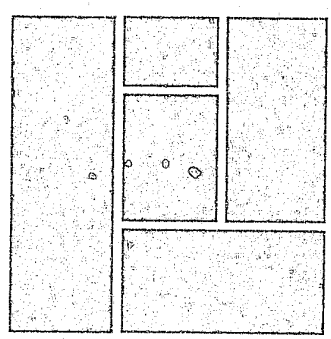

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Project Report

Executive Summary
Anticipating Community Drug Problems

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Overview

The goal of this study was to extend the use of arrestee urinalysis results in community planning by examining the relationships among arrestee drug tests and drug-related emergency room episodes, drug overdose deaths, crimes, and child abuse and neglect cases. To address the need for better methods for anticipating drug use trends and consequences, this study: (1) developed a conceptual framework to serve as a basis for interpreting drug trends; and (2) tested the relationships among monthly drug problem indicators in two communities.

Interpreting Local Drug Use Trends

Illicit drug use has become a major factor driving the demand for services from public health, community safety, and child welfare agencies. To respond effectively, planners and policymakers need current information on the prevalence and patterns of drug use and drug-related problems; and trend data on changes up or down in the prevalence of drug use and/or shifts in drug use patterns or consequences. This information further needs to be: (1) updated regularly, (2) reported in a timely fashion, and (3) applicable to local conditions--to geographic areas, such as service catchment areas or local political jurisdictions, which define the boundaries of local programs.

This is a tall order, and one that has received considerable attention over the years. Efforts to develop better local drug planning data range from synthetic estimates for small geographic areas created by extrapolating from national survey data (National Institute on Drug Abuse, 1979), to special metropolitan area studies (National Institute on Drug Abuse, 1992), and analyses prepared by local Community Epidemiology Work Groups (National Institute on Drug Abuse, 1991). Currently efforts are underway to develop new local estimation procedures (Hser, Anglin, Wickens, Brecht, and Homer 1991; McAuliffe, Breer, Ahmadifar and Spino 1991; Milkman, McDevitt, Feldman and Landson 1990; Wickens 1991). Despite past difficulties in developing models for local planning purposes (see Pennell, Curtis, and Tayman, 1991), the importance of local data has been underscored by evidence provided by the Drug Abuse Forecasting System (DUF) and the Drug Abuse Warning Network (DAWN) of wide local variation in drug abuse patterns across the country (National Institute of Justice, 1990).

Sources of local data on drug-related problems have improved in recent years, but still vary widely from place to place. National data systems like DAWN and DUF collect local area drug data for some, but not most, cities. Local law enforcement agencies in most areas maintain counts of incidents using the standard definitions of Uniform Crime Reporting System (UCR). Use of computerized data-base management systems by service providers and Federal investments in drug monitoring data systems have increased the availability of local data on community problems impacted directly or indirectly by drug abuse. Locally available data may include numbers of child abuse and neglect cases or births of drug-exposed infants, although the availability and consistency of these data vary widely. To date, however, the ability to produce the data may have outstripped the ability to interpret the trends.

We know little about the extent to which multiple data systems, measuring distinctively different events, sampling different portions of the population, and using a variety of data collection procedures, rules and definitions can be expected to converge, how to interpret the results when they do not, and the temporal relationship among drug-related problems and service needs. For example,

some drug indicators, such as urinalysis results, measure recent use; others, such as over-dose deaths or emergency room episodes, measure the consequences of drug use; still others, such as crime rates, reflect both drug abuse and a host of other factors. The indicators may also sample the behavior and problems of different portions of a community population--criminals or those living within specific jurisdictions or catchment areas. Many are subject to external constraints that limit their utility as tracking indicators. An example is the difficulty of using drug treatment as a trend indicator, given that treatment utilization is usually governed by the amount and type treatment available, and not necessarily the number and types of users in need of treatment.

In addition to a better understanding of how multiple indicators are expected to converge, planners would also like to have a better understanding of the temporal relationship among drug problems in a community. If shifts in the need for drug-related services can be identified by monitoring trends in drug use, planners will be in a better position to make assumptions about future allocations for staff and program expenditures. One basis for assessing future need is the extent to which multiple indicators agree that drug problems are increasing or decreasing, and identification of which indicators move together and provide more sensitive measures of change. A second, more ambitious, basis is to be able to predict trends in service needs from trends in drug use prevalence.

Modeling Drug Indicators: A Conceptual Framework

A 3-stage public health model was developed as a basis for understanding how drug abuse spreads through the community and the expected impact on indicators of drug-related problems. The model focuses on two distinct issues: (1) the process by which a new pattern of drug abuse spreads--the diffusion process; and (2) the expected impact, given this understanding of the diffusion process, on selected data systems that reflect problems caused by spreading drug abuse.

In describing the diffusion process, drug abuse is viewed as an epidemic in which a disease strikes in a vulnerable population and spreads to other susceptible portions of the population. At Stage 1, the new disease enters a population, striking the most vulnerable. At Stage 2, the disease spreads, creating an epidemic as each infected person exposes multiple others. At Stage 3, the problem either stabilizes or declines as the uninfected susceptible population declines in size reducing candidates for initiation and the infected population declines with the recovery or death of earlier initiates.

