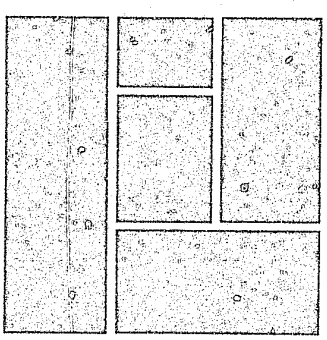

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Project Report

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Anticipating Community Drug Problems

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ABSTRACT

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. The study developed a 3-stage public health model of drug diffusion and the community drug indicators as aggregate measures of individual drug use careers.

Monthly data on drug indicators for Washington, DC, and Portland, Oregon, were used to: (1) estimate the correlations of drug problem indicators over time; (2) to examine the correlations among indicators at different stages in the spread of a new form of drug abuse; and (3) to estimate lagged models in which arrestee urinalysis results were used to predict subsequent community drug problems.

In general, cocaine and PCP indicators peaked in the same years and began to decline in the same years. 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. Beyond the initial phase, consistent short term relationships were not detected. Drugs which exhibited little long-term trend across the study period appeared uncorrelated with other community drug problems using conservative time-series models.

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CHAPTER 1
INTRODUCTION

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.

This study examined the use of arrestee urinalysis results as a predictor of other community drug problems. As a basis for developing hypotheses about potential relationships among indicators, a conceptual framework was constructed around the set of indicators available for the primary study site, Washington, DC. The framework addressed the issue of temporal relationships among indicators by considering how the diffusion of new patterns of drug abuse and the course of individual drug careers would cumulatively affect different indicators. This required an elaboration of assumptions about how drug abuse spreads, its effects on individuals over time and the resulting cumulative effects on the community over time. The product is a 3-stage public health model of drug diffusion and the influence drug diffusion might be expected to have on various community drug indicators when these are viewed as aggregate measures of individual drug use careers.

The framework was used to examine the relationships among indicators at different stages in the diffusion process. Models tested the lagged and concurrent relationships between arrestee urinalysis results and other community indicators and compared these across stages in the diffusion process. The models focus on expanding the interpretation of arrestee data such as that provided by DUF by specifying 3-month lags comparable to quarterly data.

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, DC since April 1984. Other community indicators available for Washington since 1984 included drug-related emergency room episodes, drug overdose deaths, reported crimes, and reported cases of child abuse and neglect. These data formed the basis for initial model testing.

To examine the extent to which Washington might generalize to other communities, we looked for a comparison site with similar initial booking tests of arrestees on a continuous monthly basis and community indicators similar to those available in Washington. Under a grant from the Bureau of Justice Assistance, the Community Corrections Department in Multnomah County (Portland), Oregon, conducted arrestee urinalysis at booking from January 1988 through June 1989 as part of an 18-month replication of the Washington, DC, pretrial drug testing program. Data on the percentage testing positive by drug category were available from their monthly reports. Data on other community indicators were collected by contacting the agencies directly: crime data from the three Multnomah County law enforcement agencies (The Portland Police Department, the Multnomah County Sheriff's Department and the Gresham Sheriff's Department), child abuse and neglect data from the Children's Services Division of the Oregon Department of Human Services; and drug-overdose deaths from the Multnomah County Medical Examiner's Office. Emergency room episode data comparable to that available in DAWN were not available.

Several lessons were learned about the indicators themselves. 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. Drug-specific indicators appeared to be more sensitive than the combined drug index, at least when shifts from one drug to another are underway.

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.

Chapter 2 discusses some background issues: the relationship between drug use, crime and community drug-related problems and the role of our indicators as measures of drug-related distress in the community. The conceptual framework is presented in Chapter 3. The results, shown in Chapter 4, are summarized and discussed in Chapter 5.

CHAPTER 2
COMMUNITY DRUG PROBLEMS AND INDICATORS

Background on the relationships between the community drug problems considered in this analysis is provided in this section with a discussion of the issues surrounding the construction and interpretation of indicators of these problems. This is followed by a description of the how the data for this study were collected and indicators constructed.

Drug Use and Crime

Studies of the relationship between drugs and crime are numerous (e.g., Tonry and Wilson 1990) and report high drug-use rates among criminal offenders, as well as high crime rates among users. An extraordinary proportion of crime can be attributed to drug dependent offenders (Chaiken 1986; Gropper 1985; Inciardi 1979; Johnson, Goldstein, Preble, Schmeidler, Lipton, Sprunt and Miller 1985). Substance abusers, especially offenders who use heroin and cocaine, have been found to exhibit extremely high crime rates (Ball, Rosen, Flueck, and Nurco 1981; Ball, Corty, Petroski, Bond, and Tommasello 1986; Chaiken and Chaiken, 1983; Collins, Hubbard, and Rachal 1985; Johnson et al., 1985; McGlothlin, Anglin, and Wilson 1977). As the severity of drug abuse increases among users, the frequency and severity of their criminal behavior rises dramatically (Chaiken, 1986; Chaiken and Chaiken 1982; Collins, Hubbard and Rachal 1985; Speckart and Anglin 1986a,b).

Goldstein (1985) identified three reasons for these high correlations between drugs and crime: (1) the psychopharmacological effects of drug which lead to crimes committed while under the influence; (2) economically compulsive crimes committed to support drug consumption; and (3) systemic crime associated with drug-transactions and marketing. In the underground economy, non-using dealers, including adolescents, engage in and are victimized by violent crime as part of their business (Falkin, Wexler and Lipton 1990; Brounstein, Hatry, Altshuler, and Blair, 1989; Dembo,

Williams, Schmeidler, Berry, Wothke, Getreu, Wish and Christensen 1989). They are joined in drug selling by users who traffic and engage in property crimes to generate income for drug consumption. User-sellers may lure others not only into to drug use, but also into criminal behavior in anticipation of large profits (Chaiken and Chaiken 1982; Goldstein 1985; Johnson et al. 1985).

Drug-dependent criminals generally lead lifestyles characterized by self-destructive and antisocial behaviors; they also have problems related to the absence of job training, dependence on others, and frequent conflict with criminal justice authorities (Collins, Hubbard, and Rachal 1985; Wexler, Lipton, and Johnson 1988). Criminal offenders who are regular users of hard drugs or of multiple drugs are typically at high risk of recidivism after release from prison (Chaiken and Chaiken 1982; Innes 1986; Wexler, Lipton, and Johnson 1988). The implication for policy makers and planners is that preventing and treating substance abuse will reduce criminal activity among offenders in the community and among offenders under the supervision of the criminal justice system.

This study takes as its starting point drug use among the criminal population as reflected in arrestee urinalysis results at booking. This is based on evidence of widespread drug abuse among offenders and their risk of involvement in drug-distribution. In an effort to monitor drug abuse among this high risk population, the National Institute of Justice established the Drug Use Forecasting System (DUF) provides quarterly estimates of the prevalence of drug use among arrestees at booking based EMIT urinalysis tests at booking in 24 participating cities. Other communities not participating in DUF have established similar drug testing procedures and a few, including Washington, D.C., routinely test all detained arrestees.

The arrestee urinalysis results measure drug use within a segment of the criminal population--apprehended lawbreakers--and, when conducted at booking, provide drug-specific data on use in the hours or days before arrest (the time covered varies by drug and the test criterion used). These results do not measure the quantity or frequency of use. They also do not reflect drug use among the general

law-abiding population or among lawbreakers who were not apprehended.

The second indicator of the drug-crime relationship considered is the number of criminal incidents reported to the police under the guidelines of the Uniform Crime Reporting system. Reported incidents are a measure of the volume of criminal activity within reported categories, but they cannot be disaggregated into those that are drug-related versus those that are not. Thus, while we may monitor crime rates on the grounds, supported by the research cited above that the prevalence and frequency of criminal activity are associated with drug abuse, it must also be recognized that shifts also may reflect other factors that stimulate or inhibit criminal activity. Differences in citizen reporting of different types of offenses, differences in police practices in writing up incident reports, and shifts in enforcement practices targeting specific types of incidents for attention also potentially affect trends in this indicator.

Drugs and Health Consequences

Drugs affect health in a variety of ways, directly through episodes of illness, crisis, or accident caused by consumption and indirectly by shortened life expectancy and the debilitating effects of abuse. Consequences directly attributable to drug abuse include unexpected reactions, overdose (unexpected or the result of a suicide attempt or gesture), iliness resulting from chronic drug use, symptoms of dependence (e.g., withdrawal), and secondary infections stemming from drug use practices (e.g., AIDS or hepatitis). The probability of these problems depends on the type and amount of drugs consumed, the quantity or purity of the drug consumed, the duration of drug use and/or drug dependence, the mode of ingestion, as well as personal variation in drug tolerance. Health services for these problems are offered by a range of providers--private physicians, public health clinics, drug treatment programs including detoxification, inpatient, outpatient and aftercare programs, as well as hospital emergency rooms. The choice of provider depends on the patient's access to health insurance,

private care facilities, the severity of the health crisis, and perhaps the time of day or day of week as well as the services provided by the facility. Ideally, community planners would like to have information on the need for drug treatment services, health care for problems secondary to drug consumption or resulting from chronic use, and health crises resulting from overdose. In practice, the diversity of providers, reasons for seeking care of different types, and limitations on access to services make it extraordinarily difficult to assess health care needs associated with drug abuse.

One source of information on health-related consequences to drug abuse is reports from hospital emergency rooms. These facilities encounter a wide range of the problems cited above, often at a stage of crisis which would tend to minimize patient tendency to conceal drug use as the cause of health problems. Since the 1970's DAWN, a national drug-monitoring system sponsored by the National Institute on Drug Abuse, has collected data from hospital emergency rooms on drug-related episodes. One of the primary objectives of DAWN is "to provide data for national, State, and local drug abuse policy and program planning."

DAWN counts nonmedical use of drugs, defined as the use of substances for psychic effect, dependence or attempted suicide. Up to six drugs can be identified with an emergency room episode or death. Episode data is recorded by designated reporters trained in data collection procedures. It is based primarily on information on drug use provided by patients to hospital personnel. Because the facilities reporting to DAWN shifted over time, trend analyses have, in the past, been based on hospitals that reported consistently. A national sampling plan was introduced in 1989 which will yield consistent, probability-based estimates of the prevalence of episodes in the future. However, the complex weighting system required may limit the production of local estimates for low-prevalence drugs or small population groups.

Emergency room episodes tap only a portion of the health problems caused by drug abuse. Important health consequences not reflected include, for example, the problems of drug-exposed

infants, and the need for treatment beyond the detoxification services provided at some emergency facilities. Data on these problems were not available for this study. Use of emergency rooms depends also on the availability of other health care resources and insurance coverage, which introduces a selection bias to those included from the general population. In addition, the detection and recording of drug symptoms depends in part on the skill and workload of hospital personnel.

