Brokering delinquent networks:  
Spanning the micro-macro divide in delinquency research

THESIS

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By
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Abstract

How does network structure and position affect delinquent behavior? Expanding upon research that emphasizes the importance of direct ties to friends, the current study takes a more expansive view of peer networks by focusing on the importance of a brokerage position for understanding risks of delinquent behavior. A brokerage position is a network position that connects two or more disparate networks thus, granting the individuals who hold these positions access to, control of, and the ability to spread information among networks. Using the first wave of the National Longitudinal Study of Adolescent Health (1994-1995), I perform cross-sectional analyses at the individual-level, encompassing a sample of 63,460 students nested within 123 different schools. Drawing on differential social organization theory, it is expected that individuals identified as brokers will be less delinquent than those who are not located in brokerage positions. In addition, this study considers cohesiveness and peer delinquency within networks to determine if the effect of a brokerage position is conditioned by these structural characteristics of networks. Findings indicate a protective effect of brokerage from delinquency that is augmented by the cohesiveness of one’s immediate peer network. Implications of this research suggest that peer effects on adolescents’ delinquent outcomes occur beyond immediate friendship networks.
Acknowledgments

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Major Field: Sociology

Crime, Deviance, and Social Control

Corrections and Ex-offender reentry

Social Networks
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Chapter 1: Introduction

The origins of adolescent delinquency lie at the forefront of criminological research. Researchers have consistently shown that individuals’ participation in crime and violence rises and peaks during the adolescent period in the life course (Brame & Piquero, 2003). In addition, social influence from peer friendships has been identified as playing a salient role in reinforcing these delinquent outcomes for the individual. While there have been several studies of peer effects on delinquency, violence, and drug use in schools (e.g. Haynie, 2001; 2002; Haynie & Osgood, 2005; McGloin & Shermer, 2009), research for the most part overlooks how extended peer networks (beyond immediate friends) affect these types of outcomes within schools. Expanding on research examining the importance of immediate friends on delinquency, the current study asks whether the network position of brokerage, or individuals that span distinct peer groups, conditions the established peer-delinquency relationship. Specifically, could brokers connect distinct friendship networks within schools, thus impeding the socialization effects of delinquent peers? In addition, I argue that a brokerage position itself offers a protective effect on subsequent delinquency.
The current study extends previous research on friendship networks and delinquency by investigating how individual (micro) and group (macro) level social processes affect delinquency. Haynie (2001; 2002) demonstrated how adolescents in cohesive and more delinquent peer groups were more likely to be delinquent and that this happened because they were exposed to more delinquent peers\(^1\). Although this research demonstrates how characteristics of immediate friendship networks condition social influence from delinquent friends, it does not take into account group-level explanations of social influence on delinquency and violence.

By examining peer-network effects on delinquency that occur beyond the immediate friendships one holds, I account for the more broad, or global\(^2\), friendship networks that also matter in socialization towards or away from delinquency. Individuals that are highly connected to two or more disparate network groups may have unique characteristics that in turn influence the peer-delinquency relationship and play a substantial role in the individual-level processes already linked with delinquent outcomes.

I expand on previous research on delinquency and friendship networks by drawing from a symbolic interactionist perspective to explain how social control for the

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\(^1\) This was demonstrated through the application of Edwin Sutherland’s differential association theory (1947), which suggests that delinquency occurs when one is exposed to a higher ratio of definitions favorable towards crime over those unfavorable towards crime.

\(^2\) Global friendship networks, for the purpose of this analysis, refer to friendship networks contained within school boundaries. The properties of interest in these networks are representative of the organization of collective interaction among the student body.
individual is dependent upon social influence that operates within and across peer friendship groups. Identification of brokerage positions among peer networks and their effect on social influence processes in these networks provides a means of identifying how social influence affects group levels of delinquency. Because brokerage identifies those individuals who hold key network positions, with substantial control over the diffusion of information, they may play a particularly important role in social influence processes described by Sutherland (1947).

Network measures that account for both the individual and group-level social relationships potentially provide several contributions to delinquency research. First and foremost, these measures may shed light on the mechanisms perpetuating deviant behavior in the school context by identifying those individuals who affect a substantial proportion of peer behaviors. In addition, while research has demonstrated the importance of peer networks beyond the immediate individual (e.g. Krohn, 1986; Payne & Cornwell, 2007; Warr, 1996), few have addressed how these networks operate in schools. By focusing on the salience of individual positions in peer networks, the peer groups they belong to, and the network positions that connect these groups, I can fill an empirical gap in delinquency research that, to my knowledge, has only been demonstrated outside of the school context. Furthermore, this approach may account for more of the variation in adolescent delinquent outcomes than measures that take into account only the immediate friendship network.
To understand how social influence operates within and across immediate peer networks, I investigate how brokerage positions in peer networks are associated with peer delinquency. I hypothesize that individuals who hold brokerage positions will be less delinquent than individuals who do not hold these positions for two reasons. First, information diffusion and consensus, caused by brokers, are likely to decrease conflict among adolescent peer groups and second, brokerage is likely an indicator of those with higher moral reasoning that serves as a social control against deviant behavior. This occurs because being in a brokerage position provides an individual with access to diverse information that enables them to internalize the general moral codes promoted by society (Mead, 1934). In addition, I hypothesize that structural characteristics, such as peer group cohesiveness (or closure), condition the peer-delinquency association. This latter hypothesis follows from previous research suggesting that individual social influence is more salient in cohesive or closed groups (Burt, 2005; Coleman, 1988; Haynie, 2001). In addition, I evaluate whether being in a brokerage position attenuates the effect of delinquent peers on an adolescents own delinquency.

Using the National Longitudinal Study of Adolescent Health (Add Health), I test the effect of the aforementioned attributes of peer networks on delinquent outcomes at the individual level. I analyze cross-sectional data from the Add Health Wave I in-school survey that consists of 123 schools and more than 60,000 students. Importantly, the Add Health survey provides access to comprehensive self-report data on the friendship
nominations of a generalizable sample of 7th through 12th graders. This friendship nomination data allow for a comprehensive network analysis that is rare with traditional delinquency data.
Chapter 2: Theoretical Background

Structural Holes, Brokerage, and Behavioral Outcomes

A measure of structural holes is of particular interest for studying information diffusion and control between adolescents and their friendship networks. Structural holes exist when there is a gap between two actors or groups in a network of relations (see figure 1). Measures of structural holes provide a descriptive yet parsimonious measure of large-scale network properties and help to explain why brokerage positions are so important in network studies.

