociology of Education* V62: 172–192.
- Matsueda, R. L. (1982). The dynamics of moral beliefs and minor deviance. *Social Forces* V68: 428–457.
- Matsueda, R. L., and Anderson, K. (1998). The dynamics of delinquent peers and delinquent behavior. *Criminology* V36(21): 269–299.
- Matsueda, R. L., and Heimer, K. (1987). Race, family structure, and delinquency: A test of differential association and social control. *American Sociological Review* V52: 826–846.
- McCarthy, B., and Hagan, J. (1995). Getting into street crime: The structure and process of criminal embeddedness. *Social Science Research* V24(1): 63–95.
- Menard S., and Morse, B. J. (1984). A structuralist critique of the IQ-delinquency hypothesis.
- Messerschmidt, J. W. (2000). *Nine Lives: Adolescent Masculinities, the Body and Violence*. Westview Press, Boulder, CO.
- Moody, J. (1999). *The Structure of Adolescent Social Relations: Modeling Friendship in Dynamic Social Settings*. Dissertation, UNC: Chapel Hill.
- Osgood, W. D. (1999). Poisson based regression analysis of aggregate crime rates. *Pennsylvania Working Paper Series #99-04*.
- Osgood, W. D., Wilson, J. K., Bachman, J. G., O'Malley, P. M., and Johnston, L. D. (1996). Routine activities and individual deviant behavior. *American Sociological Review* V61: 635–655.
- Patterson, G. R., DeBaryshe, B., and Ramsey, E. (1989). A developmental perspective on antisocial behavior. *American Psychologist* V44: 329–335.
- Raudenbush, S. W., and Bryk, A. S. (1986). A hierarchical model for studying school effects. *Sociology of Education* V59: 1–79.
- Sampson, R. J. (1988). Local friendship ties and community attachment in mass society: A multi-level systemic model. *American Sociological Review* V53: 766–779.
- Sampson, R. J., and Groves, W. B. (1989). Community structure and crime: Testing social-disorganization theory. *Am. J. Sociol.* V94: 774–802.
- Short, J. F. (1957). Differential association and delinquency. *Social Problems* V4: 233–239.
- Steffensmeier, D., and Allen, E. (1996). Gender and crime: Towards a gendered theory of female offending. *Annual Review of Sociology* V22: 459–487.

- Stolzenberg, R. and Relles, D. (1990). Theory testing in a world of constrained research design: The significance of Heckman's censored sampling bias correction for nonexperimental research. *Sociological Methods and Research* V18: 395–415.
- Sutherland, E. H. (1947). *Principles of Criminology*, 4th Edition. J. P. Lippincott, Philadelphia, PA.
- Thornberry, T. (1987). Toward an interactional theory of delinquency. *Criminology* V25: 863–891.
- Thornberry, T., Lizotte, A., Krohn, M., Farnworth, M., and Joon Jang, S. (1994). Delinquent peers, beliefs, and delinquent behavior: A longitudinal test of interactional theory. *Criminology* V32(1): 47–80.
- Voss, H. (1964). Differential association and containment theory: A theoretical convergence. *Social Forces* V47: 381–391.
- Vitaro, F., Tremblay, R., Kerr, M., Pagani, L., and Bukowski, W. (1997). Disruptiveness, friends' characteristics, and delinquency in early adolescence. *Child Development* V68: 676–689.
- Warr, M., and Stafford, M. (1991). The influence of delinquent peers: What they think or what they do. *Criminology* V29: 851–865.
- Welsh, W. (1999). School disorder: The influence of individual, institutional and community factors. *Criminology* V37: 73–117.
- Welsch, W., Stokes, R., and Greene, J. (2000). A macro-level model of school disorder. *J. Research in Crime and Delinquency* V37: 243–284.
- Zhang, L., and Messner, S. F. (2000). The effects of alternative measures of delinquent peers on self-reported delinquency. *J. Research in Crime and Delinquency* V37: 323–337.