

ANTISOCIAL BEHAVIOR AND YOUTH GANG MEMBERSHIP: SELECTION AND SOCIALIZATION

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We examine whether gang membership is associated with higher levels of delinquency because boys predisposed to delinquent activity are more likely than others to join. We use 10 years of longitudinal data from 858 participants of the Pittsburgh Youth Study to identify periods before, during and after gang membership. We build on prior research by controlling for ages and calendar time, by better accounting for gang memberships that occurred before the study began, and by using fixed

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effects statistical models. We find more evidence than has been found in prior studies that boys who join gangs are more delinquent before entering the gang than those who do not join. Even with such selective differences, however, we replicate research showing that drug selling, drug use, violent behaviors and vandalism of property increase significantly when a youth joins a gang. The delinquency of peers appears to be one mechanism of socialization. These findings are clearest in youth self-reports, but are also evident in reports from parents and teachers on boys' behavior and delinquency. Once we adjust for time trends, we find that the increase in delinquency is temporary, that delinquency falls to pre-gang levels when boys leave gangs.

Gangs are a major social problem. In recent decades, for example, gang-related homicides have become a larger proportion of the total. In Chicago, one study estimates the increase to be from less than 10 percent in 1965 to more than 25 percent in 1994 (Howell, 1999). Concerns about gangs have also expanded geographically. Once seen as restricted to a small number of the nation's largest cities, gang problems are now recognized in many mid-size cities and nonmetropolitan areas (Howell, 1998). And, even though gang membership during adolescence is short lived, there is a strong correlation between it and delinquent behavior (Thornberry et al., 2003). Thus, even a brief spell of participation may expose a youth to a substantially heightened risk of delinquency. To address the problem, it is important to know if the association between gang membership and delinquency is causal. If so, what mechanisms operate? Does the delinquency associated with gang membership persist after a boy's brief participation?

Gang researchers have speculated about these selection and socialization processes. For instance, selection may operate when new gang members are more likely to be drawn from among boys¹ who already engage in antisocial behaviors. On the other hand, as gang members, boys may be exposed to new opportunities to participate in criminal activities. At the extreme, if the participation of gang members in criminal activity is entirely explained by selection, then eliminating gangs would lead to no reduction in crime. Rather than adopting one extreme, we follow earlier research that has considered selective and socialization processes as

1. Although participation of girls in gangs is an important topic of study, our data source in this paper comprises boys exclusively. Some of the theoretical ideas laid out may apply to girls as well, although empirical studies with girls would be required to examine the degree to which mechanisms operate similarly for boys and girls.

complementary rather than competing (Thornberry, Lizotte, Krohn, Farnworth and Jang, 1994; Thornberry, Krohn, Lizotte and Chard-Wierschem, 1993).

LITERATURE REVIEW AND RESEARCH QUESTIONS

PRIOR RESEARCH

Cross-sectional studies have documented that gang members have higher delinquency than nonmembers (Curry and Spergel, 1992; Dukes, Martinez and Stein, 1997; Henry et al., 2001; Huff, 1996). Longitudinal studies of boys provide further evidence that at least some aspects of delinquent behavior increase during the period of gang membership relative to the period before, and that these antisocial behaviors then decline after the boy leaves the gang (Esbensen and Huizinga, 1993; Thornberry et al., 1993; Thornberry, 1998). Thornberry and colleagues (1993) were the first to use longitudinal data to test the selection versus socialization hypotheses. They found support for a social facilitation model, documenting higher delinquency among gang members when the youth were active in the gang but no significant differences between nongang youth and future or former gang members. Later research built on this study, replicating the heightened delinquency when boys were active in gangs, but also finding some evidence of selection, with future gang members showing greater delinquency than nongang youth in the year prior to entering a gang (Esbensen and Huizinga, 1993; Thornberry et al., 2003). Recent studies also suggest that one aspect of delinquency—drug sales—persists after boys exit gangs (see review in Thornberry, 1998).

This research made an important contribution to literature on gangs, being the first to examine gang members along a developmental trajectory before, during and after gang membership. Still, limitations in these initial studies can be addressed, especially using additional waves of data now available from longitudinal studies of delinquent youth. In particular, the earliest studies (Esbensen and Huizinga, 1993; Thornberry et al., 1993) relied on simple descriptive means, proportions and individual offense rates, without adjusting for measured or unmeasured characteristics of boys that might bias the association between gang membership and delinquency. More recent research has used standard regression models to adjust for measured controls and random effects models to adjust for unmeasured stable characteristics of boys (Thornberry, 1998; Thornberry et al., 2003). We extend these recent developments by estimating fixed effects models to adjust for unmeasured biases (see Method below). This approach allows us to better separate selection from socialization effects.

In addition, prior studies have defined gang participation in relation to waves of the study rather than specific to the boys' ages, and did not control for age. Because the periods before, during and after gang entry are correlated with age, age-related changes in youth behavior might be mistaken for changes associated with periods of gang membership. That is, if a delinquent behavior generally increases with age, and boys tend to be older when they participate in gangs, then failure to control for age would lead to an overestimate of the effect of gangs. Likewise, if boys are older when they are gang members, but a delinquent behavior generally decreases with age, then omitting an age control would understate the gang effect. Similarly, these studies only roughly control for year-to-year time trends in delinquency, and, within a longitudinal study, the periods of time when boys are active gang members or have left a gang tend to be later in calendar time.

These studies also do not consider gang memberships that occur prior to the study. The boys analyzed ranged in age from 11 to 15 when the studies began. Prior analyses of the Pittsburgh Youth Study indicate that gang entry begins as early as age 9 and that nearly 5 percent of all youth and 20 percent of African American youth have entered a gang by age 15 (Lahey et al., 1999). This has two potential consequences. First, boys whose only gang affiliation occurred before the study began will be miscoded as never having been gang members. Such miscoding would bias against identifying selection effects if these former gang members have higher delinquency levels than boys who truly never participate. Second, boys who participate in gangs both before and during the study, and are not gang members at the first study wave, will be miscoded as before gang, rather than after gang. To the extent that antisocial behavior is higher after than before gang membership, this approach underestimates the socialization effect (any increase in delinquent activity from the period before to during membership). Similar consequences are possible in some prior studies that combine two semi-annual interviews into yearly measures, coding boys as being in a gang if they report being a member at either interview.

We deal with these issues by using retrospective reports of gang membership before the first study wave, measures of gang membership and delinquency at each study wave, and controls for age, seasonal and calendar-time trends.

In longitudinal studies, the most examined mechanism through which gang participation might socialize boys into antisocial activity appears in prior research that has considered boys' association with delinquent peers along with their gang participation (Battin, Hill, Abbott, Catalano and Hawkins, 1998; Battin-Pearson, Thornberry, Hawkins and Krohn, 1998). Such research builds on the sizable body of literature documenting an

association between affiliation with delinquent peers and youth delinquency (Fergusson, Swain-Campbell and Horwood, 2002; Warr, 2002). We consider this potential mechanism as well, though unlike prior longitudinal studies we link specific kinds of peer delinquent activity—drug sales, drug use, violent delinquency and property delinquency—to these same specific kinds of antisocial activity on the part of the study youth. Such specificity may be important, given that prior research suggests that gang involvement has a greater influence on drug sales and violent delinquency than property delinquency (Battin et al., 1998; Thornberry et al., 1993).