Figure 1. Example of a Structural Hole in an Ego Network
Organizational behavior research identifies network measures, such as structural holes, that have been widely applied in several network scenarios, especially research concerned with properties of entire networks (see Burt, 2000). Structural holes provide opportunities for information and resources to be transmitted across disconnected networks. This information may include norms and perspectives held by subgroups or individuals within networks. The salience of structural holes for social influence processes becomes apparent when we consider those actors who fill structural holes, or brokers. An example of a broker spanning separate networks is shown in figure 2. Although this example shows the ‘purest’ form of a broker, with few ties to others in separate groups, they often are interconnected with several individuals in the networks that they span. Therefore, brokers are individuals that have access to large and diverse amounts of information and are more able to disseminate this information within and between the networks that they bridge.
Information and resources gained by broker may also be conceived of as opportunities for both information diffusion and social influence, especially when we consider information such as norms and values. In addition, brokers serve as liaisons that transfer information and norms between disparate groups within larger networks. Most existing research has focused on the role brokerage position plays in determining levels of trust, sanction, and diffusion of information for coworkers and business outcomes (Burt 1997a, 1997b; 1992; 2000; 2005). For example, Burt (1997a; 1997b) looked at the effects of brokerage position for managers on information diffusion and social influence and found that when brokers span subgroups in business organizations pro-social outcomes such as promotion in the business hierarchy result. Furthermore, this association became stronger when brokerage occurred in relatively closed or cohesive subgroups. Although Burt’s research has provided evidence for the salient role brokers play in business contexts, much less research has implemented organizational behavior
research to show how brokerage position may affect peer groups and the networks that comprise them (for an exception see Mangino, 2009). If brokerage results in positive outcomes for both individuals and organizations, it may also impact adolescent behavioral outcomes (particularly behavior that is highly sensitive to social sanction and approval) for both the individual adolescent and their entire network. Furthermore, because social influence is affected largely by flow of information between individuals (this information dictating how individuals receive and react to input on sanctions and approval of their behavior), dissemination and control of information across networks may have strong implications for social controls on behaviors, especially delinquent ones.

Peer Relationships and Delinquency

Sub-cultural (Cloward and Ohlin, 1960), differential association (Sutherland, 1947), and social learning theories (Akers, 1998) provide consistent evidence that friends, especially close ones, promote and reinforce adolescent delinquent behaviors. In addition, peer influence is particularly important during adolescence because identity formation is taking place and familial social control is weakening (Sumter et. al. 2009; Berndt, 1979). To investigate the peer-delinquency association further, recent research has utilized the school context because it serves as a primary backdrop for peer interaction and provides a unique environment to study this association from a network perspective.
Haynie’s work (2001;2002), coupled with more recent research (McGloin & Shermer, 2009; Haynie & Payne, 2006; Haynie & Osgood, 2005) has illustrated the salience of peer network structure and the effect of adolescent friendship network characteristics on individual-level delinquent outcomes. Building upon peer influence theories (Sutherland, 1947), Haynie (2001; 2002) demonstrated how the characteristics of adolescents’ immediate networks contribute towards their delinquent behavior, particularly when adolescents’ networks are comprised of high proportions of delinquent friends. Subsequent work by McGloin & Shermer (2009) has shown that friend selection by those with low self-control plays a complementary role in explaining delinquent outcomes in adolescents, although, peer delinquency was still shown to have a significant effect on respondents’ delinquency.

Recent research in criminology has also looked at the effects of peer networks on delinquency and has incorporated measures of brokerage to help explain deviant outcomes. Papachristos (2006) showed that a seemingly unorganized gang actually exhibited structural attributes identified by a network perspective. Although Papachristos did not directly connect structural attributes of gangs to problem behaviors, he did show the presence of a structure similar to Burt’s (1992) cohesive subgroups with brokerage positions serving a functional role. Specifically, Papachristos found that gangs were often comprised of distinct, dense, subgroups that were connected by specific individuals, or brokers, suggesting that these individuals hold important positions in gang networks.
that influence social interaction and information diffusion. This research also suggests that dispute resolution may result from networks that contain brokers, but lacks an empirical investigation of deviant outcomes. Similar and more comprehensive research supports these propositions. For example, McGloin (2005; 2007) finds evidence that specific gang members hold brokerage positions called “cutpoints”, but concludes that the implications of these positions requires further investigation. These findings illustrate the need for further research to determine if brokers do play an important role for social influence in delinquent social networks.

William Mangino (2009) also provides an interesting notion of the role brokerage may play in the lives of adolescent peer relations, particularly through the effect of adolescent brokers on delinquent outcomes. Mangino found that although “closure and conformity” in an adolescent’s immediate network can increase social influence from that network on that individual, those individuals who connect multiple peer groups (hold brokerage positions) are less susceptible to group pressures (i.e. over-integration/altruism) (Durkheim 1897; 1951). In addition, Mangino found that parental attachment was the most substantial mediating factor in the relationship between brokerage and delinquency, likely due to both the weakening of social influence from any particular peer group the broker belongs to and their proclivity to turn towards those most significant in their lives; their parent(s). Here we see a new process of prosocial
socialization emerging from brokerage positions; that is, brokers are more attached to parents and that this individual characteristic of brokers decreases their delinquency.

Framed within these conceptualizations, the above studies (Haynie 2001; 2002; Papachristos 2006; Mangino 2009; McGloin 2005) have demonstrated how individuals’ positioning in and structural characteristics of peer networks affect social influence and subsequent behaviors such as delinquency and violence. Moreover, brokers play a role in social influence processes and affect levels of social control. However, the implications of brokerage, for both individual and group-rates of delinquency, have not been fully explored. Furthermore, because brokerage positions are dependent on the global networks they connect, analyses that focus only on individuals’ immediate network-structure may miss the effects of the entire networks they connect.

