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American Sociological Review is currently published by American Sociological Association.

CRIMINAL CAREERS IN THE SHORT-TERM: INTRA-INDIVIDUAL VARIABILITY IN CRIME AND ITS RELATION TO LOCAL LIFE CIRCUMSTANCES*

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We analyze month-to-month variations in offending and life circumstances of convicted felons to understand change in criminal behavior. We extend previous applications of social control theory by considering whether local life circumstances that strengthen or weaken social bonds influence offending over relatively short periods of time. We seek to determine whether formal and informal mechanisms of social control affect the likelihood of committing nine major felonies. We employ a hierarchical linear model that provides a within-individual analysis as we explore factors that determine the pattern of offending. The results suggest that meaningful short-term change in involvement in crime is strongly related to variation in local life circumstances.

Issues of continuity and change have recently come to the fore in criminology. Two influential theoretical statements have focused on the continuity in criminal behavior and challenged the importance of social factors during adulthood (Wilson and Herrnstein 1985; Gottfredson and Hirschi 1990). Both theories assume that a basic propensity to commit crime is *established early in life and persists throughout the life course*. This propensity is the key to understanding criminal behavior. This view implies that life events after childhood are of little, if any, explanatory importance. Thus, events such as changes in position in the social structure or assumption of new roles that increase social integration would have no bearing on adult crime.

Sampson and Laub (1993) took a very different perspective in their life-span approach to the study of crime. While they acknowledged that measures of illegal behavior are highly correlated over time, they argued that such continuity does not preclude large and systematic changes for many individuals. Their empirical research, which tracked individuals across large segments of the life-span, documented substantial changes in offending. They explain these patterns of change in terms of variation in social control.

The purpose of the present study is to fill an important gap in our knowledge about change in criminal behavior during adulthood. Rather than examine extended time periods, we conduct a fine-grained analysis of month-to-month change in criminal behavior over three years for a sample of serious offenders. Thus, we forego the broad sweep of trajectories over the life-span in favor of a more detailed mapping of the correspondence between offending and current circumstances.

SOCIOLOGICAL THEORY AND CRIME BY ADULTS

Although the sociological tradition is compatible with the study of changes in offending during adulthood, most work on this topic stems from other traditions, such as developmental perspectives (Moffitt 1993; Patterson and Yoerger 1993) and the criminal careers perspective (Blumstein, Cohen, Roth, and Visher 1986). The limited role of sociology in this area is perhaps understandable in that prominent sociological theories primarily concern juvenile delinquency rather than adult crime. For instance, Shaw and McKay's (1942) classic theory of social disorganization portrayed delinquency as arising from adults' inability to supervise their children's activities, and there is no obvious generalization to crime by adults.

Other sociological theories are more pertinent to adult offending, either because they entail types of socialization that have long-term implications or because they specify general social processes that are not limited to a particular age. An example of the first type of theory is Cohen's (1955) strain theory, which explains delinquency as stemming from socialization that leaves lower-class adolescents unprepared to compete by middle-class standards. Differential association theory (Sutherland and Cressey 1955) and its social learning variations (Akers 1985; Elliott, Huizinga, and Ageton 1985) exemplify the second type of theory—they predict that changing from a conventional peer or reference group to a deviant one leads to crime, regardless of age. It is not simply associations that create change, but rather the learning or influence that follows from such associations, which takes time. These two types of theory imply that change in criminal behavior is nonexistent or very gradual. Thus, these theories do not predict the month-to-month correspondence between offending and social factors that we investigate in the present study.

Two other veins of sociological theory imply more immediate effects of changing life circumstances during adulthood. Social control theory, as described in Hirschi's early work, proposes that social bonds prevent crime and deviance (Hirschi 1969). Because crime results directly from the absence of bonds rather than from some mediating process, social control theory predicts relatively rapid changes in criminal behavior in response to changing life circumstances. Immediate effects also follow from rational choice or opportunity theories, such as routine activities theory (Cohen and Felson 1979). This approach emphasizes the role of social conditions in creating situations conducive to crime. When applied to individual offending, routine activities theory predicts that adults' involvement in crime will increase or decrease as their roles and relationships change their "daily round" of activities so as to present more or fewer opportunities for offending.

LONGITUDINAL DESIGNS AND THE ANALYSIS OF CHANGE

A reliance on cross-sectional designs has limited the ability of criminologists to study change. Cross-sectional designs preclude separating the effects of extrinsic variables from the effects of enduring individual differences. For example, the finding that men in stable marriages commit fewer crimes than those not involved in such relationships can be interpreted either as evidence of the social control function of marriage or as evidence that offending and failure to develop a stable marriage are both indicators of a single underlying trait, such as self-control. Thus, Farrington (1988, 1992) and others have argued that longitudinal research designs are needed to appropriately address questions relating to change in criminal behavior.

Even when longitudinal data have been collected, analyses have rarely assessed within-individual change, such as determin-

ing whether individuals commit more crimes when unemployed than when employed. Most longitudinal data currently available for studying criminal behavior were obtained infrequently, thus making the analysis of within-individual change difficult, if not impossible. With widely spaced waves of data collection and correspondingly few alternations of conditions, there must be greater dependence on aggregation in order to have enough variability to study. Nagin and Farrington (1992a, 1992b) demonstrated how relationships detected through the cross-sectional analysis of longitudinal data can be spurious and suggested the use of statistical methods that control for "persistent unobserved heterogeneity" (i.e., stable individual differences in rates of offending).

Gottfredson and Hirschi (1990) argued that longitudinal designs intended to study changes in offending offer no real advantage and waste resources because there is *little reason to believe that ordinary events are important determinants of offending*. In fact, they contended "that crime-relevant characteristics of people cause all of these events" (p. 237). Testing this contention requires analyses of within-individual change.

CONCEPTIONS OF CHANGE IN CRIMINAL BEHAVIOR

One of the most comprehensive longitudinal data sets in criminological research was collected by Glueck and Glueck (1950). Challenging the notion that ordinary events do not matter, Sampson and Laub (1990, 1993; Laub and Sampson 1993) re-analyzed the Gluecks' data using more sophisticated techniques and evaluated the findings in light of current theory. In their "sociogenic" theoretical model, they proposed that regardless of an individual's delinquent or antisocial background, criminal behavior would still be influenced in adulthood by institutions of informal social control, such as family or work. Thus, from a social control approach, Sampson and Laub (1990) suggested that "childhood pathways to crime and deviance can be significantly modified over the life course by adult social bonds" (p. 611).