CURRENT STUDY

In some sense, the question of whether gang participation is associated with antisocial activity is a tautology. Two commonly defined types of youth gangs are the street gang and drug gang, in both of which delinquency is requisite, in the former as members protect their territory from outsiders and in the latter as members sell drugs and protect their territory from rivals (Klein, 1997). Becoming a member of a gang may also bring the boy into a history of intragang and intergang disputes. Simply by association, the boy may be a target against whom others may initiate violence (Howell, 1999). Yet, it can be fruitful to consider why the strength of this association may vary (Warr, 2002 discusses similar and additional mechanisms for peer influences on delinquency). Boys who join gangs that as a whole engage in more crimes would be expected to show a greater increase in their own criminal activity. Once a part of the gang's social network, boys gain greater access to any existing information within the network regarding when, where, and how to engage in criminal activity. The members of the group can become role models and mentors to the boy in increasing his repertoire of criminal activity. In addition, as the network members become a featured part of the boy's larger social network, the norms and approval of the group may become increasingly relevant for shaping his behavior. Peers are therefore an important socializing agent within gangs.

Several selective processes require careful attention as researchers study how gang participation relates to boys' antisocial activity. In the principal selective process related to gang entry already noted, boys with a tendency toward antisocial activity are more likely to become gang members. Research has documented this relationship, showing that boys who demonstrate higher levels of delinquency early in life or who are on a trajectory of increasing criminality are more likely to enter a gang. For example, Lahey and colleagues (1999) documented such selection using a smaller number of participants and waves of the Pittsburgh Youth Study than we analyze here. Selection out of gangs may be relevant as well. That

is, boys who have less of a tendency toward antisocial activity who do become members of delinquent gangs may be more likely to exit. Study attrition may be a third source of selection. Prior research suggests that boys with more delinquent tendencies are more likely to drop out of research studies (Thornberry, Bjerregaard and Miles, 1993). If this selective attrition is particularly true of core, long-term gang members, then the extent to which gangs affect behavior may be overstated. In other words, these boys may be those most attracted to gang membership because of the benefits of associated gang activities. If data were observable for these attriters, less of an increase over previous behavior might be evident and they might be more likely to continue with criminal activity after leaving the gang.

The present study attempts to deal with these issues. Our central research question is whether youths' delinquent activity rises when they enter gangs and falls when they exit. Given that such an association is observed, our interest is in why it occurs, with the potential for changes in the delinquent activity of the boy's peers as a central possible socialization mechanism. Our analysis begins with a descriptive portrait of youths' behavior by gang status. To the extent that delinquent activity and gang membership share common causes, however, this description provides a biased estimate of the causal relationship between gang membership and delinquency. We thus use statistical models to comprehensively adjust for biases associated with preexisting characteristics of boys. We also control for age, season and calendar year and account for gang memberships that occurred before the study began.

DATA AND METHODOLOGY

SAMPLE

The Pittsburgh Youth Study (PYS) follows three samples representative of all boys who were enrolled in the first, fourth or seventh grades (called the youngest, middle and oldest samples, respectively) in public schools in Pittsburgh, Pennsylvania in 1987–1988 (see Loeber et al., 1998 for a detailed description of the PYS). The current study includes 858 boys, 503 from the youngest sample as well as 355 boys from the second cohort of the oldest sample. Because a key question was omitted from the gang questionnaire that was administered to the first cohort of the oldest sample, those participants are excluded from this study. The boys described themselves ethnically primarily as African American (487) or white (351), with the remainder choosing other (10), Asian (6), Hispanic (3) or American Indian (1). At the initial interview (Wave S), nearly all of the boys in the youngest sample were ages 6 or 7 (53 percent and 41

percent respectively); the boys in the second cohort of the oldest sample were primarily ages 12 through 14 (35 percent age 12, 41 percent age 13, 21 percent age 14). The latest available interview point for the current paper is in the 10th year of follow-up, when the boys in the youngest sample were ages 16–17 and the boys in the oldest sample 22–24. Initially, about 85 percent of boys agreed to participate in the study, with subject retention being above 80 percent in each follow-up wave.

The PYS was designed to provide a sizable sample of boys who engage in serious antisocial behavior and to maintain a comparison group of nonantisocial boys. Based on an initial screening assessment completed by parents, teachers and the youth themselves, boys were divided into two groups thought to be at high and low risk for offending. High-risk boys were oversampled, and sampling weights are available to make estimates representative of first, fourth and seventh graders from the Pittsburgh public schools in the late 1980s. Although estimating descriptive statistics that represent the population requires weighted analyses, unweighted regression models are unbiased and efficient when models are correctly specified (that is, in this context, a correctly specified model does not omit relevant predictors, including potential interactions between predictor variables and sample stratification variables; DuMouchel and Duncan, 1983). We present unweighted models. Results are highly consistent in weighted models (details available from the authors).

As expected for an urban public school sample, the boys' families had relatively limited economic resources. When the study began, the median family income in 1998 dollars was \$16,500. The majority of primary caregivers in the study had either not completed high school (18 percent) or had completed high school but had received no further education (49 percent). And, at the time of the first interview, 49 percent of the boys lived in single-parent families, 37 percent lived with both biological parents and 14 percent lived with one biological parent and one nonbiological parent figure.

Pittsburgh is an example of a city with a recently emergent gang problem, in contrast to cities like Chicago and Los Angeles with their longer traditions of gang activity and research. Gang activity and homicides in Pittsburgh escalated in the early 1990s, peaking just prior to the middle of the decade, and then falling through the late 1990s (Copeland, 2001; Kelly and Ove, 1999; Mamula, 1997). Consistent with these reports, our data show a peak in gang activity around 1993–1994.

DATA COLLECTION WAVES

As shown in Appendix A, data available for this paper covered a 10-year period including fifteen waves of data for the youngest sample and

fourteen for the oldest sample. Initially, both grade samples were reassessed at 6-month intervals. However, due to budgetary reasons, in the third and fourth years of the study the follow-up intervals were increased to 1 year, with the youngest and oldest grade samples alternating in the field. The first wave was the initial screening assessment (denoted Wave S following the terminology of the study) and later waves are denoted alphabetically from A (with SS used to denote the wave between R and T).

MEASURES

ASSESSMENT OF GANG MEMBERSHIP

Scholars debate the definition of gangs (Ball and Curry, 1995). Similar to other recent longitudinal studies of youth gangs and delinquency, we assess gang membership using boys' self-reports. Little research has been conducted on the validity of self-reported gang membership. However, a recent study of Chicago youth found that though self-reports of gang membership do not coincide exactly with police identification of gang members, self-reported gang involvement does correlate with official records of delinquency, controlling for boys' race/ethnicity and their own and official reports of prior delinquency (Curry, 2000).

In the Pittsburgh Youth Study, data were collected about gang membership for the first time in Wave D for the oldest sample (when the boys were ages 14–16) and in Wave H for the youngest sample (when the boys were ages 10–11). At these waves, boys were asked if they were currently, or had ever been, a member of a gang. Follow-up questions collected information about the boy's age at gang entry and exit and characteristics of the gang. During later waves, the boys were asked about membership in gangs since the last interview with follow-up questions asking about the gang's characteristics and whether the boy was still a member at the time of the interview.

We use the gang questionnaire to categorize boys into four gang status groups at each study wave: (1) those who had not entered a gang by the last observation point (Wave T or U) and those who had entered a gang by the last observation point and the current study wave is (2) before, (3) during or (4) after gang participation. Those who had entered and exited a gang before the first study wave were coded as "after" gang participation at the first interview. When a boy missed any interview after the first gang assessment point, we have no information about his gang status for the time between the prior interview and the missed interview. This means that if a boy dropped out of the study, joined and exited a first gang, and then rejoined the study, we would mistakenly identify him as not yet

entering a gang. We thus censor boys at the first point of missing data. If the boy was interviewed at later waves, those data are excluded from our models. Results are highly consistent when we include all available waves of data (details available from the authors).