Drugs and Child Abuse

Child welfare workers and law enforcement officials report a growing number of abuse cases involving drug abuse and argue that the two problems are causally related. This argument is supported by ethnographic studies detailing the devastating effects of drugs on family life in selected inner city areas of New York (Hamid 1992; Dunlap, 1992) and by the escalating rate of cocaine-related neglect cases entering the family courts (The Washington Post, May 20, 1992). These studies point to the popularity of crack cocaine among women of child bearing age who traditionally bear primary responsibility for child care, particularly in poor, inner city areas in which economic deprivation contributes to the risk of neglect. The result has been an increase in prostitution and sex-for-drug exchanges involving women of childbearing age and a growing involvement of women in crack house operations and crack "cooking," bringing drugs directly into homes with young children. Foster care placement rates have soared and some school districts report large portions of their students reside with neither parent, while law enforcement officers report finding infants and toddlers at the scene of drug busts.

Only recently have child protective service agencies and family courts started recording the involvement of drugs in cases of abuse and neglect. However, mandatory reporting, in place since the mid-1970's, has resulted in records on the number of cases officially reported for investigations, maintained by child protective services. It should be noted that child protective service agencies vary

widely in their screening and investigation procedures and in the classification of cases. Care must be taken to ensure that trend analysis is based on consistent reporting practices.

Trends in child maltreatment cases may also be influenced by factors other than drug abuse. These include, for example, the growth in homelessness during the 1980's, increasing awareness of, and willingness to report, child maltreatment, and the economic hardships brought about by the recent recession. As a result, the linkage between drug trends and abuse must be considered preliminary, pending better data on the extent to which reported cases involved drug abuse.

Issues in Cross-Indicator Comparisons

The trends portrayed by these various indicators produce conflict results at times. Apart from measurement problems such as those mentioned above, these differences derive in part from the fact that they measure different aspects of drug abuse. Several of the indicators--child abuse and neglect and crime incidents--reflect the consequences of drug abuse, not drug consumption and the proportion attributable to drugs is unknown. This allows other trends to play an unknown role in these community problems, although as indicated above, drug abuse has been a significant contributor in recent years. Even among the variables measuring drug consumption, there are significant differences in the pattern of use that would result in inclusion in the indicator. Arrestee urinalysis results measure any recent use of selected drugs, while emergency room episodes reflect non-fatal overdose as well as chronic health problems due to abuse, and medical examiner reports reflect fatal overdose.

Inclusion in the indicator is also determined by the eligible population--whose drug use is being recorded; in the case of the urinalysis results, apprehended lawbreaker drug use is measured; in DAWN, anyone who seeks emergency room care and reports drug use to the staff. This may tend, for example, to over-represent those who have no primary care physician, generally lower income individuals.

Interpretation of the trend indicators is made difficult not only by differences in what and who is being measured, but also by the process by which drug use spreads in the community, specific characteristics of different drugs, and the course of individual drug use careers. These aggregate measures do not clearly delineate how these factors combine to create the overall pattern reflected in the numbers reported. For this reason, on-going efforts to improve the validity and reliability of individual monitoring systems needs to be combined with a better understanding of the factors that influence the probability of inclusion in different indicators across time as drug patterns in the community change.

The following sections describe the data used in this analysis of community drug indicators. Codebooks describing the variables are provided in Appendix A.

The Data from Washington, D.C.

Monthly time-series data were developed for a 78-month period from April 1984 through September 1990 for indicators of community drug problems. Descriptions of these variables, the data sources, and limitations are presented below.

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 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. Data were not provided on all arrestees tested between April 1984 and April 1985 because some records were purged due to computer storage limitations. PSA reported that the purges were not related to case characteristics in any way. The similarity of retained records from this period to the records of arrestees tested between April 1985 and April 1986 in the distribution of top charge, age, sex, and race also suggested that records were not systematically deleted. The retained records were therefore treated in the analysis as

representative of the population of arrestees tested from April 1984 to April 1985. Cases with missing data on age, race or sex (less than 1% of the cases) and cases arrested for Federal offenses were excluded from the analysis.

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]. These 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]. Separate indicators of amphetamine and methadone use were not used due to the low prevalence. Test results are not available across this time for the other five drugs currently included in DUF testing, including marijuana, the drug that has been most prevalent to date among arrestees at the DUF sites.

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.

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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.

The series stops at June 1990 because of changes in DAWN. DAWN reports are now based on a representative sample of emergency room admissions in the Washington metropolitan area. The data from the earlier consistent panel used for this analysis was not based on a representative sample, so it was not possible to treat later DAWN as part of the same time series.

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 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.

The Data from Multnomah County, Oregon

Assistance in locating community drug indicators for Multnomah County (Portland), Oregon, was provided by the Regional Drug Initiative, a community coalition formed in 1986 to combat drug abuse (Regional Drug Initiative, 1987).

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. Discussions with medical researchers and staff in the county indicated that information on emergency room episodes could be gathered retrospectively by reviewing emergency room records, but at costs beyond the project budget.

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.

CHAPTER 3
ANTICIPATING THE CONSEQUENCES OF DRUG ABUSE

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. By necessity the model makes a number of simplifying assumptions, expressed in the form of linkages and variables not included in the discussion. For example, the causal diagram presents some relationships known to be reciprocal with one-way arrows to reflect the expected cumulative cross-time trend pattern. The variables included focus on those that might be measured or manipulated by policies with the hope that these represent those that were not included.

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.

The extent to which the selected indicators directly measure drug-related problems varies. For

some indicators, the link to drug abuse is clear. For example, drug-related emergency room episodes or drug-overdose deaths are documented incidents resulting directly from drug consumption. For other indicators, such as reported crime and child abuse, the link with drugs is less direct. For these indicators, the number or proportion of measured incidents attributable specifically to drug abuse is unknown and support for a causal link to drug abuse relies on the body of research documenting the relationship of these problems to drug abuse.

Overview of the Conceptual Framework

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. A summary of the framework is shown in Exhibit B.

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.

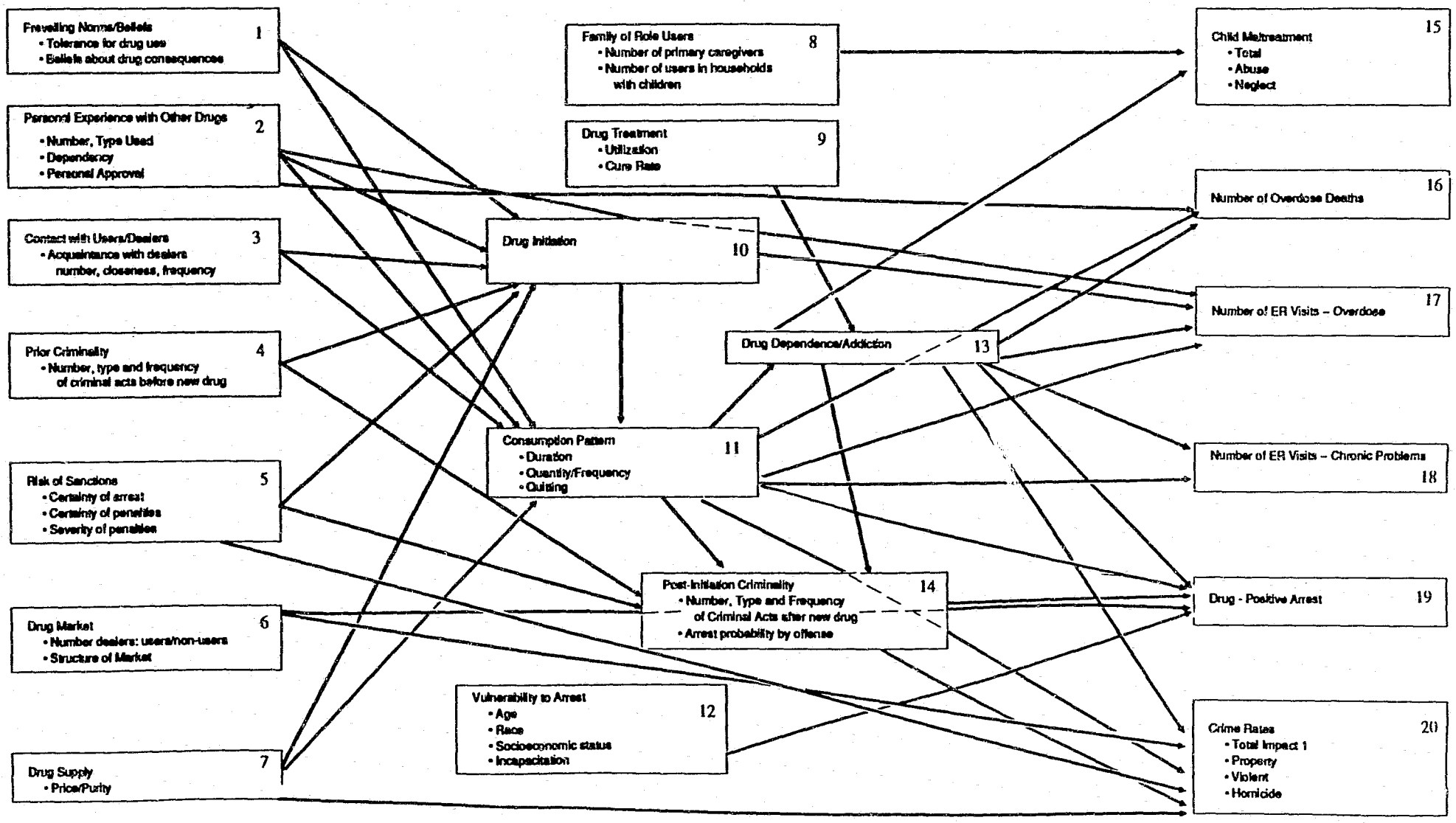


Exhibit A: Model of Drug Diffusion and Community Drug Problems

Exhibit B
Summary of Model[a]

Indicator	Direct Effects	Indirect Effects
15) child maltreatment	8) family role 13) drug dependence	1) norms and beliefs 2) prior drug experience 3) contact with users/dealers 4) prior criminality 5) risk of sanctions 7) drug supply 9) drug treatment 10) drug initiation 11) consumption pattern
16) overdose deaths	2) prior drug experience 11) consumption pattern 13) drug dependence	1) norms and beliefs 3) contact with users/dealers 4) prior criminality 5) risk of sanctions 7) drug supply 9) drug treatment 10) drug initiation
17) ER episodes - overdose	2) prior drug experience 10) drug initiation 11) consumption pattern 13) drug dependence	1) norms and beliefs 3) contact with users 4) prior criminality 5) risk of sanctions 7) drug supply 9) drug treatment
18) ER episodes - chronic	11) consumption pattern 13) drug dependence	1) norms and beliefs 2) prior drug experience 3) contact with users/dealers 4) prior criminality 5) risk of sanctions 7) drug supply 9) drug treatment 10) drug initiation

[a] The numbers refer to the block numbers shown on Exhibit A.

Summary of Model[a] (continued)

Indicator	Direct Effects	Indirect Effects
19) drug positive arrestees	6) drug market 11) consumption pattern 12) vulnerability to arrest 13) drug dependence 14) post-drug criminality	1) norms and beliefs 2) prior drug experience 3) contact with users/dealers 4) prior criminality 5) risk of sanctions 7) drug supply 9) drug treatment 10) drug initiation
20) crimes	6) drug market 11) consumption pattern 12) vulnerability to arrest 13) drug dependence 14) post-drug criminality	1) norms and beliefs 2) prior drug experience 3) contact with users/dealers 4) prior criminality 5) risk of sanctions 7) drug supply 9) drug treatment 10) drug initiation

[a] The numbers refer to the block numbers shown on Exhibit A.

