THE IMPACT OF FORMAL AND INFORMAL SOCIAL CONTROLS ON THE CRIMINAL ACTIVITIES OF PROBATIONERS

DORIS LAYTON MacKENZIE
SPENCER DE LI

The monthly self-reported criminal activities, risk behaviors, and local life circumstances of offenders who began sentences of probation in northern Virginia were examined during the year prior to arrest, between arrest and probation, and during the first eight months of probation. The criminal activities and risk behaviors of the offenders declined dramatically after arrest and continued at this lower level throughout the probation period studied. When these offenders participated in high-risk behaviors such as carrying a gun, using drugs, and heavy use of alcohol, they committed more crimes; conversely, when they lived with spouses or were employed, they committed fewer crimes. There was no change in local life circumstances from the prearrest, arrest, and probation periods. The decline in criminal activities after arrest and during probation did not appear to be related to changes in informal social controls as measured by local life circumstances. The results were interpreted as consistent with a possible a deterrent effect.

Approximately 58 percent of the 5.3 million adults under some type of correctional supervision during 1995 were serving terms of probation (Maguire and Pastore 1997). Seventy percent of the adults under correctional control are in their communities on state or federal probation or parole. Probationers account for a large proportion of the criminal activities in large, urban areas, and many of them are rearrested within three years of starting probation. Most research investigating the criminal activities of probationers has

used official measures of crime. Much criminal activity does not come to the attention of the criminal justice system. Furthermore, more intense supervision may result in increased detection but not necessarily reflect an increase in the level of criminal activity. Both of these difficulties limit the usefulness of official measures of recidivism in understanding the impact of arrest and probation on the criminal activities of offenders.

Recent research using self-report data to measure the level of criminal activity has examined the link between drug use and crime and the offending patterns of prison inmates and active burglars. In general, self-report studies investigating the criminal activities of offenders have not provided strong evidence that arrest and probation reduce criminal activity. Wright et al. (1992) did find that those who had never been arrested committed more burglaries than those who had been arrested, suggesting that arrest may indeed have some impact on reducing criminal behavior. However, none of these studies were designed to examine the activities of the offenders soon after they were arrested and sentenced to terms of probation.

Several theories suggest that probation would have an impact on the criminal activities of offenders. From the perspective of deterrence and rational choice theories, arrest and probation supervision would be expected to raise the costs of crime by causing offenders to reevaluate the possibility that their crimes would be detected. Another possibility is that during probation, offenders are coerced into situations that increase their bonds or ties to social institutions. That is, they may be required to work or have stable residences, or the sentence of probation may act as a critical life event that initiates such changes. In any case, if probation results in an increase in such ties, the resulting ties may act as informal social controls to curb criminal activity. Previous studies have shown that informal social controls such as bonds or ties to social institutions are associated with reduced criminal activity (Sampson and Laub 1993). This reduction occurs even when there are short-term changes in local life circumstances (Horney, Osgood, and Marshall 1995). During periods when offenders live with spouses, attend school, or work, they commit fewer crimes.

This study was designed to investigate the impact of arrest and probation on the criminal activities of offenders who are serving sentences of probation. Using the calendar technique of Horney et al. (1995), we interviewed probationers soon after they began sentences of probation to investigate their criminal activities, local life circumstances, and high-risk behaviors (e.g., use of drugs) in the year prior to arrest for the current sentence and from arrest to the beginning of probation. Approximately eight months later, we again interviewed them about their activities and circumstances during the time they were on probation. This permitted us to investigate whether the criminal

activities, circumstances, and risk behaviors of the probationers changed as a function of arrest and/or probation. If criminal activities decreased after probation, we would be able to investigate the mechanism of this change by examining the association among criminal justice system activity, criminal behavior, and social bonds.

Examining the Effectiveness of Probation

Despite its widespread use, probation has not been the subject of extensive research. Research examining the effectiveness of probation usually focuses on whether a person on probation refrains from committing further crimes and whether the services provided make a difference in the outcomes (Petersilia and Turner 1990). A relatively large percentage of those on probation are rearrested while still on probation. For example, Langan and Cunnif (1992) found that 43 percent of the adults serving probation sentences for felonies were rearrested for crimes within three years. Seventeen percent of all persons arrested for felonies in large, urban counties in 1990 were on probation (Bureau of Justice Statistics 1993). Furthermore, 44 percent of the persons in prison were on probation or parole at the time of the offenses that resulted in their sentences to prison. In many states, a substantial number of probations are revoked for failure to comply with release conditions (Parent et al. 1992). Studies of intensive supervision indicate that increasing the intensity of supervision results in increases in revocations and technical violations (Petersilia and Turner 1993).

Taken as a whole, the results documenting the large number of crimes committed by probationers combined with the high failure rate for those on probation have led many to question whether probation has any impact on the criminal activities of offenders. However, most studies that have attempted to understand the impact of probation on criminal activities have used official records of arrests, reconvictions, or revocations as the outcome measures (Petersilia 1998). Because many crimes do not come to the attention of the criminal justice system, or perpetrators are not identified, official records are severely limited (Hindelang, Hirschi, and Weiss 1981). Furthermore, official records are influenced by increased surveillance. That is, an increase in supervision may result in more probationers being caught, even though the level of criminal activity does not change.

Self-Report Measures of Criminal Activity

Self-report research methods have been extended to the investigation of criminal activity in the community by examining the relationship between

drug use and crime (Inciardi 1979), the adult offending patterns of prison inmates (e.g., Chaiken and Chaiken 1982) and the offending patterns of active burglars (Wright et al. 1992). The advent of self-report measures of criminal offending provides unique insight into offending patterns. Although not without problems, self-report methods capture a great deal of behavior undetected by law enforcement officials and avoid the biases associated with criminal justice processing.

Recent evaluations using self-report measures of criminal offending are illustrative of the benefits of such measures. Wright et al. (1992), for example, interviewed active residential burglars to obtain measures of the frequency of offending. Interestingly, 20 percent of the total sample of 105 burglars were serving time on probation, parole, or suspended sentences. Because the researchers interviewed only active burglars, these were offenders who clearly were not deterred by community supervision. Most importantly, though, in support of the use of self-report measures, particularly among active offenders, the researchers found that those "who have never been arrested for anything, on average, offended *more* frequently and had committed *more* lifetime burglaries than their arrested counterparts" (Wright et al. 1992:160). This finding suggests that an arrest or other response by the criminal justice system had an impact on the criminal activities of some of these burglars, although it is not possible to rule out the possibility that those who were not caught as often were more adept and therefore offended more frequently because of the success they enjoyed in their chosen occupation.

Self-report measures have also been used to investigate the relationship between drug use and criminal offending. Inciardi (1979), for example, collected interview data on a sample of active heroin users in Miami. His study revealed that in spite of a substantial amount of offending committed by the 356 participants in the sample, only a fraction of the offenses resulted in arrests. More specifically, Inciardi (1979) reported that of the 118,134 self-reported crimes committed during the 12-month time period, only 286 (0.2 percent) resulted in arrests. Similar to that of Wright et al. (1992), this study provides rather conclusive evidence that self-reported rates of criminal offending may differ substantially from officially detected criminal behavior.

The RAND Corporation pioneered the use of self-report data to measure rates of adult offending collected from prison inmates (e.g., Chaiken and Chaiken 1982). The results of RAND's work revealed that the frequency of adult offending, or lambda, was highly skewed. The distribution was skewed such that most inmates reported low rates of offending, and a minority reported very high rates of offending (sometimes exceeding 100 crimes per year; Chaiken and Chaiken 1982). The RAND Corporation's findings were controversial because of the questionable validity of its research instruments.

Some commentators contended, for example, that the questionnaire was long and complicated, resulting in a great deal of missing or ambiguous answers (Horney and Marshall 1991). Others argued that the research instruments assumed a constant rate of offending over time (Rolph, Chaiken, and Houchens 1981).

Horney and Marshall (1991, 1992) refined the techniques used by the RAND Corporation to collect self-report data from prison inmates. Instead of administering questionnaires, as did the RAND researchers, Horney and Marshall (1991) used interview techniques. In addition, Horney and Marshall developed more detailed calendars to establish the reference period and assist in recollection. The calendars were intended "to help the respondent relate, both visually and mentally, to the timing of several kinds of events" (Horney and Marshall 1991:476). Event calendars were used to gather monthly data on life history events such as employment, residential status, and living companions during the previous three years. Thus, they helped provide a context for the criminal offending questions. Further, in contrast to the RAND researchers, Horney and Marshall (1991) did not assume a constant rate of offending over time by asking inmates to recollect offending rates on a month-to-month basis. They thereby allowed for intraindividual variability.