The Gluecks' data came from interviews at ages 14, 25, and 32 with delinquent and nondelinquent boys matched on a number of social variables. Sampson and Laub (1990, 1993) constructed an overall measure of crime frequency and considered its relation to three key independent variables: job stability, commitment (a combined measure of the respondent's work, education, and economic ambitions), and attachment to spouse. They controlled for criminal "propensity" by performing separate analyses for the delinquent and nondelinquent samples and by studying relationships within a given age range while controlling for delinquency at earlier ages. Although they found clear evidence of stability of offending over time, job stability and marital attachment emerged as significant predictors of adult crime and deviance, even after childhood delinquency and crime in young adulthood were controlled. Accordingly, Sampson and Laub (1990) concluded that "both continuity and change are evident, and that trajectories of crime and deviance are systematically modified by social bonds to adult institutions of informal social control" (p. 625).

Laub and Sampson (1993) discussed the nature of change and provided illustrations of three kinds of change. What Caspi and Moffitt (1993) refer to as "systematic" or "deep" change is depicted by a high-rate offender who ceases offending completely, whereas what Laub and Sampson called "modified" change is exemplified when a high-rate offender starts offending at a lower rate. A third kind of change is illustrated by an offender switching from burglary to robbery. Although Laub and Sampson were most interested in the first two kinds of change, all fit within their conceptualization of change. Appropriate to their life-course perspective and their focus on the alteration of life trajectories, they implicitly conceptualize change as an enduring modification of behavior patterns.

Laub and Sampson's (1993) perspective also led them to look to the role of institutions, such as employment and marriage, to understand how social bonds structure the process of change. Transitions into such institutions are traditionally considered to be unidirectional (i.e., these transitions represent stages of development or permanent changes in state). A young man joins the work force or marries and starts a family, and his social investment in these institutions ac-

cumulates from that point on. Nevertheless, adult lives are not always so orderly, especially the lives of serious criminal offenders. Not only do role transitions often fail to follow an orderly progression (Rindfuss, Swicegood, and Rosenfeld 1987), but reversals of transitions may be common, as when employment is terminated or a marriage is dissolved. In their qualitative analysis of the life-history records of men from the Gluecks' study, Laub and Sampson (1993) described how some men experienced declines in job stability when the labor market changed and how others, who had married and initially got along well with their spouses, had marriages unravel ("there were separations, followed by reconciliations, followed by further separations" [p. 317]). When these scenarios were played out, "crime and deviance became more pronounced over time due to the severing of social ties to work and family" (p. 317).

Sampson and Laub (1990, 1993) have made a major contribution to criminology by showing that a focus on stability or continuity of offending is insufficient for understanding adult criminal behavior. By showing how adult social bonds can alter life trajectories, they demonstrated that change matters. The long-term view of change Sampson and Laub provided can be seen only when looking back on a relatively long segment of an individual's life course. It is also the only picture of change that can emerge when our view of the life course is constructed from infrequent measurements. We believe it may also be productive to consider a short-term view of change and ask whether levels of criminal activity shift in response to alterations in "local life circumstances." We introduce the term "local life circumstances" to emphasize conditions in an individual's life that can fluctuate relatively frequently. Because these life circumstances may be constantly shifting, any resulting changes in criminal behavior may be transient rather than enduring. The same circumstances that lead one person to an altered life trajectory because the circumstances endure (a stable marriage, for example), may produce only transient change in another individual if the circumstances are fleeting (a marriage that lasts only a few months or years).

LOCAL LIFE CIRCUMSTANCES AND SHORT-TERM VARIATION IN CRIMINAL CAREERS

Within the criminal careers paradigm (Blumstein et al. 1986), the study of change has emphasized the determinants of career initiation or termination; persistence in offending has generally been viewed simply as the converse of desistence. Research on persisting careers has focused almost exclusively on the frequency of committing crimes (incidence) and has generally assumed that offending occurs at a constant rate.

There have been few attempts to look at within-individual variability in offending over relatively short periods of time. Horney and Marshall (1991) found that incarcerated offenders described considerable month-to-month variability in levels of offending, and that activity patterns varied by type of crime. Nagin and Land (1993) found that models of offending that incorporate an intermittency parameter that allowed for periods of activity and inactivity performed better than models without such a parameter. Thus, they established that there is genuine within-individual change over time in offending. They observed, however, that "notwithstanding its contribution to the model fit, the concept of intermittency is problematic because a promising theoretical explanation for why it should occur has yet to be offered" (p. 357).

We believe one plausible explanation for intermittency is that the same kind of social control variables that Sampson and Laub (1990, 1993) found to alter trajectories of criminal offending are also responsible for short-term variation in criminal behavior. In other words, whether an individual offends at a particular time depends on whether he or she is employed, married, or going to school at that time. Although a persistent underlying trait like self-control can influence both an individual's overall level of offending and his or her overall stability of marriage and employment, that shared influence does not mean that a relationship between offending and the life circumstance is necessarily spurious. It is still possible that involvement in those social institutions influences the likelihood of offending *during the time of involvement*. The high crime rate of the most persistent offender, rather than in-

dicating a total lack of investment in social institutions, may instead reflect alternating periods of criminal activity and inactivity. A coherent causal pattern would be indicated if the relatively infrequent and brief periods of inactivity correspond to sporadic episodes of social bonding.

Some theorists have dealt with the role of more localized life circumstances in determining criminal offending. Farrington (1992), for example, asserted that

> ... short-term, situationally-induced motivating factors that are conducive to offending include boredom, frustration, alcohol consumption, getting fired from a job, or quarrelling with a wife or girlfriend. Slightly longer-lasting life circumstances or events may also be important, such as unemployment, drug addiction, and shortage of money. (P. 278)

Unfortunately, empirical evidence of relationships between such factors and offending is scarce.

Farrington, Gallagher, Morley, St. Ledger, and West (1986) analyzed data from the Cambridge Youth Study, which was collected in two-year waves, and found that boys in their sample had higher crime rates during periods of unemployment than they did during periods of employment. Unfortunately, their analysis was hampered by the fact that only 95 of the 399 youths had committed offenses, and only 11 had at least one offense when unemployed and one offense when employed. The authors appropriately noted a self-selection problem—that the youths who were unemployed could differ in many ways from those who were employed, and the higher crime rate during unemployment could occur because both variables were related to some other causal factor. They attempted to control for this possibility by restricting the analysis to youths who had been unemployed and had committed officially recorded crimes, but this resulted in very small numbers of youths. When, in their "most important test of the effect of unemployment" (p. 345) they also required minimum periods of unemployment, the resulting analysis was based on only 36 youths. The authors suggested that to determine whether individual offending varies with conditions like employment, larger samples and samples of persons with relatively high offending rates must be studied.

THE CURRENT STUDY

In the current study, we explore the role of local life circumstances as determinants of change in criminal behavior. Our data were obtained through a retrospective survey in which more than 600 serious offenders provided a month-by-month account of criminal offenses and local life circumstances. Our analysis extends Sampson and Laub's (1993) application of social control theory to criminal career trajectories by considering whether local life circumstances that strengthen or weaken social bonds influence offending over relatively short periods of time. We focus on informal mechanisms of social control and ask if the likelihood of offending is affected by going to school, being employed, living with a wife or girlfriend, drinking heavily, or using drugs. We also consider the impact of formal social control mechanisms by asking whether individuals are less likely to offend when they are on probation or parole. We employ hierarchical linear modeling to obtain a within-individual analysis of factors that determine the patterning of offending.