In the current context, the disease is a new pattern of drug abuse which is first adopted by the most vulnerable portion of the population, spreads to other susceptible members of the population, and tapers off as the number beginning use declines and/or the number discontinuing use increases. Unlike the traditional disease model, the mode of transmission involves social learning of a new pattern of behavior. Thus, social learning opportunities define who is vulnerable and introduce elements of personal choice into the diffusion process. This transmission process dictates consideration of determinants of behavior, including personal experience, social contacts, and perceptions of formal and informal social sanctions (positive and negative). Environmental variables governing transmission include drug supply and market organization, laws and enforcement policies, and drug treatment availability and cure rate. These variables are determined by economic and political factors outside the scope of this model.

The definition of a new pattern of drug abuse adopted in this model is broad. A new pattern of drug abuse is defined as the consumption of drugs in ways or combinations not in current use in the

community. Thus, a new pattern of drug abuse can refer to a newly developed drug (e.g.; a designer drug), a new form of an existing drug (e.g., crack in lieu of powdered cocaine), a new mode of ingestion (e.g.; smoking rather than injection as with heroin), and/or a new combination of drugs used together. As a practical matter, the operational definition of drug abuse is limited by the data available for this study. For example, among arrestees drug abuse is measured by EMIT urinalysis. This limits the definition to a few drugs (five in Washington, DC) without regard to differences in mode of ingestion. Among emergency room patients, drug abuse is defined by what is reported to, or observed by, health professionals at hospitals participating in the Drug Abuse Warning Network (DAWN).

The model focuses on how drug diffusion would be expected to influence trends in selected indicators of community drug problems. The availability of data guided the selection of drug-related problems considered in this model. The indicators discussed below -- drug-related emergency room episodes, drug-overdose deaths, child maltreatment, and crime rates, are those for which data could be collected for Washington, DC, across the study period (April 1984-June 1990). These represent only a few of many potential indicators of drug-related problems. Other indicators could include, for example, the number of births of drug-exposed infants, the number of foster care placements, or requests for drug treatment.

Exhibit A illustrated the variables in the conceptual framework presented in this chapter and the primary relationships among them. Blocks of variables are numbered for reference in the text. The arrows in the diagram reflect the temporal order suggested by the process of diffusion and individual drug use careers described below. As complex as it is, the diagram simplifies what are in practice reciprocal relationships among variables in the interest of capturing cross-time trend effects.

The exogenous variables shown in Exhibit A include personal characteristics that reflect the immediate social context of users or potential users. These include prior drug experience, prior criminality, and contacts with drug users or dealers--factors that influence the opportunity to learn about new drugs and acquire them. Other personal characteristics such as vulnerability to arrest and family roles affect the probability that a user's drug consumption will be measured by one of the community drug indicators of interest.

The exogenous variables also include features of the community environment of users or potential users--the drug market structure, drug supply, risk of sanctions, drug treatment utilization and efficacy, and prevailing norms and beliefs about drugs. These factors shape drug consumption among users and potential users by influencing actual and perceived costs and benefits to use.

The endogenous variables include drug initiation, consumption patterns, drug dependence, and criminality among users. These behaviors have a direct effect on the probability that drug use will be detected by the community indicator. Together the exogenous variables and this set of endogenous variables affect the indicators of community drug problems--reported cases of child maltreatment, drug overdose deaths, emergency room visits, arrestee urinalysis results, and crime rates.

