A MULTILEVEL MODEL OF DRUG ABUSE INSIDE PRISON

WAYNE GILLESPIE
East Tennessee State University

Elements from differential association and importation theory were incorporated into a contextual model to explain drug abuse inside prison. Data came from self-administered questionnaires given to more than 1,000 inmates in 30 different correctional institutions throughout Kentucky, Tennessee, and Ohio. Hierarchical linear modeling was used to examine the impact of correctional context on individual behavior. Results indicated that drug abuse inside prison varies across different correctional institutions. The effect of prior street-drug use on drug abuse in prison also varied across contexts. Moreover, an aggregate measure of crowding explained both drug abuse in prison as well as the effect of prior street-drug use on substance abuse in prison.

Keywords: *drug abuse; crowding; hierarchical linear modeling*

One of the great paradoxes in the field of corrections involves drug abuse inside prison. At first blush, it seems unlikely and somewhat contradictory that prisoners would have opportunities to engage in drug-related activities inside correctional institutions. After all, most prisons are highly structured environments that restrict the movement of inmates and monitor their behavior. Logic seems to dictate that, under such conditions of confinement, inmates would be unable to possess, produce, use, or sell controlled substances. However, the reality is that drug abuse has been and continues to be a salient aspect of the prison milieu.

Drug use inside prison represents a significant problem of adjustment to institutional life. To explain this phenomenon, earlier studies of prison drug use relied on two rather well-known theories in the field of corrections. Thomas and Cage (1977) discussed prison drug use in terms of deprivation and importation. The deprivation model, also known as indigenous influence theory, supposes that behavior inside prison is the result of a prisonization process that occurs on incarceration. During prisonization, inmates are socialized into a normative system that reflects their collective response to

THE PRISON JOURNAL, Vol. 85 No. 2, June 2005 223-246
DOI: 10.1177/0032885505277002

the pains of imprisonment associated with the organization and structure of the institution (Thomas & Cage, 1977). In this sense, drug-related behavior inside prison is simply a response or adaptation to confinement and may be explained in terms of the attitudes and beliefs associated with the inmate code.

The importation model, or cultural drift theory, stands in opposition to the deprivation model. According to this alternative perspective, inmate behavior is best explained by factors such as preprison experiences, extraprison contacts, and evaluations of life chances following release from prison. Thomas and Cage (1977) applied these theoretical models to the phenomenon of prison drug use. Their research essentially used data on prison drug use to test and evaluate these two theories of inmate adaptation; it failed to offer a comprehensive model of drug abuse inside prison.

Although the models of deprivation and importation remain useful orienting schemas, other perspectives may provide more complete explanations of drug-related behavior inside prison. In fact, as punishment and incapacitation supplanted rehabilitation and treatment as the dominant themes of modern corrections, the issue of drug use shifted from the domain of criminal justice to that of public health (Swann & James, 1998). Much current research on prison drug use now falls under the auspices of public health and social work rather than criminal justice.

The scholarship generated from this treatment perspective deals with several important empirical questions such as the prevalence of drug use in prison, patterns of use, types of drugs used, and implications for treatment (Edwards, Curtis, & Sherrard, 1999; Inciardi, Lockwood, & Quinlan, 1993; Leukefeld & Tims, 1993). This vein of research also approaches drug use in prison from a lifestyle perspective. For example, drug-related behavior in prison is a stage in the continuum of abuse and dependency. Patterns of use before and after custody are integral to understanding drug use during imprisonment (Cope, 2000; Kassebaum & Chandler, 1994; Keene, 1997).

The goal of the present study is to develop a model of prison drug abuse that incorporates elements from the treatment perspective (history of use, prison environment, etc.) with the social aspects of drug-related behavior inside prison. Although patterns of drug use inside prison have been documented by extant scholarship, explanatory models that focus on social processes inside prison are generally absent from the literature. The current study uses hierarchical linear modeling (HLM) to uncover both the individual and institutional factors that explain drug abuse (the production, use, sale, and possession of alcohol and illegal drugs, misuse of medication, and possession of drug paraphernalia) inside prison.

THE TREATMENT PERSPECTIVE

THE PREVALENCE OF DRUGS INSIDE PRISON

The linkage between crime and drug and alcohol abuse is well documented (Goldstein, 1998; Menard, Mihalic, & Huizinga, 2001; Parker & Auerhahn, 1998). Inciardi et al. (1993) noted "the use of cocaine, heroin, and other drugs does not necessarily initiate criminal careers, it tends to intensify and perpetuate them" (p. 120). An important line of research associated with the treatment perspective looks at the prevalence of drugs and drug-related behavior inside prison. Leukefeld and Tims (1993) reviewed results from the drug use forecasting system and reported that about 60% of arrestees from 22 large cities tested positive for drugs other than alcohol at the time of their arrests. They found that the criminal justice system is a reservoir for drug abusers (Leukefeld & Tims, 1993). A substantial proportion of the inmate population continues to use drugs inside prison (Swann & James, 1998).

However, the exact percentage of drug using inmates remains uncertain and may even vary from prison to prison. Thomas and Cage (1977) reported that only 22% of their sample of 273 adult male felons used drugs while in prison. Inciardi et al. (1993) found that 60% of their small sample of 44 inmates in therapeutic drug treatment communities admitted to using drugs inside prison. Likewise, Edwards et al. (1999) determined that 58% of the 376 prisoners involved in their sample injected drugs during incarceration. Based on these studies, the proportion of prisoners who use drugs during confinement appears to range from one fifth to upwards of two thirds of the total inmate population. This wide spread might be attributable to several methodological problems involving inmate samples, including telescoping, low response rates, and selection bias.

The patterns of drug-related behavior found inside prison are similar to those on the street. According to Keene (1997), "although there is a reduction in the use of all substances, the drug-use patterns in the community are reflected in custody" (p. 348). During incarceration, inmates use a variety of drugs including marijuana, valium, amphetamine, d-lysergic acid diethylamide, ecstasy, cocaine, heroin, and even steroids. Kassebaum and Chandler (1994) found that alcohol, marijuana, cocaine, and crystal methamphetamine are the most popular drugs among newly admitted inmates. Keene's (1997) research showed that marijuana is the most prevalent drug in prison, but LSD and ecstasy are common as well. Inciardi et al. (1993) also reported that the most common drugs in prison are marijuana, cocaine, and alcohol. However, they noted that inmates admitted to using d-lysergic acid diethyl-

amide, phencyclidine, methamphetamine, intravenous cocaine, and crack cocaine.