METHODOLOGY

The data presented here are based on interviews conducted with 658 newly convicted male offenders sentenced to the Nebraska Department of Correctional Services during a nine-month period in 1989–1990. A few inmates incarcerated during that time could not be interviewed for various logistical reasons; 94 percent of those invited to participate completed interviews. This sample was 57.3 percent White and had a mean age of 28.1 years. Although this sample is not representative of the general population, it is suited to addressing the impact on criminal behaviors of changes in local life circumstances. The short-term variability we wish to study is far greater in this sample than it is in most others, owing to the prison respondents' high rates of offending and the considerable instability of their lives in terms of marriage, employment, and so forth.

Because we sampled incarcerated offenders, our sample is not representative of the general population of offenders. We must assume we have oversampled men who com-

mit more crimes, those who commit crimes for which it is easier to be caught and convicted, and those who are less able to avoid detection.

Survey Instrument

We used a modified version of a survey instrument used in the RAND Corporation's Second Inmate Survey (Chaiken and Chaiken 1982). The 48-page instrument generally required a 45- to 90-minute interview. In the critical section of the interview, two calendars—an "event calendar," and a "crime calendar"—were used to establish the reference period and to record detailed information. Respondents were asked to consider a reference period based on the date of the arrest that led to the current incarceration. The reference period included the months up to and including the month of arrest for the calendar year of arrest and the two calendar years preceding the year of arrest. The measurement periods thus varied across respondents from 25 months to 36 months. All months outside the reference period as well as any months during which the respondent had been locked up were crossed out on the calendars. The remaining months were considered "street months."

The event calendar was then used to record various life circumstances. The respondent was asked to identify those street months during which he had been on probation, on parole, going to school, working, living with a wife, living with a girlfriend, drinking heavily, or using drugs (other than prescription drugs or marijuana). The interviewer placed a check beside the appropriate items for those months. The crime calendar was created in the same manner to determine the months during which the respondent committed any burglaries, personal robberies, business robberies, assaults, thefts, auto thefts, frauds, forgeries, or drug deals.

Research indicating that personal memories are organized as "autobiographical sequences" (Bradburn, Rips, and Shevell 1987) suggests that the use of life-history calendars helps to facilitate recall. Evidence of the reliability of retrospective data collected through life-history calendars is available from studies that have gathered the retrospective data within a longitudinal research design. Freedman, Thornton, Camburn, Alwin, and Young-DeMarco (1988) found that 91 percent of respondents gave identical answers about 1980 school attendance (whether attending school in a particular month) in 1980 interviews and 1985 interviews, while 83 percent gave identical responses about employment.

In a similar study, Caspi and Amell (1994) used a life-history calendar to obtain retrospective data about monthly life events that had been concurrently reported three years earlier. They compared reports of whether the respondent was living with parents, cohabiting with a partner, the primary caregiver for a child, attending school, involved in job training, employed, and searching for employment or receiving unemployment benefits. Over 90 percent of the reports matched with regard to status for the month of the first interview.

Statistical Model

Hierarchical linear modeling (HLM), a generalization of multiple regression for nested or repeated-measures data, was developed by Bryk and Raudenbush (1992) and other statisticians. Raudenbush (1993) presented a binomial version of the model that is suited to a research design like ours, which includes many waves of dichotomous data for each subject. We will first describe the HLM model for continuous data. Then we will turn to the distinctive features of the binomial version.

HLM is one of several methods developed in recent years for analyzing data containing multiple observations for each individual. These methods provide a general format for analyses that allow effects to vary randomly across cases (Goldstein 1987; Mason, Wong, and Entwistle 1983), and they follow from earlier statistical developments extending random-coefficient models (Hsiao 1986, chap. 6, esp. pp. 151–53). These models can also be viewed as extensions or generalizations of analysis of variance for repeated-measures designs (Bryk and Raudenbush 1992:chap. 2) and as elaborations of models for "pooled time-series and cross-sections" found in econometrics (Sayrs 1989). We have chosen Bryk and Raudenbush's HLM because it is flexible and is described well in

available publications. Also, a computer program for implementing the version of the method for continuous data is commercially available (Bryk, Raudenbush, and Congdon 1993), and a version of HLM for dichotomous data has been developed.

Within-person model. HLM separates within-person and between-persons models, as in repeated-measures analysis of variance. These models are distinct, but closely linked, linear models. In an HLM analysis, the within-person model must be considered first because it determines the meaning of the between-persons model. Equation 1 presents the basic elements of the within-person models used in our analysis:

$$Y_{ij} = \beta_{0,i} + \beta_{1,i}T_{ij} + \beta_{2,i}X_{ij} + r_{ij}, \quad (1)$$

where i is the index for persons, j is the index for occasions, T is an interval measure of time (months in our study), and X is an explanatory variable that varies over time for at least some of the respondents. In our application the explanatory variable is a local life circumstance like employment or marriage.

Notice that the parameters, β, can take different values for different individuals because they carry the subscript i. $\beta_{0,i}$ is the individual's intercept, which will be the fitted value of the dependent variable, crime, when both T and X equal 0; $\beta_{1,i}$ is the amount this person's level of crime (Y) changes per unit of time; and r_{ij} corresponds to the unexplained variance for this specific observation on Y. Against the backdrop of the time trend for each individual, the outcome also varies as a function of the local life circumstance, and $\beta_{2,i}$ reflects the magnitude of this relationship.

Between-persons model. In most applications, including ours, the primary results of interest are the parameters of the between-persons model. In HLM, the individual-level parameters from the within-person model serve as dependent variables for the between-persons model, leading to a separate equation for each parameter:

$$\beta_{0,i} = \gamma_{0,0} + u_{0,i}; \quad (2)$$

$$\beta_{1,i} = \gamma_{1,0} + u_{1,i}; \quad (3)$$

$$\beta_{2,i} = \gamma_{2,0}. \quad (4)$$

In the general HLM model, these between-persons equations may include additional explanatory variables for characteristics that do not change over the period of study (e.g., race and sex), but this feature plays a minor role in the present study because our theoretical interests involve change in local life circumstances.[1] In the present study, the between-persons models are simple because each model involves a single parameter, γ (with one exception discussed below). In this case, the γ parameters reflect the average level of the corresponding within-person parameters, which in turn indicate individual-level intercepts, time trends, and effects of the local life circumstance.

Error terms. In equations 2 and 3, the person-specific error terms, $u_{0,i}$ and $u_{1,i}$, mean that the between-persons model treats $\beta_{0,i}$ and $\beta_{1,i}$ as random effects (i.e., as having meaningful variance across individuals). The error term in equation 2, $u_{0,i}$, allows for random variation in the form of individual differences in the average level of offending, which typically is the principal source of correlated error when applying ordinary least squares regression to panel data. This term appears in the variance-components models found in the pooled time-series literature (Sayrs 1989) and is equivalent to the persistent heterogeneity that is a central feature of Nagin and Farrington's work (1992a, 1992b).