ANTISOCIAL BEHAVIOR MEASURES: PEERS

The Peer Delinquency Scale (PDS; Loeber et al., 1998) elicits information about the antisocial behavior of the boy's close friends. The PDS has high internal consistency and has been related to the youth's level of delinquency (Loeber et al., 1998). Each boy reported how many of his friends engaged in particular antisocial behaviors (twelve behaviors for the youngest sample before Wave G, fifteen for all other waves and for the oldest sample). We define four types of peer delinquency, relating to drug selling, drug use, violent delinquency and property delinquency, drawing on behaviors that were asked about across all waves (see Appendix B). The response structure changed across time for the youngest sample (from "none, one, some or all" of the boy's friends to "none, few, half, most or all" of the boy's friends). For consistency across waves and with the oldest sample, we collapse responses into three categories (0=none of the boy's friends, 2=all of the boy's friends, 1=all other responses).

ANTISOCIAL BEHAVIOR MEASURES: YOUTH

Boys in the oldest sample completed the forty-item Self-Reported Delinquency Scale (SRD; Elliot, Huizinga and Ageton, 1985). The SRD has been shown to be reliable and has been validated against official crime records (Huizinga and Elliott, 1983). For the first seven waves of data collected from the youngest sample, the study staff developed an age-adapted measure, the thirty-three-item Self-Reported Antisocial Behavior Scale (SRA; Loeber et al., 1998). In later waves, the SRD was administered to the youngest sample. In the SRA, boys reported whether they engaged in each activity 0=never, 1=once, 2=twice, or 3=more than twice in the reference period. In the SRD, boys reported the exact number of times they engaged in the activity in the reference period. For consistency, we downcode the SRD reports at 3 (that is, if a boy reported on the SRD that he engaged in the activity 4 or more times in the reference period, the value was recoded to 3). We also convert all reports to 6-month frequencies (by dividing reports for 1-year reference periods in half before top coding). Appendix B lists our four measures of the boy's self-reported antisocial behaviors, which are consistent with the peer measures as well as prior research (Thornberry et al., 1993). We also define a measure of aggression to cover all available waves of SRA/SRD

data because only a subset of the items we use to measure violent delinquency are available in the SRA.

Adapted versions of Achenbach's widely used measures of youth problem behaviors were also administered to the youth (Youth Self-Report, YSR), his caregiver (Child Behavior Checklist, CBCL) and his teacher (Teacher Report Form, TRF; Achenbach, 1991a, 1991b, 1991c). Each informant rated the 112 items on the checklist, plus several additional items added for the study, as 0=not true, 1=somewhat true, or 2=very true of the boy's behavior since the last interview. In the current paper, we define four categories of delinquent activity to parallel the PDS and SRD measures (see Appendix B).

ANTISOCIAL BEHAVIOR: GANG

Boys were asked separately open-ended questions about the activities of each gang as well as closed-ended questions about the activities of their most recent gang. Their responses to these questions were used to create delinquency variables parallel to those created for youth and peer delinquency. In particular, drug sales was based on three dichotomous codes tapping pushing or selling drugs. Drug use included three codes about doing drugs, getting high, and drinking. Violent delinquency included ten codes regarding fighting, using weapons in fights, providing protection, robbing or strongarming people, having forced sex, terrorizing people, attacking someone to hurt them, and shooting or killing people. Property delinquency included seven codes including robbery, stealing, vandalism and joyriding.

STATISTICAL MODELS

We are interested in the degree to which being a gang member is associated with high levels of delinquency, above and beyond the levels of delinquency that we would expect because boys predisposed to delinquent activity may be more likely to enter, and stay in, gangs. One way to address this question would be to control for measured differences between boys who do and do not participate in gangs. However, any study has only a limited number of such controls. We therefore use statistical models to adjust for preexisting characteristics of boys, both those that are measured in the study and those that are not.

By separating gang members along the pre-gang, during-gang, and post-gang timelines we partially adjust for selective differences between boys who do and do not enter gangs. This approach is limited, however. The pre-gang category is restricted to the desired set of boys who will later enter gangs, but the during-gang category mixes boys who will leave gangs and boys who will stay in gangs. Thus, the contrast of the post-gang to the

during-gang category may be inaccurate. In addition, even the simple during-gang to pre-gang contrast will only match the fixed effects approach (described below) when we restrict the estimation sample to the waves immediately before and after a boy enters a gang.

Two major alternative models are available to adjust for unmeasured preexisting differences: random effects and fixed effects (Wooldridge, 2002). Both separate the error term from a standard regression model into person-specific and time-specific components. The first differs across individuals but remains the same within each individual across time. The second differs across both individuals and time. In the random effects approach, the person-specific component is modeled as a draw from a distribution. In the most common fixed effects approach, the person-specific component is modeled with a dummy variable for each person in the sample. These dummy variables can be estimated because each person has at least two data points. Intuitively, the coefficients for these dummy variables allow the intercept to shift up or down depending on the collective effect of any characteristics of the boy that are stable across time. These controls remove between-person variance, thus the analyses examine change within an individual. (Indeed, for two waves of data, the fixed effects model is identical to a first difference model that predicts change in the outcome variable based on change in the predictor variable). The precision with which the person-specific effects are estimated increases when more time points are available for each person and estimates are more precise when more change occurs on the variables of interest. The fact that our person-specific effects are based on at most ten waves of data, and relatively few boys are observed to enter and exit gangs, will reduce precision, making it harder to detect significant effects.

The random effects and fixed effects models both have additional advantages and limitations. A major limitation of the fixed effects model is that time-constant characteristics of individuals cannot be included as predictors because they are collinear with the person dummy variables. In our case, this limitation prevents us from using the fixed effects model to examine selection by contrasting boys who never join gangs with boys who will later join gangs (because boys in the "never gang" category do not change gang status across the study waves). Still, it does allow us to examine socialization by contrasting boys who do join gangs across time, before, during and after they enter gangs. The random effects model has a different limitation: It makes the assumption that the person-specific component of the error term is uncorrelated with the predictor variables included in the model. This assumption is unlikely to hold. We expect that variables we do not measure that may predict delinquency, such as a genetic tendency toward thrill-seeking or abuse and neglect during early childhood, are also correlated with gang status. This expectation is

precisely why we desire a statistical adjustment for these unmeasured variables. The fixed effects model allows for such correlation between the person-specific error component and the predictor variables. The Hausman specification test evaluates this assumption (Wooldridge, 2002). We focus on the fixed effects approach but also summarize results from random effects models.

An important advantage of both models is that the person-specific characteristics they adjust need not be measured in the study. Such characteristics would include stable demographic characteristics, such as the boy's race, ethnicity and his parents' age and educational level when he was born. They would also include the boy's experiences prior to the initial study wave—such as changes in his parents' marital status or his exposure to violence and abuse during early childhood—because these remain constant during the study period. They would also include any stable biological or genetic characteristics. Both models, however, are limited by the fact that they do not adjust for characteristics that change over time but are unmeasured (for example, change in local policing policies, entry of a new gang into the neighborhood). Our models control for seasonal, calendar-year and age-related trends to capture some of these time-varying correlates.

Our outcomes are sums of items from youth and peer delinquency scales. We thus estimate negative binomial regression models (Long, 1997). The negative binomial regression model is appropriate for count outcomes that are skewed right, improving on the Poisson regression model by allowing the conditional variance to exceed the conditional mean. Strictly speaking, the negative binomial (and Poisson) apply to counts of discrete events (for example, the number of times the boy carried a hidden weapon). Although our outcomes are instead sums of small-range (for example, none to three) items capturing different events (carried a hidden weapon, hit people, threw rocks or bottles at people and so on), the negative binomial is expected to perform well because of the positively skewed, integer nature of the outcomes. The negative binomial regression model also has the advantage of a simple factor change interpretation: We can interpret a unit change in the predictor variable as affecting the expected count by a factor equal to the exponential of the coefficient.