The solution to these uncertainties is to conduct an analysis that identifies information and resource access and diffusion within and among peer networks using a measure such as brokerage. Specifically, brokerage positions may impact peer social influence and social control processes because brokers provide new and diverse information to the groups they connect. In addition, their social influence on group members may be augmented when the groups they belong to consist of cohesive or closed network structures, where the peer-delinquency relationship has been shown to be strongest (Haynie, 2001) and new and diverse information diffusion is rare. This happens because levels of trust are higher in these cohesive groups, thus increasing the likelihood that the
information brokers transmit is accepted by the groups they are members of. In addition, heightened levels of sanction of norm-violating behaviors that exist within cohesive groups are less salient for brokers; that is, they are less susceptible to social controls from any single peer group they are connected to (Burt, 2000). To further understand how social control arises within individuals and how this is tied into the macro-level processes that affect social influence across peer groups to effect delinquent behavior, a symbolic interactionist perspective must be adopted.

Brokerage, Closure and Delinquency: A Symbolic Interactionist Perspective

Brokerage positions change social influence and control processes for both the individual and group. This can be understood by identifying a likeness between the notion of brokerage and the symbolic interactionist concept of the generalized other (Mead, 1934). This concept was first described by Edwin Sutherland (1947) when he explained the generalized other as a central concept in understanding individual-level processes of social control in differential association theory (DAT). According to Sutherland’s DAT, individuals will commit crime when they are exposed to an excess of definitions (differential associations) favorable towards crime. Although DAT explains how social influence may contribute towards delinquency, the notion of the generalized other, which considers individual cognitive development, also plays a role in the individual’s conception of norm violating behavior and the formation of internal social controls.
The generalized other is a social-psychological concept that plays a key role in an individual’s cognitive development. This concept rests on the assumption that we are born as very self-interested individuals. Throughout the life course we mature and develop a deeper understanding of our role and the rules and expectations that govern society’s larger, organized systems. Because the generalized other perceives of his or herself in the ‘grand scheme of things’ they are more likely to follow the law and ‘get along’ with others. Social control arises when the individual takes on multiple roles or perspectives within and across groups (a shifting from Mead’s “I” to the “me”) deeming the generalized other as “the most effective form of social control” (Mead, 1934).

This generalized identity also has implications for social learning (from friends around us), explained through differential social organization theory (DSO)\(^3\). Sutherland used this concept to explain how social influence (through exposure to messages in favor of or against crime) affects both the individual, through differential associations, and the social group, through differential social organization (Matsueda, 2006). By combining models of collective action (Granovetter, 1973) and network interaction (Coleman, 1990; Granovetter, 1983) with symbolic interaction, Matsueda explains how differential associations that determine levels of crime for the individual are also embedded within “static structural components” that can be explained through the (network) structure and

\(^3\) Like Sutherland’s differential association theory, differential social organization attempts to explain how an excess of definitions favorable towards crime can cause levels of delinquency to increase, although differential social organization attempts to explain levels of delinquency across groups instead of across individuals.
organization of groups. Because DSO takes into account group-level properties that affect social influence, network positions that affect information and resource transmission across groups, such as brokerage, may have strong implications for outcomes dependent on social influence and control. In addition, brokers’ ability to carry and convey multiple channels of information within and between the networks that they bridge allows them to take on the role of the generalized other and therefore, be less delinquent themselves.

Unfortunately problems arise when we consider the role that within-group bias and individual interest play in shaping the formation of perspectives towards the appropriateness of the law, the way society functions, and the social contract (law) that it creates. In this scenario, the generalized other’s actions may be in agreement with higher moral reasoning, but not with written law or legitimate authority. An answer to this problem relies on the generalized other’s role in communication networks. Individual brokers control information flow between groups and hold perspectives that are more reflective of the entire network or society in general, thus their positioning in the network enables them to coordinate moral perspectives across groups and individuals in their network that “transcend the bias of in-group or individual interests” (Matsueda, 2006).

Thus, brokers experience the generalized other effect through their connections with

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4 Referring to the tendency for one to act in accord with the norms advocated by their in-group, a property characteristic of the “closed” or cohesive groups referred to by Coleman (1990).
multiple groups within global networks, by sympathizing with multiple moral perspectives.

In addition, the concept of the generalized other, when integrated with a network perspective, suggests how dispute resolution and conflict minimization across groups may occur. Matsueda’s explanation of the interrelationship between the concepts of “closure” (Coleman, 1990) and “weak ties” (Granovetter, 1973) is a parallel with Ronald Burt’s applications of brokerage and closure. Through their connections with individuals and groups across structural holes, the generalized other effect allows the generalized other to form a consistent definition of the appropriateness of law and authority as well as a mutual understanding of norms across groups, which decreases the likelihood for them to participate in intergroup conflict that may lead to violence (Sutherland, 1947).

While evidence suggests that peers influence delinquency and violence at the individual level through differential associations (Haynie, 2001), DSO’s role in these processes and the network structure beyond the individual has not been considered. Although the adolescent peer groups and schools are distinct from the groups and societies Sutherland referred to in his theory of DSO, similarities in group structure and formation do exist. For example, because adolescence is an important time in the life course when individuals are trying to find identity and belonging (Berndt, 1979; Sumter et al. 2009) and because much of this identity formation is dependent on both peer group selection and socialization (McGloin & Shermer 2009; Weerman, 2011), definition and
boundaries between peer groups are of equal, if not greater, importance when compared to the societal groups Sutherland had mentioned. In the school context, adolescents are forming normative definitions in favor of or against ‘law’ violation and also for or against the appropriateness of other groups’ (i.e. other groups’ submission to authority and the values and norms they adhere to). In these scenarios, processes of DAT and DSO likely operate to influence levels of intergroup conflict and social control within these groups. For these reasons DSO, in addition to DAT, may be applied to the unique society of peers that exist within the school.
Chapter 3: Statement of the Problem

In order to test the relationship between delinquency and brokerage I formulate several hypotheses:

H$\textsubscript{1}$) brokerage influences delinquency at the individual-level. Specifically, holding a position that spans separate peer groups (being a broker) will be negatively associated with delinquency.