A CONTINUUM OF USE

Drugs are addictive substances, and use and abuse are life-long processes. Drug use inside prison is an expression of this continuum. Keene (1997) compared three groups of inmates at different phases of incarceration. In the first group of 134 prisoners, 74% admitted to using drugs in their communities before they were incarcerated. In another group of 119 inmates, 75% were using drugs during imprisonment. Furthermore, of 119 exconvicts, 82% disclosed using drugs in their communities after release. Keene (1997) concluded, "custodial drug use can be seen to reflect continuing use before and after prison in similar populations" (p. 350). It is in this sense that prison becomes simply another context in which the user must manage his or her habit.

Through systematic interviewing in the Delaware correctional system, Inciardi et al. (1993) described drug-related behavior in prison. They found that both visitors and correctional officers supply inmates with illegal drugs. Once inside, drugs are most often concealed on the person rather than hidden in their cells. Prisoners also produce alcohol on the inside by fermenting fruit, sugar, and bread. Furthermore, both inmates and correctional officers sell drugs inside prison. Inmates use drugs in their cells, in the yard, in the shower, or on work assignments. Additionally, inmates congregate in small groups of two to four inmates and typically use drugs together. Intravenous drug users commonly share injection equipment with one another. Thus, whereas illicit drugs are only available in limited quantities and at considerable cost inside prison, inmates still manage to engage in a myriad of drug-related activities.

Moreover, the management of drug-related behaviors inside prison requires inmates to make decisions and choices during their confinement. Cope (2000) suggested that inmates use strategic thinking to meet short-term goals. For example, prisoners may stop using drugs if they desire transfer or parole and realize that a urinalysis will be involved. Short-term changes such as this led Cope (2000) to contend that "inmates are to some extent in control of the trajectory of their drug career in prison" (p. 360). In fact, the self-control demonstrated by inmates in regard to their drug-related behavior inside prison may be the result of the monitored correctional context. That is, the highly controlled prison environment forces inmates to constantly monitor their own behavior. The prison environment also forces inmates to make choices about when and where to use illicit drugs.

THEORETICAL BACKGROUND

DIFFERENTIAL ASSOCIATION

Sutherland's (1947) differential association theory is a prominent sociological theory of deviance. Measures identified with the theory of differential association usually explain more of the variance in deviance than do constructs from other microsociological theories of crime (Alarid, Burton, & Cullen, 2000; Matsueda, 1982). Sutherland's original theory contained nine propositions. For purposes of this research, it is possible to reduce his theory to a few key points. First, drug-related behavior inside prison is learned in interaction with other persons through a process of communication within intimate personal groups. Learning to abuse drugs in prison is defined by exposure to and association with patterns of behavior. This process of learning the nuances of making, using, selling, or possessing illegal substances in prison involves the mechanisms and cues that are involved in any other learning. It is not necessarily restricted to imitation. Next, learning to abuse alcohol and drugs in prison includes grasping the techniques of engaging in this behavior on the inside as well as learning the affiliated motives, drives, rationalizations, and attitudes. The specific direction of motives and drives is learned from definitions (or evaluations) of the legal codes or, in this particular case, the rules of the institution. Last, a person is more likely to engage in drug-related activities inside prison when his or her definitions favorable to abusing alcohol or drugs inside prison outweigh his or her definitions to the contrary (Sutherland, Cressey, & Luckenbill, 1992).

Since its inception, various scholars (Akers, 1998; Glaser, 1956; Heimer & Matsueda, 1994; Sykes & Matza, 1957; Tittle, Burke, & Jackson, 1986) have attempted to further develop and modify differential association. However, Burgess and Akers (1966) conducted the most extensive revision of Sutherland's original treatise by incorporating principles from operant conditioning into the model. In particular, they stressed the importance of reinforcement as a mechanism of learning deviant behavior. Regardless of these attempts at empirical clarification, Sutherland's original theory continues to be tested and applied to different populations.

DIFFERENTIAL ASSOCIATION AND DRUG-RELATED BEHAVIOR

The theory of differential association has often been used to explain a range of drug-related phenomena. Although a number of studies confirm the empirical validity of this perspective, most have involved adolescent participants (Benda, 1994; Marcos, Bahr, & Johnson, 1986; McGee, 1992; Kandel

& Davies, 1991). These studies have identified peer associations as the most important element of differential association (Benda, 1994; Marcos et al., 1986; McGee, 1992).

Yet as Alarid et al. (2000) noted, the theoretical power of differential association hinges on its ability to explain deviance that extends beyond juvenile delinquency. The degree to which differential association can explain adult criminal behavior remains largely untested. Yet in their study of 1,153 adult felons, Alarid et al. (2000) found that the theory of differential association had consistent effects across types of crime and gender groups. The present study furthers this branch of research by offering the theory of differential association as an explanation of drug abuse inside adult prisons.

Thus, the purpose of this research is to develop a multilevel model of drug-related behavior inside prison using elements from importation theory, the treatment perspective, and differential association. It is expected that, at the microlevel, an inmate's past history of using and selling drugs on the street will predict their involvement in the prison drug enterprise. Also, as a prisoner's reported number of rule-violating friends inside prison increases, so too should his involvement in drug-related activities. Furthermore, an inmate's self-report of making, using, selling, or possessing illegal drugs inside prison should be associated with negative definitions or evaluations of the prison rules. Conversely, it is expected that activities such as participation in prison religious services may potentially decrease drug-related behavior by supplanting negative definitions of prison rules. Moreover, at the macrolevel, contextual features of the institutions might exacerbate drug abuse in prison. For example, prison crowding might concentrate inmates and focus their collective problems.

METHODOLOGY

SAMPLE AND DATA

Both prisoners at Level 1 and prisons at Level 2 are units of analysis in the present study. Data came from two sources. A survey questionnaire for inmates was developed to measure a variety of demographic, attitudinal, and behavioral information. Inmate-level data were obtained by surveying 1,054 prisoners in 30 correctional facilities across Kentucky, Tennessee, and Ohio. Surveys were administered en masse during visits to selected correctional institutions from January to March, 2001. Please see Gillespie (2003) for a more detailed account of the research methodology used in this study.

The final sample included 388 participants from 11 prisons in Kentucky, 300 inmates from 8 correctional facilities in Tennessee, and 366 prisoners from 11 institutions in Ohio. This research protocol was also subjected to an institutional review because prisoners represent a special category of research participants. Every precaution was taken to ensure the participants' confidentiality. No incentives were given to participate in this study.