We estimate negative binomial models with and without fixed effects, referring to the latter as “standard” models. The process by which fixed effects estimates are calculated differs in the negative binomial regression case in contrast to the least squares approach, with important implications for the precision of the estimates. In particular, the fixed effect negative binomial regression model is estimated as a conditional fixed effect, with the joint probability of the boy's delinquency scores at each individual

wave being conditional on the probability of his total delinquency across the waves (Hausman, Hall and Griliches, 1984). The conditioning occurs by placing the sum of each boy's outcome variable across waves in the denominator. As a result, boys with all zeros on the outcome variable do not contribute to the log likelihood (that is, are excluded from the estimation sample). This reduced sample size can result in large standard errors. The omission of many cases also raises intuitive concerns that estimates may be biased.

Ordinary least squares, while less desirable than negative binomial regression in terms of functional form, provides an alternative estimation approach in which cases without variation on the outcome variable can contribute to the fixed effects estimates and in which the properties of the estimates do not require large samples. The problem of heteroscedasticity common to least squares estimation with count outcomes can be dealt with by using the general Huber-White correction for heteroscedasticity (Wooldridge, 2002). In addition, Allison and Waterman (2002) recently critiqued the conditional fixed effects negative binomial regression model and evaluated an alternative unconditional fixed effects negative binomial regression model. We focus on the standard and conditional fixed effects negative binomial regression models in the tables and text, and comment on the consistency of results based on ordinary least squares and unconditional negative binomial fixed effects models.

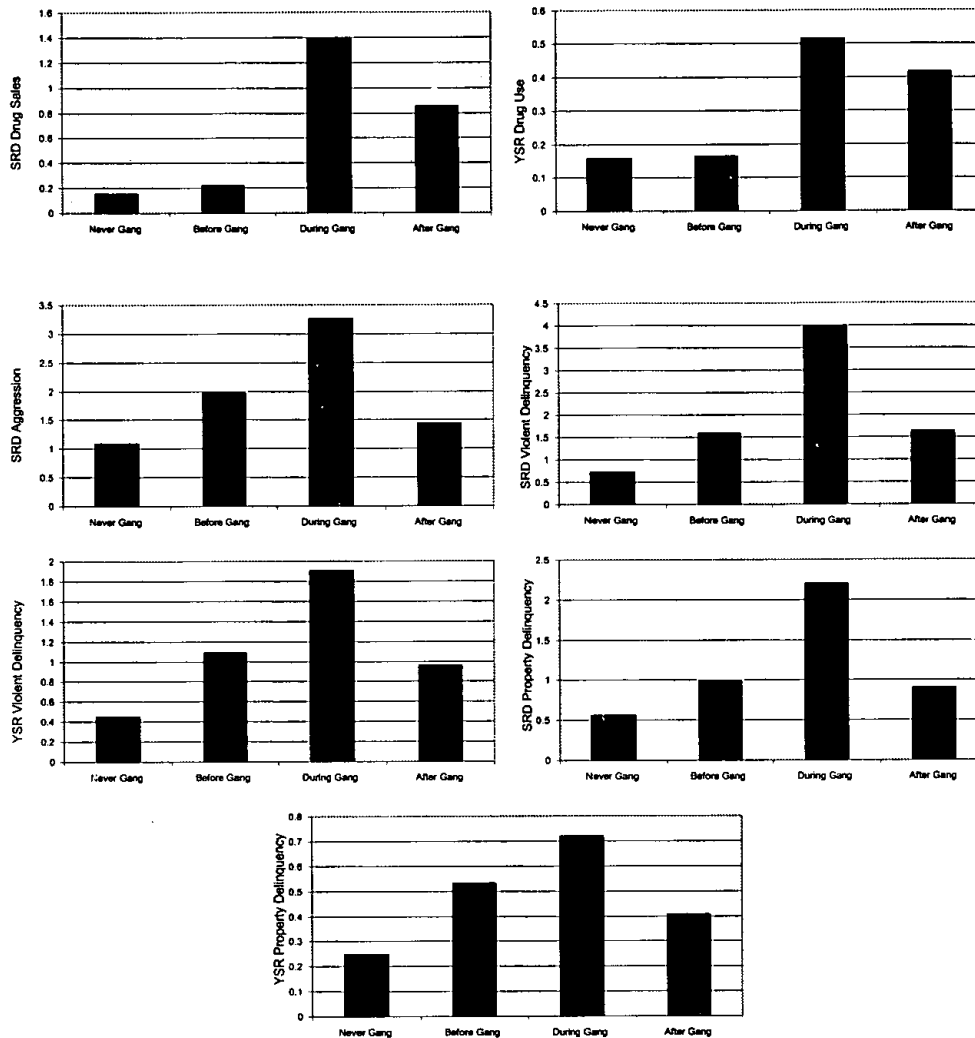
We estimate the unconditional fixed effects negative binomial regression model using SAS 8.2. All other results presented in this paper were calculated using Stata 7.

RESULTS

GANG PARTICIPATION

Among the study participants, 165 boys were observed to participate in gangs during the course of the study—134 participated in a single gang, 26 in two gangs and 5 in three gangs). Most spent only a brief period in the gang. Nearly 85 percent were observed to exit the first gang they entered. And nearly three-quarters who exited were observed to be in the gang for only one or two waves of the study (48 percent one wave, 25 percent two waves). Boys self-defined gangs and reported a range of gang activities. At the wave when they entered the gang, nearly all boys (99 percent) reported that the gang they entered engaged in violent delinquency. Of the other three delinquent activities, 59 percent reported drug selling, 51 percent property delinquency and 21 percent drug use. Fully 12 percent of boys reported that their gang engaged in all four of the activities and 35 percent reported three of the four activities.

Figure I. A descriptive portrait of youth-reported activity by gang status



Average levels of delinquency by boys' gang status for each of the seven self-reported measures are presented in Figure 1. Within each chart, a selection effect is evident if the second bar is higher than the first, indicating higher levels of delinquency among boys who will later join gangs than among boys who do not join gangs ("before gang" versus "never gang"). Socialization is evident if boys report greater delinquent activity when they are gang members (third bar) than before (second bar) or after (fourth bar) they participate in a gang. If this socialization effect is temporary, then levels of delinquency "after gang" should return to "before gang" levels. Persistent delinquency following gang participation would indicate a more permanent change, such as through the boy's maintenance of a new peer networks or taste for delinquency. The

statistical significance of these differences was tested by estimating a standard negative binomial regression model in which three dummy variables indicate the four gang statuses (data not shown). The charted means in Figure 1 are predictions from these models.

In these descriptive results, there is evidence of selection for violent and property delinquency, but not for drug sales and drug use. That is, the average level of drug-related delinquency of future gang members does not differ significantly from the average level of drug-related delinquency among boys who never join gangs (compare the “never gang” and “before gang” bars in the top row of Figure 1). In contrast, boys who will later join gangs exhibit significantly higher levels of violent and property delinquency even before they enter a gang than boys who never join gangs.

For all outcomes we also see a socialization effect of gang participation. In all seven charts in Figure 1, the third bar “during gang” is significantly higher than the second bar “before gang.” This indicates that, among gang members, drug selling, drug use, violent delinquency and property delinquency all increase on average during the period of active gang membership relative to the period before gang entry. For violent and property delinquency, this elevation is temporary. Once the boy exits the gang, his delinquency returns to statistical equivalence with (or falls significantly below) pre-gang levels (compare “after gang” and “before gang” bars in second through fourth rows of Figure 1). In contrast, drug selling and drug use both persist after the boy exits the gang. That is, the “after gang” level of drug-related delinquency remains significantly higher than the “before gang” level in the two charts in the top row of Figure 1.