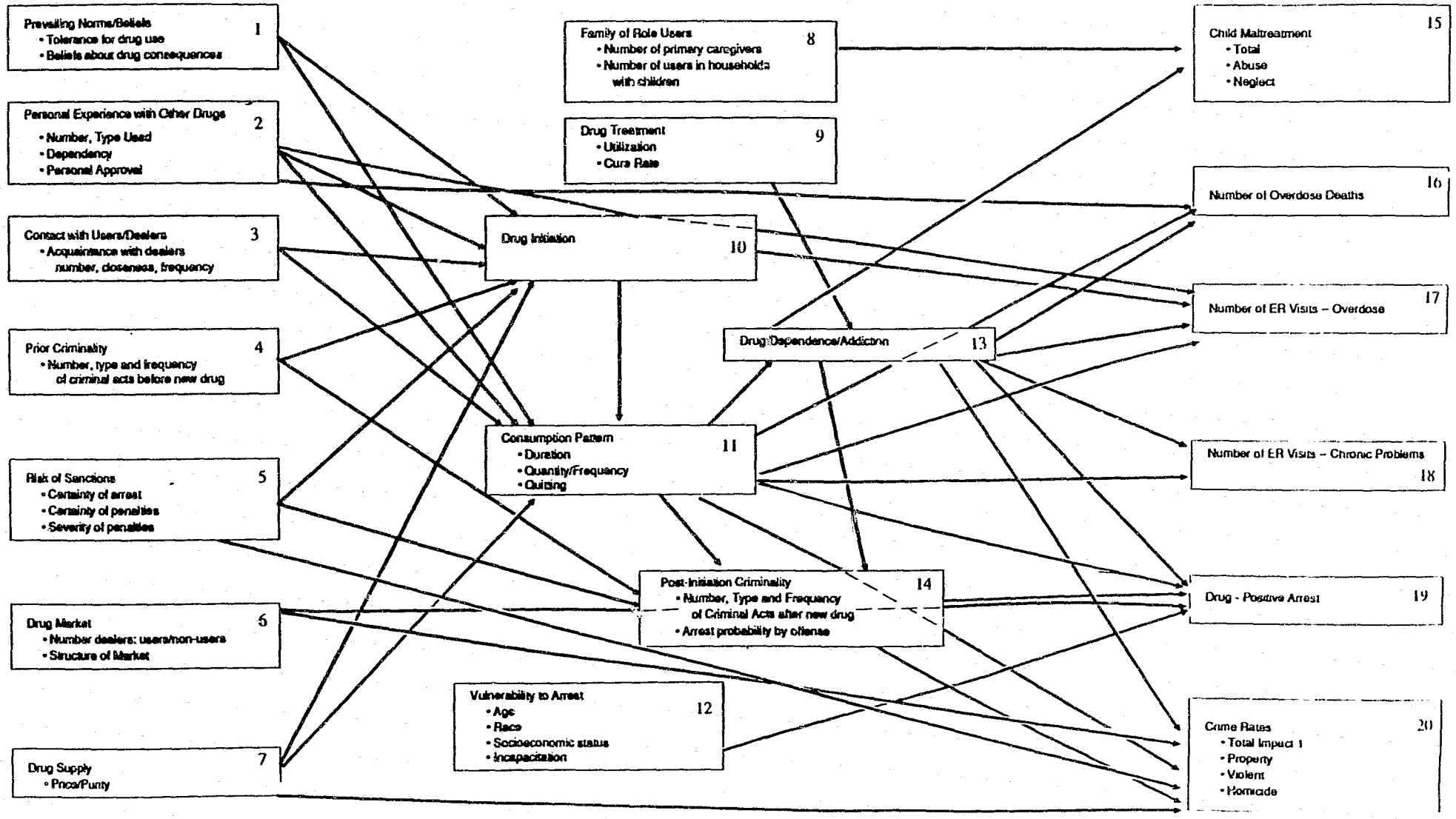

Exhibit A: Model of Drug Diffusion and Community Drug Problems

Stage 1: Initiation of a New Drug Use Pattern

Diffusion. Stage 1 involves the introduction of a new pattern of drug abuse to a vulnerable population. The population vulnerable to a initiation of a new form of drug abuse (as shown in block 10 in the model) consists of those who know drug users and dealers, have access to drug supplies, associate with peers who approve of or encourage drug use, and have a history of deviant behavior (blocks 1, 2, 3, and 4).

At highest risk are lawbreakers and those with a history of abuse of other drugs. Their past behavior predicts attitudes supportive of drug abuse, risk-taking and deviant behavior. Their social networks are likely to include dealers and users from whom they learn about new patterns of drug abuse. Within their social environment, informal social controls stigmatizing illegal or deviant behavior are likely to be weak, and norms endorsing drug use likely to exist. Thus, as a result of both their past behavior and social context, they may be willing to try new patterns of drug abuse.

The vulnerable population may also include those in the general population without a history of drug abuse or criminal behavior, but with some contact with drug users or dealers. This portion of the population, assumed to be somewhat less vulnerable given their lack of personal experience with drugs, has exposure to opportunities to learn about the drug and to norms supportive of drug use, which may result in use of the new drug.

Probability of Inclusion in Arrestee Urinalysis Data. Stage 1 initiates to the new pattern of drug abuse drawn from this vulnerable population are likely to be over-represented in the arrestee population for several reasons. Many within the vulnerable population are already at risk of arrest because of on-going criminal activity. Their risk of arrest may increase if initiating a new pattern of drug abuse causes them to increase their rate of criminal activity or initiate new types of criminal activity--property crimes, assaults, drug distribution, or homicide (block 14). Initiation of the new pattern of drug abuse may cause those without a history of criminal activity to begin to break the law and thereby become eligible for arrest. Once drug use has been initiated, all are eligible for arrest under drug possession laws. Positive urinalysis tests at arrest (block 19) are therefore expected to reflect new forms of drug abuse at an early stage in their entry into a community.

The criminal activity of users influences the likelihood of arrest, and thus urinalysis, including: the proportion of new users who were lawbreakers at the time of initiation; the proportion of the formerly law-abiding who begin criminal activity following initiation of the new drug; the rate of criminal activity among former lawbreakers and formerly law-abiding following initiation of the new drug abuse (if this rate increases over time from first use, the impact on probability of inclusion in the arrestee sample will depend on the number of users and the duration of their use); the probabilities of arrests for the types of crimes new and continuing lawbreakers commit; and the reduction in probability of new arrest due to time spent incarcerated. The probability of arrest is affected also by personal characteristics of the user--age, race and socioeconomic status, drug market involvement and structure, and consumption pattern, particularly frequent use, which influences the chance that use will result in a positive urinalysis test (blocks 6, 11, 12, and 14). At Stage 1, users are likely to experiment with the new drug or use it casually. As the frequency of use and quantity of drugs consumed increases, users move to regular use and some portion to dependence. As the frequency of drug consumption and the prevalence of drug dependence increases, the probability of detection upon urinalysis at arrest increases.

The consumption pattern is, in turn, influenced by the social understanding of the vulnerable

population about the behavior and its consequences. Variables in the social context include: the perceived likelihood and severity among lawbreakers of informal and formal (legal) sanctions for use; norms and beliefs supportive of, or in opposition to, use of the drug; contact with users or dealers; and prior experience with, or dependence on, other drugs. Other factors that shape consumption will include: drug price and purity, and sanctioning of drug law violations (the certainty of arrest and conviction, the severity of sanctions applied in drug offense cases) (blocks 5 and 7).