H$\textsubscript{2}$) the protective effect of brokerage on delinquency is conditional on closure in peer friendship groups. Specifically, the deterrent effect of being a broker on delinquency is magnified when individuals are in cohesive (dense) peer groups, and

H$\textsubscript{3}$) an interactive relationship also exists between levels of peer delinquency and brokerage. That is, brokerage attenuates the association between peer delinquency and individual delinquency.
Chapter 4: Methods and Analysis

Data

The analysis will utilize survey data from the National Longitudinal Study of Adolescent Health. The Add Health study is a multi-wave clustering design from a nationally representative sample of U.S. adolescents in grades 7 through 12 stratified by grade and sex. In particular, I draw on data from the Wave I in-school survey (conducted during the 1994-1995 school year). This survey provides information on a myriad of topics including adolescent delinquent behavior and, by asking students to identify their five best male and five best female friends, provides network data on peer friendship nominations.

Add Health data have several advantages for this study. First, Add Health’s detailed, self-report data on peer relationships within schools can be used to construct detailed network measures. The self-report aspect of the Add Health survey provides a means to compensate for the projection of individual (actor) behaviors onto descriptions of friends (alters), a problem that arises when perceptions of friends’ attributes are recorded instead of collecting self-reported attributes of network members’ behavior (Gottfredson & Hischi, 1990; Haynie, 2001; Mangino, 2009; McGloin & Shermer, 2009). Add Health
also offers unique global network data within school boundaries. Because previous research has found that most adolescent networks are found within the school (Blythe, Hill & Thiel, 1982; Coleman, 1961), Add Health’s collection of global network data is highly useful for analyzing peer networks.

Sample

To address the research questions, an individual-level analysis is conducted, using students as the unit of analysis. For the in-school sample including all available schools yields 144 schools available. Because I am interested in all students included in each school, I exclude those cases (schools) that do not have enough network data (i.e. < 50% of respondents in the schools of interest completed the network questions) or did not have respondents take the in-school survey. Excluding these particular schools yields a sample of 79,590 students nested within 129 schools. In addition, I must omit six more schools from my analysis as my main measure of brokerage is not representative of the schools of interest yielding a final sample of 65,285 students nested within 123 schools.

Examining descriptive statistics reveals minimal differences before and after sample selection. For example, comparison of descriptive statistics of the delinquency index

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5 Five of these six schools contain no brokers and the other school contains a completely disconnected friendship network. Therefore, these schools have either undivided or fully divided peer networks that are not representative of the population of interest.

6 I recode items with multiple responses as missing as they comprise a very small portion (less than 1%) of respondents for each variable in my sample. In order to account for missing data at the item level I use the multiple imputation procedure ICE available in Stata 11, which includes imputation of missing values, creation of multiple datasets, and estimation by pooling these multiple datasets.
(dependent variable) before and after sample selection revealed no substantial differences.

Measures

*Dependent Variable*

I have chosen to examine delinquency through a five-item measure that looks at the counts of different types of delinquent acts and represent these with a delinquency index. The survey questions used are:

1) Smoke Cigarettes (“During the past twelve months, how often did smoke cigarettes?”)
2) Drank Alcohol (“During the past twelve months, how often did you drink alcohol?”)
3) Get Drunk (“During the past twelve months, how often did you get drunk?”)
4) Truancy (“During the past twelve months, how often did you skip school without an excuse?”)
5) Get in a Physical Fight (“In the past year, how often have you gotten into a physical fight?”)

The first four measures use the following scale: 0 = never, 1 = once or twice, 2 = once a month or less, 3 = 2 or 3 days a month, 4 = once or twice a week, 5 = 3 to 5 days a week, and 6 = nearly every day. The final delinquency outcome, getting in a physical fight, uses a scale with options: 0 = never, 1 = once, and 2 = more than once.

<table>
<thead>
<tr>
<th>Minor Delinquency</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the past year, how often did you:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>smoke cigarettes?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continued

Table 1. Frequency Distribution of Delinquency Items

21
## Table 1. Continued

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never Frequency</th>
<th>One or More Times Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drink beer, wine, or liquor?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>never</td>
<td>45,966</td>
<td>24,897</td>
</tr>
<tr>
<td>one or more times</td>
<td>64.9</td>
<td>35.1</td>
</tr>
<tr>
<td><strong>Get drunk?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>never</td>
<td>32,336</td>
<td>38,154</td>
</tr>
<tr>
<td>one or more times</td>
<td>45.9</td>
<td>54.1</td>
</tr>
<tr>
<td><strong>Skip school without an excuse?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>never</td>
<td>49,015</td>
<td>21,093</td>
</tr>
<tr>
<td>one or more times</td>
<td>69.9</td>
<td>30.1</td>
</tr>
</tbody>
</table>

### Violence

<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the past year, how often have you gotten into a physical fight?</td>
<td>37,883</td>
<td>56.0</td>
</tr>
</tbody>
</table>

Each delinquency item is recoded into a dummy variable (0 = no act, 1 = participated once or more times). Following this, the delinquency items are summed creating a scale that ranges from zero to five. Table 1 presents frequency distribution of delinquency items used in the individual-level index.

Table 2 shows descriptive statistics for the delinquency index. Delinquency has a low average count, at 1.77, with considerable variation around the mean and shows a substantial percent of adolescents who report no participation in deviant activities during the past year (28.9%).
Table 2. Means and Standard Deviations of Variables Used in the Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (%)</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delinquency Index (created from items on Table 1.)</td>
<td>1.77</td>
<td>1.64</td>
<td>.00</td>
<td>5.00</td>
<td>65,285</td>
</tr>
<tr>
<td><strong>Network Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broker</td>
<td>.06</td>
<td>---</td>
<td>.00</td>
<td>1.00</td>
<td>65,285</td>
</tr>
<tr>
<td>Density (ego send-and-receive network)</td>
<td>.30</td>
<td>.15</td>
<td>.06</td>
<td>1.00</td>
<td>65,285</td>
</tr>
<tr>
<td>Size(ego send and receive network)</td>
<td>8.37</td>
<td>4.30</td>
<td>1.00</td>
<td>39.00</td>
<td>65,285</td>
</tr>
<tr>
<td>Isolate</td>
<td>.01</td>
<td>---</td>
<td>.00</td>
<td>1.00</td>
<td>65,285</td>
</tr>
<tr>
<td><strong>Other Independent Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>14.87</td>
<td>1.72</td>
<td>10.00</td>
<td>19.00</td>
<td>65,285</td>
</tr>
<tr>
<td>Age²</td>
<td>224.2</td>
<td>51.44</td>
<td>100.00</td>
<td>361.00</td>
<td>65,285</td>
</tr>
<tr>
<td>Male(Female Ref.)</td>
<td>.49</td>
<td>---</td>
<td>.00</td>
<td>1.00</td>
<td>65,285</td>
</tr>
<tr>
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Table 2. Means and Standard Deviations of Variables Used in the Analysis

Independent Variables

Network Variables. Descriptive statistics for all variables are also presented in Table 2.