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.

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.

Summary

The conceptual framework above serves as a guide for developing hypotheses about the relationships among drug indicators. Two major limitations to testing these assertions empirically are: (1) the absence of time-series data on the key variables influencing the behaviors measured by community indicators; and (2) the conceptual difficulty in distinquishing between changes in aggregate indicators expected to result from increased diffusion of drug use to expanding portions of the population, and changes in drug-related problems across the course of drug-use careers of users. This points clearly to

a need to begin to measure overlap among the populations included in various indicators. For example, this might mean collecting information on the number of arrestees who have been to the emergency room for drug-related care and the number of emergency room patients who have been arrested and tested for drugs. Similarly, the number of those in both groups who had received drug treatment would be important.

The following analysis explores the utility of developing stage-based predictions of the relationships among community indicators on the grounds that these relationships may vary systematically across the course of a drug epidemic such as the PCP and cocaine epidemics in Washington, DC, during the 1980's.

CHAPTER 4
RESULTS

The initial portion of the analysis examines convergence among indicators of community drug problems, focusing on extent to which the consequences to drug abuse--health problems, crime and child maltreatment--vary concurrently with arrestee drug use, as measured by urinalysis results. The model of drug diffusion presented in the previous chapter argues that new patterns of drug use will be detected first in arrestee urinalysis results. As use spreads, the urinalysis results continue to rise and drug-related problems start to increase. As use stops spreading and perhaps declines, problems may or may not decrease depending on factors such as the number of addicts, treatment availability, and enforcement policies.

The examination of the changes in Washington, DC indicators between April 1984 and June 1990 presented in this chapter compares arrestee drug use prevalence to trends emergency room episodes, drug-overdose deaths, crimes, and child maltreatment. Graphs and estimates of the correlations among indicators across the entire period overall and at different stages are used to describe the patterns. Graphs of similar indicators for Portland, Oregon for 1988 and 1989 are presented for comparative purposes. These analyses focus on several issues: differences across drugs and across consequences in the relationship to arrestee drug use, the effects of using different indicators of community drug problems on the results observed, and the month-to-month variability in each indicator to be expected at different stages.

The second section of this chapter examines the extent to which arrestee urinalysis results precede and can be used to forecast shifts in consequences to drug abuse. Lags between changes in prevalence and changes in indicators of drug consequences are expected to depend on the extent and speed with which: (1) the new behavior spreads from the criminal population to the noncriminal portion of the

population; and (2) individual users encounter serious problems from continued use. Models testing the linear lagged relationships among indicators focus on 6, 9 12 and 15 months, to simulate the quarterly indicators of arrestee drug use available from DUF.

Cocaine Use and Community Problems

Arrestee use of cocaine began to increase in 1984, with the percentage testing positive rising from under 20% to 60% at the start of 1988. During this time, crack was introduced to the streets of Washington. Cocaine prevalence among arrestees remained high from the end of 1987 through 1989, but declined in 1990. As Figure 1 shows, the trends exhibited month-to-month fluctuations as high as 4 to 5 percentage points even though these results are based on large numbers of arrestees and weighted by offense category to correct for fluctuations in enforcement policies using procedures described in the in the section on measurement issues at the end of this chapter.

Health consequences. Negative health effects, and thus the emergency room data and medical examiner death reports, were hypothesized to increase as a new form of drug use spread to additional users and as individual users overdose or experience chronic health problem related to persistent drug use. Chronic health problems among addicts are expected to continue even after the number of users declines, primarily because the much of decline in users will probably consist of a drop in new users and casual or experimental users. Drug over-dose episodes, in contrast, were expected to vary not only with the number of addicted users with high tolerance and the number of novice users, but also with access to drugs, increasing when available drugs were purer or cheaper than normal.

Cocaine-related emergency room episodes rose slowly in 1984 and 1985, showed moderate increases in 1986, and grew sharply in 1987 and 1988, as crack use became established (Figure 1). During 1989 and 1990, cocaine-related emergency room episodes generally declined, but at a slower rate than over declines in arrestee positive urinalysis tests. There was considerable month-to-month variation

in episodes, which might have reflected variation in consumption due perhaps to the price and purity of available cocaine, and not necessarily to variation in the prevalence of use as measured by arrestee urinalysis results.

Monthly cocaine-related overdose deaths, also shown in Figure 1, were much less frequent than emergency room episodes, and rarely exceeded 10 per month until 1986. The numbers, shown on a log scale, grew during 1986 and 1987, and remained relatively high with wide monthly variation.

All three cocaine indicators, arrestee urinalysis positives, emergency room episodes, and deaths reached their highest levels in 1988. The graphs depict overall similarities in trend, but suggest that shorter term relationships, if they exist, may be masked by considerable monthly variance in the indicators.

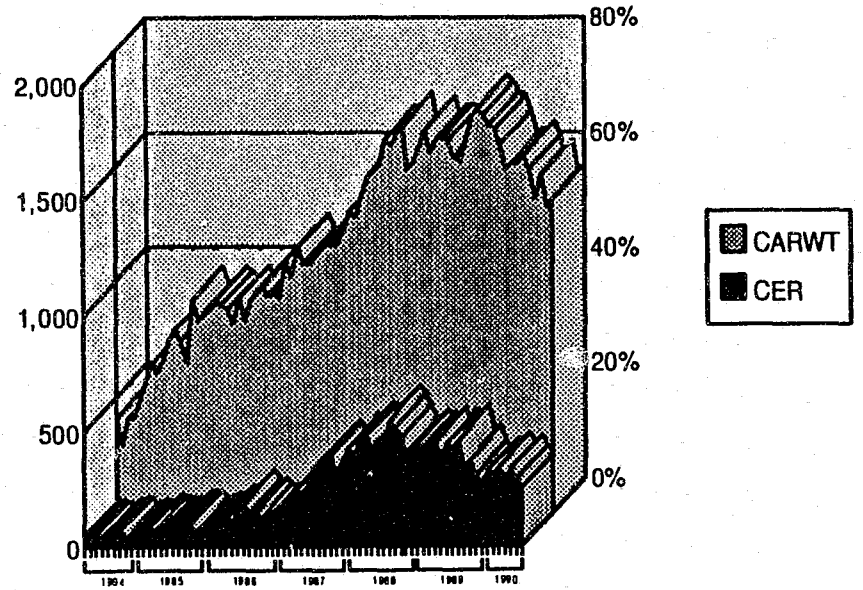
In contrast to Washington, Portland did not have an increase in recent cocaine use among arrestees across the 18 months from January 1988 to June 1989 (Figure 2). Between 30% and 40% of the arrestees tested positive for cocaine in 15 of the 18 months between January 1988 and June 1989. At this time, cocaine use had become well-established in Portland and the percentage of arrestees testing positive at initial booking was not generally on the increase. The month-to-month fluctuations were considerable, and showed only a modest tendency to vary with cocaine-related overdose deaths.

Crime. Drug-related crime consists of violent crime, including homicide, due to psycho-pharmacological effects of the drug or to disputes arising out of drug dealing transactions, as well as property crimes such as burglary, larceny and automobile theft to support drug consumption. Crime was expected to increase following a rise in the proportion of arrestees testing positive. Because the increase in criminal activity 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 should lag behind the rise in arrestee drug positive trends.

Crime may also increase following introduction of a new drug to the arrestee population due to increased demand for drugs created by the expanding number of users. The potential for crime related

Trends in Cocaine Use Among Arrestees and Cocaine-Related Health Consequences: Washington, DC 1984-1990

Cocaine-Related Emergency Room Episodes and the Weighted Proportion of Arrestees Positive for Cocaine



Cocaine Overdose Deaths (Log Scale) and the Weighted Proportion of Arrestees Positive for Cocaine

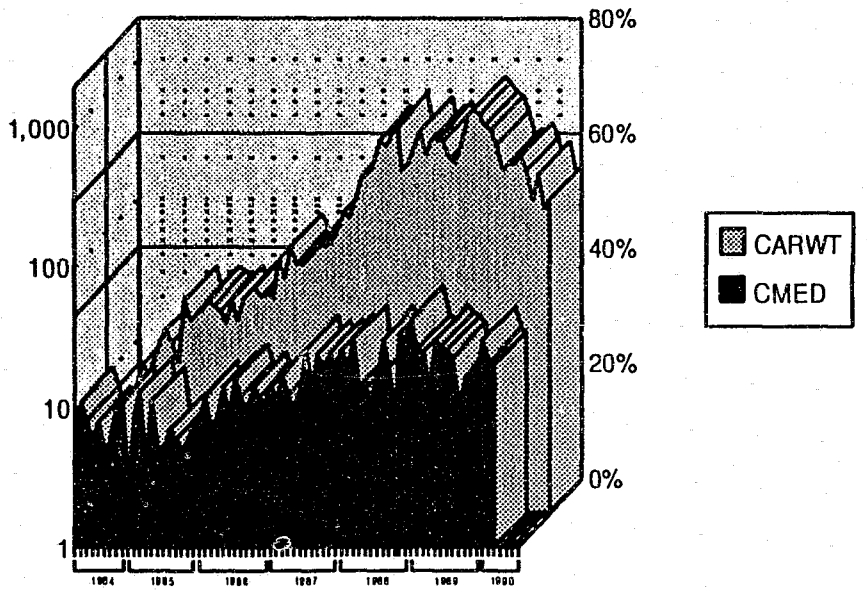
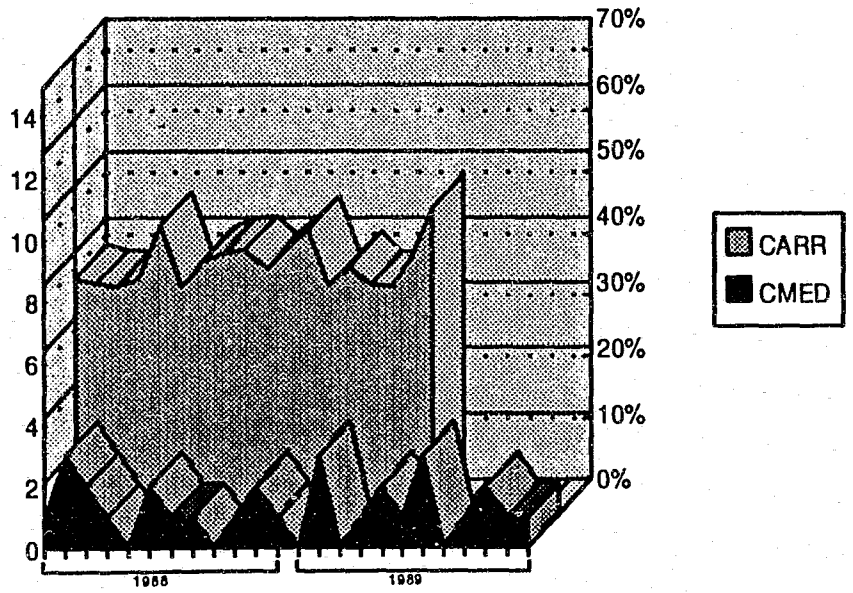