Horney and Marshall (1991) reported that the "event" and "crime" calendar technique was effective in aiding recall, often leading respondents to verbalize the process of remembering certain events. In terms of offending patterns, the research revealed that patterns of active offending varied considerably among individuals and by crime type, for example (Horney and Marshall 1991). Consistent with the RAND Corporation research, they also found a highly skewed distribution of offending. Horney and Marshall (1992) used an experimental design to compare the RAND Corporation's technique (see Chaiken and Chaiken 1982) with their own technique described above. Interestingly, despite the use of the refined technique, the distributions obtained using the RAND methodology and the refined methodology did not differ significantly.

In summary, recent studies of adult offending collected from prison inmates, active heroin users, and active residential burglars reveal the utility—indeed, the necessity—of using self-report methods to obtain valid measures of adult criminal offending patterns. Both studies of active adult offenders (e.g., heroin users and residential burglars) demonstrate unequivocally that the majority of criminal offending is not detected by law enforcement officials. Further, Horney and Marshall's (1992) experimental comparison of two methods of collecting self-report data from prison inmates revealed that although the use of the RAND Corporation's self-report instruments was the subject of a great deal of controversy due to presumed

methodological shortcomings, the results obtained (i.e., measure of lambda) using the RAND instruments and more refined techniques did not differ significantly.

The Potential Impact of Probation

Criminal career research provides evidence of the need to take into consideration both continuity and change if we are to understand criminal behavior. Sampson and Laub (1993) emphasized the importance of considering the informal social controls that form the structure of interpersonal bonds linking individuals to social institutions such as work, family, and school. In their theory, adult social ties are important to the degree that they create obligations and restraints that impose significant costs for translating criminal propensities into action. Although they acknowledged the fact that there appears to be continuity in individual antisocial behavior, unlike the continuity theorists (e.g., Gottfredson and Hirschi 1990; Wilson and Herrnstein 1985), Sampson and Laub (1993) argued that such continuity does not preclude large changes in individuals' offending patterns.

In their reanalysis of Glueck and Glueck's (1950) data, Sampson and Laub (1990) found support for their proposal that childhood antisocial behavior and deviance can be modified over the life course by adult social bonds. Although they did find evidence of criminal propensity or continuity in deviance from childhood to adulthood, they also found evidence of change in offending. Both job stability and marital attachment were significant predictors of adult crime, even when they controlled for childhood delinquency and crime in young adulthood.

Further evidence showing that criminal propensity can be modified in adulthood comes from research by Horney et al. (1995) examining the self-reported criminal activities of incarcerated offenders. They found that even short-term changes in local life circumstances were associated with changes in offending. In their study, Horney et al. (1995) examined month-to-month variation in offending and the life circumstances of imprisoned felons to understand changes in criminal behavior. For these offenders, local life circumstances that strengthened or weakened social bonds influenced offending over relatively short periods of time. Horney et al.'s (1995) studies of individual offenders demonstrated the importance of local life circumstances that change social bonds. These circumstances may provide an essential intermediate level of analysis that can be linked both to enduring individual differences (continuity) and immediate circumstances in which the acts occur. Individuals with high propensities to offend have fewer social bonds compared to those with lower propensities, yet they are still influenced by short-term changes in bonds. That is, although high-propensity individuals may be

less likely to attend school, to work, or to live with spouses, sometimes they do live with spouses, work, or attend school. At such times, they are less likely to commit crimes.

Surprisingly, Horney et al. (1995) did not find any effect of formal social controls such as probation and parole. The offending behavior of their participants was no lower during periods when they were under supervision by the criminal justice system than when they were not. Thus, there was no evidence that formal social control by the criminal justice system reduced offending in this population.

Using a very different methodology, Nagin and Paternoster (1993) also found evidence of both continuity and change in decisions to commit criminal offenses. They presented scenarios to college undergraduates and measured the students' self-control, decisions to offend, perceived attractiveness of the target, and cost and benefits of offending. They found that self-control was directly related to decisions to offend. Yet even when self-control differences were accounted for, the attractiveness of the target and the perceived costs and benefits were influential in decisions to offend. Like Horney et al. (1995), Nagin and Paternoster (1993) concluded that variation in offending reflects both variations in criminal propensity, a relatively permanent characteristic of individuals, and also an individual's perception of the attractiveness and costs of crime. Thus, in contrast to the findings of Horney et al. (1995), Nagan and Paternoster's (1993) findings suggest that sanctions would be important in deterring criminal activity.

Theoretically, formal social controls would be expected to have a direct effect on criminal behavior because of the increased threat of detection. From the perspective of rational choice and opportunity theories, this threat of detection increases the costs of committing a crime. An individual weighs the cost, and if the cost is high enough, he or she will be less likely to commit the crime. An arrest or conviction might reasonably be expected to lead an offender to recalculate the costs of committing crimes. Although offenders do not necessarily abandon their early estimates of the risk of getting caught, they update the risk on the basis of new information (Nagin 1998). Additionally, offenders being supervised in the community might be expected to perceive an increased probability of being detected regardless of whether this supervision actually does or does not increase the probability of a crime being detected. That is, offenders may adjust their estimates of the risk of detection because they know that a supervising agent is checking on their activities. There is some evidence that offenders are able to adjust their perceptions in a Bayesian-like fashion (Nagin 1998). For example, Horney and Marshall (1992) examined convicted offenders. They found that participants in their sample who had high arrest ratios reported higher risk perceptions.

Criminal justice sanctions could also have indirect effects on criminal activity. Possibly, sanctions act as "presses" to increase social bonds to conventional social institutions. We do not know how individuals make choices to work, return to their families, or attend school. Requirements of supervision such as finding a job, meeting with a probation agent, or paying restitution may initiate changes with these, in turn leading to increases in social bonds. If supervising agents require probationers to live in stable residences and keep jobs, this coerced employment and housing may be just as effective in reducing criminal activities as the self-initiated changes observed by Horney et al. (1995). In the drug treatment literature, offenders who are coerced into treatment by the criminal justice system do just as well as others who are not coerced (Anglin and Hser 1990). It is also possible that arrest and probation are critical life events that initiate changes in social bonds (Sampson and Laub 1993). From either of these perspectives, coerced bonds or critical life events, the expected impact of arrest and probation would be to increase bonds to conventional social institutions, and as a result, criminal activities would be reduced. Previous research indicates that probationers who are employed and live with spouses commit fewer crimes (Morgan 1993); however, we do not know if probation leads to increases in employment and family commitment.

Short-term changes in informal social control factors that create positive bonds with social institutions such as family, employment, and school have been found to be associated with criminal activities. Surprisingly, the longitudinal research by Horney et al. (1995) did not demonstrate that formal social controls were related to criminal activity. Yet research on perceptual deterrence suggests that formal social controls might reasonably be related to criminal activity by increasing the perceived costs of crime (Nagin 1998; Nagin and Paternoster 1993). One reason for these differences in findings may be related to the populations examined. Horney et al. (1995) studied serious offenders serving terms in prison; Nagan and Paternoster (1993) studied college students. Another possible reason for the difference may be memory difficulties. Horney et al. (1995) asked offenders to report month-to-month variation over a three-year period prior to their incarceration. Quite possibly, these offenders did not remember specifically when they were being supervised in the community. Thus, the failure to find an effect of changes in supervision may be the result of an inability of the offenders to remember. Or possibly, the offenders in Horney et al.'s (1995) study were not deterred from criminal activities by criminal justice sanctions, and for this very reason, they ended up in prison. In comparison to those who are in prison, less serious offenders or those who have not penetrated so deeply into the criminal justice system may be more influenced by sanctions.

Research Questions

This research was designed to examine the self-reported criminal activities of offenders who were beginning terms of probation to compare their activities during the year before probation with their activities after arrest and when they began their probation sentences. These offenders were assumed to be less serious offenders than those studied by Horney et al. (1995). In comparison to more serious offenders, an arrest and a sentence of probation might be expected to have a stronger impact on the perceived costs of committing crimes. This reevaluation of the costs of crime was expected to lead to decreased criminal offending by these offenders. Furthermore, we obtained the information on criminal activities during a period much closer to when the criminal justice responses transpired. Thus, the details of the monthly activities should have been remembered more accurately. Our research focused on three questions: (1) What is the impact of arrest and probation on the criminal activities of these offenders? (2) Are changes in local life circumstances such as increases in social bonds and decreases in risk behaviors associated with changes in criminal behavior? and (3) Do local life circumstances change during probation? If arrest and probation are associated with a decline in criminal activity, we are left with a question about the mechanism that leads to this change. On one hand, the effect could be a deterrent effect due to offenders' reassessments of the risks of being caught. However, another possibility is that arrest and probation affect the social bonds of offenders. That is, after being arrested or because of the requirements of probation, offenders may be more apt to find jobs, live with their spouses, or attend school. An arrest may act as a catalyst or a "press" to initiate a change in behavior, or probation may coerce such changes. In either case, the increased bonds would be expected to be associated with a decline in criminal activity.