Equation 3 shows how HLM generalizes this principle to other elements of the within-person model, making this a "random coefficients" model. In this case, the error term, $u_{1,i}$, reflects unexplained variability in linear time trends. Thus, including this error term allows the linear time trends to vary across individuals. This term helps correct for a second type of problem of independence because it allows for gradual change over time, which is a major source of serially correlated error. Equation 4 does not contain an error term because there is no a priori reason to assume that the effects of local life circumstances vary across individuals.

We can form an overview of the between-persons model by substituting equations 2, 3, and 4 into equation 1:

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[1] Elaborating this aspect of the models, to assess whether the impact of local life circumstances varies across groups, would be an appropriate direction for future research.

$$Y_{ij} = \underbrace{\left(\gamma_{0,0} + \gamma_{1,0}T_{ij} + \gamma_{2,0}X_{ij}\right)}_{\text{[Effects on }Y\text{]}}$$

$$+ \underbrace{\left(u_{0,i} + u_{1,i}T_{ij} + r_{ij}\right)}_{\text{[Composite error term]}}. \qquad (5)$$

This arrangement makes apparent the composite error term, which resolves the problems of independence that arise with multiple measures of Y for each respondent. Similar composite error terms are characteristic of repeated-measures analysis of variance and variance components models for pooled time-series.

Within-person change. The estimate of the impact of the local life circumstance X that is captured by $\gamma_{2,0}$ in equation 4 represents the combined effects of differences between individuals in their average circumstances and within-person change over time in this circumstance (Bryk and Raudenbush 1992: 117–23). This is inappropriate because our substantive interest is in change. An estimate that is restricted to within-person change can be obtained by two modifications to the preceding equations. First, the values for X in equation 1 are transformed to deviations from each individual's mean calculated across the entire period of observations:

$$X_{ij}^{*} = X_{ij} - \overline{X}_{i.} \,.$$

Second, the individual means, $\overline{X}_{i.}$, are included as an explanatory variable in the equation for overall individual differences (equation 2):

$$\beta_{0,i} = \gamma_{0,0} + \gamma_{0,1}\,\overline{X}_{i.} + u_{0,i} \,.$$

Under this formulation, $\gamma_{0,1}$ reflects the effects of between-persons differences in average local life circumstances, while $\gamma_{2,0}$ (from equation 4) satisfies our need for an estimator that reflects the effects of within-person change.[2]

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[2] Fixed-effects estimators for panel data also restrict the analysis to within-individual change. Both the fixed-effects approach and our approach limit the analysis to deviations from individual means on X. In fixed-effect models the same transformation is applied to Y, whereas we accomplish the same result with random effects by including the individual mean of X as a predictor. The fixed-effects approach is difficult to apply to discrete outcomes when there are more than a few waves of data (Greene 1990:686–88), but our model gives us one of its principal advantages.

Model estimates. An HLM analysis yields estimates of the between-persons parameters, their standard errors, and their statistical significance. The results also include estimates of the magnitude and reliability of the variance components of random effects. HLM uses the covariances among the errors of the βs to derive generalized least squares estimates of the γs. In this fashion, HLM capitalizes on any interdependence among the within-person components to increase the efficiency of the estimates and to gauge their standard errors. Bryk and Raudenbush (1992) presented the statistical theory underlying HLM in an extended treatment that is not highly technical. The method relies on iterative estimates of the true variance and the error variance of the $\beta_{k,i}$, which are derived through a Bayesian weighting of information from the within-person and between-persons portions of the analysis. HLM also capitalizes on the EM algorithm, developed by Dempster et al. (1977), to make use of data from all respondents, including respondents with insufficient data for separate estimation of the within-person parameters. As with most methods for analyzing continuous dependent variables, HLM assumes that errors for particular observations, $r_{i,j}$, are normally distributed. Furthermore, treatment of the within-person parameters as random effects requires specification of their error distributions, and these error terms, $u_{1,i}$, are also assumed to be normally distributed.

The HLM model does not require that each person provide data on any particular set of occasions, which means that the method is suitable for irregular data sets, unlike many other approaches to analyzing panel data. This flexibility arises because the parameters of interest, the between-persons parameters, γ, are defined in relation to the within-person parameters, β. Thus, the analysis does not hinge on having a particular set of observation times for Y, but rather on the available observations of Y providing enough information to estimate the individual-level βs. HLM gauges the precision of these person-specific estimates from information such as the number of data points and the variances of Y, T, and X for the respondent.

Binomial HLM. The statistical model for the binomial version of HLM closely follows the format of the basic HLM model (Rau-

denbush 1993). The within-person model becomes a logistic regression:

$$\log_n\left[odds\left(Y_{ij}=1\right)\right] = \beta_{0,i} + \beta_{1,i}T_{ij} + \beta_{2,i}X_{ij}. \quad (6)$$

Thus, the fitted values from the within-person model no longer refer directly to levels of Y. Instead this is a linear model of the logit, which is the natural logarithm of the odds that the dichotomous Y variable will take on the value 1, (i.e., an offense occurred this month) rather than the alternative value of 0 (i.e., no offense this month). Also, the within-person model no longer includes an error term because the logistic model is inherently probabilistic. This use of the logistic regression model brings to HLM a standard approach for correcting the problems that would result from applying ordinary least squares regression to a dichotomy.

Equations 2, 3, and 4 still define an appropriate between-persons model, despite the change to the logistic within-person model.[3] Of course, these equations now reflect average values of βs that are logistic coefficients rather than ordinary regression coefficients. No change in the between-persons model is necessary, however, because the within-person coefficients (which serve as the dependent variables) are continuous and have meaningful intervals. The generalized least squares derivation of the estimates of the between-persons parameters remains applicable, although the weighting of the variance components changes according to the precision of logistic regression estimates. Because the logistic regression model is nonlinear in relation to the observed values of Y, the estimation requires an iterative reweighting of the within-person data.

Our full model. Our analysis extends the simple model presented above in two re-

spects. First, the analyses included seven local life circumstances rather than the single X in the example. All life circumstances are dichotomies (coded 1 if the feature is present and 0 if not) extracted from the event calendars in the same fashion as the measures of offending. The specific life circumstances are supervision by the justice system (probation or parole), attending school, working, living with a wife, living with a girlfriend, heavy alcohol use, and use of illicit drugs other than marijuana.

We also extended the simple model by including a more elaborate control for individual time trends. Because the analysis includes up to 36 waves of data for each respondent, it would be unreasonable to assume that individual time trends are so consistent as to be linear. Instead, the basic model allows greater flexibility in the time trend through a third-order polynomial function of time. The within-person intercept and all three powers of time were specified as random effects. As a result, changes over time in offending are attributed to substantive variables only if offending closely tracks that variable over time. More gradual or diffuse changes are instead attributed to the individual time trend.