Brokerage is measured using cutpoints, a network measure that indicates individual

---

Not all respondents in an individual’s peer network were present when the Add Health survey was taken, although they can be selected as part of an actor’s network. Therefore, actors who do not have attribute measures, but still have network measures may be included in my analysis.
actors that divide networks into ‘blocks’ or ‘bi-components’ (potential separate or fragmented peer groups). A cutpoint locates vulnerable parts of the network by identifying a particular individual (a broker) that, upon removal, would disconnect otherwise connected groups (Scott 2000). Figure 3 presents a visual representation of a cutpoint \((n_1)\), the ties to separate peer groups that would be lost with the removal of the cutpoint, and the separate components that would result with the removal of the cutpoint. Identification of the individuals that span peer-groups within the larger school network provides a consistent and parsimonious indicator of the individuals who have access to diverse information and resources as well as control of the diffusion of these resources across the school network (Bearman & Moody 2004; McGloin 2005). Cutpoints are measured using a binary variable indicating if an individual holds a position in the network as a cutpoint (yes = 1, no = 0). I use the UCINET 6 software program to analyze networks for the identification and creation of brokerage positions.
To capture closure among ego-centered peer groups, I use the Add Health network variable representing ego send-and receive- network density. This measure is based off of ego (or individual) centered networks and captures the extent to which alters (or other individuals in the ego’s network) are directly tied to the ego by providing a measure of the density of these friendship ties.
The measure of peer delinquency is constructed using individual-attribute data from the Add Health survey and information on an individual’s immediate friendship network to create a measure of the mean delinquency of one’s friends. I compose this standardized scale using measures from the in-school survey that are identical to the measures used to create the dependent variable, respondents delinquency (alpha = .80) (Haynie, 2001; McGloin & Shermer, 2009).

Size of ego-network is an additional variable created by Add Health used to control for the size of an individual’s peer group (Burt, 2000). Evidence has shown that the size of immediate networks is positively associated with access to information and resources. Therefore, controlling for this network characteristic will be necessary to separate the effect of information control and access of brokerage from that of immediate network size.

A measure indicating if an individual is an isolate is also included in my analysis. An individual qualifies as an isolate if they have not nominated other individuals as friends and have not been nominated by any other individuals as friends. Previous research looking at brokerage effects in peer networks has shown isolates to be unique individuals who are more delinquent than other individuals in their respective global networks (Kreager, 2004; Mangino, 2009).

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8 This measure is non-directional and is therefore based on the ego(individual of interest)-network of sent and received friendship nominations.
An interaction between brokerage and closure will be included in my analyses to examine the hypothesized amplification effect of brokerage on delinquency in closed immediate networks (hypothesis 2). This variable is represented as the product of the cutpoint and the ego send-and-receive network density measures. An additional interaction between the delinquency levels of friends and brokerage is included in the analysis to examine possible differential effects of brokerage when social influence from friends is geared towards greater delinquency (hypothesis 3). This interaction is represented as the product of the cutpoint measure and peer delinquency measures.

Other Independent Variables. Parental attachment is measured using a scale constructed from mean responses across items asking respondents whether or not their mother/father cares about them. To compensate for non-intact families I replaced what would be the mean value between two parent families, with the value of the present parent. For the individual-level construct, the resulting scale demonstrates high reliability (alpha=.77), or that the items represent the underlying construct of respondents’ attachment to parents.

In addition, school climate research and delinquency studies that have focused on the school environment have found substantial evidence supporting the positive effects of school attachment (Gottredson et. al, 2005). Therefore, a representative scale is constructed to control for its anticipated negative effect on deviant outcomes using items asking respondents how much the agree or disagree with: 1) feeling close to people at
their school, 2) feeling like they are part of their school, and 3) feeling happy to be at their school (alpha = .79).

Involvement with friends is also controlled in this study as research has illustrated its importance in determining the strength of social influence, represented by time spent with friends (Osgood & Anderson 2004; Haynie & Osgood 2006). This measure was constructed using respondent self-reports from the friendship nomination data of frequency and types of involvement with each friend ranging from calling each other on the phone to spending time together on the weekends and after school. Although this measure does not take into account the number of friends an individual has, it provides an indicator of the amount of time spent with friends in general, also assumed to be reflective of the strength of ties to these friends. Each item is used to construct a friend involvement index that has high reliability (alpha = .93).

Control Variables. Prior research has connected several individual attributes with delinquency and are included as control variables in the analysis. Age (in years) is represented by a continuous measure of self-reported age ranging from ten to nineteen years of age. I also include a quadratic transformation of age ($age^2$) to account for the curvilinear relationship of age with delinquency during the teenage years (Brame & Piquero, 2003).

Gender is represented as the dichotomous variable, 1 = male (female is the reference group).
A measure of *race* is constructed using two binary categorical variables: 1) \(1 = \) Black representing African Americans and 2) \(1 = \) Other race (White/Caucasian as the reference group), this later category contains categories of Asian/Pacific Islander, American Indian/Native American, Hispanic/Spanish, and Other from adolescents’ self reported race.

*Non-intact family* is a binary variable coded one if both biological parents are not present and zero otherwise. This variable was constructed from separate items asking the respondent if the biological mother and/or biological father were present in the home.

*Low socioeconomic-status (SES)* is a binary variable constructed from items indicating parents’ level of education. If either parent received less than a high school education they are assigned a value of one (low SES). If both parents, or the present parent (in the case of non-intact families), have a high school education or more, they are assigned a value of zero.