FIXED EFFECTS MODELS OF YOUTH-REPORTED DELINQUENT ACTIVITY

We present negative binomial models predicting both boys’ drug sales and drug use (see Table 1) and boys’ violent and property delinquency (see Table 2). We summarize both standard and fixed effects negative binomial models to highlight the way our results change when we adjust for preexisting characteristics of the boys in the latter models. We account for the clustering of waves within boys in the standard model using the Huber-White approach (Wooldridge, 2002).

These models include three dummy indicators to capture the four categories of gang status (“never” in a gang; ever in a gang and at a wave “before,” “during” or “after” participation). We then conduct additional tests to estimate four key contrasts.² The first contrast (“before versus

2. The additional two contrasts can be calculated based on the presented coefficients. “During versus never” is the sum of the “during versus before” and “before versus

never") captures selection: Do boys who will later join gangs ("before") report higher levels of delinquency than boys who do not join gangs ("never"). The next contrasts capture socialization. Does a boy's delinquency increase when he enters a gang ("during versus before") and decrease when he exits ("during versus after")? The final contrast further refines the evidence of socialization: Does a boy's delinquency decline sufficiently after he exits a gang such that it returns to his pre-gang level of delinquency ("after versus before")? Because these hypotheses are directional, one-sided significance levels are reported. All of these contrasts are conducted such that the coefficient will be positive if consistent with the hypothesis.

Table 1. Standard and Fixed Effects Models of Boys' Self-Reported Drug Sales and Drug Use

	Drug Sales		Drug Use	
	Standard	Fixed Effects	Standard	Fixed Effects
Before versus never	1.14** (0.28)	—	0.46** (0.17)	—
During versus before	1.14** (0.27)	1.12** (0.21)	0.68** (0.17)	0.55** (0.18)
During versus after	1.07** (0.18)	0.89** (0.15)	0.50** (0.10)	0.38** (0.14)
After versus before	0.07 (0.29)	0.23 (0.25)	0.18 (0.18)	0.16 (0.22)
Number of boys	805	114	800	124
Number of waves	7,248	1,192	6,800	1,209

Note: Values are differences in coefficients between listed gang status groups. Standard errors are in parentheses. "Standard" models are negative binomial regression models with standard errors adjusted for clustering of waves within boys. "Fixed effects" models are conditional fixed effects negative binomial regression models. Both "standard" and "fixed effects" models include gang status dummy indicators and control for within-cohort dummy indicators of study wave, the boy's age in month, and the square of the boy's age in months. "Fixed effects" models are restricted to boys who ever join gangs. Because the alternative hypotheses are directional, one-sided significance levels are reported: ** $p < .005$, * $p < .025$. + $p < .05$.

never" coefficients. "After versus never" is the sum of the "after versus before" and "before versus never" coefficients. All of these coefficients are positive and significant for the models reported in Tables 1 and 2. These coefficients are not presented in the tables because they combine selection and socialization, and thus are of lesser theoretical interest.

Table 2. Standard (STD) and Fixed Effects Models of Boys' Self-Reported Aggression, Violent Delinquency and Property Delinquency

	Aggression		Violent Delinquency (SRD)		Violent Delinquency (YSR)		Property Delinquency (SRD)		Property Delinquency (YSR)	
	STD	Fixed Effects	STD	Fixed Effects	STD	Fixed Effects	STD	Fixed Effects	STD	Fixed Effects
Before versus never	0.43** (0.07)	-	0.64** (0.11)	-	0.67** (0.09)	-	0.54** (0.13)	-	0.60** (0.13)	-
During versus before	1.09** (0.09)	0.71** (0.08)	1.12** (0.11)	0.86** (0.09)	0.79** (0.09)	0.38** (0.09)	0.73** (0.13)	0.74** (0.12)	0.43** (0.13)	0.25+ (0.14)
During versus after	0.52** (0.09)	0.55** (0.08)	0.65** (0.09)	0.65** (0.09)	0.26** (0.09)	0.27** (0.08)	0.65** (0.15)	0.69** (0.12)	0.24+ (0.13)	0.20 (0.13)
After versus before	0.58** (0.11)	0.16 (0.11)	0.47** (0.13)	0.21+ (0.13)	0.53** (0.11)	0.11 (0.11)	0.08 (0.19)	0.04 (0.16)	0.19 (0.16)	0.04 (0.19)
Number of boys	858	165	805	164	800	159	858	158	800	135
Number of waves	10,593	2,195	7,249	1,594	6,797	1,471	10,593	2,115	6,799	1,229

Note: Values are differences in coefficients between listed gang status groups. Standard errors are in parentheses. "Standard" models are negative binomial regression models with standard errors adjusted for clustering of waves within boys. "Fixed effects" models are conditional fixed effects negative binomial regression models. Both "standard" and "fixed effects" models include gang status dummy indicators and control for within-cohort dummy indicators of study wave, the boy's age in month, and the square of the boy's age in months. "Fixed effects" models are restricted to boys who ever join gangs. Because the alternative hypotheses are directional, one-sided significance levels are reported: ** p<.005, * p<.025, + p<.05.

All the models presented also control for age, seasonality and calendar-time trends through cohort-specific dummy variables for study wave and linear and quadratic terms for the boy's age in months. The use of wave dummies, rather than a linear measure of calendar time, allows for the relationship between time and delinquency to take on an arbitrary shape. For example, a general increase over time may take on a stair-step shape if increases happen in one season and plateau in another. Sudden spikes associated with particular events are also allowed. By being cohort-specific, the wave dummy variables allow these relationships to differ for the older and younger samples. Within cohort and wave, boys' ages in months vary. The additive and quadratic terms capture any additional time-trends associated with increasing age.

The most consistent finding is that evidence of socialization remains once we control for time-trends (standard models) and for time-trends and preexisting characteristics (fixed effects models). For all outcomes, the "during versus before" contrast is significantly positive, indicating that boys report more delinquency when they are active in the gang than they did before they entered the gang, above and beyond general age-, seasonal- and time-trends in the data and above and beyond preexisting

characteristics of boys that are correlated both with gang entry and delinquency (see “during versus before” rows in Tables 1 and 2). For example, when boys are active in gangs they engage in over 3 times more drug selling than they did before they entered the gang ($\exp[1.14]=3.13$).

We also see that the evidence of selection for violent and property delinquency remains when we control for time-trends in the standard negative binomial regression model (see significant “before versus never” contrasts in the “standard” columns of Table 2). However, adjusting for time-trends reveals selection for drug-related delinquency not evident in the simple descriptive means (see Table 1). This is because drug-sales and drug-use increase with age, not peaking until late adolescence, and generally increase with calendar time. Because boys who are “before gang” are younger and at earlier study waves, their drug-related delinquency appears similar to the average drug-related delinquency across all study waves of the “never gang” youth until we adjust for these time-related trends. In contrast, violent and property delinquency generally decline across age and calendar time. Thus, the “before versus never” coefficients in Table 2 for violent and property crimes, though still significant, are somewhat smaller than those that do not control for time-trends (the coefficients, not shown, underlying Figure 1).