The final element of the model is a dummy variable indicating the month of the arrest leading to the current incarceration.[4] This variable corrects the offense rate for this specific month, which is artificially high due to our sample selection criteria.

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[3] The coefficients for the between-persons model represent conditional relationships in that the analysis controls for individual differences in overall rates of offending. Because the binomial model is nonlinear in relation to probabilities, these conditional within-individual relationships tend to be stronger than the marginal relationship of the explanatory variables to the average rates of offending for the entire population (Zeger, Liang, and Albert 1988). We report only conditional relationships because our focus is on change within individuals over time.

[4] The time variables were transformed to reduce the correlations among the components and improve the efficiency of the estimation of the model. These transformations have no impact on the substantive results of the model, but they must be taken into account in order to reproduce the average time curves. The last wave of data collection was given a value of 0 on the components of the polynomial of time, making the dummy code for the last month orthogonal to the other time components. To give the linear component a mean of 0 across persons, a value of 0 was assigned to 15.4 months before the final month. The squared term for month was this value multiplied by itself and divided by 10 (to reduce its range and place its coefficient in a more useful range). We subtracted 8 from the result, to give it a mean of 0. Finally, the cubed power of time was formed as the product of the linear and squared terms, divided by 10.

Fifty-three percent of the sample reported one or more offenses for this month versus 32 percent for all other months.[5] Because this variable refers to a single month, it was defined as a fixed effect.

RESULTS

The analysis was limited to respondents who contributed information on the full set of variables for at least 10 "street months." Though HLM does not require any minimum number, respondents with fewer months of data would contribute little to the analysis. Only 41 of the 658 respondents failed to meet this criterion; the remaining 617 respondents provided data for an average of 28.36 months.

The analysis was conducted separately for each of four measures of offending. The first measure, "any crime," was coded 1 for months in which a respondent reported committing at least one of the nine felonies. The other measures of offending referred to specific crimes: property crime (burglary, personal robbery, business robbery, theft, auto theft, forgery, and fraud), assault, and drug crime (dealing). Table 1 reports descriptive information on the measures used in the analysis.

Because our analysis focuses on within-person change, our ability to detect the impact of local life circumstances is largely dependent on the number of respondents who experience change on those variables. Column 2 of Table 1 reports the proportion of respondents who had at least one transition during the period of study for each of the local life circumstances (e.g., from student to nonstudent or nonstudent to student, as opposed to always a student or never a student). Fully 85 percent of the sample experienced at least one transition over this interval of no more than three years, and over one-half experienced two or more transitions.

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[5] The rate still falls well below 100 percent because: (1) arrest could occur more than a month after the actual offense; (2) a small proportion of respondents were incarcerated for offenses not included in the measure (e.g., drunk driving); and (3) some respondents claimed not to have committed the offense for which they were incarcerated, although they admitted to other offenses.

Table 1. Descriptive Statistics for Variables Used in the Analyses: Male Offenders in Nebraska, 1989–1990

Variable	Proportion of Months	Proportion of Sample with Change in Status
Measures of Offending		
Any crime	.33	
Property crime	.11	
Assault	.06	
Drug crime	.23	
Explanatory Variables		
Probation or parole	.11	.25
School	.11	.25
Work	.65	.58
Live with wife	.19	.12
Live with girlfriend	.29	.30
Heavy drinking	.28	.19
Illegal drug use	.24	.22

Note: N = 617 individuals; 17,500 street months.

Summary Statistics for Change in Offending

Table 2 presents some simple summary statistics about the changes in offending following changes in local life circumstances. These statistics reflect periods that begin with a change in a local life circumstance (e.g., starting school) and end with either a change in offending (for our "any crime" measure), a subsequent change in that local life circumstance (e.g., stopping school), or the end of the period of observation. The odds of starting crime is computed for periods preceded by a month for which no crime was reported; it is the ratio of the number of instances in which a subsequent crime was reported divided by the number of instances in which no offense was reported throughout the period. The odds of stopping crime is the comparable ratio for periods preceded by a month in which an offense occurred. The odds ratios and log odds in Table 2 indicate that changes in offending depend on changes in local life circumstances. Thus, for men on probation or on parole, the odds ratio of .42 for starting crime (.69 divided by 1.63) indicates that the odds of starting to offend are

over twice as high after probation or parole stops as after the supervision starts. The odds ratio of .74 for stopping crime (.49 divided by .66) indicates that the odds of stopping crime are greater after probation or parole stops than after the supervision starts.

The results presented in Table 2 suggest that changes in offending systematically follow changes in local life circumstances. Typically, the odds of a change in offending roughly double (or are halved) following a change in a local life circumstance, such as marriage, employment, or drug use. Furthermore, the two directions of change in the explanatory variables typically have comparable relationships with criminal behavior, as is assumed in the HLM analysis. For instance, moving in with one's wife doubles the odds of stopping offending (compared to moving away), and moving away from one's wife doubles the odds of starting to offend (compared to moving in). The largest discrepancy is for living with a girlfriend. The odds of stopping offending were considerably lower after moving away from a girlfriend, but starting to offend was unrelated to this variable. The presence of a single discrepancy of this limited magnitude is not surprising from such a simple and ad hoc summary of the data.

Variance Components

The HLM analyses provide greater statistical control and allow us to gauge the precision of our results. Table 3 shows results for the variance components of the model. Estimates of variance components are provided for unconditional models, which include the time trends but not the explanatory variables, and conditional models, which include all variables. Preliminary analyses indicated that the higher-order elements of the polynomial time trend were not justified for some of the measures of offending. For all measures, there was substantial variation in average level of offending, as reflected by the size and reliability of the variance components for the within-person intercepts. This replicates Nagin and Farrington's (1992a, 1992b) finding that there are substantial individual differences in propensities to offend, and extends that finding to a prison population with a much higher overall rate of offending.

Table 2. Odds of Changes in Offending Following Changes in Local Life Circumstances: Male Offenders in Nebraska, 1989–1990

Life Circumstance	Odds of Crime Starting	Odds of Crime Stopping
Probation or Parole		
Starts	.69	.66
Stops	1.63	.49
Odds ratio	.42	.74
Log odds	−.86	−.30
School		
Starts	.33	.36
Stops	.76	.25
Odds ratio	.43	.70
Log odds	−.84	−.35
Work		
Starts	.33	.36
Stops	.76	.25
Odds ratio	.43	.70
Log odds	−.84	−.35
Live with Wife		
Starts	.62	.75
Stops	1.20	.42
Odds ratio	.52	.56
Log odds	−.66	−.59
Live with Girlfriend		
Starts	1.02	.25
Stops	1.11	.66
Odds ratio	.92	2.64
Log odds	−.09	.97
Heavy Drinking		
Starts	.51	.42
Stops	.25	1.12
Odds ratio	2.09	2.67
Log odds	.74	.98
Illegal Drug Use		
Starts	.59	.20
Stops	.27	.37
Odds ratio	2.16	1.86
Log odds	.77	.62

Note: Odds ratios greater than 1 and positive log odds indicate greater odds of starting crime after the local life circumstance starts and greater odds of stopping crime after the local life circumstance stops.