Figure 1

Trends in Use of Cocaine and Opiates Among Arrestees and Deaths Due to Cocaine and Opiate Use: Portland, 1988-1989

Deaths Due to Cocaine Use and the Proportion of Arrestees Positive for Cocaine



Deaths Due to Opiate Use and the Proportion of Arrestees Positive for Opiates

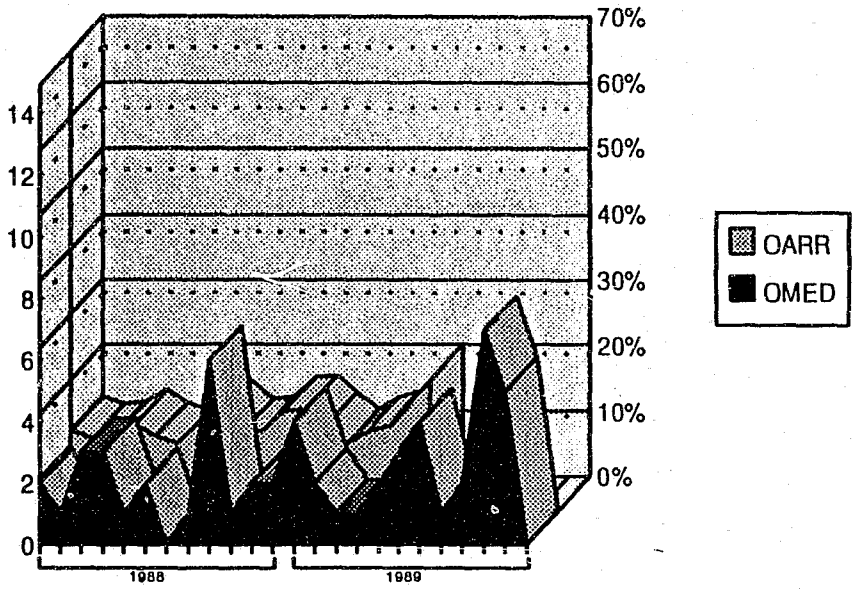


Figure 2

to drug distribution is expected to vary with the structure of the drug market--the degree of organization, the centralization of distribution, and level of competition for customers, and thus should vary across time, drugs and geographic area. Cocaine distribution in particular has been associated with violence triggered by deals gone bad, competition for market share, and market regulation. Crime related to distribution may not, however, drop with declining prevalence of recent use among arrestees. 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.

From 1984 through 1987, the number of index crimes (which did not include drug offenses) showed the expected seasonal variations, but did not generally rise (Figure 3). Indeed, violent crimes declined somewhat across these years, starting to move upward in 1988. Most of the growth in the number of crimes occurred after 1987, when recent cocaine use by arrestees was at its highest.

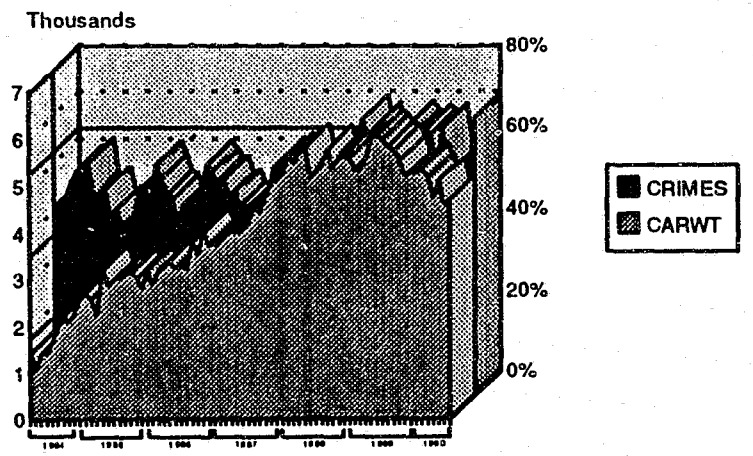
Homicides, shown in the lower right of Figure 3, began to rise in late 1987 and showed a much steeper increase than the overall number of violent crimes. From 1984 through mid-1987, homicides rarely exceeded 20 per month; in 1988 and 1989, homicides exceeded 45 in several months, and usually exceeded 30 per month. Although a decrease in property crimes accompanied the 1990 decrease in arrestee cocaine use, homicide and other violent crime continued to rise.

In Portland, there were declines in both property and violent crimes in 1988 and 1989, but little overall change in the proportion of arrestees testing positive for cocaine (Figure 4). Again, the month-to-month variability in the indicators, particularly the seasonal variation in crime rates, make it difficult to identify consistent relationships between arrestee urinalysis results and crime.

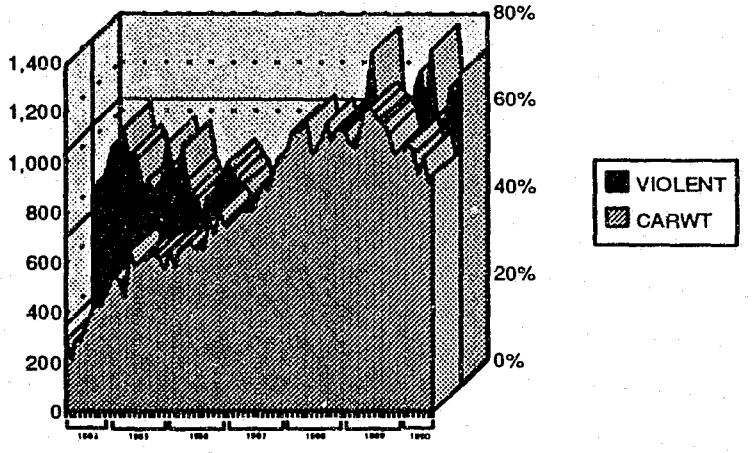
Child Abuse. Increases in reported cases of child abuse and neglect may follow introduction of a new pattern of drug abuse, depending upon the psychoactive effects of the drug, the use by child caregivers, and the economic disruption caused by abuse. The addictive properties of crack and its

Trends in Cocaine Use among Arrestees and Crime: Washington, DC 1984-1990

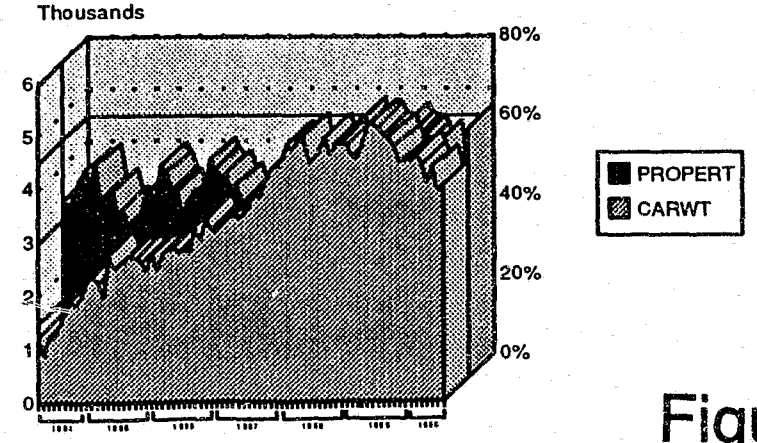
Index Crimes and the Weighted Proportion of Arrestees Positive for Cocaine



Violent Crimes and the Weighted Proportion of Arrestees Positive for Cocaine



Property Crimes and the Weighted Proportion of Arrestees Positive for Cocaine



Homicides and the Weighted Proportion of Arrestees Positive for Cocaine

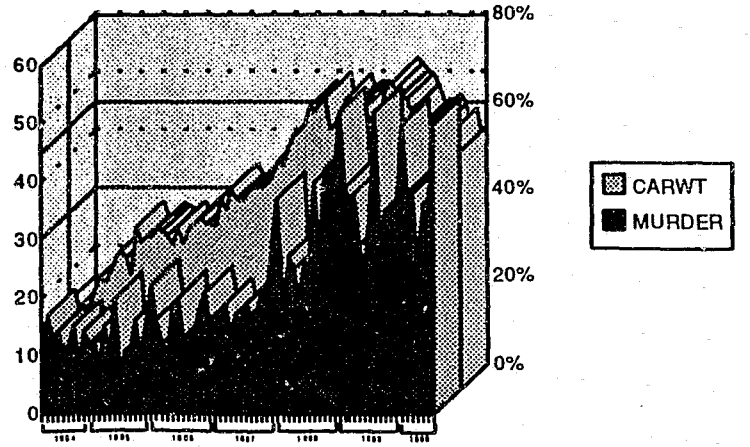
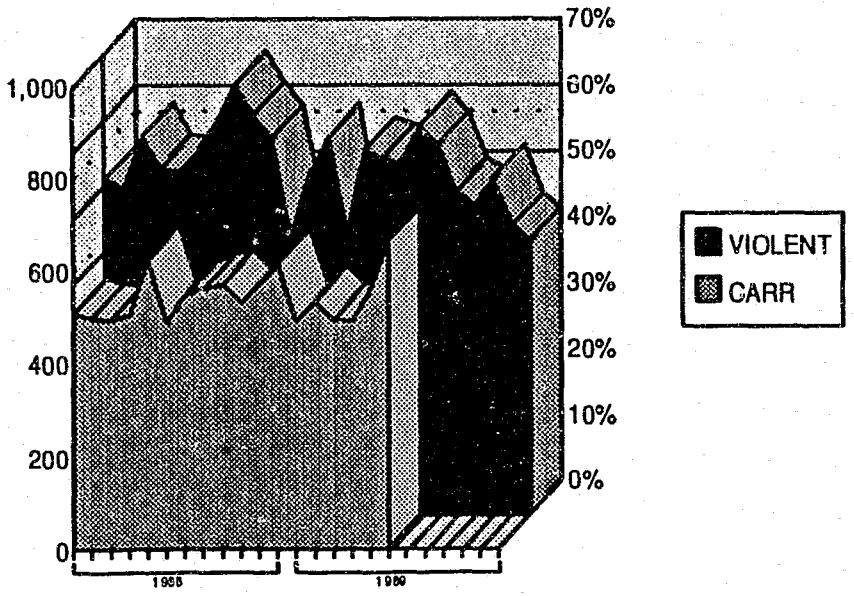


Figure 3

Trends in Cocaine Use among Arrestees and Crime: Portland, 1988-1989

Violent Crimes and the Proportion of Arrestees Positive for Cocaine



Property Crimes and the Proportion of Arrestees Positive for Cocaine

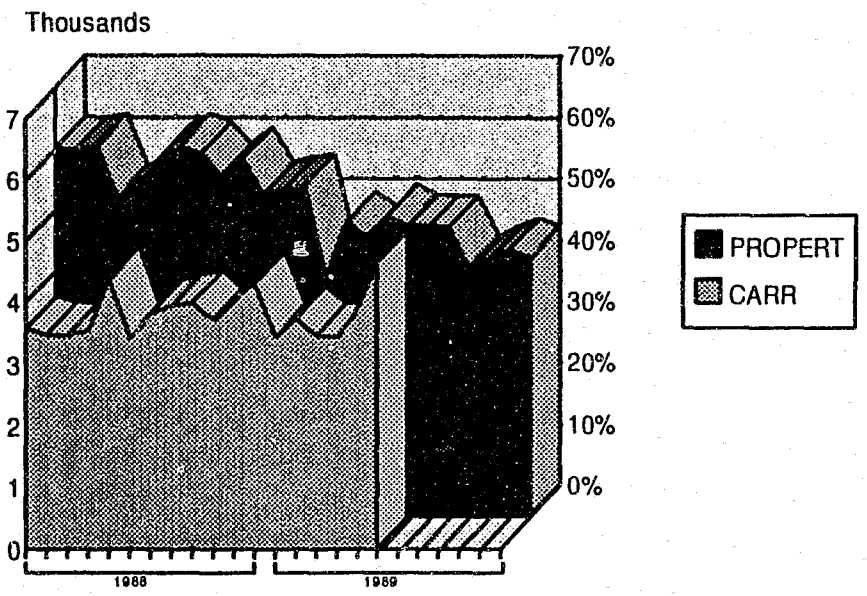


Figure 4

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. Because maltreatment of children is argued to be related to drug dependence, declines in prevalence associated with fewer initiates and casual users may not be accompanied by declines in reported cases. Such declines would be expected only as the number of chronic abusers decreases.