METHOD

Participants

A sample of 125 offenders beginning sentences of probation were interviewed shortly after they began probation in one of three probation districts in northern Virginia. Of these, 107 (85.6 percent) were interviewed a second time approximately six months after the first interview. Demographic characteristics, arrest records, and preprobation criminal activities of the 125 offenders who participated in the study are reported in Table 1.

TABLE 1:   Demographic Characteristics, Prior Arrests, and Preprobation Criminal Activities

Mean age (*SD*)	31.13 (9.54)			
Male (%)	75.4			
Race (%)				
White	31.0			
Non-White	69.0			
Mean prior arrests (*SD*)	4.81 (5.39)			
Mean criminal activities	%	n	λ	SD
Burglary	6.5	7	67.3	166.15
Theft	18.7	20	43.0	64.45
Forgery	15.0	16	251.1	721.03
Robbery	8.4	9	13.8	26.34
Assault	28.0	30	16.5	58.12
Drug dealing	37.4	40	1,003.3	2,617.8

Sample Selection

The sample was selected from case opening records provided by three probation districts in northern Virginia. All of the offenders had been convicted of felony offenses and were sentenced to terms of probation by the circuit court in one of the three districts. They were being supervised at level I, II, or III at the beginning of their probations, as defined by the statewide supervision level definitions. These levels of supervision vary from intensive (level I) to low (level III) depending on how often probationers have to report to their supervising agents (ranging from bimonthly to quarterly), the number of times agents are required to make home visits and collateral contacts (e.g., employment), and the number of times probationers are tested for drug use. Probationers who were not being actively supervised or who were required to spend time in halfway houses or treatment facilities at the beginning of probation were excluded from the study. Probationers were also excluded from the eligibility pool if they were identified as non-English speakers by the interviewers or the probation district or if they resided outside the identified areas or in other states.

From September 16, 1994, until March 31, 1996, a total of 297 probationers were identified as eligible for the study according to the case opening sheets provided by the probation offices. We were unable to contact 126 (57.5 percent) of these probationers because the addresses were incomplete or there was no phone number available. There was no evidence that we reached these offenders, because letters sent to the addresses provided by the probation offices were returned, or we could not reach them by phone. We were prohibited by human participant concerns as stipulated by the University of

Maryland's Institutional Review Board from contacting the probation offices again regarding the addresses and telephone numbers of nonrespondents. Of the remaining 171 who were contacted, 46 (26.9 percent) either refused to participate in the study or failed to show up for any scheduled interviews. The remaining 73.1 percent were interviewed at time 1. We were able to interview 107 (85.6 percent) of these a second time.

Because we could not contact a large number of the offenders who began sentences of probation, we think it is important to recognize that generalizing from our results to all probationers would be problematic. Most likely, the offenders we could not contact were different from others in unmeasurable ways. For example, the difficulty in contacting them by phone and mail may indicate that they were homeless or that they could not afford phones. We were able to obtain some information from the case opening forms (public information) to compare those we interviewed with those we could not contact and those who refused to participate (see Table 2). There were no significant differences in age, gender, offense, district, supervision level, risk, or need as measured by probation officers using a standard objective classification instrument (MacKenzie 1989) between the final sample (those interviewed twice) and three groups: (1) those who did not complete the second interview, (2) those we could not contact, and (3) those who refused to participate when we contacted them. The only significant differences between those interviewed twice and the others were in racial group. There were proportionately more offenders who were White or of other races and fewer African Americans interviewed in comparison to those we could not contact or who refused to participate. The number of Whites may be overrepresented in the sample; however, the majority of the participants (65 percent) were African Americans.

Procedure

Probationer interviews. Once a probationer agreed to participate, an interview was scheduled at a local restaurant at a time and place convenient to the probationer. The first interview took place within the second month of probation (time 1). To begin the interview, the researcher described the nature of the research project and requested the probationer to sign a voluntary consent form. If consent was obtained, the interview began.

The first interview gathered demographic and personal history information, as well as detailed information on drug use and crime patterns. The probationer was asked about his or her lifestyle and criminal activities during the year before arrest and in the period between arrest and probation. At the end of the interview, the probationer was given $25. Approximately six months

TABLE 2:   Comparisons of Probationers Interviewed with Those Who Could Not Be Contacted and Those Who Refused to Participate

	Interviewed at Time 1 (n = 126)	Interviewed at Times 1 and 2 (n = 107)	Eligible But No Contact (n = 126)	Refused (n = 45)
Race (%)				
White	31.0	30.8	22.1*	51.1*
Black	64.3	65.4	68.0*	40.0*
Other	4.8	3.7	9.8*	8.9*
Mean age (SD)	31.2 (9.56)	31.3 (9.91)	31.3 (8.27)	33.4 (11.05)
Gender (% male)	76.2	76.6	80.2	86.7
Offense type (%)				
Person	12.7	13.1	8.8	13.6
Property	27.8	29.0	24.8	20.5
Fraud	15.1	15.0	9.6	9.1
Drugs	39.7	38.3	51.2	50.0
Other	4.8	4.7	5.6	6.8
District				
One	49.2	43.9	45.2	37.8
Two	17.5	18.7	13.5	24.4
Three	39.7	37.4	41.3	37.8
Supervision level				
Intensive	7.1	8.4	4.8	0
Level II	69.8	68.2	72.8	73.3
Level III	22.2	22.4	22.4	26.7
Risk score (%)				
Low	27.8	29.9	30.6	41.9
Moderate	21.4	22.4	27.3	18.6
Moderate to high	27.8	29.0	22.3	30.2
High	22.2	18.7	19.8	9.3
Need score (%)				
Minimum	55.6	58.9	52.1	58.1
Medium	32.5	31.8	37.2	30.2
Maximum	11.1	9.3	10.7	11.6

*$p < .05$.

after completion of the first interview, the probationer was contacted to schedule a second interview (time 2). The second interview took place after the probationer had been on probation for approximately eight months. The time frame covered by the second interview was the period from the beginning of probation until the second interview (approximately eight months, $SD = 1.65$). Again, at the completion of the second interview, the probationer was paid $25. If the probationer was incarcerated at the time of the second interview, the interview was conducted at the institution, and a money order for $25 was deposited in the probationer's account at the institution. A total of

12 of the 107 time 2 interviews were conducted in institutions, 11 in local jails and 1 in the state boot camp.

Probation agents in the districts were not aware of which offenders were participating in the study unless the probationers told the agents.

Instruments

Probationer interviews were conducted to gather information on demographic characteristics, personal history, self-reported criminal activity, and drug involvement before and after the start of the probation term. Survey forms were used to record the information collected during probationer interviews. "Event calendars" and "crime calendars" similar to those used by Horney and Marshall (1991, 1992) were used to collect data on social bonds, risk behavior, and self-reported criminal activity. In the first interview, each probationer was first asked to point to the month on the calendar when he or she was arrested for the current offense for which he or she had received a sentence of probation. Following this, all months prior to the 12 months before the arrest were crossed off the calendar. Thus, each month from the 12 months prior to the arrest and the period from arrest to probation was shown on the calendar. The probationer was then asked to identify the months in which he or she was incarcerated (i.e., spent more than two weeks in a jail, prison, or other correctional facility). These months were crossed off the calendar. The remaining months were marked as "street months" on the interview calendar. The probationer was then asked to determine those street months during which he or she had lived with a spouse, lived with a girlfriend or boyfriend, gone to school, had a job, drank heavily, used drugs, or owned a gun. The information was entered in the event calendar. The crime calendar was created in the same manner to identify the street months in which the respondent had been involved in assaults, robberies, burglaries, forgeries or frauds, thefts, or drug dealing. The time 2 interview focused on the period from the beginning of probation to the time of the interview (approximately eight months).