The findings for the persistence of delinquency after a gang exit also differ in the multivariate versus the descriptive models. Whereas there was evidence of persistence in drug-related delinquency in the descriptive statistics displayed in Figure 1, this is not the case in Table 1. The “during versus after” contrasts in Table 1 are positive and significant, indicating that boys report more drug-related delinquency while they are active members than they do after they leave the gang. In fact the decrease in drug-related delinquency upon exit is fairly comparable to the increase on entry: For drug sales, boys report an increase of just over 3 times ($\exp[1.14]$) when they enter a gang and a decline of just under 3 times ($\exp[1.07]$) after they leave the gang. Indeed, the “after versus before” contrasts for drug sales and drug use in Table 1 are not significant, indicating that the boys’ level of drug-selling and drug use have declined enough to equal the levels they had reported before they entered gangs. Similar to the bias described above for the selection (“before versus never”) findings, this reflects the fact that the “after gang” periods occur when boys are older and later in calendar time when general time-trends reveal greater drug-related delinquency.

A similar bias is evident for aggression and violent delinquency, though in the opposite direction. Whereas the descriptive means in Figure 1 revealed no persistence in violent delinquency after a gang exit, the standard models that adjust for time-trends do indicate persistence (significant “after versus before” contrasts in the “standard” columns of

Table 2). We also see the greatest difference between the standard and fixed effects models for violent delinquency, indicating a biasing effect of failure to control for preexisting characteristics of boys that are correlated with both gang participation and violence. The “after versus before” contrasts are significant for violent delinquency in the standard but generally not the fixed effects models. Although the “during versus before” contrasts for violent delinquency are significant in both models, they also reflect this bias by being smaller—one-half to one-quarter the size—in the fixed effects versus the standard models. This indicates that the increase in violent delinquency upon gang entry is overestimated before we account for unmeasured preexisting characteristics of boys. Once these confounds are controlled, the increase and decrease in violence associated with gang entry and exit are fairly comparable, leaving little evidence of persistence once the boy leaves a gang.

Although replicating the generally strong association between current gang participation and elevated delinquent activity, these findings differ somewhat from prior research. Prior longitudinal studies have found that this association is strongest for violent delinquency and that drug-related activity is most likely to persist after a gang exit (see Thornberry, 1998 and Thornberry et al., 2003). Our data are more consistent with these prior studies before we add controls for time trends. That is, the post-gang periods are later in calendar time and age when drug selling and drug use had increased and violent and property delinquency were lower among Pittsburgh youth. We also see more evidence of selection into gangs than have prior studies, perhaps due to accounting for gang memberships that occurred before the study began as well as due to adjusting for these general time trends.

EXPLORING SOCIALIZATION MECHANISMS

We estimated additional models to examine whether peer delinquency (the proportion of the boys’ friends who commit delinquent acts) is a potential socialization mechanism. Table 3 presents fixed effects models that predict peer drug sales, drug use, violent delinquency and property delinquency, controlling for age-, seasonal- and calendar-time trends and preexisting characteristics of boys. The pattern of significant effects generally mirrors the findings for the boys’ own activities. All four outcomes increase significantly when the boy enters a gang (“during versus before”). All also significantly decline after an exit (“during versus after”), although there is some evidence of persistence in peers’ drug use and violent delinquency (“after versus before”).

These findings suggest that changes in peer delinquency may be one mechanism through which boys’ own delinquency changes when they

participate in gangs. We thus added peer delinquency to the fixed effects models predicting youth delinquency within domain (for example, controlling for peer drug sales when predicting youth drug sales). The socialization coefficients are uniformly reduced suggesting that peer delinquency is a partial mechanism (compare Table 4 with the “fixed effects” columns in Tables 1 and 2).³

Table 3. Fixed Effects Models of Peer Delinquency

	Drug Sales	Drug Use	Violent Delinquency	Property Delinquency
During versus before	0.68** (0.15)	0.42** (0.09)	0.68** (0.08)	0.42** (0.07)
During versus after	0.51** (0.12)	0.23** (0.07)	0.48** (0.07)	0.31** (0.06)
After versus before	0.18 (0.19)	0.20+ (0.10)	0.20+ (0.10)	0.11 (0.09)
Number of boys	142	161	163	164
Number of waves	1,313	1,953	1,465	1,981

Note: Values are differences in conditional fixed effects negative binomial regression coefficients between listed gang status groups. Standard errors are in parentheses. In addition to gang status dummy indicators, the models control for within-cohort dummy indicators of study wave, the boy's age in months, and the square of the boy's age in months. Because the alternative hypotheses are directional, one-sided significance levels are reported: ** $p < .005$, * $p < .025$. + $p < .05$.

In particular, the coefficients measuring the increase in delinquency associated with gang entry (“during versus before”) are between 13 percent and 46 percent less. Additionally, the coefficients measuring the decrease in delinquency associated with gang exit (“during versus after”) are between 13 percent and 65 percent less. With the exception of Youth Self-Report property delinquency, however, all of these coefficients remain significant, suggesting that a mechanism in addition to peer delinquency operates. In addition, generally, peer delinquency explains the gang-entry increase and the gang-exit decrease comparably enough such that the “after versus before” coefficients continue to be insignificant. The exception is with aggression. For this outcome, we capture more of

3. The sample size is reduced when we control for peer delinquency due to missing values on these variables. We estimated the models in Tables 1 and 2 on this reduced sample size to evaluate whether the difference in coefficients between Table 4 and Tables 1 and 2 is merely due to differences in the samples. The percent reduction in coefficients is highly similar when we use these new results: 27 percent to 48 percent reduction in the “during versus before” coefficients and 13 percent to 65 percent reduction in the “during versus after” coefficients when we control for peer delinquency.

the mechanism of a decline in aggression upon leaving a gang than the mechanism for a rise in aggression upon joining a gang, thus the “after versus before” coefficient is significant when peer delinquency is controlled.

CONSISTENCY OF FINDINGS IN ALTERNATIVE MODELS

We reestimated the fixed effects models from Tables 1 and 2 using OLS rather than a negative binomial specification and found that the results of twenty of the twenty-one significance tests are the same. (The exception is that none of the “after versus before” contrasts are significant in OLS, whereas one is just significant in the negative binomial specification).

Table 4. Fixed Effects Models of Boys’ Self-Reported Delinquency Controlling for Peer Delinquency

	Drug Sales	Drug Use	Aggression	Violent Delinquency (SRD)	Violent Delinquency (YSR)	Property Delinquency (SRD)	Property Delinquency (YSR)
During vs before	0.61** (0.22)	0.37* (0.19)	0.62** (0.10)	0.59** (0.10)	0.31** (0.09)	0.59** (0.12)	0.14 (0.15)
During vs after	0.38* (0.16)	0.33* (0.14)	0.31** (0.09)	0.38** (0.09)	0.15+ (0.08)	0.44** (0.12)	0.07 (0.13)
After vs before	0.23 (0.26)	0.04 (0.23)	0.31* (0.13)	0.21 (0.13)	0.17 (0.12)	0.15 (0.16)	0.07 (0.19)
# boys	111	121	163	163	158	153	134
# waves	1,052	1,082	1,465	1,465	1,343	1,861	1,118

Note: Values are differences in conditional fixed effects negative binomial regression coefficients between listed gang status groups. Standard errors are in parentheses. In addition to gang status dummy indicators, the models control for within-cohort dummy indicators of study wave, the boy’s age in month, and the square of the boy’s age in months. Because the alternative hypotheses are directional, one-sided significance levels are reported: ** p<.005, * p<.025. + p<.05.

We also reestimated the models with the unconditional, rather than conditional, fixed effects negative binomial regression model. These results are consistent with those reported in Tables 1 and 2 although they reveal more evidence of persistence in delinquency (the “after versus before” contrast is significant at one-sided p<.05 for drug sales and one-sided p<.025 for aggression) and, in terms of property delinquency, the results for Youth Self-Report are more similar to the results for Self-Reported Delinquency (in the unconditional model of Youth Self-Report, one-sided p<.025 for “during versus before” and one-sided p<.05 for “during versus after”).