The total number of reported cases of child maltreatment rose in Washington from just over 500 per month in 1984 to approximately 800 per month in 1989 (Figure 5). While not as steep as the rise in recent cocaine use indicated by arrestee urinalysis results, the increase did occur across the same period of time. The highest number of reported cases across this time period occurred in 1988 and 1989, the same year that recent cocaine use among arrestees peaked.

In Portland, the number of child abuse and neglect cases was slightly lower in December of 1989 than in January 1988 (Figure 6). Like recent cocaine use among arrestees was relatively stable, the reported number of child maltreatment cases was relative stable across the 18 months for which arrestee urinalysis results were available.

Opiate Use and Community Problems

The heroin epidemic in Washington took place in the 1970's and its use had declined significantly from its high prior to 1984. Recent opiate use among arrestee continued to decline slowly from over 20% to approximately 15% between 1984 and the first half of 1990 (Figure 7).

At this stage in a drug epidemic, most users are expected to be older, long-term users whose problems with the drug would result from their chronic use and continuing need to support their habit. Because the number of users remained relatively stable across this period of time, few changes in indicators of opiate-related community problems were expected. The exception might be an increase in emergency room episodes or deaths brought about by years of abuse.

Trends in Cocaine Use Among Arrestees and Reported Cases of Child Abuse and Neglect: Washington, DC 1984-1990

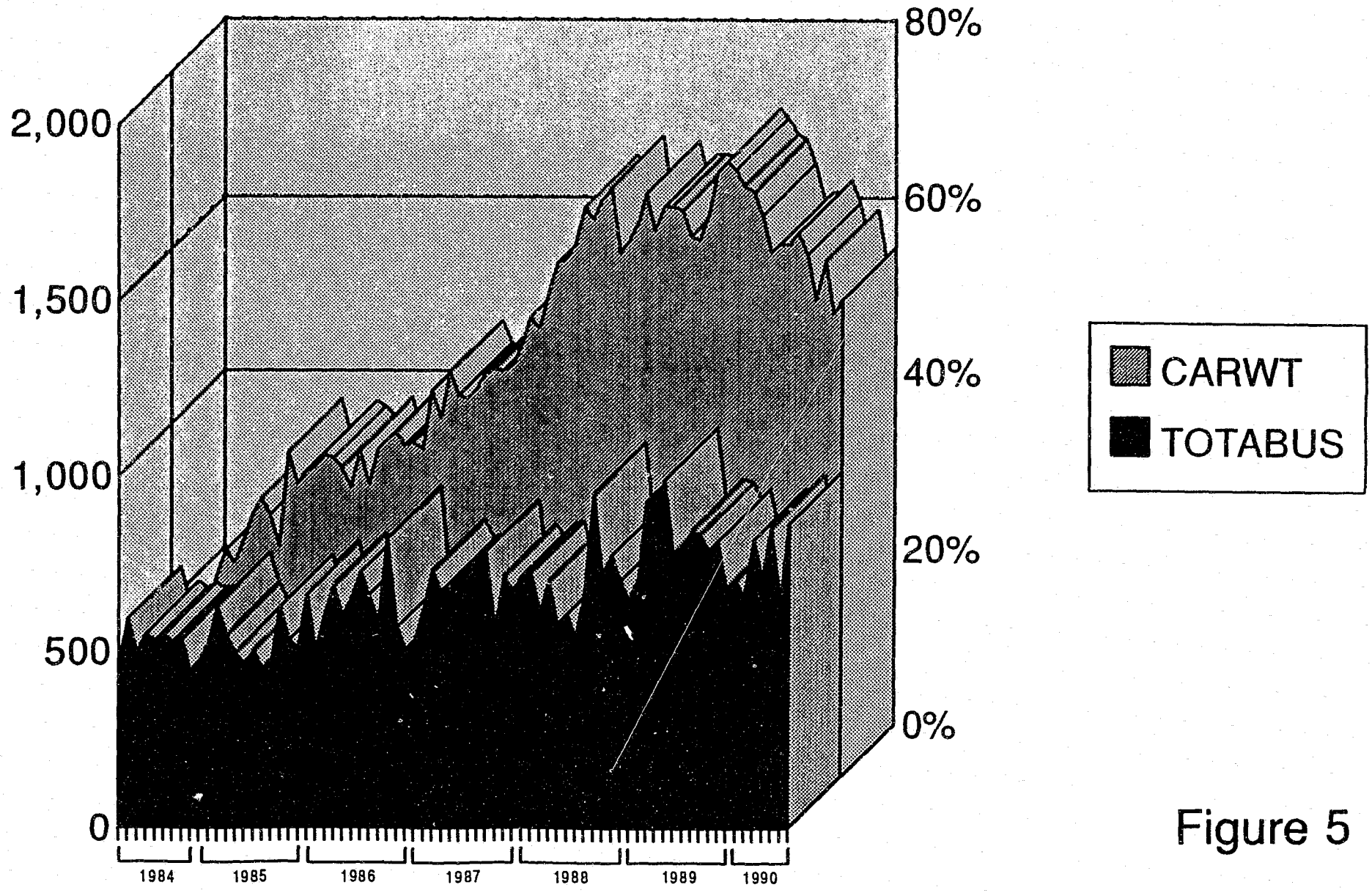
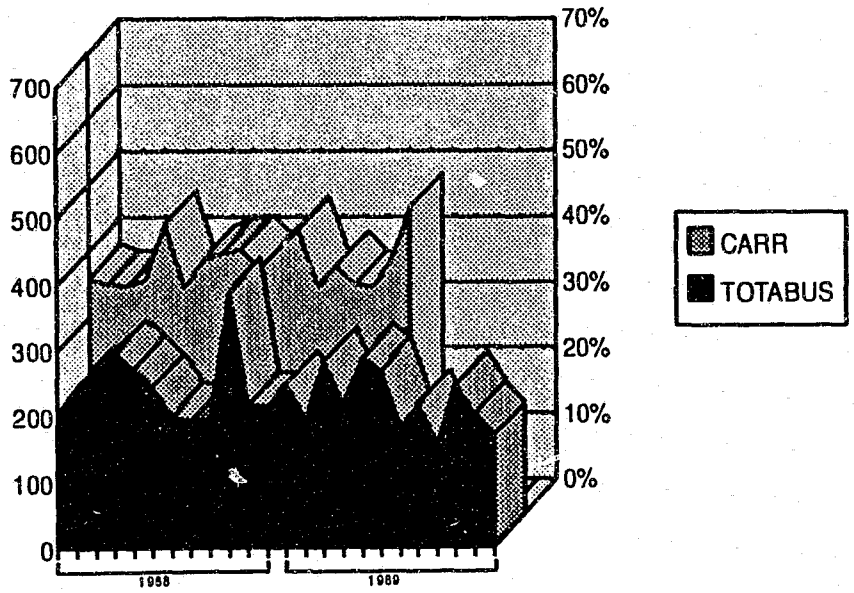


Figure 5

Trends in Use of Cocaine and Any Drugs and Reported Cases of Child Abuse and Neglect: Portland, 1988-1989

Reported Cases of Child Abuse and the Proportion of Arrestees Positive for Cocaine



Reported Cases of Child Abuse and the Proportion of Arrestees Positive for Any Drugs

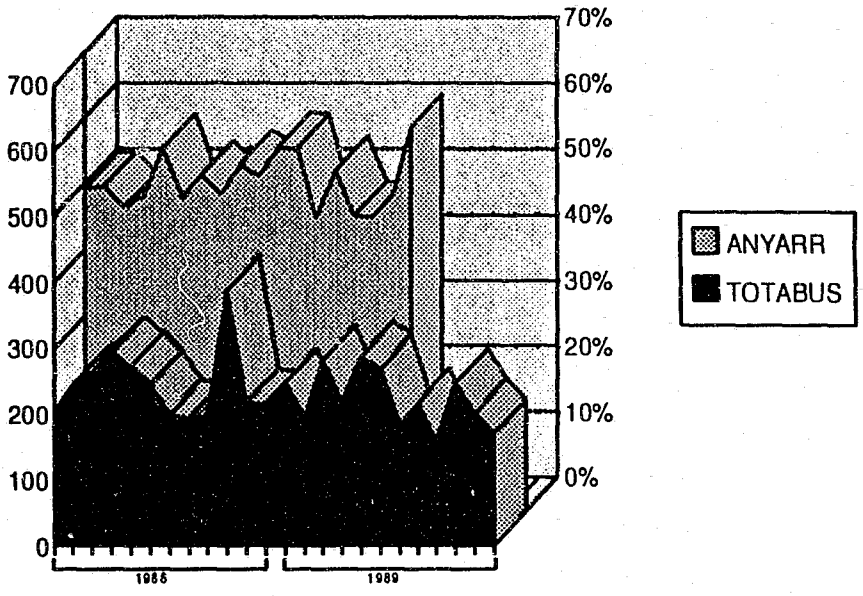
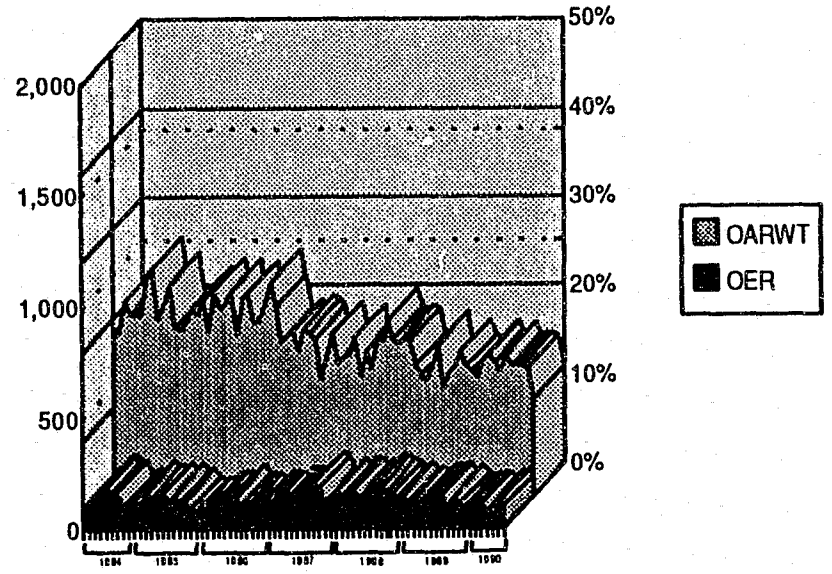