Probability of a Drug-related Emergency Room Episode or Death. Negative health effects, and thus the probabilities of inclusion in the emergency room data (blocks 17 and 18) and medical examiner death reports (block 16), are assumed to be related at Stage 1 primarily to prior experience with illicit drugs; familiarity through personal experience or the experiences of acquaintances with the effects of the new drug; drug supply--price and availability; drug purity; and mode of ingestion (smoking, snorting, injection, etc.).

Two primary reasons for drug-related hospital emergency room visits and deaths are: emergencies resulting from overdose; and health problems stemming from chronic use. At Stage 1, the probability of a health emergency due to inappropriate consumption is high relative to the probability of a health problem due to chronic use. At this stage, both experienced and novice drug users have limited opportunities to learn from others about the new drug's effects, appropriate dosage or the impact of mixing drugs. As the epidemic progresses, the opportunity to learn about drug consequences from other users increases, reducing the risk of a toxic reaction among less experienced users. However, this may be accompanied by increased risk of overdose among addicted users whose high tolerance leads to increased dosage. The risk of chronic problems per user is expected to grow at later stage of the epidemic as the proportion of addicted, long-term users grows.

The relationship between emergency room data and arrestee urinalysis results will depend in part on how the episode indicator is defined. If emergency room episodes are classified by reason for the visit, the number of episodes involving overdose or unexpected reaction is expected to follow closely the spread of the drug to new users, while the number of episodes for treatment of a chronic drug-related problem is expected to lag substantially behind the spread of the new form of drug abuse. An overall indicator--one that counts episodes involving drugs without classifying the reason for the visit--may be difficult to interpret because as the number of overdoses drops with declines with a drop in new users, the number of chronic episodes may well increase--even if the overall number of users in the community declines. In general, an overall rise in drug-related episodes is expected to lag behind trends in arrestee urinalysis results. The number of chronic problems is expected to grow over time and exceed the number of overdoses as the epidemic progresses, although fluctuations in drug price and purity obviously also affect the probability of overdose.

The total numbers of emergency room episodes reported at Stage 1 are expected to be small because the number of users at Stage 1 is relatively small; only a small proportion of users experience health consequences that require emergency room treatment; and Stage 1 initiates are more likely to be experienced in, or knowledgeable about, use of other illicit drugs, despite the lack of information about risks specific to the new drug.

Deaths from drug overdose represent more extreme incidents of misjudging dosage or suicide and are more likely among chronic users than among new users. Chronic users are likely to use more frequently and have developed higher levels of drug tolerance and dependence which lead to greater consumption. Thus, drug deaths are expected to lag behind the spread of the new form of drug abuse in

the community. As with emergency room episodes, drug price and purity also are expected to cause fluctuations in deaths, independently of the number of users.

Variables influencing the number of drug-related emergency room episodes and deaths at Stage 1 include: the number of new and continuing users; the proportion of users experienced with other drugs; the proportion users dependent on the drug, and consumption patterns (blocks 2, 10, 11, and 13). Again, consumption pattern and drug dependence are influenced by: the perceived likelihood and severity of informal and formal (legal) sanctions for use; norms and beliefs supportive of, or in opposition to, use of the drug; contact with users or dealers; prior criminality as well as prior experience with, or dependence on, other drugs (blocks 1, 3, and 4). Environmental factors that shape consumption include: drug price and purity, and sanctioning of drug law violations (blocks 5 and 7).

Impact on Reported Crimes. Crime, measured by the number of incident reports filed by the police, is likely to rise during Stage 1 (block 20). As described above, lawbreakers who begin the new form of drug abuse are expected to increase their number and type of criminal activities. This may include an increase in violent crimes due to the psycho-pharmacological effects of the drug or to disputes arising out of drug dealing transactions, and an increase in income-generating crimes such as burglary, larceny and automobile theft motivated by an interest in money to support consumption. A certain portion of the formerly law-abiding initiates may begin to commit crimes for the same reasons.

Because the increase in criminal activity rates is expected to lag behind the initiation of the new drug use and may, in fact, occur only when use has moved from experimental, casual use to regular use, the rise in crime rates should lag behind the rise in arrestee drug positive trends. Note that differential rates in reporting crimes to the police may make influence the extent to which arrestee urinalysis results are correlated with crime rates, independently of the underlying relationship between drug use and crime.

Variables that influence drug-related crime rates include: the proportion of users who were lawbreakers prior to using the new drug; the proportion of new users who begin to break the law after starting use; and the rate of offending among users (blocks 4, 10, and 14). User offending rates are, in turn, affected by consumption patterns and the psycho-active effects of the drug, and by the need to support consumption--a function of drug price and drug dependence among users (blocks 7, 11, and 13). Drug-related crime rates will also be affected by law enforcement and sanctioning practices for various types of offenses (the certainty of arrest and conviction, the severity of sanctions applied in drug offense cases) and vulnerability to arrest (blocks 5 and 12), as well as the factors that influence drug initiation and consumption (blocks 1, 2, and 3).

Impact on Reported Child Abuse and Neglect Cases. A new pattern of drug abuse may affect the number of reported cases of child abuse and neglect (block 15) in several ways. The psychoactive effects of the drug may stimulate abusive behavior and/or incapacitate child caregivers. Less directly, the diversion of economic resources and time to acquire drugs may results in severe, chronic neglect and, in the worst cases, abandonment.