I also control for *school size* (measured as total student enrollment), as this attribute has been shown to play an important role in determining levels of delinquency in the school (Welsh, Stokes, & Greene, 2005; Crosnoe, Cavanagh & Elder, 2003). This variable is represented as the dichotomous variable, \(1 = \) *large school* (small and medium schools serve as the reference category). Schools greater than 1,000 qualify as large schools, which is relatively close to previous research considering the effects of school size on behavioral outcomes (Lee & Smith, 1997).
Analysis

Due to the delinquency index’s high frequency of zero counts (no occurrences of delinquency) and distribution with a high positive skew, the analysis uses Poisson regression of delinquency on the independent variables. After examining the main effects of each independent variable to investigate hypothesis one, interactions of relevant network variables are incorporated to explore hypotheses two and three. These analyses provide a direct and parsimonious means to investigate the salience of brokerage for the individual adolescent.
Chapter 5: Findings

Results from initial models provide findings that coincide with previous research on adolescent delinquency and the peer context with some exceptions. Model 1 in Table 3 is a baseline model presented to verify relationships of delinquency with commonly associated covariates in studies of peer delinquency as well as network variables. Binary variables are interpreted using the non-standardized coefficient in the first column of each model and for non-binary variables the coefficients have been standardized to represent a change in the logarithm of the dependent variable (delinquency index) per standard deviation change in the independent variables of interest. This transformation is represented in the third column of each model as the beta coefficient (β). Coefficients can be exponentiated and transformed to represent the percent change in delinquency per standard deviation increase of a particular independent variable ((exp(coefficient)-1) X 100 = percent change) (Long 1997).

Model 1 in Table 3 presents the main effects of several non-network control variables on delinquency. For each standard deviation increase in age, delinquency index increases an average of 155 % (p≤ .001) and males are predicted to score 17 % higher than females on the delinquency index (p≤ .001). African-Americans are predicted to be
13% less delinquent than whites (p ≤ .01). This finding may be reflective of the delinquency index’s reliance on substance and alcohol use as measures of delinquency as whites participate in substance use more often than African Americans (Bachman et al., 1991). As expected, having a non-intact and low SES family versus an intact and high SES family are positively associated with 13% and 7% increases in delinquency index, respectively (p ≤ .001). Attachment variables coincide with social control theory, suggesting that for each standard deviation increase in parental attachment scale, delinquency index decreases by 8% (p ≤ .001) and for each standard deviation increase in school attachment scale delinquency decreases by 12% (p ≤ .001). Also notable and in agreement with previous research (Haynie & Osgood 2006; Osgood & Anderson 2004), is the strong positive association of friend involvement with delinquency. Specifically, a one standard deviation increase in the friend-involvement index accompanies a 20% increase in a respondent’s delinquency (p ≤ .001). Results also show that being from a large school (greater than 1000 students) decreases delinquency by 3% when compared to schools of smaller sizes. This association, although in contrast to previous research on schools and delinquency (Gottfredson, 2005) is small in magnitude. Future research may investigate the possible mediating effects of other variables such as school climate, financial resources, and administrative quality on delinquency to further clarify the school size-delinquency relationship. Importantly, a robust positive association is found between the average delinquency of one’s friends and their delinquency index score.
supporting the peer-delinquency association. Specifically, a one standard deviation increase in the mean delinquency of one’s friends is related to a 22 % increase in their own delinquency (p ≤ .001).
Table 3. Models of Negative Binomial Regression Results Predicting Respondent’s Level of Delinquency

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
<th>Model 3</th>
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<td>.94</td>
<td>.55***</td>
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<td>.94</td>
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<td>.09</td>
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<td>.05</td>
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<td>.20</td>
<td>.20</td>
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<td>-.03</td>
<td>-.03</td>
<td>-.19***</td>
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<td>.00</td>
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<td>(0.00)</td>
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<td>.01</td>
<td>.03</td>
<td>(0.03)</td>
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<td>Broker X Density ‡</td>
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<td>(.15)</td>
<td>-.25†</td>
<td>(.15)</td>
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<tr>
<td>Broker X Peer Delinquency</td>
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<td></td>
<td></td>
<td>-.01</td>
<td>(0.03)</td>
<td>.00</td>
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</table>

N = 63,460 adolescents. † p<.10  * p<.05   ** p<.01   *** p<.001 (two-tailed test)

Standard errors are given in parentheses.
+ Ego send and receive network.

Model 1 in Table 3 also presents the main effects of all network variables. In line with hypothesis 1 and net of other effects, being a broker results in a 6% decrease in
respondent’s level of delinquency when compared to those who are not brokers \((p \leq .001)\). Peer group cohesiveness also has a robust association with delinquency. For each standard deviation increase in the density of an individual’s immediate peer network a 3% decrease in delinquency results \((p \leq .001)\), this relationship being independent of other network effects\(^9\).

Models 2 and 3 in Table 2 examine interaction effects to clarify how the association between brokerage position and delinquency is conditioned by the structure of immediate peer networks.

Model 2 investigates the brokerage-closure hypothesis (hypothesis 2), that brokerage’s protective effect is augmented when the broker belongs to cohesive (dense) peer groups. This model examines the baseline model with the addition of the interaction between being a broker and having dense (cohesive) peer groups. For ease of interpretation the predicted values of delinquency for brokers and non-brokers have been displayed in Table 4. This interactive effect is negative, marginally significant and suggests that, overall, brokers are less delinquent than non-brokers at all predicted levels of friendship-group density. In addition, the protective effect of being a broker in a dense friendship group increases in magnitude for each standard deviation increase in friendship-group density. Specifically, when friendship-group density is rather low (one

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\(^9\) Separate analyses were run to test for this direct effect. For example, two models were tested: a baseline model with and a baseline model without brokers, and show a consistent and robust positive association of density with delinquency across both models. Additional results are available by contacting the author.
standard deviation below its mean of .30) brokers score .03 lower on the delinquency index than non-brokers while a higher friendship-group density (one standard deviation above its mean) translates into a delinquency index that is .10 lower for brokers when compared to non-brokers. This positive interactive relationship increases even more as we increase friendship group density to .90, where a broker is predicted to score .22 lower on the delinquency index than a non-broker. In other words, the negative relationship between dense friendship networks and delinquency is magnified when individuals are brokers.

<table>
<thead>
<tr>
<th>Density</th>
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<th>Broker*</th>
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<td>.90</td>
<td>1.60</td>
<td>1.38</td>
</tr>
</tbody>
</table>

*For ease of interpretation predicted values from delinquency index have been adjusted for high positive skew by centering values at the delinquency index’s mean.