Figure 6

Trends in Opiate Use Among Arrestees and Opiate-Related Health Consequences: Washington, DC 1984-1990

Opiate-Related Emergency Room Episodes and the Weighted Proportion of Arrestees Positive for Opiates



Opiate Overdose Deaths (Log Scale) and the Weighted Proportion of Arrestees Positive for Opiates

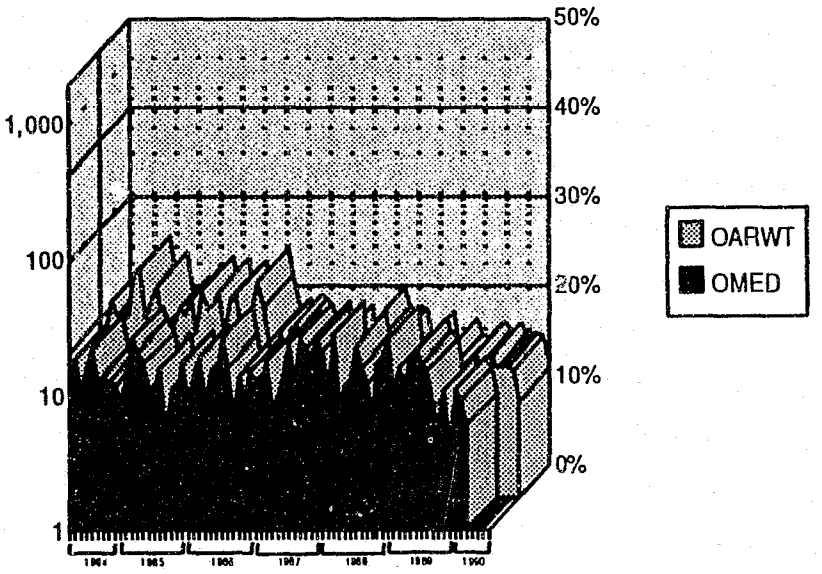


Figure 7

Negative Health Consequences. Emergency room episodes involving opiates remained relatively stable across the entire time period (Figure 7). They fell slightly in 1986, but rose again in 1987 and 1988, perhaps the result of combined use of opiates with cocaine. By the second half of 1989 and 1990, the number of episodes involving opiates had tapered off. Overall, the pattern of opiate emergency room episodes did not reflect the slow downward trend in the proportion of arrestees testing positive at booking.

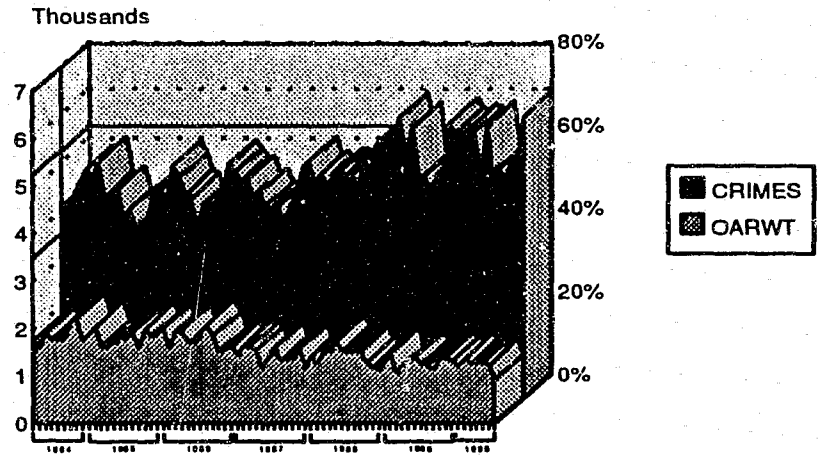
In Washington, very little change in the monthly number of opiate-related deaths occurred across this period (Figure 7), despite the aging of the opiate users and the increasing duration of their heroin use careers. In contrast, the proportion of arrestees testing positive for opiates in Portland rose slightly between the start of 1988 and mid-1989, as did the number of opiate-related deaths (see Figure 2 above).

Crime. The downward trend in opiate use was not reflected in the numbers of reported crimes (Figure 8). The opiate market in Washington was not associated with the violence of the cocaine market, nor are the psychopharmacological effects of heroin associated with violence. Thus, the lack of convergence between arrestee opiate use trends and trends in violent crime, including homicide, is not surprising. However, property crimes, associated with efforts by opiate users to support their habit, did not decline with decreasing arrestee heroin use. From 1987 through 1989, property crimes increased, while recent opiate use among arrestees fell. In Portland, the slight increase in opiate use among arrestees between January 1988 and June 1990 was accompanied by a decline in both property and violent crimes (Figure 9).

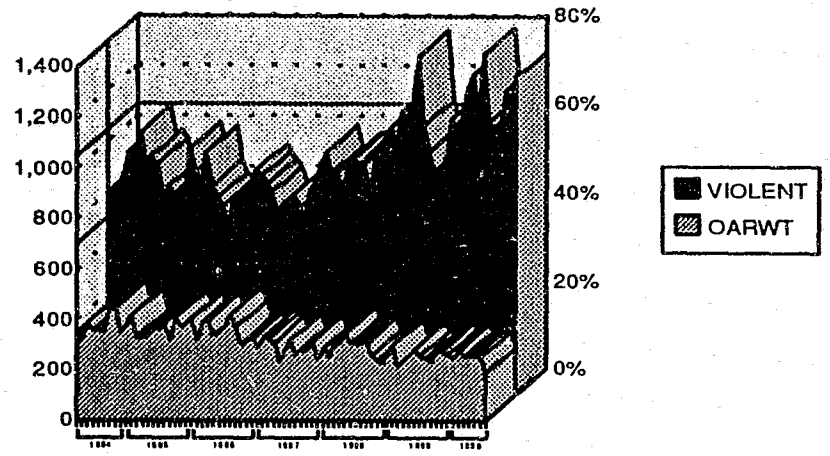
Child Abuse and Neglect. Heroin use, never as popular among women as men, was not expected to be related to child abuse and neglect across this period of time, particularly in view of the increasing age of most users. As Figure 10 shows, child maltreatment cases rose between 1987 and 1990, while recent opiate use among arrestees declined.

Trends in Opiate Use among Arrestees and Crime: Washington, DC 1984-1990

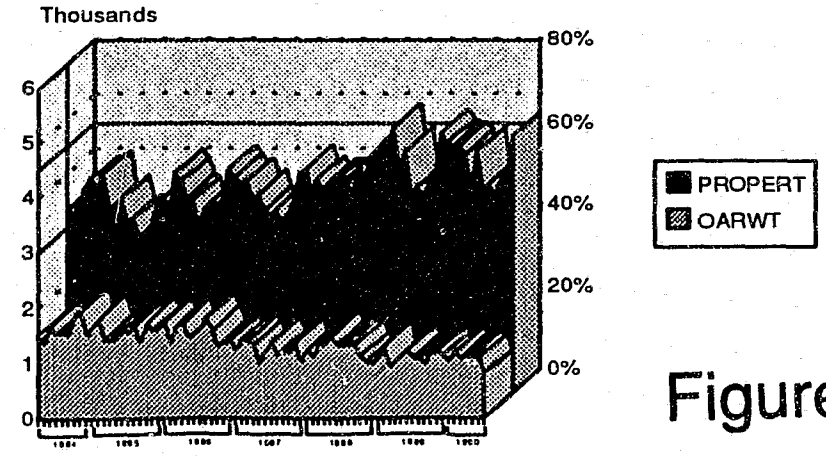
Index Crimes and the Weighted Proportion of Arrestees Positive for Opiates



Violent Crimes and the Weighted Proportion of Arrestees Positive for Opiates



Property Crimes and the Weighted Proportion of Arrestees Positive for Opiates



Homicides and the Weighted Proportion of Arrestees Positive for Opiates

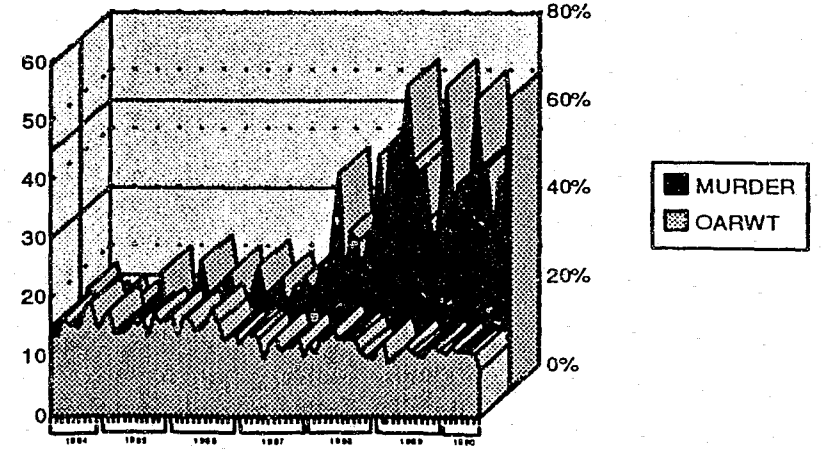
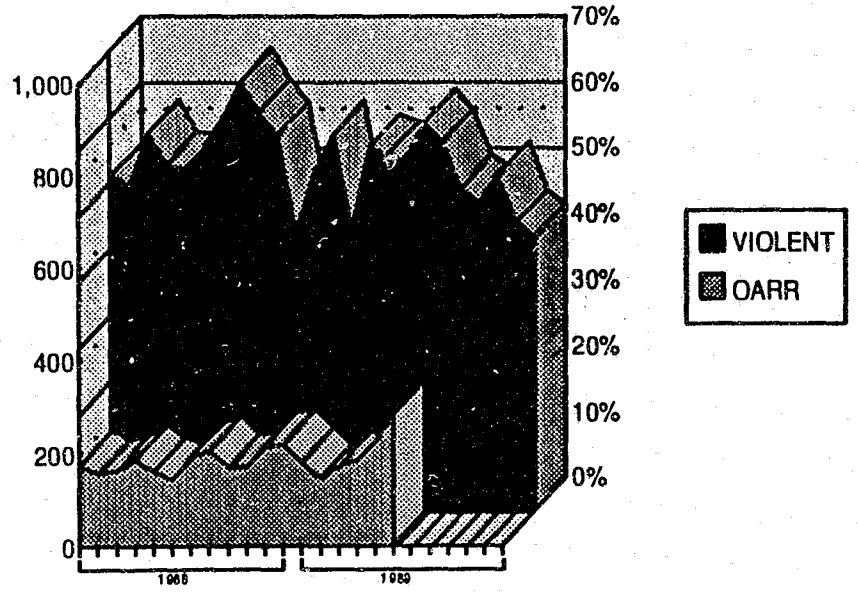