Table 3. Variance Components for Random Effects in Binomial Hierarchical Linear Models: Male Offenders in Nebraska, 1989–1990

Type of Crime and Model Term	Unconditional Model			Conditional Model		
	Reliability	Variance	χ^2	Reliability	Variance	χ^2
Any Crime						
Intercept	.81	11.298	4,398.2*	.76	8.750	4,498.3*
Month	.42	.026	1,202.9*	.40	.025	1,157.0*
(Month)^2	.26	.011	763.0*	.24	.011	715.0*
(Month)^3	.16	.007	465.3	.14	.006	432.1
Property Crime						
Intercept	.66	7.061	4,781.6*	.62	6.161	3,957.4*
Month	.22	.008	628.9	.21	.008	623.2
(Month)^2	.16	.007	513.3	.16	.007	507.8
Assault						
Intercept	.56	4.799	3,922.4*	.53	4.617	3,509.6*
Month	.17	.007	429.6	.17	.007	427.3
Drug Crime						
Intercept	.72	14.324	5,445.0*	.66	12.701	5,015.8*
Month	.32	.020	1,035.8*	.30	.022	932.2*
(Month)^2	.21	.013	624.7	.18	.012	523.7

*$p < .05$ (two-tailed tests)

Note: All terms had 616 degrees of freedom, except the intercepts in the conditional models, which had 609.

Effects of Local Life Circumstances

Table 4 reports the estimates of the within-person effects of local life circumstances from the binomial HLM analyses. The table includes the logistic coefficients, γ (as in $\gamma_{2,0}$ in equation 4), their standard errors, and the odds ratios corresponding to the coefficients. (Coefficients for the time trends and between-persons differences in the local life circumstances, which are not of substantive interest for this analysis, are available on request from the authors.)

Use of illegal drugs was related to all four measures of offending. Use of drugs had an especially strong association with involvement in drug dealing—the logistic coefficient of 2.75 corresponds to a 15-fold increase in the odds of drug crime during months of drug use. Although the relationship of illegal drug use to property crimes and assaults is less extreme, it is still substantial. During months of drug use, the odds of committing a property crime increased by

54 percent, and odds of committing an assault increased by over 100 percent. Combining these for the summary index, illegal drug use increased the odds of committing any crime by sixfold.

Our findings on the impact of drug use are consistent with studies of heroin addicts that have compared periods of addiction with periods of nonaddiction. Ball, Shaffer, and Nurco (1983) and Anglin and Speckart (1986) found substantially higher self-reported crime-commission rates during periods of addiction. Our results indicate that drug use apparently has the same kind of deleterious effects, even when a criterion less stringent than addiction is used (i.e., monthly use) and when drugs other than heroin are considered (i.e., illegal drugs other than marijuana; very few of our respondents used heroin).

Heavy drinking was positively related to the four measures of offending, significantly so for property offenses. Indeed, heavy drinking was more strongly related to commission of property crimes than was illicit

Table 4. Logistic Coefficients (γ) and Odds Ratios from Binomial Heirarchical Linear Models of Monthly Offending in Relation to Change in Life Circumstances: Male Offenders in Nebraska, 1989–1990

Life Circumstance	Any Crime		Property Crime		Assault		Drug Crime	
	γ	Odds Ratio	γ	Odds Ratio	γ	Odds Ratio	γ	Odds Ratio
Probation or parole	−.21 (.20)	.81	−.27 (.20)	.76	.06 (.22)	1.06	.08 (.28)	1.08
School	−.73* (.18)	.48	−.25 (.20)	.78	−.17 (.23)	.84	−.94* (.24)	.39
Work	.13 (.11)	1.14	.25* (.12)	1.28	−.28 (.16)	.76	.11 (.15)	1.11
Live with wife	−.52 (.29)	.59	−.19 (.31)	.82	−.84* (.38)	.43	−.48 (.39)	.62
Live with girlfriend	.50* (.17)	1.64	.25 (.18)	1.28	−.06 (.23)	.94	.49* (.21)	1.63
Heavy drinking	.39 (.21)	1.48	.63* (.23)	1.88	.31 (.29)	1.36	.53 (.29)	1.71
Illegal drug use	1.81* (.19)	6.10	.43* (.20)	1.54	.73* (.27)	2.07	2.75* (.25)	15.70

*$p < .05$ (two-tailed tests)

Note: Numbers in parentheses are standard errors.

drug use. Although not statistically significant, coefficients relating heavy drinking to commission of any crime and to commission of a drug crime are sizable as well. Their relatively large standard errors result from the limited number of individuals who had changes in their heavy drinking status (see Table 1).

Table 4 shows that living with a wife is associated with lower levels of offending, but living with a girlfriend is associated with higher levels. Living with a girlfriend significantly raised the odds of offending by over 64 percent for commission of any crime and for commission of a drug crime. The relationship of living with a wife to these measures of offending was of equal magnitude, but was not statistically significant (again because of the small number of individuals with change on this variable). There was a statistically significant decrease of 57 percent in the odds of committing an assault when living with a wife.

These results are in accord with Sampson and Laub's (1993) finding that marital attachment was one of the strongest predictors of adult criminality, even after childhood delinquency and early adult criminality were controlled. Their composite measure of marital attachment was based on interview data and included the respondent's assessment of the general marital relationship, his attitude toward marital responsibility, and, for the final wave of data, a measure of family cohesiveness. Although we do not have measures of marital attachment, we do have the comparison of living with a wife and living with a girlfriend. If we assume that formalizing a relationship through marriage indicates attachment, then the lesser attachment may explain why living with a girlfriend does not lower the odds of offending. We have no explanation for the unexpected increase in the odds of offending associated with living with a girlfriend.

Changing life circumstances in the domains of work and school also contributed to the odds of offending in any given month. Attending school had uniformly beneficial consequences, significantly reducing the odds of involvement in any crime by 52 percent and the odds of involvement in drug crimes by 61 percent. Working was only weakly related to all of the measures of offending. Surprisingly, the odds of committing a property crime increased by 28 percent in the months when men worked. Though this was statistically significant, it is exceeded by an opposite, but not significant, coefficient for commission of assault. Because changes

in work status were common, these coefficients have the smallest standard errors.

We viewed employment as an important aspect of social bonding that should reduce the likelihood of offending. Our crude measure (respondents simply reported whether they worked during a given month) may be responsible for the weak results on lowered odds of offending. We measured none of the aspects of attachment to a job that Sampson and Laub (1993) considered; our measure did not even distinguish part-time from full-time employment, or temporary from permanent work. The surprising increase in the odds for commission of a property crime may reflect the increased opportunities for theft and perhaps also for forgery or fraud that are available in the workplace. The only aspect of local life circumstances that was not related to any of the indices of offending was justice supervision in the form of probation or parole.