Prior research suggests that the use of life history calendars such as those employed in this study facilitates recall and increases the reliability of responses collected in a retrospective survey (Caspi and Amell 1994; Freedman et al. 1988; Horney et al. 1995). Horney and Marshall (1991), for example, suggested that the life history calendar approach results in more reliable self-report data on drug abuse and criminal behavior than information collected using alternative procedures. When the two calendars are administered in the same survey, the event calendar provides the context for recalling antisocial activities. A respondent, for instance, might recall his or her involvement in heavy drug use in a particular month because it was the

month during which he or she lived with a boyfriend or girlfriend. Our calendar recorded every move from one area to another, which was used by respondents as a frame of reference for dating other events. All of these events then set the context to help a respondent determine whether he or she had abused drugs or committed particular types of crimes in the specific month.[1]

Variables

This study included three sets of variables: monthly measures recorded in the event calendars, individual-level measures representing time-stable individual characteristics, and time variables measuring the period effects. The variables collected on the monthly level included illegal activities, social bonds, and risk factors. All of these monthly variables were measured by the person month, which was one month of calendar data collected from one offender. The individual variables measured either demographic characteristics or past experiences. They took on fixed values for each respondent. We also included three dummy variables measuring the effects of the three time periods covered in the surveys (prearrest, arrest to probation, and probation). We used this set of variables to test whether illegal activities fluctuated in different time periods. The variables and their measurements are described in the Appendix.

Monthly measures of illegal activities. The data set contains information on respondents' monthly involvement in six criminal offenses, including theft, burglary, forgery, robbery, assault, and drug dealing (see the Appendix for definitions of the crimes given during the interviews). We used two variables to measure criminal activities. Nondrug crimes measured whether a respondent committed any of the six offenses in a street month, excluding drug offenses. Drug dealing measured whether a respondent sold drugs in the month. Both offense measures were dichotomous. A respondent was assigned a value of one on the scale of nondrug crime if he or she reported any of the six offenses (excluding drug dealing) in the month. Otherwise, the respondent was assigned a value of zero. Drug dealing was coded similarly.

Monthly measures of social bonds and risk factors. Several studies have found that adult social bonds such as marriage and employment significantly influence the life course (Horney et al. 1995; Sampson and Laub 1990, 1993). These studies suggest that fluctuations in these local life circumstances could produce a shift in levels of criminal activities. Following the example of Horney et al. (1995), we examined some informal mechanisms of social control in the analysis and asked if the likelihood of offending is affected by these circumstances. The variables we used to measure social bonds included

going to school, having a job, living with a spouse, and living with a girlfriend or boyfriend. If a respondent had done these activities during the month, he or she was given a one; otherwise, he or she received a zero.

In addition, we included three risk factors in our analysis. The three variables were heavy alcohol use, drug use, and gun ownership. Prior studies have shown that these factors are positively correlated with criminal activities (Goldstein 1985; Sheley 1994). Each of these variables measured a self-reported activity in a street month, that is, the month when a respondent was not locked up. A respondent was assigned a value of one if he or she had been involved in the risk behavior during the measured month and zero otherwise.

Individual-level measures. We included several demographic variables in the analysis to investigate whether offending patterns varied by age, gender, and race. We also included a variable to measure criminal history. The variable was the total number of times an offender had been arrested before the current offense that led to the probation sentence. All of these variables have been shown in prior research to be correlates of illegal or deviant behavior (Andrews and Bonta 1998). These five variables were one-time measures; they did not fluctuate by month.

Arrest and probation. Last, we included three dummy variables to measure the effects of three distinct periods in the data set. Time 1 was the year before the arrest for the probation sentence, time 2 was the time between arrest and the start of probation, and time 3 was the eight-month probation period covered in the second interview. Each time period variable was assigned a value of one if the measured month was within the period and zero otherwise.

RESULTS

Data were collected from 125 probationers at time 1 and 107 probationers at time 2. For the reasons mentioned above, 18 probationers were unable to be interviewed for the second survey. The hierarchical analysis introduced later in this section was based on all 125 probationers interviewed.

Descriptive Analysis

Figures 1 and 2 show the month-to-month variations for the monthly variables included in this study. In these figures, data from 36 months are plotted. The period from the 1st month to the 12th month was the year before the arrest. The period between arrest and probation varied from individual to

individual but typically lasted 1 to 5 months. The last period on the monthly charts is the 8-month probation period. For most offenders, this 8-month period was located somewhere between the 14th and the 26th months. Because the chart was based on the data collected from street months, the sample size used to compute the numerical points in the chart varied substantially from month to month once the arrest occurred. The values for the months beyond the 26th month were generally based on smaller samples and thus were less reliable.

Figure 1 shows the monthly variations for variables measuring social bonds. Each of the lines in the chart represents the mean level of participation for the sample as a whole. As Figure 1 illustrates, most respondents had jobs when they were in the community (e.g., during the street months). The respondents reported lower involvement in the other three types of social bonds. The percentage of respondents living with spouses, living with girlfriends or boyfriends, or going to school was below 30 percent in any street month. Although the proportion of respondents having jobs showed a trend of slight overall increase, the proportion living with girlfriends or boyfriends had a slightly decreasing trend. The other two variables measuring social bonds, including living with a spouse and going to school, had negligible overall changes. In sum, despite some monthly fluctuations, the overall changes in variables measuring social bonds were moderate. However, it should be emphasized that these curves in Figure 1 illustrate the mean-level changes for the sample as a whole. Within-individual changes may not necessarily follow the same pattern. The impact of within-individual changes will be investigated later in this article using a multilevel hierarchical analysis.

Figure 2 demonstrates the monthly changes in risk behaviors and criminal activities. With the exception of alcohol abuse, the mean levels of involvement in risk behaviors and criminal activities all declined after the arrest and during probation. The deepest decline occurred right after the arrest in the 13th month. Afterward, involvement in risk and criminal behaviors fluctuated, but the levels of involvement were generally lower than they were before the arrest.

The variable with the most noticeable change in Figure 2 is gun ownership. In the months before arrest, over 10 percent of the sample reported owing a gun. The rate was cut by more than half after the arrest. It was eventually reduced to zero after the 22nd month. Although less dramatically, involvement in drug use, drug dealing, and nondrug crime also declined substantially after the arrest. The levels remained low throughout the street months following the arrest, including the 8 months during which offenders were on probation. Figure 2 seems to suggest that arrest and probation reduced criminal activities committed by the sample as a whole. Additional analysis is needed to investigate whether these relationships remain when
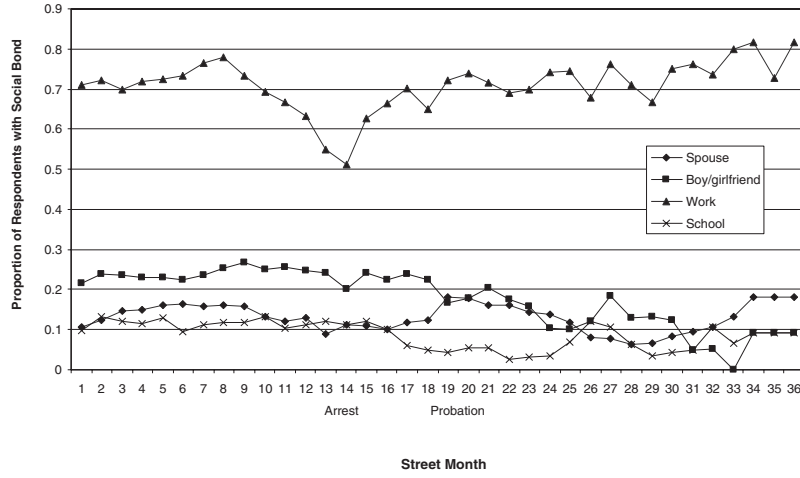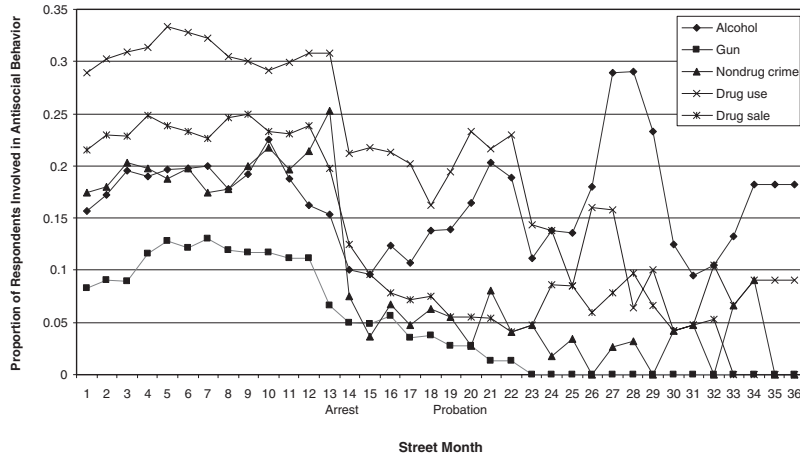
Figure 1: Monthly Changes in Social Bonds

Figure 2: Monthly Changes in Risk Behaviors and Criminal Activities

other social and demographic variables are controlled and whether arrest and probation foster similar within-individual changes.