A mixed sampling strategy combined availability and systematic random sampling techniques. At the state and prison levels, availability sampling was used. A combination of availability sampling and systematic random sampling was implemented at the inmate level. Availability samples are generally easy to complete and expedient and are economical, but precision and accuracy are sacrificed with this method (Bachman & Paternoster, 1997). Availability or convenience samples are the least representative and generalizable type of samples. Furthermore, Bachman and Paternoster (1997) proposed that the nonrepresentativeness of availability samples must be noted in the methodology section.

Correctional administrators in Kentucky and Tennessee generated a master list of prisoners who had been incarcerated at state facilities for at least 6 months. Systematic random sampling was used to select participants into the Level 1 sample. Letters were then sent to potential participants informing them of the study, its location, as well as the time and date of the research project. Liaisons at each prison coordinated data collection by arranging a suitable space for survey administration and ensuring that the participants received their letters of solicitation. However, correctional officials in Ohio were unable to generate a master list to serve as a sampling frame, so all inmates at the prisons in that state were informed of the study via sign-up sheets posted in their dormitories. Occasionally, inmates required help reading the survey instrument; however, these face-to-face encounters occurred in less than 1% of the cases.

Because administrators in Ohio could not generate a master list of prisoners incarcerated at their institutions, it is impossible to know the response rate for the entire sample. However, the response rates in Kentucky ranged from a low of just above 7% at Luther Luckett Correctional Complex to a high of almost 85% at Bell County Forestry Camp. The mean response rate for correctional facilities in Kentucky was 18.18%. Tennessee's response rates extended from a low of 6.50% at the Turney Center Industrial Prison and Farm to a high of 16.50% at the Morgan County Correctional Complex. The average response rate for Tennessee prisons was 10.53%. It is generally believed that low response rates introduce bias into any research design. However, nonresponse and low response rates such as the ones reported in

this study are not uncommon in research related to drug and alcohol abuse (McAuliffe, Geller, LaBrie, Paletz, & Fournier, 1998). Jones and Lang (1980) even found that increasing response rates does not improve the accuracy of survey results. In fact, Ray and Still (1987) concluded that research based on data with low response rates is still quite meaningful. It should be noted that the response rates in this study were low in some locations; however, the data are probably somewhat representative of the correctional populations in these three states.

In comparison to the collection of data at Level 1, data collection at the prison-level was a relatively simple process. Level 1 data were aggregated to reveal Level 2 characteristics as defined by the inmate population. In addition to the aggregated data from Level 1, supplemental information about the prisons was acquired from correctional administrators in each state. Wardens and other officials provided information on prison conditions such as the age of the facility, its population, the inmate-to-staff ratio, etc. Thus, data for the current project came from both self-reports from prisoner surveys and official sources from correctional administration.

The sampling strategy used in this study may be justified on several grounds. The nested data structure implicit in multilevel research designs requires a large amount of data. A main concern was not only getting an adequate number of respondents at Level 1 but also obtaining an appropriate number of prisons at Level 2. To accomplish this task, the survey was administered to inmates incarcerated within prisons in states that were contiguous to the main research site. Contiguous states were selected because the costs associated with travel and time were relatively low. Furthermore, this research is quite exploratory. That is, only one multilevel study of prison life had been conducted at the time of this research (Wooldredge, Griffin, & Pratt, 2001). It did not seem prudent to embark on a grand multistage strategy without some initial exploratory findings to merit such investigation.

VARIABLES

Table 1 shows the variables, metrics, and descriptive statistics for the conceptual model. Although data on more than 200 different variables were collected during baseline survey administration, only 11 were selected for use in the present analysis. The dependent variable was computed by summing responses to four questions designed to assess drug abuse in prison. The reliability coefficient for this index was .80, and varimax factor analysis extracted only one component with an Eigen value of more than 1.00. Therefore, this scale appears to be an accurate indicator of a single concept (i.e., drug abuse). Participants were asked how often they had made, used, sold, or

TABLE 1: Variables, Metrics, and Descriptive Statistics for the Conceptual Model (n_i = 1,054; n_j = 30)

Variable	*Metrics*	*Low*	*High*	*Mean*	*Standard Deviation*
Inmate-level variables					
Drug abuse in prison (4-item scale)	Never (0), once (1), 2 to 5 times (2), 6 to 12 times (3), more than 12 times (4)	0.00	16.00	1.76	3.28
Age	Number of years	18.00	71.00	35.89	10.02
Race	White (0) or non-White (1)	0.00	1.00	0.44	0.50
Years incarcerated	Number of years	0.00	41.00	9.58	6.95
Involvement in prison religious services	No (0) or yes (1)	0.00	1.00	0.48	0.50
Prior use of illegal drugs on the street	Never (0), seldom (1), often (2), always (3)	0.00	3.00	1.51	1.12
Prior sale of illegal drugs on the street	Never (0), seldom (1), often (2), always (3)	0.00	3.00	0.97	1.13
Deviant prison friends	Number of associates (up to six)	0.00	6.00	1.09	1.76
Individual definitions toward the rules (3-item scale)	Very much unlike me (1), unlike me (2), does not apply to me (3), like me (4), very much like me (5)	0.00	20.00	12.73	3.57
Others' definitions toward the rules (3-item scale)	Very much unlike me (1), unlike me (2), does not apply to me (3), like me (4), very much like me (5)	3.00	15.00	8.73	2.82
Prison-level variable					
Prison crowding (aggregated measure)	Not crowded (0), slightly crowded (1), moderately crowded (2), extremely crowded (3)	0.90	2.70	1.92	0.50

possessed both alcohol and illegal drugs in the past 12 months while in prison. A similar question gauged their misuse of medication and another measured possession of drug paraphernalia. The response categories on these four variables were ordinal and included *never*, *once*, *2 to 5 times*, *6 to 12 times*, and *more than 12 times*.

The four variables that formed the dependent construct were taken from a listing of disciplinary infractions applicable to inmates in Kentucky's Department of Correction. As such, it seems appropriate to treat the dependent variable as drug abuse rather than drug use or drug possession. The majority of participants (i.e., 64.6%) reported no drug-related behavior during the past year in prison. However, 35.4% did reveal that they had engaged in drug-related behavior inside prison for which they could have received a disciplinary infraction. As an interesting aside, of the 373 participants who indicated participating in drug-related behavior inside prison, only 37 had no history of prior drug use on the street.