Table 4. Predicted Delinquency Index of Brokers versus Non-Brokers as Friendship Group Density Increases

Model 3 presents the baseline model with the interaction of being a broker with peer delinquency to clarify how the peer-delinquency association operates when brokers are introduced (hypothesis 3). Although results show an association in the expected direction, (i.e. a decrease in levels of delinquency) the magnitude of this association is negligible and not statistically significant.
In sum, findings provide evidence that supports hypotheses one and two, while not supporting hypothesis 3. This suggests that being a broker has a deterrent effect on delinquency, and that this relationship is magnified when brokers belong to cohesive (dense) peer groups. The absence of a conditioning effect of peer delinquency on the brokerage-delinquency relationship provides support for Mangino’s (2009) findings, that brokerage does not mitigate against social influence to be delinquent at the individual level. Although, and in contrast to Mangino’s findings, brokerage continues to have a significant association with delinquency when accounting for parental attachment. This suggests that brokerage does not operate solely through the protective effect of parental attachment on delinquency.\(^\text{10}\)

\(^{10}\) Additional analyses investigated this relationship in two separate models: one with and one without parental attachment, and show a negative and robust association of brokerage and delinquency regardless of the inclusion of the parental attachment variable. Full results from these analyses are also available upon request.
Chapter 6: Discussion and Conclusion

The protective effect of brokerage on delinquency or, more specifically, of serving as an intermediary between immediate friendship networks, is supported in this analysis. In addition, the protective effect of being a broker is augmented when brokers are members of more cohesive peer networks. Most importantly, the main effect of brokerage on delinquency suggests that a generalized other effect may exist. Brokers are exposed to and control information channels that connect multiple peer groups and thus, are able to identify multiple perspectives across networks. By sympathizing with multiple subgroups within the global network, in-group bias, from cohesive peer groups, and individual self-interestedness, arguably the cause of individual transgressions from the law, are limited. Thus, the broker incorporates a perspective that leads to a decrease in delinquency for themselves and also lowers their likelihood to participate in violent conflict.

The amplified negative relationship of brokerage with delinquency in cohesive peer groups suggests that information transmitted to friendship group members is more readily accepted when friendship groups are cohesive. In other words, brokers who are less deviant themselves may influence others around them to be less deviant because the information they bring to their peer groups is more readily accepted. This provides
further support for Haynie’s (2001) findings, that more cohesive peer groups are more susceptible to social influence from peers. Therefore, just as differential association theory suggests that the positive effect of differential associations towards delinquency increases delinquency (Sutherland, 1947) and this effect is magnified in cohesive peer groups (Haynie, 2001), a similar association exists, but in the opposite direction, for brokers in cohesive peer groups. Therefore, being a broker that connects cohesive peer groups leads to both a decrease in individuals’ and groups’ exposure to differential associations towards delinquency and provides a generalized other effect that unifies moral perspectives across individuals and groups.

This investigation of peer network effects on delinquency provides several contributions to past research on the peer-delinquency relationship including a novel examination of the mechanisms that operate in an entire network as defined by school boundaries. We now know that being a broker decreases individual delinquency. We also know that this effect is magnified under certain conditions. By clarifying the specific school characteristics and structural properties of peer networks that regulate adolescent delinquency, policy makers and school administrators can focus their efforts to reduce problem behaviors. Specifically, connecting individuals across previously disconnected peer groups and encouraging strong friendships within these groups may decrease overall levels of delinquency. In contrast, similar attempts at spanning peer groups may prove less effective for highly delinquent peer groups. A final implication
suggests that parental attachment is not a necessity when considering the protective effect from delinquency by brokers. Therefore, spanning peer groups may prove effective in preventing delinquency regardless of students’ attachment to parents.

Although not the focus of this study, implications arise for the study of social control theory (Agnew, 1993). The positive, significant, and independent negative association of friendship group cohesiveness with delinquency suggests that close relationships with friends curb adolescents’ likelihood to be delinquent and that this effect remains regardless of friends levels of delinquency. Further investigation may look to elucidate the processes contributing to this relationship through ethnographic research of adolescent behavior and interaction in the school setting.

Although the data used from the Add Health survey provide many advantages for conducting my analysis, it does contain drawbacks. First, students who completed the in-school Add Health survey were limited on the number of friendship nominations and second, the possibility of out-of-school friendship nominations suggests some friends may have been missed in this school based study. Fortunately, supplementary analyses investigating these possible problems have been conducted in previous research and suggest that they are minimal (Mangino 2009; Haynie 2001; Moody 1999). In addition, a measure of friendship attachment was not included in this analysis because pertinent items were not available in Add Health’s in-school survey. Although friendship attachment has been a common control measure in peer delinquency studies, a measure of
friend involvement was included in its place, which has been shown to be at least as important in explaining variation in the peer-delinquency relationship as measures of friend attachment (Maimon & Browning 2010; Osgood & Anderson 2004).

Future research may investigate the brokerage-closure hypothesis further by focusing on an analysis at both the school and individual-levels. For example, the use of multi-level modeling would allow one to determine if measuring a structural characteristic of individuals’ friendship groups (such as density or cohesiveness) functions beyond the individual and thus, the entirety of networks they are connected to (across the school) also matter. An analysis using multi-level models would also allow for a more thorough investigation of how criminological theory plays out in school contexts. The use of hierarchical linear modeling (HLM) techniques such as Rasch models (Raudenbush et al. 2003) would allow one to account for increased variation in delinquency index items. Recent research has suggested that network characteristics of both individuals and peer groups are differential across different types of delinquency, such as alcohol use and fighting (Kreager et al. 2011). Using methodological techniques such as these would also allow one to differentiate between variation in delinquency at individual and school-levels of analysis for these different delinquent behaviors. Additional future research could also use a multi-level perspective to test macro-level criminological theories such as social disorganization by investigating the roles that other network characteristics of peer groups play within and outside of school boundaries or in
other theoretically distinct contexts. Future research may also use more representative measures of peer group cohesiveness and structure such as the clustering coefficient\(^1\)(Wattz & Strogatz 1998) coupled with Jim Moody’s CROWDS algorithm\(^2\) (1999; 2000), measures which have been used in recent research to look at characteristics of peer networks in schools.