Figure 8

Trends in Opiate Use among Arrestees and Crime: Portland, 1988-1989

Violent Crimes and the Proportion of Arrestees Positive for Opiates



Property Crimes and the Proportion of Arrestees Positive for Opiates

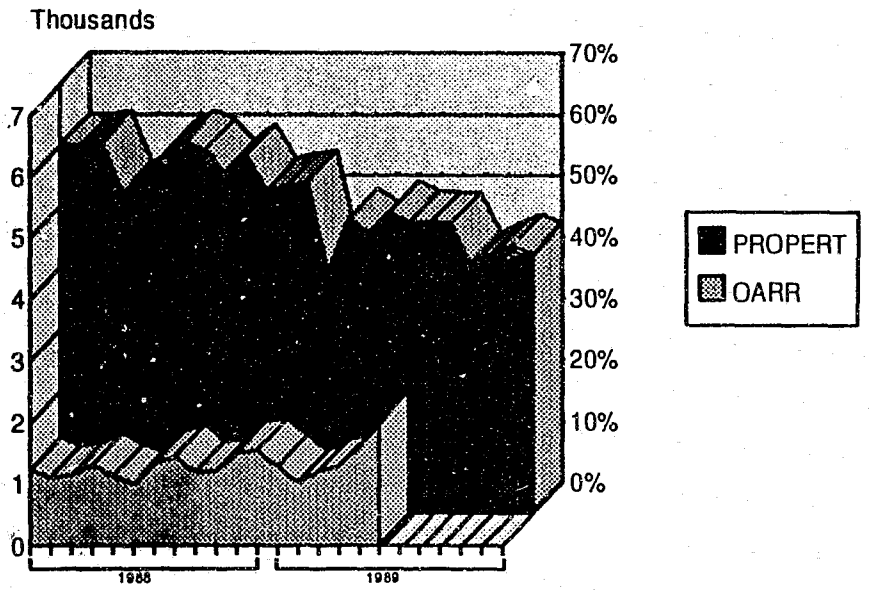


Figure 9

Trends in Opiate Use Among Arrestees and Reported Cases of Child Abuse and Neglect: Washington, DC 1984-1990

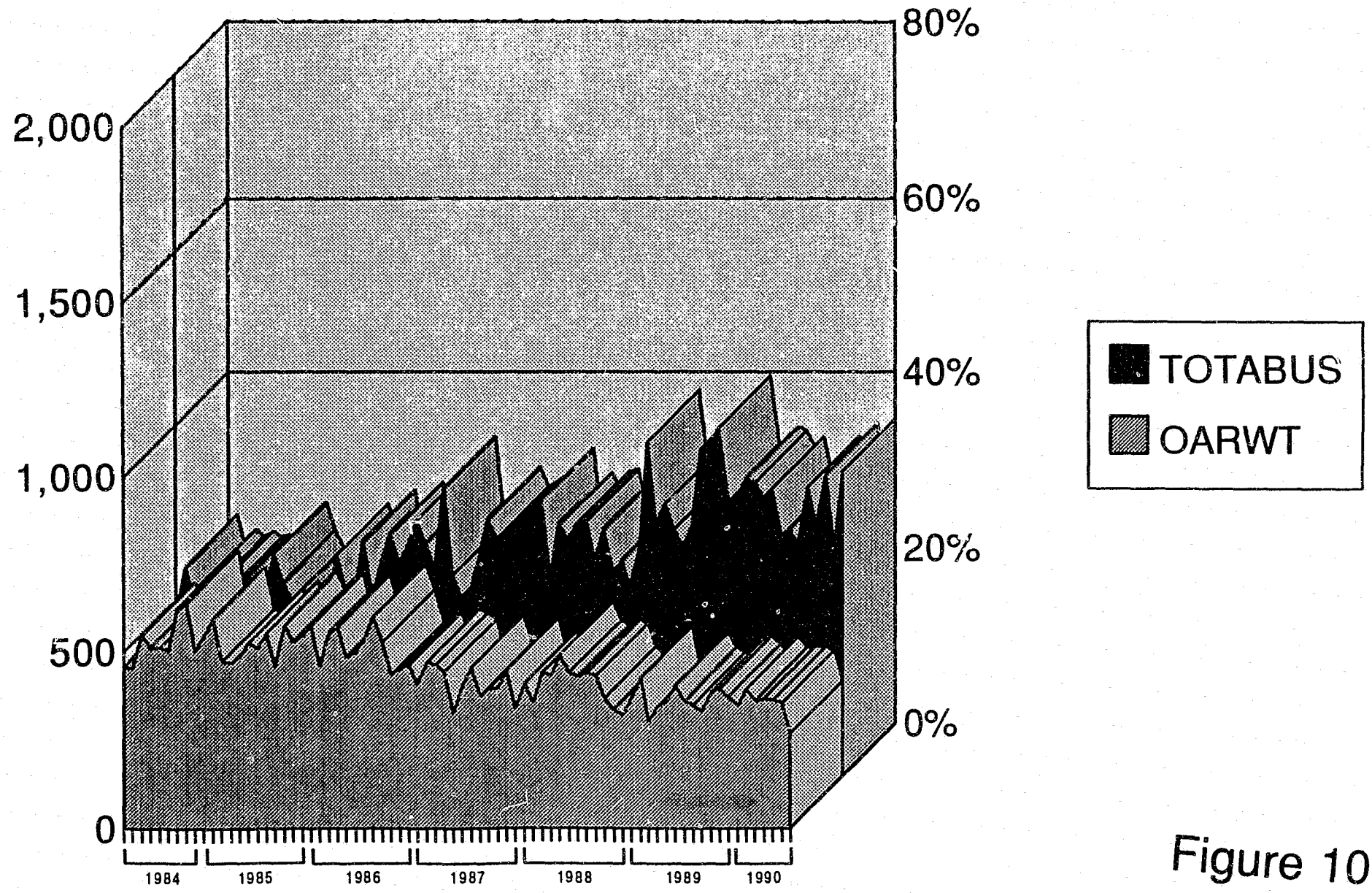


Figure 10

PCP Use and Community Drug Problems

PCP use provides an interesting contrast with the cocaine and opiate trends presented above. The PCP epidemic, which was much more pronounced in Washington than in other cities, began in the early 1980's, peaked in 1987, and declined sharply from 1988 to 1990 (Figure 11). PCP was associated with toxic reactions and violent crime, while patterns of use were less likely to be the persistent, long-term consumption associated with heroin or cocaine addiction.

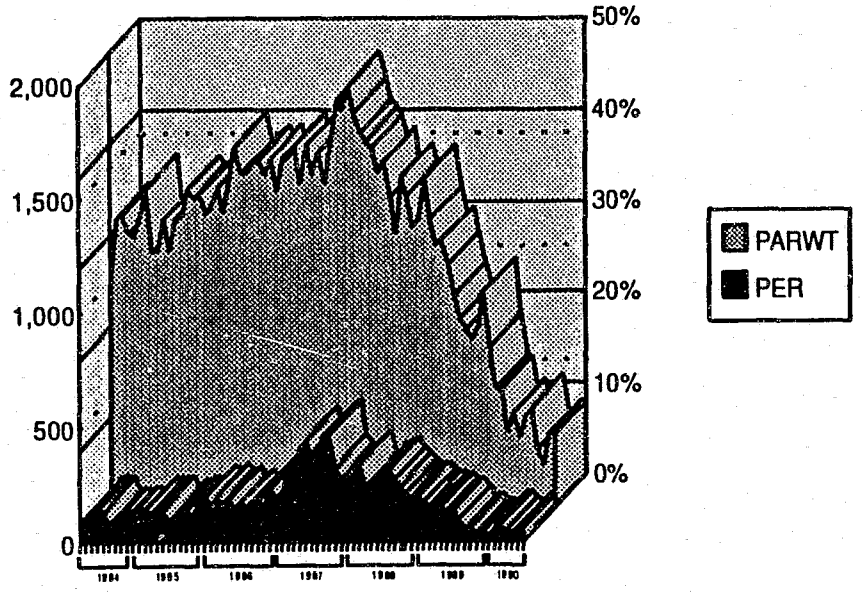
Negative Health Consequences. The peak in emergency room episodes involving PCP occurred shortly after the peak in the percentage of arrestees testing positive for PCP (Figure 11). As use declined, so did the emergency room episodes, presumably because most visits involved toxic reactions, and rather than chronic use. Deaths associated with PCP use were relatively rare, but did decline from the high of over 10 a month to less than 10 by 1990. Portland did not include a screen for PCP in its arrestee drug testing program, because PCP use was not widespread in that city as in most others.

Crime. Although PCP was associated with violent behavior, violent crimes by users under the influence were expected to be relatively rare in comparison to violent crimes associated with cocaine use and marketing. The decline in PCP use did not have a discernable effect on the number of violent crimes reported (Figure 12), although any such effect would undoubtedly have been offset by growing violent crime associated with crack use and marketing that was increasing among arrestees as PCP use declined.

Child Maltreatment. As Figure 13 shows, PCP use among arrestees declined while the cases of child abuse and neglect increased rapidly. These divergent trends can be attributed to increasing crack cocaine use at this time.