The independent variables were measured at the inmate- and prison-levels. Demographic variables at the inmate-level included age, race, total years incarcerated, and participation in prison religious services. All participants in this study were male, and their mean age was almost 36 years. Race was dichotomized to include Whites and non-Whites; Whites represented about 56% of the sample. The number of years incarcerated was simply a continuous measure of the participant's lifetime correctional confinement. On average, participants had been imprisoned just more than 9.5 years throughout their lives. Participation in religious services in prison was a binomial or dummy variable, and about 48% reported attending religious programs in prison.

Variables from the importation perspective included prior use and sale of illegal drugs on the street. Two survey questions simply asked participants to report the frequency of both using and selling illegal drugs on the street. Response categories included *never*, *seldom*, *often*, and *always*. Although these two variables were ordinal in nature, they were treated an interval in practice. Labovitz (1967) noted that it is safe to use ordinal variables in correlation-based analysis in many circumstances. Jaccard and Wan (1996) also suggested that the likelihood of making Type I or Type II errors did not increase when ordinal variables were used in regression analyses. Moreover, an ordinal variable is less problematic as an independent predictor as opposed to a dependent outcome.

The variables derived from Sutherland's (1947) differential association theory included the number of rule-violating friends inside prison and definitions toward the rules. Three indicators of differential association were adapted from Burton, Cullen, Evans, and Dunaway's (1994) study. First,

inmates were asked how many of their six closest prison friends were charged or could have been charged for a rule infraction during the past year of incarceration. Burton et al. (1994) also noted that definitions or evaluations of the law are integral to differential association. For this study, the wording was slightly modified to assess general definitions about the rules in prison rather than the law. To measure their definitions of the prison rules, participants were asked to indicate how representative six statements were of themselves (e.g., "sometimes you don't have any choice but to break the rules," "most of the people I associate with would never break the rules," etc.). The response categories included the following choices: *very much unlike me*, *unlike me*, *does not apply to me*, *like me*, and *very much like me*. Based on prior research, two indices were computed; one dealt with individual definitions and the second involved others' definitions of the prison rules. The alpha coefficients for these scales were both quite low at .53; the reliability coefficients could have been increased to .78 by deleting certain variables, but it was deemed theoretically important to preserve the original specifications of these indices. It should be noted that, with an alpha coefficient of only .53, the scales are questionable indicators of differential association definitions. Variables for the scale regarding individual definitions of the prison rules were coded so that as scores increase on the scale, negative attitudes toward the prison rules actually decline. The individual definitions scale had a range of 4 to 20 with a mean of 12.73 and a standard deviation of 3.57. The index for others' definitions ranged between 3 to 15 and had a mean of 8.73. On this measure, as scores increased so too did others' negative definitions of the prison rules.

A number of contextual variables were examined in this study. Correctional administrators provided the following information about sampled prisons in this study: age of the facility, security level, number of correctional staff and officers, inmate-to-staff ratio, number of prison programs, prison capacity, and demographic characteristics (e.g., race and age). The analysis revealed that none of these official measures were useful in explaining drug abuse in prison, so they were not included in the conceptual model. Several other contextual variables were aggregated from the participants' responses and included in the analysis. However, of these, only prison crowding significantly reduced the between-prison variance of drug abuse. This contextual variable was measured by asking participants to indicate how crowded they felt their institution was: *not crowded*, *slightly crowded*, *moderately crowded*, or *extremely crowded*. Interestingly, this variable had no effect at the microlevel, but it significantly affected drug abuse in prison when it was aggregated to the macrolevel.

MULTILEVEL MODELING

Multilevel modeling, or HLM, is ideal for analyzing the social hierarchy of prisons. As previously mentioned, prisoners comprise Level 1 or the microlevel of analysis. The macrolevel (i.e., Level 2) includes prisons. Multilevel models contain variables measured at both the micro- and macrolevels of this hierarchy. Lower-level observations are nested within higher levels (Kreft & deLeeuw, 1998). Each level of the hierarchy is represented by a separate statistical model. Bryk and Raudenbush (1992) offered a concise elaboration as follows:

> With hierarchical linear models, each of the levels in this structure is formally represented by its own submodel. These submodels express relationships among variables within a given level, and specify how variables at one level influence relations occurring at another. (p. 4)

Bryk and Raudenbush (1992) also noted that one of the primary applications of multilevel modeling involves the formulation and testing of hypotheses about cross-level effects, or how variables at one level affect relationships at another. Traditional analytic techniques are unable to specify these cross-level effects in a statistically appropriate fashion.

Furthermore, HLM is preferable to traditional regression analyses when examining microphenomena that are naturally nested within macrocontexts. Ordinary least squares regression assumes independent error terms. That is, traditional analytic techniques assume that observations are independent of one another. Ordinary least squares cannot account for intraclass correlations in natural hierarchies. Kreft and deLeeuw (1998) described an intraclass correlation as "the degree to which individuals share common experiences because of closeness in space and/or time" (p. 9). An intraclass correlation is a measure of similarity, or homogeneity, within groups and heterogeneity between groups. This intracontext dependency violates the assumption of error independence in conventional regression analyses. Using traditional regression equations with units containing intraclass correlations inflates the alpha level and increases the probability for a Type I error. Hierarchical linear models provide a more conservative test of significance.

As mentioned, HLM estimates the coefficients more precisely because the models at multiple levels are linked together. This technique corrects for the intraclass correlation by employing submodels to account for variables at both levels of analysis. The models are fitted. First-level models are joined by a second-level model. Kreft and deLeeuw (1998) noted that the regression coefficients of the Level 1 model are then regressed on the Level 2 independ-

ent variables. Moreover, Wilcox Rountree, and Land (1996) made the following insightful comment:

> Hierarchical linear or logistic regression models account for the implicit hierarchy of data by employing submodels—each of the levels in the structure of the hierarchy is represented with its own submodel. These submodels, along with nested error terms, can account for effects and sources of variation at each of the levels of analysis represented in that data. (p. 1357)

When the Level 1 equation is combined with the Level 2 model, error terms from both levels are included into the combined HLM regression formula. The error variances are partitioned between the micro- and the macrolevels. Traditional analytic models can only account for variance at one level. Multilevel modeling is the most appropriate method for representing the social hierarchy of prison and exploring cross-level effects.