Reduced models. We also estimated two reduced models using subsets of the seven local life circumstances. One model excludes the substance use variables of heavy drinking and illegal drug use. This reduced model is useful for two purposes. First, it is informative about potential indirect effects that might be mediated by the impact of substance use. Attending school, being employed, and living with a wife could reduce crime indirectly by reducing substance use. Comparing this reduced model to the full model gives little evidence of this. Relationships that were significant in the full model typically changed little when we did not control for substance use. There was one notable change, however: Living with a wife became significantly and negatively related to the general measure of crime ($\gamma = -.61$, s.e. = .29), which adds consistency to the previous pattern of results. Nevertheless, it does not appear that controlling for substance use obscured important effects.

This reduced model is also of interest because the causal role of the substance use variables is subject to an alternative interpretation. Heavy alcohol use and illegal drug use are deviant or conventionally disapproved behaviors, as are our measures of crime. Thus, rather than influencing crime, these behaviors may be alternative manifestations of the same factors that lead to crime

(Osgood, Johnston, O'Malley, and Bachman 1988:81–83). That would imply that their relationship is spurious rather than causal, an issue that the present analysis cannot resolve. The reduced model is useful in this regard because it provides estimates of the effects of the other local life circumstances, unbiased by any potential spurious relationship between crime and substance use.

The second reduced model concerns probation or parole, the only local life circumstance that was not related to any of the indices of offending in the full models. These results may arise because the impact of probation or parole is indirect, being mediated by intermediate effects of supervision, such as reducing illegal drug use and promoting employment. The second reduced model addresses this possibility by excluding all measures of local life circumstances other than justice supervision, thereby ruling out any indirect effects. Even in this model, there are no significant effects of justice supervision on offending. Though three of the four coefficients indicate lower rates of offending during justice supervision, the relationships are weak, reflecting a 26 percent reduction in odds of offending at most. Clearly, justice supervision did not produce substantial reductions in crime among these serious offenders. These results are consistent with previous findings in the perceptual deterrence literature that the threat of formal sanctions is much less effective in altering behavior than are informal processes of social control (Paternoster and Iovanni 1986; Paternoster, Saltzman, Waldo, and Chiricos 1983).

DISCUSSION

Our results provide clear evidence of meaningful short-term change in involvement in crime, and this change is strongly related to variation in local life circumstances. Our use of a hierarchical linear model allowed us to rule out criminal propensity as a confounding variable by controlling for individual differences in the overall probability of offending. Thus, our results cannot be explained by the possibility that drug use, unstable marriage, and criminal offending are all indicators of an underlying stable trait—a lack of self-control, for example. Rather, we found that, regardless of overall level of offending,
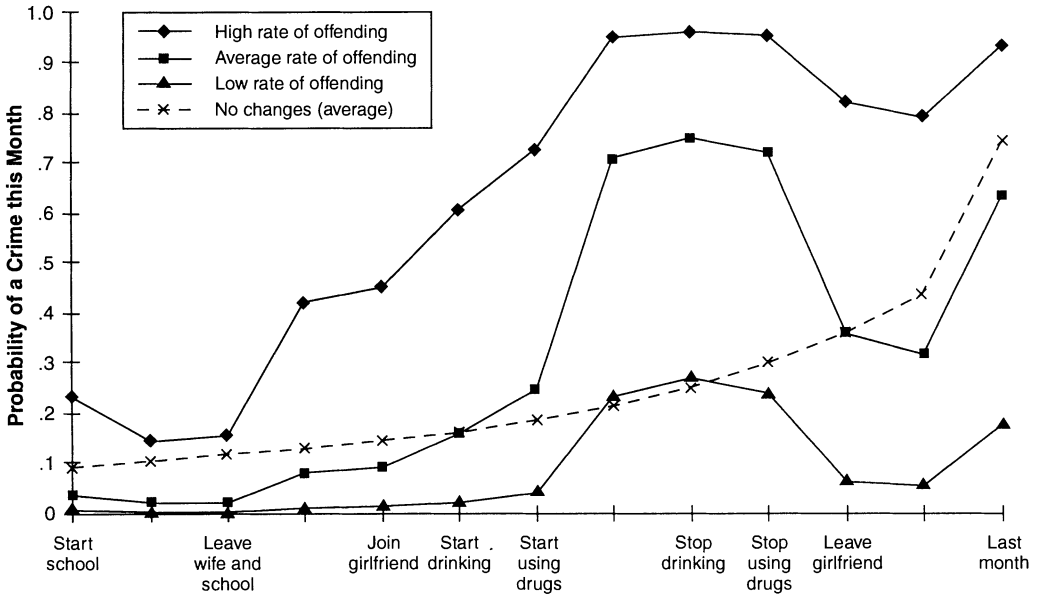
Figure 1. The Effect of Changing Life Circumstances on the Probability of Committing a Crime: Three Hypothetical Individuals

these men were more likely to commit crimes when using illegal drugs and conversely were less likely to commit crimes when living with a wife.

Figure 1 illustrates the implications of the estimates in Table 4. This figure shows that, even in the presence of substantial individual differences in the propensity to offend, varying local life circumstances produce dramatic changes in rates of offending. Probabilities of committing a crime by three hypothetical individuals who offend at average, low, and high rates (corresponding to monthly probabilities of .33, .06, and .80 when all X variables are at their means) are portrayed. They begin this period living with wives and not using drugs or using alcohol heavily. The horizontal axis indicates changes that occur from one month to the next, and the lines plot the corresponding changes in rates of offending. For comparison, a fourth line indicates the overall time trend when local life circumstances are held constant. Although changes in life circumstances have greater effects for the average- and high-rate offenders, offense rates for all three hypothetical individuals vary markedly with changes in living arrangements, school attendance, and substance use.

We believe that measuring offending activity in fairly short units of time is important for understanding the relationship between life events and criminal behavior. As Freedman et al. (1988) noted, "the traditional panel study provides only multiple snapshots of individual lives" (p. 39). When one- or two-year intervals are used, the correspondence between events in time may be missed, especially in the unstable lives of serious offenders. To detect change over brief time spans, it is also important to use self-reports of criminal activity. Although official records may be good indicators of the overall level of criminal activity, measures of arrests or convictions have base rates that are too low to allow meaningful estimation of the relationship of offending to local life circumstances.

We used life-event calendars to collect retrospective data in one-month units. Although studies on the reliability of such techniques (Freedman et al. 1988; Caspi and Amell 1994) have been encouraging, Freedman et al. (1988) reported that "one important issue in obtaining retrospective data appears to be the degree of volatility of the activity patterns, since respondents find it more difficult to recall widely fluctuating event

patterns" (p. 66). Because we studied a population with considerable volatility in their activity patterns, it would be extremely beneficial to replicate this study with a longitudinal design that allows the prospective collection of data at short intervals.