Within-individual change. Table 3 lists the proportion of offenders who reported social bonds, risk behaviors, and criminal activities during the street months in the three different time periods. Paired *t* tests were conducted to test whether the difference between any two periods was statistically significant. In this table, time 1 is the 12 months before the arrest, time 2 is the period between the arrest and the start of probation, and time 3 is the 8 months during probation. The proportions in the table represent the number of months out of the total number of street months in a period during which offenders engaged in the activities listed in the first column. For example, on average, these offenders were employed during 68 percent of the months prior to arrest. As shown in the table, the proportions of months with social bonds for time 2 are lower than those for time 1. As indicated by the *t* tests, three of the four differences were statistically significant, indicating that the offenders were more likely to have jobs, attend school, or live with spouses before the arrest than after the arrest. The differences in social bonds between time 1 and time 3 were generally small. None of the four *t* scores was significant. Thus, any changes in social bonds from the year before the arrest to after the arrest and probation were decreases in the bonds. There were no significant increases in social bonds when the arrest or probation periods were compared to the year before the arrest.

The proportion of months during which offenders reported owning guns decreased from time 1 to time 2 and again from time 2 to time 3. Self-reported drug use also declined substantially from time 1 to time 3. The other variable measuring risk behavior, heavy alcohol use, decreased from time 1 to time 2 but rose to the prior-to-arrest level in time 3. The decline in gun ownership and drug use from time 1 to time 3 was highly significant, suggesting that probation reduced these two types of behaviors. However, probation did not appear to lower heavy alcohol use. The proportion of months during which inmates drank heavily at time 3 was almost identical to the proportion at time 1.

The most significant and consistent changes occurred among the group of variables measuring criminal activities. As shown in Table 3, the proportions of months during which offenders reported committing theft, forgery, robbery, assault, or drug dealing all declined significantly from time 1 to time 2 and from time 1 to time 3. Although burglary declined from time 1 to time 2, the decline was not significant. There were no differences between the arrest-to-probation period and probation. These results suggest that formal sanctions, including arrest and probation, substantially reduced involvement in criminal activities. The change occurred after arrest, and no further decline occurred when the sentence of probation began.

TABLE 3:   Proportion of Street Months for Which Offenders Reported Social Bonds, Risk Factors, and Criminal Offenses

	Proportions			Paired t Tests[a]		
	Time 1 (n = 125)	Time 2 (n = 82)	Time 3 (n = 107)	Times 1 and 2 (n = 82)	Times 1 and 3 (n = 107)	Times 2 and 3 (n = 70)
Social bonds						
Had a job	.68	.55	.74	2.79**	−1.82	−3.48**
Attended school	.10	.08	.07	2.59**	1.36	−.22
Lived with a spouse	.13	.10	.13	1.97*	.39	−.47
Lived with a girlfriend						
or boyfriend	.23	.20	.15	.75	1.55	1.79
Risk factors						
Drug use	.31	.22	.17	1.71	3.05**	.54
Alcohol abuse	.19	.09	.18	.71	−.76	−2.42*
Gun ownership	.12	.05	.02	2.17*	3.68**	1.22
Criminal activities						
Nondrug offenses						
(total)	.21	.05	.04	4.51**	5.24**	.94
Theft	.10	.02	.01	2.91**	3.62**	1.60
Burglary	.02	.00	.00	1.24	1.58	−1.00
Forgery	.03	.01	.01	2.10*	2.34*	.28
Robbery	.02	.00	.00	2.31*	2.00*	—
Assault	.07	.03	.03	2.69**	2.53**	.63
Drug dealing	.24	.10	.07	4.00**	4.77**	.73

a. The numbers change because this is a paired test. Only 82 were in the community between arrest and probation, and although 107 were interviewed at time 2, only 70 of the 82 were in the community and participated in the time 2 interviews.
*$p < .05$. **$p < .01$.

Multilevel Hierarchical Model

The results in Table 3 are consistent with those presented in Figures 1 and 2. They all indicate that arrest and probation had a strong negative effect on criminal activities. Their effects on gun ownership were also negative and significant. In addition, probation had a negative effect on drug use. Although these results are useful in understanding how legal sanctions affect antisocial behavior, they do not tell us whether within-individual changes take place, controlling for other individual differences. Furthermore, these results do not show how informal social controls such as family relationships and employment mediate the effects of arrest and probation. To investigate these possibilities, we constructed a multilevel hierarchical model that included most of the variables listed in Table 2. The unit of analysis on the measurement level

in the multilevel hierarchical analysis was street month. We included a respondent in the analysis as long as he or she spent at least one month on the street. None of the 125 respondents in our sample was incarcerated for the entire study period. Therefore, all of them registered at least one street month in the data set. Consequently, the analysis included 125 individuals, with 2,729 person months.

One of the major advantages of multilevel hierarchical approach is its ability to control for between-individual differences when estimating within-individual changes. Because the influences of time-stable individual characteristics are controlled, variables that affect Y but do not change across individuals may not bias the coefficient estimates. This feature is especially appealing when the dependent variable in the study, Y, is crime. In criminological research, there is considerable evidence suggesting that crime is affected by both population heterogeneity and state dependence (Nagin and Farrington 1992; Nagin and Land 1993; Sampson and Laub 1993). Population heterogeneity consists of individual differences that are stable over the life course, including biological attributes, personality characteristics, and level of self-control. State dependence, on the other hand, comprises changes in the life course that make one more likely to commit crimes. Time-stable individual differences that affect crime tend to be stable across time (Gottfredson and Hirschi 1990; Nagin, Farrington, and Moffitt 1995; Wilson and Herrnstein 1985), and this type of difference can be controlled with a multilevel model. The elimination of specification errors due to time-stable individual differences allows for stronger and more valid inferences about the effects of formal and informal social control than can be made by many alternative methods. In addition, a multilevel hierarchical model allows for explicit control for the effects of interaction terms between two or more variables. The ability to control for interaction effects between social control and other independent variables has two important benefits. First, because the potential interaction effects are controlled in a multilevel hierarchical model, the impact of formal and informal social controls on crime can be more accurately evaluated. Second, because the influences of all of the independent variables, including the interaction terms, are evaluated simultaneously, the model provides sufficient information to judge whether the interaction terms have additional effects on crime over and above the impact of the main effects and other explanatory variables. By examining the coefficients for the independent variables and their interaction terms, one can estimate how these variables affect within-individual changes in criminal behavior. Another benefit of using a hierarchical model is its help in retaining the largest possible sample size when analyzing repeated measures. When using traditional techniques such as an analysis of variance to analyze repeated data containing missing values, the data set must be reduced to ensure a balanced design,

or the repeated-measures aspect needs to be ignored, causing problems with the assumptions of the model. With a multilevel hierarchical model, cases containing missing values on the response variables can be included in the analysis. If the response variables are missing, either by accident or design, a multilevel model may still provide efficient estimates of its parameters using all of the available data (Tanguay, Buschang, and Goldstein, 1993). Using a multilevel hierarchical model, we were able to generate efficient parameter estimates while keeping all of the 125 respondents in our analysis.

Monthly data collected from both interviews were analyzed using a multilevel hierarchical model consisting of two levels. A two-level hierarchical structure is achieved by nesting monthly measures within participants, which allows for explicit control of individual differences on the second level when evaluating within individual variations on the first level (Bryk and Raudenbush 1992; Goldstein, 1995; Goldstein et al. 1998).

The level 1 model must be specified first because it determines the meaning of the level 2 model:

$$y_{ij} = \sum_{k=0}^{p} \beta_{jk} x_{ijk} + e_{ij}, \tag{1}$$

where i is the index for months, j is the index for persons, k is the index for explanatory variables, and x_{ijk} is an explanatory variable that varies over time for at least some of the respondents when k is not equal to zero. The level 2 model can be specified for a coefficient in the level 1 model that varies across individuals:

$$\beta_{jk} = \beta_k + e_{2kj}, \tag{2}$$

where β_k is the individual-level intercept and the level 2 residual for the coefficient associated with the kth variable (see Goldstein, Healy, and Rasbash 1994) for detailed discussion of the two-level model).