The effects of a new form of drugs on child abuse and neglect are expected to be related to: family roles of users--the number of primary caregivers who use the drug and the number of other users who live in households with children; and the number of drug-dependent users, given that the diversion of family resources to drugs is expected to increase with dependence (blocks 8 and 13), as well as the many factors that influence drug initiation and consumption patterns. These factors are expected to vary by drug. The addictive properties of crack and its popularity among women, given that the majority of primary

caregivers are female, predict a closer relationship between child maltreatment and cocaine use than found for other drugs across the late 1980's.

Stage 2: Spreading Drug Use

Diffusion. Stage 2 involves the spread of the new drug abuse to larger and larger numbers of persons, many of whom will have little or no prior drug experience or criminal involvement, but are susceptible as a result of personal exposure to drug users or dealers, although these contacts may be casual. This group, referred to in following discussions as the general population, is much larger than the vulnerable population recruited at Stage 1 and contains far more law-abiding persons than lawbreakers. Recruits will be initiated into the drug use behavior by friends or friends-of-friends who have heard about the new drug and try it for a variety of reasons--curiosity, peer pressure, or a desire for the positive psychoactive effects attributed to the drug. However, at this stage the number of new users can expand exponentially, if one assumes each new user exposes multiple other potential users to the new drug. The demand for drugs at Stage 1 is expected to stimulate the marketing of the new drug and spawn a growing number of dealers who do not use the new drug, but act as "carriers" by marketing drugs to wider audiences. This provides an additional route of diffusion at Stage 2.

Probability of Inclusion in Arrestee Urinalysis Data. As at Stage 1, Stage 2 new users may initiate criminal activity, increase their rate of criminal activity, or initiate new forms of criminal activity. Although this increases their risk of arrest, Stage 2 initiates are expected to have a lower probability of arrest than Stage 1 initiates, primarily because they are expected to have less experience with crime and less propensity to engage in criminal activity. Thus, Stage 2 in the new drug epidemic may have less impact on arrestee urinalysis results per user recruited than Stage 1. A lower rate of criminal activity among Stage 2 initiates might, however, be offset by increasing criminal activity among Stage 1 and Stage 2 initiates who become deeply involved, depending on the proportion who become addicts or dealers. In addition, increased enforcement efforts stimulated by recognition of the new pattern of abuse may increase the probability of arrest of users and dealers, thereby increasing the likelihood that arrestees will test positive for the new drug.

The additional variables that predict probability of arrest and detection through urinalysis at Stage 2 include: the proportion of users who are chronic users or addicts; the proportion of users who are dealers; and changes in the probability of arrest for drug offenses (blocks 5, 13, and 14). At this stage, drug treatment (block 9) may become more important as an influence on the prevalence of addiction.

Probability of a Drug-related Emergency Room Episode or Death. Although only a subset of all users experience these health consequences, the number of emergency room episodes due to the new drug is expected to increase as the number of users increases and, more particularly, as the number users who have used the drug for a sufficient period of time to develop chronic drug-related health problems increases. At Stage 2 the proportion of all emergency room episodes attributable to chronic drug-related problems is expected to increase more rapidly than drug-related emergencies, although the timing will vary by drug depending on the percentage of users who become dependent and the average duration of use prior to dependence. Thus, the lag time between the number of arrestees testing positive and the overall number of emergency room episodes should grow over time.

At Stage 2, the relative importance of the variables associated with emergency room visits and drug overdose deaths at Stage 1 shifts. As the risk of dependence through use of the drug over a longer period of time becomes more prevalent, the number of drug dependent users becomes increasingly

important as a predictor of overdose deaths and emergency room visits and introduces the effects of drug treatment utilization and cure rate to the set of factors to be considered (block 9).

Impact on Reported Crimes. Crime rates are expected to climb as the number of users increases. Stage 2 crime rates are again related to the variables that operate in Stage 1. However, as proportion of new users who are lawbreakers declines, the prevalence and incidence of criminal activity among users-a smaller proportion of whom are experienced lawbreakers--is expected to decline. Thus, the relationship between the number of users and reported crime rates may be less strong than at Stage 1. However, this is may be offset by increasing crime rates among chronic users recruited at Stage 1.

In addition, at Stage 2 the increased demand for drugs created by the expanding number of users may change the structure of the drug market, increasing violence associated with drug transactions--deals gone bad, competition for market share, and market regulation--among users, user-dealers, and an expanding number of non-using drug dealers engaged in drug distribution. The potential for distribution-related crimes is expected to vary across site and time with the structure of the drug market--the degree of organization, the centralization of distribution, and level of competition for customers. Variables that influence crime rates at Stage 2 thus also include: the number of dealers; and structure of the drug market (block 6).

Impact on Reported Child Abuse and Neglect Cases. The number of child abuse and neglect are expected increase at Stage 2 with growth in the number of users addicted to the drug--a portion of whom will divert family resources to drugs, and the number of primary caregivers who use the drug. Again at Stage 2, the variables related to the number of cases of child maltreatment include: the family role of users, and number of drug-dependent users (blocks 8 and 13), and the factors that influence drug initiation and consumption patterns. A variable of particular importance may be treatment utilization and effectiveness (block 9). Note that the number of cases reported in official statistics may be constrained by screening practices at Child Protective Services and the availability of services. Shortages in staff time and shifts in screening procedures can limit the extent to which cases are admitted to the system.