The measurement of offending and life circumstances at frequent intervals over a relatively short period of time provides a different perspective on change than that provided by Sampson and Laub (1990, 1993; Laub and Sampson 1993). Whereas their long-term perspective showed that life events could modify criminal career trajectories, our short-term perspective has shown that local life circumstances can change criminal careers by modifying the likelihood of offending *at particular times*.

Because we looked at only a tiny portion of the life course, we cannot say whether the changes we observed represent alterations in life trajectories for some individuals, nor can we assess the degree of continuity in these respondents' criminal careers. We are encouraged, however, that the underlying processes involved in producing short-term change may be the same processes that produce "deep" change, or the alteration in a life trajectory. Living with a wife reduces the short-term likelihood of committing crime; a stable marriage and attachment to a spouse may lead to the long-term cessation of offending.

We have made no attempt to explain the processes underlying change. As we noted in our introduction, social control and rational choice (or opportunity) theories provide the most relevant sociological perspectives. Sampson and Laub (1993) emphasized the role of "*informal* social controls that emerge from the role reciprocities and structure of interpersonal bonds linking members of society to one another and to wider social institutions such as work, family, and school" (p. 18) and contended that "adult social ties are important insofar as they create interdependent systems of obligation and restraint that impose significant costs for translating criminal propensities into action" (p. 141). Their focus on the quality or strength of these social ties goes beyond what we could assess with our simple indicators. Their results suggest that we might have found stronger relationships between offending and lo-

cal life circumstances if we had been able to appreciate more fully the level of investment those circumstances represented for individuals.

Rational choice or routine activity perspectives may also provide useful frameworks for thinking about the role of local life circumstances. When individuals are married and living with their spouses, their perceptions of the consequences of crime may change, either because they view themselves as having more to lose, or because a sense of shame is enhanced when the reactions of a significant other person are considered. When individuals are using drugs, on the other hand, they may become even more present-oriented, judge the utility of committing a crime to be greater, and give lesser consideration to sanctions and shame. Involvement in marriage and family, school, and work may also be important because of the role these institutions play in structuring daily activities. Time devoted to activities related to those institutions is time unavailable for "hanging out" on the streets or in bars and may therefore reduce an individual's exposure to situations conducive to involvement in criminal behavior.

Reconciling Continuity and Change

We cannot assume that the local life circumstances we studied were randomly distributed among offenders. Probably, they were to some extent determined by time-stable characteristics of the individuals. Our results in no way negate findings of long-term continuity—individuals do differ in their long-term criminal propensities and in their abilities to maintain stable schooling, employment, and marriages.

We believe that these tendencies interact with each other in complex ways and that contrasting continuity with change is a false dichotomy. As Rowe and Osgood (1984) noted, long-term correlates of offending, even genetic factors, do not rule out important social influences on crime because social processes may be essential links in the chain of causes that produce those relationships. For example, Booth and Osgood (1993) found that the positive relationship of testosterone levels to adult offending was mediated by current social integration. Thus,

although continuity over the life course supports the importance of early influences, it has no direct bearing on the contribution of social factors during adulthood.

One view of the interplay between continuity and change can be found in the recent work of Nagin and Paternoster (1993), who showed how theories of criminal opportunity and rational choice can be linked to theories that focus on enduring individual differences in propensities. Using scenarios presented to college undergraduates, they found that a measure of self-control was directly related to decisions to commit offenses and indirectly related to intentions to offend through self-control's influence on judgments about total sanctions, the perceived utility of committing the offense, and shame. Yet even after differences in self-control were accounted for, decisions to offend were still influenced by the attractiveness of the target, the ease of committing the crime, and perceptions of the costs and benefits of committing the crime. As Nagin and Paternoster (1993) noted, "a belief that variation in offending is reflective of variations in criminal propensity or poor self-control does not preclude the possibility that would-be offenders are sensitive to the attractions and deterrents of crime" (p. 490).

Gottfredson and Hirschi (1990), while arguing for the central role of a time-stable criminal propensity, acknowledged a role for immediate circumstances in determining when and where crimes are committed. They have reconciled the seeming contradiction by distinguishing between self-control—"relatively stable differences across individuals in the propensity to commit criminal (or equivalent) acts" (p. 137)—and the criminal acts themselves—"short-term, circumscribed events that presuppose a peculiar set of necessary conditions (e.g., activity, opportunity, adversaries, victims, goods)" (p. 137). Yet Gottfredson and Hirschi (1990) denied a role for life circumstances beyond the immediate situation, such as those we have studied, by arguing that these ordinary events are caused by the individual's crime-relevant characteristics and thus are only spuriously connected to crime.

We have shown that less immediate local life circumstances are also important. These circumstances may provide an essential intermediate level of analysis that can be linked both to enduring individual differences rooted in early childhood experience and to the immediate circumstances in which criminal acts occur. Our results closely parallel those of Nagin and Paternoster (1993). They showed that, although individuals with low self-control discounted the costs of crime relative to individuals with high self-control, they were not insensitive to costs. We have shown that, although individuals with a high propensity to offend maintain few social bonds to society relative to individuals with a low propensity, they are not insensitive to those bonds. Persons with a high propensity for crime may be unlikely to graduate from school, unlikely to maintain meaningful employment, and unlikely to stay in stable, committed marriages. Even so, they may *sometimes* go to school, *sometimes* work, and *sometimes* live with a wife, and *at those times* they are less likely to commit crimes. Likewise the high-propensity individuals may be more likely than others to be involved with drugs and heavy alcohol use, but *sometimes* they do not use these substances, and *when they do not*, they are less likely to commit crimes.

We believe our findings also provide a link to the long-term change described by Sampson and Laub (1993). The combined effects of several crime-inhibiting local life circumstances may lead to the accumulation of enough social capital to motivate an individual to work at maintaining the social bonds. The maintenance of the bonds may, in turn, provide additional social capital and further reduce offending. If such a process continues to spiral, it could produce the kind of incremental change that results in a major alteration of a life trajectory. Just as lives are built one day at a time, over-arching life-span trajectories can only evolve from responses to daily social realities. Inevitably, short-term and long-term analyses of change must converge. Achieving this convergence would lend considerable support to our theories, and the effort will provide a richer appreciation of the task of explaining how individual lives evolve.

In sum, our findings strongly support the conclusion that continuity and change are not opposites, but rather are two faces of intertwined causal processes. Our results forcefully demonstrate that social events during

adulthood are related to crime. Contrary to the image presented by some theorists of crime, life after puberty does matter. Yet changes in offending during adulthood do not negate the importance of enduring individual differences in criminal propensity or of related constructs like self-control. Instead, our results suggest that differences among individuals combine with their shifting social environments to produce current levels of criminal activity.

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[3] **Models for Longitudinal Data: A Generalized Estimating Equation Approach**
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