CONCEPTUAL MODEL

It is possible to treat the dependent variable in this project as continuous in nature. As such, it is feasible to speculate that the Level 1 and Level 2 independent variables have a linear relationship with the outcome variable. This association may be represented in terms of two mathematical equations, one for each level of the analysis. The general equations for the Level 1 and Level 2 models are written as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \ldots \beta_{kj}X_{kij} + e_{ij}. \qquad \text{Level 1 Equation} \quad (1)$$

$$\beta_{kj} = \Theta_{k0} + \Theta_{k1}W_{1j} + \ldots \Theta_{kq}W_{qj} + U_{kj}. \qquad \text{Level 2 Equation} \quad (2)$$

The first equation is the within-prison model and uses Level 1 data collected from the survey of inmates, and the second equation is the between-prison model and calls for aggregated or prison-level data. A model of drug abuse in prison can be specified from these general equations.

RESULTS

THE NULL TEST

The Level 1 model associated with the null test may be represented by the following equation:

TABLE 2: The Null Model for Drug Abuse Inside Prison: Variance at the Inmate and Prison Levels[a]

Random Effects	*Variance Component*	*z Score*
Level 2 variance mean drug-abuse score	1.024[b]	2.96
Level 1 variance	9.849	22.64

a. n = 1,054 inmates (Level 1); n = 30 prisons (Level 2)
b. Intraclass correlation ([1.024/10.871]*100) = 9.4.

$$\begin{aligned}(\text{Drug abuse in prison})_{ij} = \beta_{0j}\ \beta_{1j}(\text{age})_{ij} + \beta_{2j}(\text{race})_{ij} + \beta_{3j}(\text{years incarcerated})_{ij} \\ + \beta_{4j}(\text{involvement in prison religious services})_{Ij} \\ + \beta_{5j}(\text{prior street-drug use})_{ij} + \beta_{6j}(\text{prior street drug sales})_{ij} \\ + \beta_{7j}(\text{number of deviant prison friends})_{ij} \\ + \beta_{8j}(\text{individual definitions of the rules})_{ij} \\ + \beta_{9j}(\text{others' definitions of the rules})_{ij} + e_{ij}.\end{aligned} \tag{3}$$

In this expression, β_{0j} is the intercept or the mean level of drug abuse for Prison J. The regression coefficients (i.e., β_{1j}, β_{2j}, β_{3j}, etc.) represent the effects of microlevel variables on the dependent variable. The regression coefficients indicate the effect of one explanatory variable on drug-related behavior although controlling for the others. The information in brackets signifies the microlevel predictors. Last, e_{ij} is the microlevel error term. The only Level 2 model at this phase of the analysis may be represented by this equation:

$$\beta_{0j} = \Theta_{00} + U_{0j}. \tag{4}$$

The null test determines whether it is appropriate to use HLM. To use HLM, significant variation in the mean level of drug-related behavior across institutional contexts must first be demonstrated. It is appropriate to use HLM only if the dependent variable (i.e., making, using, selling, or possessing illegal drugs) varies across different contexts. If the dependent variable does not vary across contexts, ordinary least squares regression is more suitable than hierarchical linear regression. Table 2 illustrates the null model for drug-related behavior. In the null model, only the dependent variable is allowed to vary across contexts (i.e., prisons).

The null test shows variation in drug-related behavior across both the micro- and macrolevel units of analysis. The variation across contexts is referred to as an intraclass correlation. The intraclass correlation is computed by dividing the variance at Level 2 (i.e., 1.024) by the sum of the variance at Levels 1 and 2 (i.e., 10.871) then multiplying by 100. Thus, an intraclass cor-

TABLE 3: The Reduced Random Coefficients Model for Drug Abuse Inside Prison

Fixed Effect	*Coefficient*	*Standard Error*	*t Ratio*
Constant (mean drug abuse)	1.692	.167	10.132
Inmate age	–0.052	.010	–5.200
Inmate race	–0.689	.177	–3.893
Years incarcerated	0.040	.013	3.077
Involvement in prison religious programs	–0.617	.172	–3.587
Previous use of illegal drugs on the street	0.050	.115	4.391
Previous sale of illegal drugs on the street	0.179	.094	1.904
Number of deviant prison associates	0.402	.049	8.224
Individual definitions about the prison rules	–0.071	.026	–2.731
Others' definitions about the prison rules	0.093	.033	2.818

Random EffectsComponent	*Variance z Score*	*p Value*	
Mean drug abuse	0.619	2.92	< .05
Previous sale of illegal drugs on the street	0.170	2.15	< .05
Level 1 variance	7.198	22.65	< .05

relation of 9.4 for drug abuse indicates that 9.4% of the variation in the drug abuse index occurs at the prison level. The majority of the variation (i.e., 90.6%) of drug abuse in prison originates at the individual level. Although this intraclass correlation is low, it is still significant and suggests that the prison context is important in fully understanding drug-related behavior inside prison.

RANDOM COEFFICIENTS

When proceeding to the next stage in HLM, the first step is to determine if any microlevel parameters vary across macrolevel units. The Level 1 model remains as specified in Equation 3 above. However, because all slopes are allowed to vary in the random coefficients model, the following Level 2 model is tested.

$$\beta_{kj} = \Theta_{k0} + U_{kj} \qquad \text{for } k = 0 \text{ through } 9. \tag{5}$$

The statistical test of this model with MLwiN (Centre for Multilevel Modelling Team, 2001) software indicated that not every Level 1 independent measure varied in its effect on drug-related behavior across prisons. Table 3 shows the reduced random coefficients regression model.

The microlevel parameters that did not vary in their effects across Level 2 are fixed. These fixed, microlevel parameters are specified as follows:

$$\beta_{1j} = \Theta_{10}, \beta_{2j} = \Theta_{20}, \beta_{3j} = \Theta_{30}, \beta_{4j} = \Theta_{40}, \beta_{6j} = \Theta_{60}, \beta_{7j} = \Theta_{70}, \beta_{8j} = \Theta_{80}, \beta_{9j} = \Theta_{90}. \quad (6)$$

In this model, only one microlevel parameter (i.e., the effect of prior street-drug use) varied across prisons. In this case, the individual-level parameter that varied across contexts is specified as random in the following manner:

$$\beta_{5j} = \Theta_{50} + U_{5j}. \quad (7)$$

If the effects of each independent variable had varied across macrolevel units, then a full random coefficients regression model could have been used to represent this variation. However, it is unlikely that every microlevel effect will vary across prisons. As such, a reduced random coefficients model with both fixed slope coefficients and random coefficients is typically reported.