Recent research in criminology has taken large steps by utilizing measures of immediate friendship network structure to show the importance of close friendship groups for predicting delinquent outcomes. By moving beyond immediate friendships and examining individuals’ positions in a broader context within the school, arguably where socialization processes are most important for adolescent maturation, we acquire a deeper understanding of how friendships are a crucial part of the development of social control in adolescents’ lives and that this process is intertwined with peer network structure and position. Therefore, being a broker within these school contexts gives reason to believe social control processes are as much developmental as they are static and that psychological processes that underlie criminological theories of DAT and DSO are indeed rooted in immediate and broader social context.

\(^1\) This is methodological tool available in network analysis programs such as UCINET VI, which provides a consistent and parsimonious measure of network transitivity, that networks contain many friends of friends.

\(^2\) This algorithm, created for use with the software *SPAN: SAS Programs for Analyzing Networks*, allows for a more accurate means to define structurally cohesive peer groups by taking into account their large overlapping structure.
References


of Sociology, Ohio State University.


Appendix: Definitions and Calculations of Independent Variables
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Network Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Broker</td>
<td>Indicated by the measure ’cutpoint’ in UCINET 6; such that, in network G with adolescent node-set N, node n&lt;sub&gt;i&lt;/sub&gt; and subgroup G&lt;sub&gt;s&lt;/sub&gt; (with adolescent node-set N&lt;sub&gt;s&lt;/sub&gt; = N - n&lt;sub&gt;i&lt;/sub&gt;) that results from dropping n&lt;sub&gt;i&lt;/sub&gt; and its ties to all other adolescents in the network. Node n&lt;sub&gt;i&lt;/sub&gt; is a cutpoint if the number of components (distinct, unconnected subgroups) in G is less than the number of components in G&lt;sub&gt;s&lt;/sub&gt;.</td>
<td>Cutpoint = 1;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not a cutpoint = 0</td>
</tr>
<tr>
<td>2) Density (Ego Send-and-Receive Network)</td>
<td>Density of the network composed of ego, the set of alters nominated by ego, and the set of alters who nominate ego.</td>
<td>$ESRDEN_{i} = \frac{\sum SR}{sr \times (sr - 1)}$</td>
</tr>
<tr>
<td></td>
<td>Where:</td>
<td>Where:</td>
</tr>
<tr>
<td></td>
<td>$SR$ = total ego send-and-receive-network</td>
<td>$SR$ = total ego send-and-receive-network</td>
</tr>
<tr>
<td></td>
<td>$sr$ = number of nodes in $SR$</td>
<td>$sr$ = number of nodes in $SR$</td>
</tr>
</tbody>
</table>

Continued
Table A1. Definitions and Calculation of Independent Variables
<table>
<thead>
<tr>
<th></th>
<th>Mean Friendship Delinquency</th>
<th>Mean value of ego’s peers (defined by a particular ego friendship network) on measures of minor delinquency.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$\frac{\sum x_j}{nj}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$x_j$ = the value of the delinquency index for the $j$th member of the ego network;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$nj$ = the number of nodes in the $j$th adolescent's network based on send-and-receive friendship</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nominations (excluding ego).</td>
</tr>
</tbody>
</table>

|   | Size of Ego Network         | Number of alters who are nominated by ego or who nominate ego, plus ego.                                |
|   |                             | $NESR_\eta = sr$                                                                                         |
|   |                             | Where:                                                                                                   |
|   |                             | $sr$ = the number of nodes in SR                                                                        |

|   | Isolate                    | An ego qualifies as an isolate if they nominate no peers as friends and no peers nominate them as friends. |
|   |                             | Isolate = 1;                                                                                             |
|   |                             | Not an isolate = 0                                                                                        |

Other Independent Variables

Continued
Table A1. Continued

<table>
<thead>
<tr>
<th></th>
<th>Parental Attachment Index………………………</th>
<th>Mean value across responses to &quot;How much do you think (mother/father) cares about you?&quot; (Cronbach alpha=.77)</th>
<th>1 = not at all; 2 = a little; 3 = some; 4 = quite a bit; 5 = very much (avg. of responses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>School Attachment Index…………………………</th>
<th>Mean value across responses to &quot;feels close to people at school&quot;, &quot;feels part of school&quot;, &amp; &quot;happy to be at this school&quot;. (Cronbach alpha=.79)</th>
<th>Large school =1 ; Small or medium school = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>7)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continued
Table A1. Continued

<table>
<thead>
<tr>
<th></th>
<th>Mean value across reported strength of up to 10 of ego's nominated friendships (Cronbach alpha=.93)</th>
<th>For each of (5) male and (5) female friends: went to house in the last seven days.; you met after school to hang out or go somewhere in the last seven days.; you spent time with him last weekend.; you talked about a problem in the last seven days.; you talked on the telephone in the last seven days. (avg. of responses).</th>
</tr>
</thead>
<tbody>
<tr>
<td>8) Friend Involvement Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) Age</td>
<td>Respondents age at time of in-school interview</td>
<td>Continuous Variable in Years</td>
</tr>
<tr>
<td>10) Age$^2$</td>
<td>Logarithmic transformation of respondents age at time of in-school interview</td>
<td>(Continuous Variable in Years)$^2$</td>
</tr>
</tbody>
</table>

Control Variables

Continued
|   | Male .................................................. | Dichotomous dummy variable indicating respondent is a male | Male = 1; 
|   |                                           |                                                          | Female = 0 |
|   | Black .................................................. | Dichotomous dummy variable indicating respondent is African American | Black = 1; 
|   |                                           |                                                          | White or Other races = 0 |
|   | Other Race........................................... | Dichotomous dummy variable indicating respondent is of descent other than White or African American | Other Race = 1; 
|   |                                           |                                                          | Black or White = 0 |
|   | Non-intact Family.................................. | Dichotomous dummy variable indicating if both of respondent’s parents are together at time of in-school interview | Intact Family= 1; 
|   |                                           |                                                          | Non-intact family = 0 |
|   | Low SES............................................... | Dichotomous dummy variable indicating neither respondent’s mother or father received a complete high school education or more | Low SES = 1; 
|   |                                           |                                                          | Non-Low SES = 0 |
|   | Large School Size................................... | Dichotomous dummy variable indicating if the school size is large (>1000 students) | Large School = 1; 
|   |                                           |                                                          | Not a large school = 0 |