Stage 3: Drug Use Stabilization or Decline

Diffusion. At Stage 3, the prevalence of the new form of drug abuse stabilizes or declines as recruitment of new users slows and/or the number quitting exceeds the number initiating the drug. The expansion of the user population at Stage 2 results in drug initiation among the more susceptible members of the general population. At Stage 3, the remaining nonusers are likely to be less susceptible to use through fewer contacts with users and lower probability of prior drug use or criminal activity. In addition, responses to spreading epidemic at Stage 2 can reduce tolerance for drug use and beliefs about its safety and increase negative sanctions for use. This will decrease the vulnerability of nonusers even upon exposure. At the same time, the number of continuing users may decline. The number of drug-dependent users may decline if drug treatment utilization and cure rates increase. In addition, both drug-dependent and casual users may discontinue use as formal and informal negative social pressures and sanctions increase and beliefs about safety and consequences change.

The stabilization or decrease in use at Stage 3 is related to the supply of users: the proportion of nonusers in the general population who have any contact with drug users or dealers from whom to learn about drug use and obtain drugs or any prior drug use experience; the proportion of users who discontinue use, either spontaneously or as a result of treatment; and the proportion of users who die. In addition, the Stage 3 diffusion process may be affected by changes in the actual or perceived social and economic

consequences to use.

Critical change variables are expected to be: shifts in beliefs about the ill effects of the new form of drug abuse which may become apparent as more users develop serious medical, legal or social trouble due to their drug use; shifts in social support or tolerance for use of the drug; increased availability and/or effectiveness of drug treatment; shifts in enforcement policies which increase the risk of sanctions of the drug; and/or shifts in dealer/supply-oriented enforcement policies which raise the cost or reduce drug availability (blocks 1, 5, 7, and 9).

Probability of Inclusion in Arrestee Urinalysis Data. The variables that influence the likelihood of inclusion in arrestee urinalysis results are those that affect the likelihood of detection at Stage 2. However, criminal activity and the probability of arrest are expected to be lower among casual users, the most likely to quit drug use. Thus, declines in drug use prevalence may not have a proportionate decline in arrestee drug positives. Arrestee drug-positives are expected to be more sensitive to declines in the number of drug-dependent users, and thus reflect treatment utilization and efficacy.

Probability of a Drug-related Emergency Room Episode or Death. Emergency room episodes and deaths should decline at Stage 3 as the number of users declines. However, because the casual user is more likely to discontinue use, and less likely to experience negative health consequences, the declines in health consequences may not be as noticeable as the declines in number of users.

Impact on Reported Crimes. Crime rates are expected to fall as the number of users decreases. However, this may be offset by the relatively higher levels of crime among chronic or addicted users who do not quit and the rate of criminal activity among users who quit drugs, but not crime. Shrinking drug markets may also stimulate an increase in violent crime among dealers competing for market share, increasing the impact of the structure of the drug market, the number of dealers, and formal sanctioning practices.

Variables that affect crime rates at Stage 3 include, as before, the number of drug dependent users, the structure of the drug market, the drug supply, risk of sanctions, and consumption patterns. One additional variable is the prevalence and incidence of crime users after quitting.

Impact on Reported Child Abuse and Neglect Cases. The number of child abuse and neglect cases is expected to be related to the number of users addicted to the drug--a portion of whom will divert family resources to drugs, and the number of primary caregivers who use the drug. Stage 3 may result in decreases in reported cases if: the number of primary caregivers, mostly women, who use the drug decreases--spontaneously or as a result of treatment. Similarly, reported cases will decline as the number of chronic, addicted users who drain family resources declines.

Variables that influence the relationship between arrestee urinalysis results and child abuse reports at Stage 3 include changes is the variables previously cited--the number of primary caregivers who are drug-dependent; and the number of users living in households with children. In turn, these are influenced by changes in the number of continuing users and the number of drug dependent users, and thus are related to drug treatment, social norms and beliefs, and sanctioning practices.

Drug Problem Indicators: The Data

As a step towards developing models of relationships among drug indicators, monthly data on multiple drug indicators were collected from two cities, Washington, DC and Portland, Oregon. The selection of study sites and community indicators was determined by data availability. The first criterion was monthly data on results of urinalysis of arrestees at booking, available for almost all detained arrestees in Washington from April 1984 through September 1990, and in Portland from January 1988 through June 1989. The second criterion was monthly data on other community indicators.

Data for Washington, DC, included:

Arrestee Drug Use. Pretrial Services Agency (PSA) provided EMIT urinalysis results and top charge, sex, age and race data on adult arrestees tested at booking. The drugs included in testing were opiates, amphetamines, cocaine, PCP and methadone, but not marijuana. The tested arrestees, about 60 percent of those arrested across this period of time, included most detained arrestees and are the population from which the Washington, DC, DUF samples are selected. Individual (but anonymous) results of initial booking urinalysis tests were used to construct monthly data on: (1) the proportion testing positive, (2) the number testing positive, and (3) the proportion testing positive weighted to the 1985 distribution of arrestees by charge category (drug offenses versus non-drug offenses) to correct for changes in enforcement practices across time[1]. Three types of measures were constructed by drug category: (1) any of the five drug categories (one or more than one); (2) any cocaine; (3) any PCP; (4) any opiates; and (5) the average number of drug positive results[2].