In the multilevel hierarchical model, the level 2 variables included age, gender, race, and total number of arrests reported in the first interview. The level 1 variables were monthly measures of changes in social bonds and risk behaviors, including living with a spouse, living with a girlfriend or boyfriend, having a job, going to school, heavy alcohol use, drug use, and gun ownership. The monthly measures were computed by subtracting their monthly values from individual means. We also included the individual means in the model to control for individual differences on these variables. To control for nonlinearity in individual time trends, we included the month number and its quadratic term in the model. In addition, we used two dummy variables, time 2 and time 3, to measure the effect of arrest and probation. To

test whether social bonds had different effects in different time periods, we included a set of interaction terms computed by multiplying the two time period variables by social bond measures. We also included interaction terms between age and social bonds to test whether the effect of social bonds varied with age. The statistical model consisted of 2,729 level 1 measurement units (person months) and 125 level 2 measurement units (individuals). There were 35 coefficients to be estimated. These included 7 level 1 parameters, 15 level 2 parameters, 12 interaction terms, and an intercept.

The parameter estimates from the multilevel hierarchical model are provided in Table 3. Two separate analyses were conducted for the two dependent variables measuring criminal behavior, namely, nondrug crime and drug dealing. Because both dependent variables were dichotomous, a logit function was used in the analysis. The logistic coefficients, standard errors (in parentheses), and odds ratios estimated from the model are displayed in Table 3. The estimation procedure we used in the analysis was the second-order penalized quasi-likelihood (PQL) procedure, which is less biased and allows for greater control of level 1 autocorrelation than the first-order marginal quasi-likelihood procedure (see Goldstein 1995 for a detailed description of these procedures).[2] As shown in Table 4, all the level 1 random coefficients were significant, indicating the presence of autocorrelation in the nonlinear model.

Nondrug crime. Living with a spouse and having a job had a negative effect on nondrug crime, whereas heavy alcohol use and drug use affected the dependent variable positively. In comparison to time 1, time 2 and time 3 had negative effects on nondrug crime. Three of the four interaction terms between age and social bonds significantly affected the dependent variable. In contrast, only one of the eight interaction terms between time and social bonds had a significant effect. In general, the main effects of the variables measuring social bonds, risk behavior, and formal sanctions were consistent with our hypotheses. Marital relationship and employment appeared to reduce involvement in nondrug crime. Excessive drinking and drug use, on the other hand, increased the likelihood of nondrug crime. As expected, arrest and probation significantly reduced nondrug offenses. The effect of arrest was especially strong. It reduced the odds of nondrug crime and drug dealing 48 times, holding all other variables constant.

Because the interaction terms of age with living with a spouse, living with a girlfriend or boyfriend, and having a job were significant, the effects of these variables must be interpreted interactively. To facilitate the interpretation, we computed predicted probabilities of nondrug crimes for four different age categories, including age 20, age 30, age 40, and age 50, and these circumstances. The probabilities of the different age groups for the respondents

TABLE 4:   Logistic Coefficients and Odds Ratios from Binomial Two-Level Hierarchical Model of Monthly Involvement of Criminal Activities, Drug Use, and Drug Dealing

	Nondrug Crime			Drug Dealing		
	γ	SE	Odds Ratio	γ	SE	Odds Ratio
Intercept	−1.39	.48**	.25	−.79	.42	.45
Social bonds						
Living with spouse	−8.52	1.94**	.00	.58	1.38	1.79
Living with girlfriend or boyfriend	−1.77	1.18	.17	−.85	1.01	.43
Having a job	−1.75	.76*	.17	.33	.62	1.39
Going to school	−1.74	1.01	.18	2.90	1.23	18.17
Risk and illegal behaviors						
Drug use	1.39	.26**	4.01	1.67	.21**	5.31
Alcohol abuse	.91	.29**	2.48	.19	.28	1.21
Gun ownership	.51	.34	1.67	1.89	.35**	6.62
Periods						1.00
Time 2: arrest to probation	−.73	.29*	.48	−.74	.26**	.48
Time 3: during probation	−3.11	.45**	.04	−1.40	.34**	.25
Interaction terms						
Age × Living with Spouse	.29	.06**	1.34	.02	.04	1.02
Age × Living with Girlfriend or Boyfriend	.08	.04	1.08	.04	.03	1.04
Age × Going to School	.08	.04	1.08	−.08	.05	.92
Age × Having a Job	.07	.03*	1.07	−.03	.02	.97
Time 2 × Living with Spouse	−.41	1.47	.66	−1.52	1.10	.22
Time 2 × Living with Girlfriend or Boyfriend	1.27	.88	3.56	1.38	.75	3.97
Time 2 × Going to School	.61	.85	1.84	−.38	.93	.68
Time 2 × Having a Job	−.85	.60	.43	−.23	.53	.79
Time 3 × Living with Spouse	−3.21	1.49*	.04	−1.30	1.19	.27
Time 3 × Living with Girlfriend or Boyfriend	.68	.80	1.97	.86	.62	2.36
Time 3 × Going to School	−.24	.77	.79	−.73	.74	.48
Time 3 × Having a Job	.01	.73	1.01	−.20	.53	.82
Control variables						
Age	−.06	.01**	.94	−.08	.01**	.92
Gender (male)	−.02	.22	.98	.88	.20**	2.41
Race (non-White)	−.28	.17	.76	.14	.16	1.15
Total number of prior arrests	.14	.01**	1.15	.04	.01**	1.04
Month	.01	.02	1.01	.00	.03	1.00
Month squared	.00	.00	1.00	.00	.00	1.00
Level 1 random coefficient	1.10	.03**		.985	.03**	

NOTE: The individual means of monthly activities were included in the model for the purpose of statistical control. To save space, the parameter estimates of these monthly means are not presented in this table. These estimates are available on request. $N = 125$ individuals and 2,729 street months.
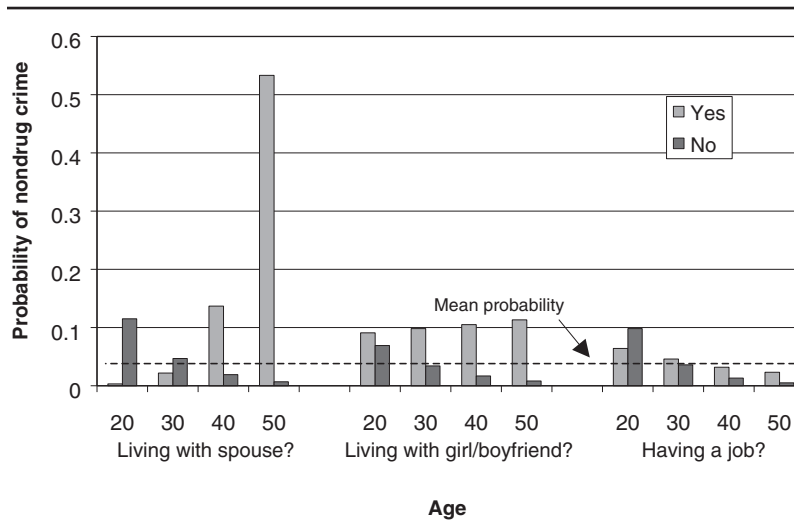*$p < .05$. **$p < .01$.

Figure 3:   Social Bonds and Probability of Nondrug Criminal Activity

living with spouses, living with girlfriends or boyfriends, and having jobs are shown in Figure 3. When computing these probabilities, all the variables other than those used to compute the interaction terms were held at their mean values. The mean probability of nondrug crime for the sample as a whole was .04.

Figure 3 shows that living with spouses reduced nondrug crimes for younger offenders. For example, 20-year-olds who lived with spouses were predicted to commit fewer crimes if they were living with spouses (.003) but more crimes if they were not (.115). However, it increased the probability of nondrug crime for older offenders. Compared to the respondents who were not living with girlfriends or boyfriends, those who were living with significant others had a higher probability of committing nondrug crimes. The older the respondents were, the more likely they would commit nondrug crimes if they were living with girlfriends or boyfriends. Last, the effect of having a job also varied with age. Respondents who were employed at younger ages during the street months were less likely to commit nondrug crimes than those who were not employed. However, employment increased the probability of nondrug crimes for older respondents, although most of the probabilities for older offenders were below the mean level of offending, regardless of whether they were working or not.