Also, at this stage of the analysis, it is important to note how the Level 1 independent variables are associated with drug abuse inside prison. Demographic variables (i.e., age, race, years incarcerated, religious program involvement) were useful in predicting drug-related behavior inside prison. For example, age was inversely associated with drug abuse inside prison. Also, on average, White participants reported more drug-related behavior inside prison than non-Whites. As the number of years an inmate had been incarcerated increased, so too did his drug-related activities on the inside. Last, participants who were involved in religious programs inside prison reported less drug abuse than inmates who did not attend religious services.

The variables derived from the importation perspective were related to drug-related behavior as expected. In particular, as the degree of an inmate's prior use on the street increased, so too did the extent of drug abuse inside prison. Likewise, an inmate's reported selling of illegal drugs on the street was predictive of his drug-related behavior inside prison. These findings support the contention that behaviors associated with drugs prior to incarceration persist during confinement, albeit imprisonment does seem to curtail this behavior somewhat. For example, 74.8% of respondents indicated that they used illegal drugs prior to incarceration on the street, and 49.4% of participants said that they sold illegal drugs outside prison. However, only 35.4% of the inmates reported any drug-related behavior inside prison.

The measures taken from the theory of differential association were also useful in explaining drug-related behaviors inside prison. Drug abuse in prison increased as participants reported associating with inmates who had been charged or could have been charged for a rule infraction during the past

TABLE 4: The Reduced Contextual Model for Drug Abuse Inside Prison

Fixed Effect	*Coefficient*	*Standard Error*	*t Ratio*
Constant (mean drug abuse)	1.691	.132	12.811
Aggregate inmate perception of crowding	1.151	.281	4.096
Inmate age	–0.053	.010	–5.300
Inmate race	–0.722	.180	–4.011
Years incarcerated	0.041	.013	3.154
Involvement in prison religious programs	–0.611	.175	–3.491
Previous use of illegal drugs on the street	0.481	.105	4.581
Aggregate inmate perception of crowding	0.692	.197	3.513
Previous sale of illegal drugs on the street	0.191	.094	2.032
Number of deviant prison associates	0.407	.049	8.306
Individual definitions about the prison rules	–0.070	.026	–2.692
Others' definitions about the prison rules	0.095	.034	2.794

Random Effect	*Variance Component*	*z Score*	*p Value*
Mean drug abuse	0.302	2.29	< .05
Previous sale of illegal drugs on the street	0.089	1.44	> .05
Level 1 variance	7.180	22.51	< .05

year. Moreover, drug abuse inside prison increased according to negative evaluations of the prison rules. As an inmate reported increases in negative definitions or evaluations about the prison rules, his drug-related activities inside prison inclined. Thus, in keeping with differential association theory, drug-related behavior inside prison does seem to occur in personal groups with rule-violating peers who hold negative definitions about the prison rules.

CONTEXTUAL ANALYSIS

The next stage of HLM involves specifying a Level 2 contextual model. In this contextual model, the Level 1 model is essentially like equation 3. However, the Level 2 model may take on several forms, depending on which variables are significantly related to the microlevel relationships. This final step of HLM involves the specification of a full contextual model where Level 2 variables are included to account for both the variation in mean drug abuse and the variation in the effect of prior, street use of illegal drugs. Table 4 presents the results once the contextual variables are included in the model. The following Level 2 equations were initially tested during this phase.

$$\beta_{0j} = \Theta_{00} + \Theta_{01}(\text{Prison Crowding}) + U_{0j}, \quad (8)$$
$$\beta_{5j} = \Theta_{50} + \Theta_{51}(\text{Prison Crowding}) + U_{5j}.$$

With the addition of this aggregated contextual measure, the variance component for mean drug abuse declined by about 35% yet remained significant. Likewise, this Level 2 variable reduced the variance component for the effect of prior street-drug use by more than 55% and made it no longer significant.

In particular, the analysis uncovered a significant interaction between the effect of prior street-drug use and prison crowding. This means that inmates who reported a history of using drugs on the street prior to incarceration are especially likely to engage in drug abuse inside crowded prisons. From a theoretical perspective, this finding demonstrates that importation and deprivation are not contradictory theses; instead, the theories seem to be related. That is, microlevel imported qualities (e.g., prior street-drug use) actually interact with macrolevel deprivations inside prison (e.g., prison crowding) to influence individual-level adaptation and behavior.

It is also important to note at this point of the analysis that, with the exception of prior street-drug use, the effects of the independent variables on drug-related behavior did not change. Drug abuse inside prison was positively associated with youth, white race, years incarcerated, nonparticipation in prison religious services, prior history of selling drugs on the street, rule-violating prison friends, and negative definitions of the rules. Moreover, several prison-level variables had neither main nor interaction effects on drug abuse inside prison. These included the age of the prison, its location, its security level, the number of prison programs, the inmate-to-staff ratio, percentage non-White, percentage young, and capacity.

DISCUSSION AND CONCLUSION

LIMITATIONS

Perhaps the most problematic aspect of this research was the low response rates calculated for some prisons. Low response rates undermine the confidence at which results from a survey can be generalized from the sample to the population. High response rates generally inspire confidence, whereas low ones do not. There are a number of reasons why the response rates were so low in this study. First and foremost, coercion or inducement could not be used to entice prisoners to participate. They represent a protected class of research participants, and their decision to decline participation must be

respected. Also, several liaisons at different prisons were simply uncooperative. Generally, the researchers observed that response rates were highest where correctional officials were very cooperative and engaged. At the two prisons with the lowest response rates (i.e., Luther Luckett Correctional Complex and Turney Center), the officials assigned to assist the researchers were absent from work on the date of data collection. Yet, regardless of the causes for low response, caution should be taken when generalizing or applying the results of this study to a broader population.

A few minor caveats are also in order about the analysis. MLwiN software requires that missing data be accounted for; the program will simply not run properly with missing values. As such, missing values were replaced with the measure of central tendency (i.e., mean or mode) that was appropriate for the measurement level of each variable. Missing values were replaced with the group or prison-specific measure of central tendency. The alternative method, known as grand-mean substitution, would have involved substituting the variable's sample-mean for missing values. Additionally, MLwiN also requires variables to be standardized. All independent variables at Level 1 and Level 2 were centered by their grand means. Centering improves estimation and makes regression coefficients more readily interpretable (Bryk & Raudenbush, 1992). The data set had very few missing values, and missing values were substituted in only a small number of cases (e.g., under 1% in most cases).