Drug-Related Emergency Room Episode and Over-Dose Deaths. The National Institute on Drug Abuse provided data from the Drug Abuse Warning Network (DAWN) on: (1) the number of drug-related emergency room episodes in the Washington, D.C. area throughout the Standard Metropolitan Statistical Area; and (2) the number of drug over-dose deaths reported by the Washington, D.C. medical examiner (but not by suburban medical examiners). Only records from facilities reporting consistently across the period were included, resulting in an exclusion of about 4% of the emergency room episodes. Monthly records were created that included the number of episodes and deaths for cocaine, PCP, opiates, and any of the five drug categories.

Crimes. The District of Columbia's Office of Criminal Justice Planning and Statistics provided monthly data on crime in Washington as reported under the Uniform Crime Reporting System. The data include the numbers of index crimes and the two components of index crimes--violent crimes and property crimes. Property crimes included burglary, larceny-theft, motor vehicle theft, and arson. Violent crimes included murder and non-negligent manslaughter, forcible rape, robbery and aggravated assaults. In addition, homicide, a component of the violent crime indicator, was included as a separate crime category because of its link to drug-related violence across this time

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[1] Weights, applied to control for differences in enforcement practices, held constant the proportion of arrestees charged with drug offenses and non-drug offenses across all months.

[2] For this variable, each record was assigned the number of tests for which positive results were obtained. The theoretical range was 0 to 5, the observed range from 0 to 4.

period. Misdemeanors and Federal offenses are not included.

Child Maltreatment. The Division of Family and Children's Services of the D.C. Department of Human Services provided monthly data on the number of officially reported cases of child maltreatment. The data from monthly reports maintained by the agency include three mutually exclusive child maltreatment categories: abuse, neglect, and endangerment. The sum equals all reported cases. At the start of 1988, sexual exploitation was added to the definition of cases to be included in the abuse category. This addition is expected to have little impact on the trend analysis because this type of case is reported so infrequently.

Data for Portland, Oregon, collected with the assistance of the Oregon Regional Drug Initiative, included:

Arrestee Urinalysis Results. Data on arrestee urinalysis results were provided by the Multnomah County Community Corrections Division. These tests were available from January 1988 through June 1989, when initial booking tests were conducted under a grant from the Bureau of Justice Assistance. The data used came from monthly reports maintained by the testing program and include the number and proportion testing positive for cocaine, opiates, amphetamines, and any of these three drugs. Breakdowns by age, sex, and charge were not available. The proportion of eligible arrestees tested ranged from 29 to 66 percent, exceeding 50% in only 3 months. The majority of those not tested had refused the test. Thus, the monthly prevalence of drug use among arrestees may be underestimated if drug users were more likely to decline the test than nonusers.

Health Consequences. Multnomah County does not report to DAWN. Records maintained by the Multnomah County Medical Examiner's Office were reviewed and a file constructed of deaths due to cocaine, heroin, methamphetamine, or combinations of these drugs from January 1988 through September 1990. Monthly counts were calculated for all drug-related deaths and drug-related deaths by age and sex groups.

Child Abuse and Neglect. The monthly number of child abuse and neglect cases reported to the Children's Services Divisions of the Oregon Department of Human Services were collected for 1988 and 1989. The total abuse cases consist of those classified as: neglect, abuse and other which includes mental abuse, sexual abuse, threats, abandonment and fatalities. The counts refer to the number of children, not the number of reported incidents.

Crime. Data on the number of reported crime incidents reported monthly from January 1988 through June 1990 were provided by the Portland Police Department, the Gresham Police Department, and the Multnomah Sheriff's Department, the three Portland area law enforcement agencies. Monthly counts of offenses were provided for all crimes, property crimes, and violent crimes.

Graphs and descriptive statistics were used to examine the extent to which the consequences to drug abuse--health problems, crime and child maltreatment--were correlated with arrestee drug use across the entire period overall and at different stages of diffusion. This was followed by testing of models designed to extend earlier analyses of Washington, D.C. from April 1984 through June 1988, which found that arrestee urinalysis results added to the explanation of variance in subsequent community drug problems (Harrell and Cook, 1990). The earlier analysis examined the predictive power of the arrestee

urinalysis results using least-squares regression models to estimate the additional proportion of variance in community indicators explained by earlier arrestee urinalysis results, but did not correct the time series data for shared long-term trends, or systematic within-series variation. The findings found strong support for predictive validity of arrestee urinalysis results, but it was not clear whether these results would obtain after controlling for seasonal variations, moving averages, and autoregression and shared long-term trends.

A Box-Jenkins univariate ARIMA model was developed for each time series to identify the types of corrections to each trend needed prior to modeling the relationships among trends. Regression models with variables appropriated corrected for autoreggression and within variable trends were used to test the predictive power of arrestee urinalysis results. The models tested lags of 6, 9, 12 and 15 months to simulate the effects of using quarterly arrestee urinalysis results such as that produced by DUF to predict other drug-related problems.

Main Findings

- **Arrestee drug use signaled new patterns of drug use.**

As in the earlier heroin epidemic, visual inspection of the trend lines shows that arrestee urinalysis was the first indicator to signal a significant period of increasing problems--both with PCP and cocaine.