With the exception of going to school and living with a girlfriend or boyfriend, social bonds seemed to reduce nondrug crime for younger offenders. The finding that living with spouses had a positive effect on nondrug crime

for older offenders was surprising. We are uncertain how to explain this difference. Jang (1999) found some evidence of changes in the relative influences of commitment to parents, commitment to school, and association with delinquent peers during the teen years. However, our findings do not indicate a relative difference but a reverse in the direction of the effect because the younger offenders committed fewer crimes during periods when they were living with spouses and were employed, but the reverse was true of the older offenders. One possible explanation for the results is that older offenders who commit crimes that lead to relatively minor sanctions (e.g., probation) have developed lifestyles that are conducive to involvement in criminal activities. Their spouses may also be criminally active, or an arrest or a sentence may not change their employment status. Another possibility is that there are very different factors that influence older offenders. For example, the need for money because they are married and have financial obligations or the increased opportunities for crimes that result from employment may be important factors in older offenders' criminal activities. Rather than resulting from risk taking, impulsivity, and a lack of attachment, as they might with younger offenders, the criminal activities of older offenders may be influenced by the need for money or attractive opportunities for crime offered by their employment. Furthermore, in terms of spousal relationships, there might be a selection process causing the interaction effects. It is well known that the probability of offending drops considerably as people age. Those who do not drop out as they get older may be a special group of offenders. Many of them may be hardcore criminals. It is possible that the kinds of partners who would hang out with youthful offenders are different from those who would hang out with older, hardcore offenders. We suspect that the partners who hang out with youthful offenders constitute a much larger proportion of people who think that they can reform their offending mates, whereas those hanging out with hardcore offenders might have given up on reforming them. Some might even endorse and facilitate offending, prompting offenders to commit more criminal activities.

To investigate the significant interaction between living with a spouse and period, we compared the respondents living with spouses during the probation period with those who were not living with spouses in the same period. The result indicated that the probability of committing a nondrug offense was significantly lower if one was living with a spouse in a street month. Probation had a negative effect on nondrug crime regardless of martial relationship. The effect, however, was much stronger for the respondents living with spouses than for those living without spouses during the probation period.

Drug dealing. Going to school was the only social bond variable significantly related to drug dealing. Contrary to the expectations, going to school

had a positive effect on drug use. Being in school might have increased a respondent's opportunities to associate with delinquent peers and his or her opportunities to sell drugs. As a result, his or her involvement in drug dealing was increased. Drug use and gun ownership had a positive effect on drug dealing. These results are consistent with previous research findings that drug dealers are likely to use drugs and own guns (Goldstein 1985; Sheley 1994). Finally, time 2 and time 3 had significant negative effects on drug dealing, suggesting that arrest and probation reduce a respondent's involvement in drug dealing. None of the interaction terms were significant.

DISCUSSION

Given how different our sample is from samples in other studies, the criminal activities as measured by the percentage reporting a crime, the annualized rate of criminal activity for those who report committing a crime, and the proportion of the street months for which the sample reported social bonds, risk factors, and criminal offenses are surprisingly similar to findings from other research. For example, in their studies of male prison entrants, English (1993) and Horney and Marshall (1991) found lambdas of 76.7 and 117.2 for theft and 13.7 and 24.9 for robbery, respectively (see also Spelman 1994; Zimring and Hawkins 1995). These compare to lambdas of 43 for theft and 13.8 for robbery for our sample. Because our sample was made up of probationers and a large percentage were female (25 percent), the lower lambdas would be expected. Similarly, because Horney and Marshall's (1991) sample assumedly represented more serious offenders, the higher participation rates would be expected; they found participation rates of 32.3 percent for burglary (ours was 6.5 percent), 10.9 percent for robbery (ours 8.4 percent), 30.8 percent for theft (ours 18.7 percent), 18.4 percent for forgery and 9.7 percent for fraud (ours for forgery and fraud combined 15 percent), and 32 percent for drug dealing (ours 37.4 percent). These participation rates are quite similar except in the case of burglary, and we do not know why our sample's rate was so much lower. Possibly, burglars who are caught are more apt to be sentenced to prison, and high participation rates increase their chances of being caught. Also, female offenders may be less apt to commit burglaries, and the large percentage of women in our sample may lower the overall participation rate.

The proportion of street months during which Horney et al.'s (1995) sample reported criminal offenses, social bonds, or risk activities is surprisingly similar to ours (see Table 2). Their offenders reported being involved in property crime 11 percent of the street months (ours 2 to 10 percent), assaults 6 percent (ours 7 percent), and drug dealing 23 percent (ours 24 percent).

During the months on the street, their sample worked 65 percent of the time (ours 68 percent), went to school 11 percent (ours 10 percent), lived with spouses 19 percent (ours 13 percent), lived with girlfriends or boyfriends 29 percent (ours 23 percent), drank heavily 28 percent (ours 19 percent), and used illegal drugs 24 percent (ours 31 percent). These comparisons give us more confidence in our findings, although as previously noted, because we were unable to contact a large percentage of the potential candidates of the study, the results should be interpreted cautiously.

The design employed in this study is a simple time series with one experimental group and multiple observations over time. In this type of study, each participant acts as his or her own control. As discussed by Cook and Campbell (1979), the main threats to internal validity in such a study include history, instrumentation, simple selection, and seasonal variation. There was no evidence suggesting that any of these threats constituted a serious problem in our study. To the knowledge of the probation departments, there were no new sentence guidelines or arrest policies or any other historical events that significantly affected the study outcomes. As we discussed previously, the instrumentation used in this study, namely, the event calendars and crime calendars, have demonstrated high levels of reliability (Caspi and Amell 1994; Freedman et al. 1988; Horney et al. 1995). Selection problems occur when the composition of participants changes abruptly during the course of observations. This was not a problem, because we were able to include most of the respondents in our study from the 12 months prior to arrest to the 8-month probation period. In addition, our analysis provided no indication that the probationers' involvement in social bonds and criminal activities fluctuated on a monthly basis. Data collection continued for an 18-month period; therefore, any seasonal variation would be expected to contribute to general but not systematic variance.

Maturation threats to internal validity occur when an observed effect is caused by a respondent's growing older, wiser, or more experienced. Cook and Campbell (1979) suggested that one of the major advantages of a time series over other forms of quasi-experimental analysis is its help in assessing the maturational trend prior to some intervention. According to the self-report data analyzed in this study, the criminal activities of offenders significantly declined after arrest and remained at the lower level during probation. The offenders committed fewer nondrug crimes, and they were involved in less drug dealing. The criminal activities of the probationers did not differ in the period between arrest to probation and after probation. Thus, the major decline in criminal activities occurred after arrest. This was true for both nondrug offenses and drug dealing. Maturation would be expected to show a gradual change over time, not a distinct change at the time of arrest. The largest potential threat to the internal validity of this study is the demand

characteristics of the study if the participants anticipated that we were study-ing the effects of arrest and probation, and therefore, they told us that their criminal activities declined when in actuality, they had not. However, if this were the case, we would have expected the demand effect to have been for probation, not necessarily arrest, because we told the participants that we were studying probation.

Not only were arrest and probation associated with a decline in criminal activities but also, there was a reduction in risk behaviors. For example, after arrest and probation, the probationers were less likely to use drugs and own guns. Although they were less apt to drink heavily during the period between arrest and probation, their drinking level rose to almost the prearrest level after probation. Furthermore, these risk behaviors were associated with crim-inal activity. During the months when the probationers used illegal drugs or drank heavily, they committed more nondrug crimes. When they used illegal drugs or owned guns, they were involved in more drug dealing. The associa-tion between these high-risk behaviors and criminal activities is important because probationers are frequently prohibited from drinking heavily, using drugs, or carrying guns by probation agencies, and the behavior is monitored. The decrease in illegal drug use during probation may demonstrate the effec-tiveness of the urine-testing program used in this jurisdiction during proba-tion. And the finding that drug use is associated with criminal activity sug-gests that this is a reasonable behavior for probation agencies to target.

The fact that after a hiatus between the arrest and probation, these offend-ers began drinking heavily again may indicate the inability of probation agents to monitor this behavior because breathalyzers are not as effective as urine tests in controlling alcohol use because of the need to test so frequently. When these offenders are drinking heavily, they commit more nondrug crimes. Our fear is that this return to the level of prearrest drinking during probation may signal a future return to crime.