Furthermore, a few comments about model stability are appropriate. The Level 1 independent variables that were not significantly related to the dependent variable at the random coefficients stage of the analysis were dropped from the models reported in Tables 3 and 4. That is, the coefficients for variables such as the participant's educational level, marital status, and time served were altogether omitted from the contextual model. Moreover, the Level 2 variables from official sources (i.e., prison administration) were added in a step-wise fashion during the final phase of the analysis; the nonsignificant Level 2 variables were then dropped as well. For example, during contextual analysis, many Level 2 independent variables (e.g., prison age, prison population, the number of educational and counseling prison programs, the inmate-to-staff ratio, the geographic location of the prisons, the prison security level, the percentage under age 25 years old, and the percentage African American) were tested yet found to be nonsignificant. To promote model stability, these nonsignificant Level 2 effects were subsequently dropped from the analytic model. Because there were only 30 prisons at Level 2, no more than three contextual variables were allowed in the model at any one time. Thus, to make the hierarchical model as stable as possible, only significant Level 1 and Level 2 variables were kept in the final regression

solution. As such, only reduced models are presented in the tables. Stepwise regression was necessary to stabilize the hierarchical regression models.

Theoretically, Matsueda and Anderson (1998) criticized differential association for its tautological nature. They pointed out that delinquent peers and delinquent behavior are reciprocally related. Delinquent peer associations predict future delinquency, and delinquency increases the chances of associating with delinquent peers. The same logic holds true in this study. Perhaps engaging in drug-related activities inside prison increases the likelihood that an inmate will associate with fellow prisoners caught up in the prison drug network. This very well may have been the case. Matsueda and Anderson also discovered that delinquent behavior affected future peer associations to a greater extent than peer associations influenced delinquency. This study is limited then, at least from a theoretical perspective, because additional variables from competing criminological theories (e.g., social bonding, general strain, etc.) were not included in the research design. However, the primary goal of this research was to offer a parsimonious model of drug abuse in prison by drawing from one of the dominant theories in criminology: differential association.

A HIERARCHICAL MODEL OF DRUG ABUSE INSIDE PRISON

The null test revealed that reported drug abuse varied significantly across the 30 prisons in this study. In the random coefficients model, the effects of Level 1 independent variables were also tested for variation across prisons. Only the effect of prior street-drug use significantly varied across prisons. The other importation variable, prior illegal drug sales, approached significance at the .05 level in the random coefficients model; its effect did not vary from prison to prison. Moreover, although the effects of demographic and theoretical variables did not vary across prisons, they significantly predicted drug abuse inside prison. As an inmate's age increased, the extent of his drug-related behavior inside prison declined. White inmates had a significantly higher mean level of such illicit activities inside prison when compared with non-Whites. Increased prison drug activity was also related to heightened time spent incarcerated. However, inmates who participated in prison religious services were less involved in prison drug abuse than prisoners who did not attend these services. Variables from differential association also affected drug-related activities inside prison. In particular, drug-related behavior was positively predicted by association with friends who were convicted or could have been convicted of a rule infraction during the past year in prison. Also, negative definitions or evaluations of the prison rules were predictive of drug-related behavior inside prison.

The final stage of the analysis called for the introduction of Level 2 variables into the model to explain the between-prison variation in both drug-related behavior and the effect of prior street-drug use. No official measures of prison context were significant. However, once aggregated, the level of prison crowding significantly reduced this between-prison variation for each parameter. Essentially, this means that both the individual characteristics of inmates and the contextual features of correctional institutions are needed to fully understand inmate-level behavior and adaptation. This research succeeded in demonstrating that an element from an inmate's past (i.e., prior street-drug use) interacts with an institutional feature (i.e., prison crowding) to predict drug abuse inside prison.

IMPLICATIONS FOR RESEARCH AND POLICY

The current study is an exercise in pure or basic research; it was not designed to evaluate correctional policy per se. As such, most of its contributions are conceptual rather than applied. From a theoretical perspective, it provides some empirical validity for differential association as an explanation of adult deviance. Although the two differential association scales had low reliability coefficients, both measures still had significant fixed effects on drug abuse inside prison. A more precise operationalization might have revealed even greater effects. As previously mentioned, scholars have proffered differential association as an explanation of juvenile delinquency (e.g., substance use among adolescents). The present study incorporates classic elements of differential association with cultural drift theory and extends differential association to an adult population. It also shows how elements of cultural drift (i.e., importation) interact with indigenous influence (i.e., deprivation). Certainly, this study illustrates the efficacy of theoretically informed, multilevel studies of deviance.

Although this study is basic and exploratory research, it is possible to extract at least one notable policy implication. Individual-level factors explained the majority of the variation in drug abuse inside prison. Less than 10% of the variance in the drug abuse index occurred at the prison level. Correctional policies that address drug-related activities should focus on individual approaches such as treatment, testing, and education (Gravett, 2000). However, policies designed to eliminate drug abuse inside prison may not be completely successful if the interactions between inmates and their institutions are not given some consideration. In this study, contextual features of prisons did explain some of the variation in drug abuse. Therefore, reducing drug-related behaviors inside prison may require alleviating prison crowding and dispersing rule-violating groups of inmates. Prison crowding, in particu-

lar, is associated with a myriad of problems, including recidivism, suicide, violence, and related misconduct (Cox, Paulus, & McCain, 1984; Farrington & Nuttall, 1980; Megargee, 1977). Simply put, correctional policy might be improved by taking into account both micro- and macrolevel antecedents of inmate behavior.

REFERENCES

Akers, R. L. (1998). *Social learning and social structure: A general theory of crime and deviance*. Boston: Northeastern.

Alarid, L. F., Burton, V. S., & Cullen, F. T. (2000). Gender and crime among felony offenders: Assessing the generality of social control and differential association theories. *Journal of Research in Crime and Delinquency*, *37*, 171-199.

Bachman, R., & Paternoster, R. (1997). *Statistical methods for criminology and criminal justice*. New York: McGraw-Hill.

Benda, B. B. (1994). Testing competing theoretical concepts: Adolescent alcohol consumption. *Deviant Behavior*, *15*, 375-396.

Burgess, R. L., & Akers, R. L. (1966). A differential association-reinforcement theory of criminal behavior. *Social Problems*, *14*, 128-146.