- **Arrestee drug use covaried with other community drug Indicators, but only during periods of changing drug use.**

In general, the cocaine indicators exhibited similarly shaped trend curves over the 78-month period, as did the PCP indicators. Multiple indicators of these drugs tended to peak in the same years and begin to decline in the same years. However, there was no discernable relationship between monthly arrestee drug use shifts and monthly changes in other community drug use problems for drugs such as opiates that were not increasing or decreasing consistently. Thus, the arrestee test results provided information on the introduction of a new drug and confirmed declines witnessed in other indicators, but did not yield significant month-to-month predictions of trends.

- **Arrestee drug use did not predict month-to-month shifts in community drug problems, beyond the initial signal.**

After correcting trends in the indicators for autoreggression, trends, and moving averages, arrestee test results did not predict monthly variation in community drug problems. Neither long-term trends nor shorter-term relationships (lags of 6 to 15 months) were found to be significant, although it should be remembered that the procedures used produced a stringent test of this hypothesis.

Recommendations

Despite more and better data in many areas, systematic needs assessment using multiple community indicators of drug problems remains an elusive goal. Problems in interpretation of drug indicators remain at both the methodological and conceptual level. Although the conceptual framework developed for this study begins to specify the factors that need to be measured, and the relationships that

need to understood, in order to interpret trends in multiple indicators of community drug problems, this effort in some ways underscores what we do not know and do not measure. It is becoming increasingly apparent, based on this analysis and other recent work (see Pennell, Curtis, and Tayman, 1991) that considerable elaboration of both measures and models of the processes at work will be required to advance the use of multiple drug indicators for community planning purposes.

This analysis suggests several guidelines for producing and using drug indicators.

- **Drug use trends, both among arrestees and in other community indicators, should be reported by drug whenever possible.**

Between 1984 and 1990 when the prevalence of PCP and cocaine use among arrestees underwent dramatic changes, arrestee positives for these drugs were significantly correlated with emergency room episodes and deaths associated with these drugs. However, these correlations were masked considerably due to substitution effects when the analysis was based on the combined drug index (use of any drug).

The problem of masking potential consequences will be more acute if the drugs in a combined index have distinctly different consequences. An example might be the expected differences between cocaine and PCP in reported cases of child maltreatment. This problem is accentuated in interpreting trends in indicators that are not drug-specific such as crime and child maltreatment cases, suggesting the need to make local estimates on the proportion of crimes or child maltreatment cases associated with specific drugs.

Similarly, combining emergency room episodes or deaths due to different drugs into an index may mask the distinctly different health problems they pose and cause trends to look overly stable. Emergency room response will, for example, need to be quite different for violent PCP reaction than for an opiate overdose. Identification of the reason for the visit to the emergency room is likely to improve the understanding of the health consequence trends. Comparison of the trends in Washington, DC, underscores the potential for misinterpretation of combined drug indices.

- **Steps should be taken to minimize the monthly variance in measuring indicators by pooling data across months and weighting to correct for shifts unrelated to drug use prevalence.**

The month-to-month variance in arrestee urinalysis results, and to a greater extent, in other community indicators indicated considerable fluctuation in the consequences to the problem, the measurement of the indicator, and/or the prevalence of use. This suggests that quarterly data taken from selected consecutive weeks, rather than spread across the three-month period, would be likely to introduce additional variance into estimates of trends. This would have the effect of increasing the random variance in trends in arrestee drug use based on DUF quarterly data. Pooling test results spread across the three month period is likely to provide a more stable trend indicator.

Using the proportion of arrestees testing positive weighted to correct for fluctuations in top charges appears to be a good way of removing some trend variation due to shifts in enforcement policies.

- **Additional research is needed on the overlap in populations among indicators, and the set of factors that differentially affecting indicators.**

The time-series models and the stage-based models did not identify consistent time lags between arrestee urinalysis results and subsequent community drug problems. Several explanations for this finding are possible. Visual inspection of the trends suggests arrestee urinalysis may rise first, as arrestees start use, with emergency room admissions rising later, primarily as dependence and tolerance rise among users. This is consistent with evidence that the role of arrestee urinalysis data is to signal a new drug, but that the pattern of subsequent demands for service associated with abuse will be determined by other factors identified in the conceptual framework, but not tested. Such factors might include the proportion of users who were dependent on the drug, as influenced by treatment availability and drug price and purity.

A second reason for not finding consistent time-lags between indicators would be overlap in the populations measured. To the extent that the population experiencing the problems measured by community indicators consists of lawbreakers, time-lags due to diffusion from one group to another would be minimized. If, for example, the majority of community drug problems are experienced by lawbreakers, then the only time-lags between arrestee urinalysis results and emergency room admissions counts should result from cumulative individual drug career progressions, as experimental users go on to addiction and need emergency treatment for health problems related to chronic use.

Research on these issues is needed to clarify the interpretation of local community drug indicators. As a start, we should work on developing community indicators that are drug-specific, measure drug problems among a defined population, measure the overlap in the populations eligible for count in multiple drug indicators. At the same time, we need to examine, or elaborate, the conceptual framework, to identify the key intervening variables at work and to develop ways to track trends in variables such as enforcement policies, drug treatment need, utilization and efficacy, and social norms. Tracking key intervening variables would provide considerable insight into what is causing changes and what policies are having an impact, as well as contributing to effective anticipation of the need for drug-related services.

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