Finally, we reestimated the models with random rather than fixed effects and tested the random effects assumption. The random effects

models, like the fixed effects models, show evidence of socialization. The “during versus before” and “during versus after” contrasts are significant for all outcomes. However, specification tests suggest that the random effects model is not adequate for this data. Before we control for time variation by age, season and year, the random effects assumption is rejected by the Hausman test for all outcomes. When we add controls for time-trends, the assumption is rejected for violent delinquency (Self-Reported Delinquency and Youth Self-Report; details available from the authors). In addition, if the random effects models adequately adjust for preexisting characteristics of boys, then gang boys should not differ from nongang boys in these models before they enter gangs. In the language of our tables, the “before versus never” contrast should be insignificant. However, we find that these contrasts remain significant for all outcomes in the random effects models.

PARENT AND TEACHER REPORTS

Our analyses to this point have been based entirely on youth self-reports. Thus we cannot distinguish whether gang membership is associated with actual changes in behavior or with other factors such as changes in the social desirability the boy perceives for reporting delinquent activity when he is involved in a gang. To help examine this issue, we reestimated the models using parent and teacher reports of the boys’ delinquent activities. As with youth self-reports, the findings for these informants are subject to various interpretations. However, generally, whereas boys’ reports might overestimate gang effects, parent and teacher reports might underestimate them (for example, we might see less of an association between gang status and delinquent activity because parents and teachers are less aware of the boys’ activities). In addition, because parents and teachers were not interviewed for the latter half of the study period among the oldest sample, we lack data for the late adolescent and young adult period from these informants. Significant findings based on parent and teacher reports might therefore be interpreted as strong evidence of socialization pathways.

We estimated the fixed effects models for parents reports (Table 5) and for teacher reports (Table 6) twice, once without controls for peer delinquency and once with controls for peer delinquency. We begin with the models without peer delinquency to identify any evidence of socialization and then examine whether peer delinquency might be a socialization mechanism. Both parents and teachers report that youths’ property delinquency increases when they enter a gang and that it remains elevated after they exit the gang (significant “during versus before” and “after versus before” coefficients in the “property delinquency/without peer controls” columns). Both parents and teachers also report an

elevation in youths' violent delinquency, though parents appear to see it sooner. In particular, parents report an increase associated with the boys' gang entry (significant "during versus before" coefficient in the "violent delinquency/without peer controls" column in Table 5). But teachers do not report such an increase until after the boy has exited the gang (margin-

Table 5. Fixed Effects Models of Boys' Delinquent Activity: Parent Reports

	Drug Use		Violent Delinquency		Property Delinquency	
	Without Peer Controls	With Peer Controls	Without Peer Controls	With Peer Controls	Without Peer Controls	With Peer Controls
During versus before	0.46 (0.34)	0.32 (0.36)	0.27** (0.09)	0.14 (0.11)	0.38** (0.13)	0.30* (0.14)
During versus after	-0.09 (0.26)	-0.13 (0.27)	0.08 (0.09)	0.18+ (0.10)	0.02 (0.13)	-0.02 (0.14)
After versus before	0.55 (0.42)	0.46 (0.44)	0.18 (0.11)	-0.04 (0.14)	0.36* (0.17)	0.32+ (0.17)
Number of boys	77	76	153	143	128	123
Number of waves	833	750	1,661	966	1,416	1,247

Note: Values are differences in conditional fixed effects negative binomial regression coefficients between listed gang status groups. Standard errors are in parentheses. In addition to gang status dummy indicators, the models control for within-cohort dummy indicators of study wave, the boy's age in month, and the square of the boy's age in months. Because the alternative hypotheses are directional, one-sided significance levels are reported: ** p<.005, * p<.025, + p<.05.

Table 6. Fixed Effects Models of Boys' Delinquent Activity: Teacher Reports

	Drug Use		Violent Delinquency		Property Delinquency	
	Without Peer Controls	With Peer Controls	Without Peer Controls	With Peer Controls	Without Peer Controls	With Peer Controls
During versus before	0.55 (0.64)	0.18 (0.71)	0.02 (0.11)	-0.11 (0.15)	0.65** (0.18)	0.69** (0.19)
During versus after	0.15 (0.60)	-0.62 (0.74)	-0.25+ (0.13)	-0.29+ (0.16)	-0.13 (0.19)	-0.28 (0.20)
After versus before	0.40 (0.82)	0.80 (0.88)	0.27+ (0.15)	0.18 (0.19)	0.78** (0.24)	0.97** (0.25)
Number of Boys	51	46	150	137	122	115
Number of Waves	347	287	1,296	662	1,055	907

Note: Values are differences in conditional fixed effects negative binomial regression coefficients between listed gang status groups. Standard errors are in parentheses. In addition to gang status dummy indicators, the models control for within-cohort dummy indicators of study wave, the boy's age in month, and the square of the boy's age in months. Because the alternative hypotheses are directional, one-sided significance levels are reported: ** p<.005, * p<.025, + p<.05.

ally significantly negative “during versus after” coefficient and significantly positive “after versus before” coefficient in the “violent delinquency/without peer controls” column of Table 6). Neither parents nor teachers report an association between gang participation and drug use. Regarding mechanisms of socialization, parents’ reports of violent delinquency increasing when boys join a gang is most explained by youth reports of changes in peers’ violent delinquency (see “during before before” coefficient in “violent delinquency/with peer controls” column of Table 5). The associations with property delinquency decrease slightly for parent reports and unexpectedly increase for teacher reports once youth-reported peer delinquency is controlled (see “during versus before” and “after versus before” coefficients in “property delinquency/with peer controls” columns of Tables 5 and 6).

DISCUSSION

SUMMARY OF FINDINGS

We examined the degree to which being a gang member is associated with high levels of delinquency, above and beyond expected levels (given that boys predisposed to delinquent activity may be more likely to enter and stay in gangs). We built on prior research by controlling for boys’ age and calendar time, by accounting for gang participation before the study began and by using fixed effects statistical models to comprehensively adjust for all preexisting characteristics of boys. We found more evidence than prior studies have that boys who join gangs are more delinquent before entering the gang than those who do not join. Even with such selective differences, however, we replicate prior findings of a substantial increase in drug selling, drug use, violent delinquency and property delinquency when boys are active gang members. Additional analyses suggest that the mechanisms through which gangs have their effects include changes in delinquency of the boys’ peers. That is, peer delinquency is elevated during periods of gang memberships and explains a portion of the increase in boys’ delinquency when they enter gangs and the decrease when they exit.

In initial descriptive associations, we replicate prior evidence of drug-selling persisting after boys exit gangs. However, this association is explained by periods after gang membership being correlated with later years when drug-selling had generally increased among Pittsburgh youth. After we adjust for age, season, calendar year and preexisting characteristics of boys, we find little or no evidence of persistence in drug-related, property or violent delinquency after a boy exits a gang.

Associations with parent and teacher reports of boys' delinquent activity further substantiate these findings. Both indicate increases in boys' property delinquency when they are gang members. Parents, and to a lesser extent teachers, also report increased violent delinquency, and these associations are explained by youth reports of changes in his peers' violent criminality.

CONCLUSIONS AND LIMITATIONS

The fixed effects models we employ do not adjust for time varying covariates associated with both delinquency and gang membership. Thus, we cannot rule out the fact that some third variable predicts both gang participation and increased delinquency in a particular time period, rather than there being a causal effect of gangs. Our models do adjust for any such variables correlated with the boys' age, with season and year, or with peer delinquency. Future research on gangs should focus on measuring potential time-varying confounds and causal mechanisms. Although not using a fixed effects approach, Thornberry and colleagues updated their earlier models with controls for family poverty level, parental supervision, commitment to school, negative life events, youth violence and delinquent peers in the year prior to gang membership. They still find a strong positive association between a dummy variable for current gang membership and self-reported violence with these time-varying controls (Thornberry, 1998; Thornberry et al., 2003).