Burton, V. S., Cullen, F. T., Evans, D. T., & Dunaway, G. R. (1994). Reconsidering strain theory: Operationalization, rival theories, and adult criminality. *Journal of Quantitative Criminology*, *10*, 213-239.

Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models: Applications and data analysis methods*. Newbury Park, CA: Sage.

Centre for Multilevel Modeling Team. (2001). MLwiN (Version 1.10.0007) [Computer software]. London: Centre for Multilevel Modeling.

Cope, N. (2000). Drug use in prison: The experience of young offenders. *Drugs: Education, Prevention, and Policy*, *7*, 355-366.

Cox, V. C., Paulus, P. B., & McCain, G. (1984). Prison crowding research: The relevance for prison housing standards and a general approach regarding crowding phenomena. *American Psychologist*, *39*, 1148-1160.

Edwards, A., Curtis, S., & Sherrard, J. (1999). Survey of risk behaviour and HIV prevalence in an English prison. *International Journal of STD & AIDS*, *10*, 464-466.

Farrington, D. P., & Nuttall, C. P. (1980). Prison size, overcrowding, prison violence, and recidivism. *Journal of Criminal Justice*, *8*, 221-231.

Gillespie, W. (2003). *Prisonization: Individual and institutional factors affecting inmate conduct*. New York: LFB Scholarly.

Glaser, D. (1956). Criminality theories and behavioral images. *American Journal of Sociology*, *61*, 433-444.

Goldstein, P. J. (1998). The drugs/violence nexus: A tripartite conceptual framework. In J.A. Inciardi & K. McElrath (Eds.), *The American drug scene* (pp. 243-253). Los Angeles: Roxbury.

Gravett, S. (2000). *Drugs in prison: A practitioner's guide*. London: Continuum.

Heimer, K., & Matsueda, R. (1994). Role-taking, role commitment, and delinquency: A theory of differential social control. *American Sociological Review*, *59*, 365-390.

Inciardi, J. A., Lockwood, D., & Quinlan, J. A. (1993). Drug use in prison: Patterns, processes, and implications for treatment. *The Journal of Drug Issues*, *23*, 119-129.

Jaccard, J., & Wan, C. K. (1996). *LISREL approaches to interaction effects in multiple regression*. Thousand Oaks, CA: Sage.

Jones, W. H., & Lang, J. R. (1980). Sample composition bias and nonresponse bias in a mail survey: A comparison of inducement methods. *Journal of Marketing Research*, *17*, 69-76.

Kandel, D., & Davies, M. (1991). Friendship networks, intimacy, and illicit drug use in young adulthood: A comparison of two competing theories. *Criminology*, *29*, 441-469.

Kassebaum, G., & Chandler, S. M. (1994). Polydrug use and self control among men and women in prisons. *Journal of Drug Education*, *24*, 333-350.

Keene, J. (1997). Drug use among prisoners before, during and after custody. *Addiction Research*, *4*, 343-353.

Kreft, I., & deLeeuw, J. (1998). *Introducing multilevel modeling*. Thousand Oaks, CA: Sage.

Labovitz, S. (1967). Some observations on measurement and statistics. *Social Forces*, *46*, 151-160.

Leukefeld, C. G., & Tims, F. R. (1993). Drug abuse treatment in prisons and jails. *Journal of Substance Abuse Treatment*, *10*, 77-84.

Marcos, A. C., Bahr, S. J., & Johnson, R. E. (1986). Test of bonding/association theory of adolescent drug use. *Social Forces*, *65*, 135-161.

Matsueda, R. (1982). Testing control theory and differential association: A causal modeling approach. *American Sociology Review*, *47*, 489-504.

Matsueda, R., & Anderson, K. (1998). The dynamics of delinquent peers and delinquent behavior. *Criminology*, *36*, 269-308.

McAuliffe, W. E., Geller, S., LaBrie, R., Paletz, S., & Fournier, E. (1998). Are telephone surveys suitable for studying substance abuse? Cost, administration, coverage, and response rate issues. *Journal of Drug Issues*, *28*, 455-482.

McGee, Z. T. (1992). Social class differences in parental and peer influence on adolescent drug use. *Deviant Behavior*, *13*, 349-372.

Megargee, E. I. (1977). The association of population density, reduced space, and uncomfortable temperatures with misconduct in a prison community. *American Journal of Community Psychology*, *5*, 289-298.

Menard, S., Mihalic, S., & Huizinga, D. (2001). Drugs and crime revisited. *Justice Quarterly*, *18*, 269-299.

Parker, R. N., & Auerhahn, K. (1998). Alcohol, drugs, and violence. *Annual Review of Sociology*, *24*, 291-311.

Ray, J. J., & Still, L. V. (1987). Maximizing the response-rate in surveys may be a mistake. *Personality & Individual Differences*, *8*, 571-573.

Sutherland, E. H. (1947). *Principles of criminology* (4th ed.). Philadelphia: J.B. Lippincott.

Sutherland, E. H., Cressey, D. R., & Luckenbill, D. F. (1992). *Principles of criminology* (11th ed.). Dix Hills, NY: General Hall.

Swann, R., & James, P. (1998). The effect of the prison environment upon inmate drug taking behaviour. *The Howard Journal of Criminal Justice*, *37*, 252-265.

Sykes, G., & Matza, D. (1957). Techniques of neutralization: A theory of delinquency. *American Journal of Sociology*, *22*, 664-670.

Thomas, C. W., & Cage, R. J. (1977). Correlates of prison drug use: An evaluation of two conceptual models. *Criminology*, *15*, 193-210.

Tittle, C. R., Burke, M. J., & Jackson, E. F. (1986). Modeling Sutherland's theory of differential association: Toward an empirical clarification. *Social Forces*, *65*, 405-432.

Wilcox Rountree, P., & Land, K. C. (1996). Perceived risk versus fear of crime: Empirical evidence of conceptually distinct reactions in survey data. *Social Forces*, *74*, 1353-1376.

Wooldredge, J., Griffin, T., & Pratt, T. (2001). Considering hierarchical models for research on inmate behavior: Predicting misconduct with multilevel data. *Justice Quarterly, 18*, 203-231.

Wayne Gillespie received his Ph.D. in sociology with concentrations in criminology and social psychology from the University of Kentucky in 2001. His dissertation was recently published in book format by LFB Scholarly Publishing. He currently teaches criminology, juvenile delinquency, and research methods at East Tennessee State University where he is coordinator of the graduate program in the Department of Criminal Justice & Criminology.