Social bonds did not increase after arrest and probation. In fact, those who remained in the community during the period between arrest and probation were less apt to live with spouses, attend school, or have jobs, possibly indi-cating the negative impact of arrest on social bonds. There were no differ-ences in social bonds between the prearrest period and probation. Thus, although arrest and probation are associated with a decline in criminal activi-ty and risk behaviors, there is no evidence that social bonds increased as a result of arrest or probation. As expected, social bonds were associated with criminal activity. During periods when these offenders lived with spouses or had jobs, they committed fewer nondrug crimes. This was not true of drug-dealing activities. The only social bond significantly related to drug dealing was going to school, and this finding was in the reverse of the expected direc-tion: Those who attended school reported more drug dealing. As well as

finding no increases in social bonds after arrest and probation, we found no evidence that the relationships between criminal activities and social bonds changed as a function of arrest or probation.

We proposed two possible mechanisms for a decline in criminal activity after arrest and during probation. First, formal social controls could have a direct effect on criminal behavior because the arrestees perceive an increased threat of detection, as would be predicted by deterrence theory (Nagin 1998). Second, the effect of arrest and probation could be an indirect effect resulting from an increase in social bonds that occurs after arrest or probation (Sampson and Laub 1990).

As expected, increases in social bonds were associated with reductions in criminal activities, at least for the nondrug crimes. However, there was no evidence that social bonds increased after arrest or during probation. In fact, the 82 offenders who remained in the community between arrest and sentencing were employed, attended school, or lived with spouses in significantly fewer months during this period. There were no significant differences between the prearrest period and the probation period in social bonds. That is, on the whole, these offenders were employed, attended school, lived with spouses, or lived with girlfriends or boyfriends prior to arrest approximately the same proportion of time that they did so during probation. Nor did the effect of social bonds differ during the different periods. Thus, there was no evidence that either arrest or probation led to an increase in social bonds.

From the perspective of long-term change, this is a disappointing finding. The results are consistent with a deterrent effect from arrest and probation. From this perspective, the offenders weigh the increased risk of detection and reduce their criminal activity. This conclusion is supported by the failure to find any changes in social bonds and also because the impact of the criminal justice system involvement began with arrest. After the reduction that occurred following arrest, there was no further decline in criminal activity when the offenders began their sentences of probation.[3] Thus, the impact of arrest and probation supervision may be direct control over criminal behavior; offenders perceive the increased risk and take fewer chances of being detected.

The disappointing factor is the possibility that the offenders may be influenced only as long as they are being supervised. There is no evidence of an increase in social bonds that might be related to long-term positive changes in lifestyle. From this perspective, the effect of probation may be short lived because it influences the probationers only while they are being supervised in the community. That is, the arrest and continued probation supervision may act as deterrents because offenders perceive that they are at risk for detection. This perception may change in the future as time goes by and the level of supervision declines. We hypothesize that an increase in bonds might be

important to developing a noncriminal lifestyle that will continue to be influential after supervision ends. Without such changes, when probation is over, these offenders may return to their previous levels of criminal activity because the deterrent effect of arrest may wear off when they are no longer under supervision. Our data do not follow offenders for a long enough period to examine whether this hypothesized increase in criminal activity occurs when probation supervision ends.

On the positive side, our findings clearly reveal that the criminal activities of these offenders dramatically declined after arrest and probation. Thus, criminal justice system response may be more effective than previously thought in reducing criminal activities. This is very important to consider when the effects of incapacitation are estimated. Most simulations of the effect of incapacitation use estimates from the self-reported criminal activities of prison inmates. Our research suggests that these estimates should be readjusted on the basis of the proportion of offenders who might have been in the community on probation because they may be committing crimes at a much lower rate.

How to improve the social bonds of probationers so that long-term positive changes can be sustained is a topic that deserves close examination in future research. One of the reasons for the lack of development in social bonds may be inadequate supervision. Like most probation departments, the probation districts we studied were characterized by heavy caseloads and staff shortages. With increased probationer populations and inadequate resources, the probation officers could only spend a limited amount of time with each probationer. Most of the probationers (67 percent) in our study reported that they met with probation officers once a month or less. The meetings normally lasted 15 to 30 minutes or less. It would be difficult to facilitate sustainable positive changes when there is such limited interaction between the probationers and the officers. Given such circumstances, the best the probation officers could probably accomplish was to use the threat of additional criminal justice intervention to prevent further criminal activities. More intensive supervision may help build social bonds and promote long-term positive changes.

In summary, we found evidence that the criminal activities of offenders decreased substantially after arrest and stayed at this reduced level during the first eight months of probation. High-risk activities associated with criminal activities also declined. Short-term changes in life circumstances were associated with criminal activity; however, these life circumstances, such as living with a spouse or employment, did not change after probation began. Thus, there was no evidence that the impact of probation on the criminal activities of these offenders resulted from coerced bonds or critical life events that led the offenders to change their life circumstances. Instead, because the

major decline in criminal activities occurred after arrest, we propose that arrest and probation have a deterrent affect on these offenders. Our fear is that this effect may be short lived.

APPENDIX
Variables and Their Measurements

Variable	Description	Scale
Monthly measures		
Living with a spouse	Living with a wife or husband in the street month	0 = no, 1 = yes
Living with a girlfriend or boyfriend	Living with a girlfriend or boyfriend in the street month	0 = no, 1 = yes
Having a job	Having a job in the street month	0 = no, 1 = yes
Going to school	Going to school regularly during the street month	0 = no, 1 = yes
Alcohol abuse	Drank heavily, got drunk often, or had a drinking problem in the street month	0 = no, 1 = yes
Gun ownership	Owned a gun in the street month	0 = no, 1 = yes
Drug use	Used drugs in the street month	0 = no, 1 = yes
Drug dealing	Dealt in drugs in the street month	0 = no, 1 = yes
Nondrug crime	Committed any of the following offenses in the street month: (1) burglary, including breaking into a house or a business to take something; (2) theft, including stealing from a till or cash register, taking someone's property without his or her knowledge, and breaking into a car or stealing a car, truck, or motorcycle; (3) forgery, including using a bad or stolen credit card, passing a bad check, and doing any frauds or swindles of a person, a business, or the government; (4) robbery (i.e., using force or the threat of force to take someone's property, including snatching a purse, jacking a car, or robbing a store clerk or bank teller); and (5) assault, including fighting with someone, threatening someone with a weapon, shooting at someone, trying to cut someone, and beating or strangling someone	0 = no, 1 = yes

(continued)

APPENDIX Continued

Variable	Description	Scale
Individual-level measures		
Age	Respondent's age	19 to 70 years
Gender (male)	Respondent's gender	0 = female, 1 = male
Race (non-White)	Respondent's race	0 = White, 1 = non-White
Total arrests	Total number of prior arrests	1 to 11 times arrested
Time measures		
Time 1	Twelve months prior to arrest	0 = no, 1 = yes
Time 2	Months between arrest and probation	0 = no, 1 = yes
Time 3	Months during probation	0 = no, 1 = yes

NOTES

1. The reliability of retrospective data collected using life history calendars has been documented in several studies. In one study, Freedman et al. (1988) found that 91 percent of respondents gave identical answers about whether they attended school in a particular month in 1980 in both 1980 interviews and 1985 interviews. In another study, Caspi and Amell (1994) compared self-report monthly life events in which respondents participated three years previously with data collected concurrently during the time the events took place. The events they examined included living with parents, cohabiting with a partner, being the primary caregiver for a child, attending school, and having a job. Their results indicated that over 90 percent of the reports regarding status for the month matched. Horney and Marshall (1991) also regarded the life history calendar as a reliable method to collect self-report data on monthly involvement in deviant and nondeviant behavior. By comparing this method with the well-known RAND self-report method for measuring crime rates, they found the life history calendar approach to be as valid as the more complicated RAND method in the measurement of individual offending frequency. Moreover, they suggested that life history calendars are a more useful tool for identifying situational and lifestyle correlates of different offending rates within individuals.

2. For a two-level model with repeated measures on individuals, autocorrelation could occur between the level 1 residuals if measurements on individuals are obtained very close together in time. In the presence of autocorrelation, the standard repeated measures assumptions are untenable and lead to biases in parameter estimation. Studies have shown that the second-order PQL procedure can be used to generate unbiased estimates in a hierarchical logistic regression model when there are various forms of correlation between the first-level residuals (Goldstein 1995; Goldstein et al. 1994).

3. However, because the activity declined so dramatically after arrest, it would be statistically difficult to detect any further decline after probation.

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