In this study, we saw that peer delinquency was elevated during a period of gang membership and explained some of the association between gang membership and youth delinquency. One way to illuminate this finding in future research would be to use more detailed data about boys' peer networks. Such studies could examine, for example, whether some youth join gangs simultaneously with existing friends, and both show elevations in delinquency, or whether some youth add new delinquent friends, and eliminate prior non-delinquent friendships, during periods of gang membership. Likewise, such studies could examine how this mechanism operates upon gang exit: Do boys stop associating with delinquent youth, and return to old friends, or do they and their long-term friends drop out of gangs simultaneously? Another fruitful direction for understanding this mechanisms would be to continue research that has examined whether there is a different effect of associating with delinquent peers inside versus outside of a gang structure (for example, Battin et al., 1998; Thornberry et al., 2003).

We should emphasize that there is also an issue of causal direction. Does a decrease in peer delinquency lead to a decrease in the boy's delinquency, or does a decrease in the boy's delinquency lead to a decline

in his peers' delinquency? The direction suggested above is sensible, but the other is plausible as well. For example, a boy might exit a gang and reduce his own delinquency because the opportunities for delinquency are now diminished. Because his delinquency is reduced, his associations with delinquent boys may decline. Given that some effect of gang membership remains, even after controlling for peer delinquency, future research should also examine additional mechanisms. For example, Hagedorn (1994) emphasized the importance of using organizational theories to understand gangs and to recognize heterogeneity across gangs in their structures.

Our results do not provide evidence of persistence in the boy's delinquency after he leaves a gang, including drug selling that had been shown to persist in prior studies. The fact that drug selling does not remain elevated afterwards, once time trends are controlled, should not minimize the importance of its elevation among active gang members. The increased use of custodial sentences for drug offenses means that even a brief increase in drug selling during a short period of gang membership could be substantively meaningful (Blumstein and Beck, 1999). In addition, boys report that increased violence and peer drug use persist after they leave gangs, indicating that some effects of gang participation may not be transient. Of course, our failure to find evidence of persistence is susceptible to a Type II error. This potential is amplified by the fact that relatively few boys are observed to exit a gang more than once. Additional waves of data might provide more post-gang data points and identify additional gang exits. Understanding why many boys leave gangs, while some stay, is also an important direction for future research, which would also benefit from larger samples of gang exits.

We find evidence of socialization effects of gangs based on parent and teacher reports, though significant coefficients are seen for fewer outcomes and contrasts than is the case for youth reports. We cannot distinguish whether the stronger evidence in self-reports reflects that youths are more aware of their own behavior than parents or teachers, or that they overstate their delinquency during times when they say they are gang members. Future research might further examine the degree to which associations hold across multiple informants. For example, though peers may have their own biases (for example, susceptibility to rumors), they may have greater information about adolescents' activity than would parents and teachers. Along these lines, recent research in Canada found that classmates reported gang members to be more aggressive than nongang youth (Craig, Vitaro, Gagnon and Tremblay, 2002).

Using more comprehensive controls for preexisting characteristics of boys as well as controls for age, season and calendar year, this study further substantiates earlier research on a substantial elevation in

delinquency when boys are active gang members. Limitations notwithstanding, these results reinforce the need for interventions aimed at delinquent youth gangs.

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Appendix A. Timing of Data Collection

Measured Construct	Wave Letter and Years Since Screening																					
	S	A	C	E	G	I	J	K	L	M	N	O	P	Q	R	SS	T	U				
	0	.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5
Youngest sample																						
Gang membership								x ^a	x	x	x	x	x	x	x	x	x					
Peer delinquency		x ^c	x ^c	x ^c	x ^c	x ^c	x ^c	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Self-reported delinquency	x ^b	x ^b	x ^b	x ^b	x ^b	x ^b	x ^b	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CBCL (Parent)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TRF (Teacher)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
YSR (Youth)								x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Oldest sample																						
Gang membership					x ^a	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Peer delinquency		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Self-reported delinquency	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CBCL (Parent)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TRF (Teacher)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
YSR (Youth)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Note.—Beginning in F for the oldest sample and I for the youngest sample, planned semi-annual follow-ups were omitted for budgetary reasons and boys were interviewed in alternating annual follow-ups based on grade sample. X=data collected and available for analyses. ^a In the first gang membership questionnaire, boys were asked about gang in which they had ever participated. At later waves, the gang questionnaires asked about gangs the boys had participated in since the last wave of the study. ^bSelf-Reported Antisocial Behavior Scale before G for the youngest sample (drug sales excluded from questions). ^c Drug sales excluded from questions and violent delinquency not directly comparable with later waves.

Appendix B. Classification of Boy's and Peers' Activities

Type of Activity		Property Delinquency	Drug Sales	Drug Use
Instrument Peer Delinquency Scale	Violent Delinquency & Aggression^a			
	1. hit people to hurt them ^b	1. purposely damaged property	1. sold hard drugs ^a	1. drank/used alcohol
	2. attacked someone with a weapon ^b	2. broke into buildings to steal		2. used marijuana/hashish
	3. used strongarm methods ^b	3. stole things (at home, school, or store)		
	1. carried a hidden weapon	1. purposely damaged property	1. sold soft drugs ^a	
	2. hit people	2. arson to buildings/cars	2. sold hard drugs ^a	
	3. threw rocks or bottles at people	3. didn't pay (for movies, bus, food)		
Self-Reported Behavior/ Self-Reported Delinquency	4. attacked people w/weapon to hurt/kill ^b	4. stole things (at home/school)		
	5. used a weapon/force to get things ^b	5. shoplifted		
	6. hurt/Threatened people for sex ^b	6. snatched purses/picked pockets		
	7. sexual harassment/assault ^b	7. stole from cars		
	1. gets into many fights	1. destroys things of others	1. uses alcohol/drugs	
	2. attacks people physically	2. sets fires		
	3. threatens to hurt people	3. steals		
Youth Self-report	1. gets into many fights	1. destroys things of others	1. uses alcohol/drugs	
	2. attacks people physically	2. sets fires		
	3. threatens to hurt people	3. steals		
	4. hits/fights with students	4. vandalizes		
	5. starts fights over nothing			
Teacher Report Form	1. gets into many fights	1. destroys things of others	1. uses alcohol/drugs	
	2. attacks people physically	2. sets fires		
	3. threatens to hurt people	3. steals		
	4. hits/fights with students	4. vandalizes		
	5. starts fights over nothing			
Child Behavior Checklist	1. gets into many fights	1. destroys things of others	1. uses alcohol/drugs	
	2. attacks people physically	2. sets fires		
	3. threatens to hurt people	3. steals at home		
	4. hits/fights with students	4. steals outside the home		
	5. starts fights over nothing	5. steals at school		
	6. steals a bicycle/skateboard			
	7. goes into building/vehicle to steal			
	8. vandalizes			
	9. shoplifts			

Note: For all measures of youth and peer delinquency, analyzed summary variables take the simple sum of the items within each category.^a Violent delinquency is constructed for all instruments. Because several key items were not asked of the first grade sample when the Self-Reported Antisocial Behavior instrument was used, we also define a measure of aggression using the first three SRA/SRD items (carried a hidden weapon, hit people, and threw rocks or bottles at people).^b These questions were not asked of the first grade sample in the first seven waves of data collection when the Self-Reported Antisocial Behavior instrument was used