Trends in PCP Use Among Arrestees and PCP-Related Health Consequences: Washington, DC 1984-1990

PCP-Related Emergency Room Episodes and the Weighted Proportion of Arrestees Positive for PCP



PCP Overdose Deaths (Log Scale) and the Weighted Proportion of Arrestees Positive for PCP

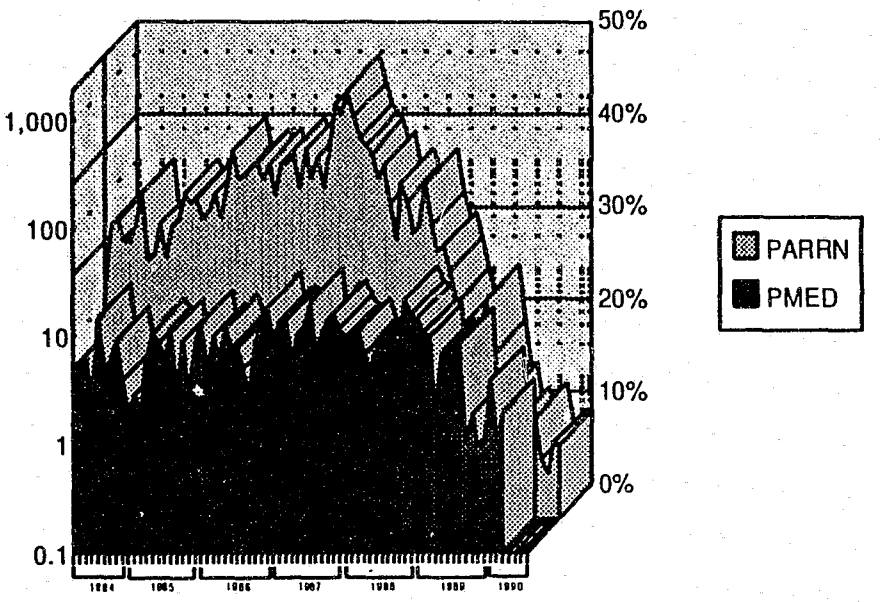
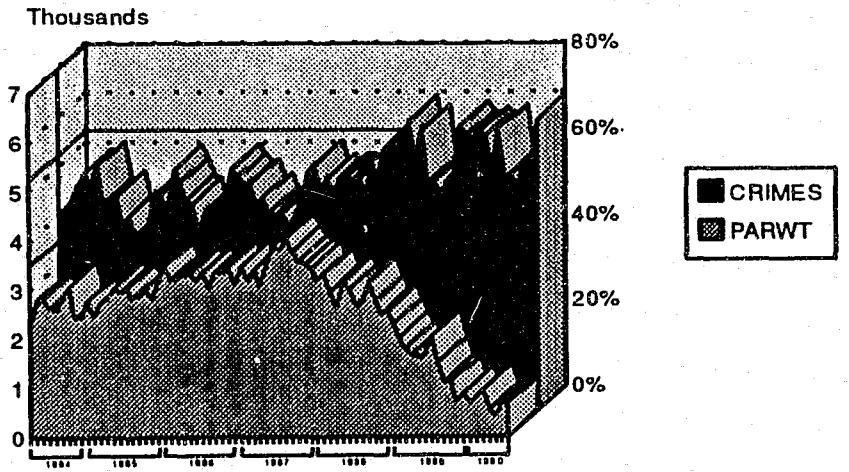


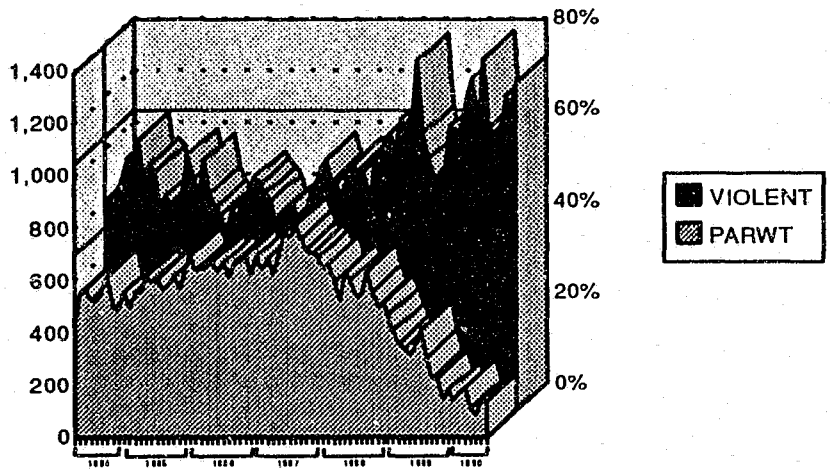
Figure 11

Trends in PCP Use among Arrestees and Crime: Washington, DC 1984-1990

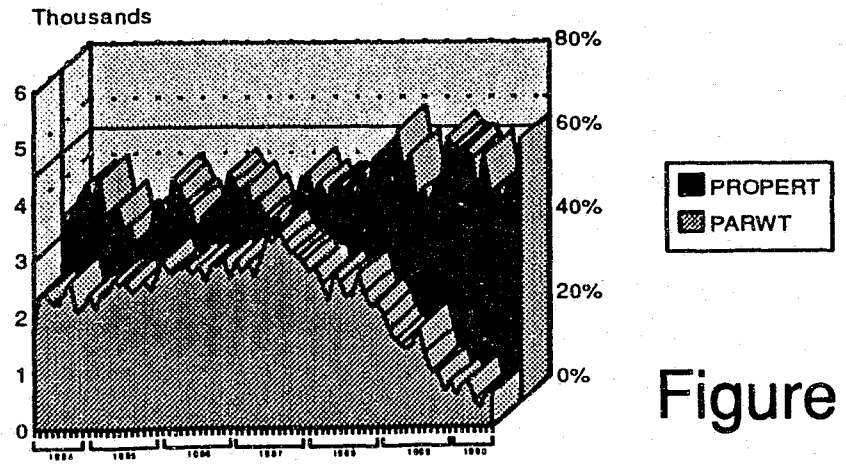
Index Crimes and the Weighted Propotion of Arrestees Positive for PCP



Violent Crimes and the Weighted Propotion of Arrestees Positive for PCP



Property Crimes and the Weighted Proportion of Arrestees Positive for PCP



Homicides and the Weighted Proportion of Arrestees Positive for PCP

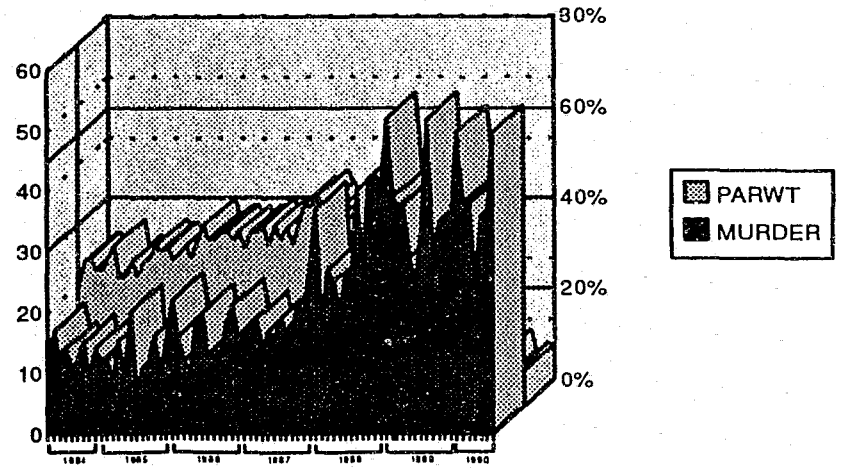


Figure 12

Trends in PCP Use Among Arrestees and Reported Cases of Child Abuse and Neglect: Washington, DC 1984-1990

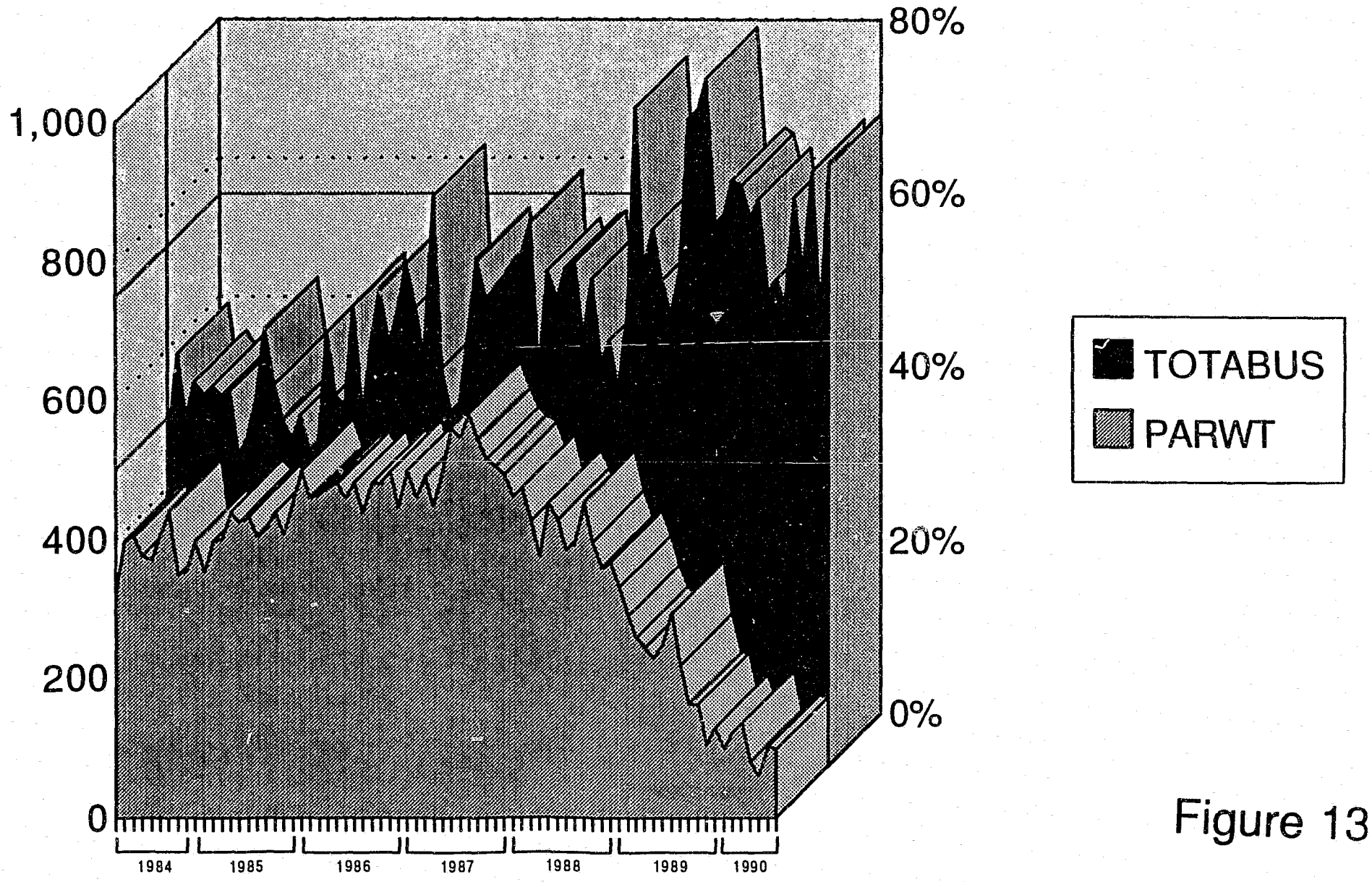


Figure 13

Convergence among Community Drug Indicators

The trends described above are summarized in Table 1 which shows the average monthly value on each indicator by year. The standard deviations in parentheses below the mean values illustrate the relatively large month-to-month variation in some indicators, most notably crimes and overdose deaths.

Our analysis of the convergence among drug indicators focused on cocaine and PCP, the two drugs that showed distinct trend shifts between 1984 and 1990. A series of models were tested to evaluate the extent to which arrestee urinalysis results could be used to predict community drug problems across this period of rapidly changing drug use patterns. The models, tested using ordinary least-squares regression, specified the community drug problems as the dependent variable, and the arrestee urinalysis results as the independent variable and controlled for autoregression when present in the community indicator series.

In addition, similar models were run for subgroups of months selected to represent stages in drug diffusion. The objective was to test the hypothesis that the relationship among indicators will vary by the stage in a drug epidemic, as suggested by the conceptual framework presented in the prior chapter. This framework argues that concurrent correlations will be lowest at stage 1 when arrestee drug use begins its increase, highest at stage 2 when both arrestee drug use and community problems are rising, and somewhat lower at stage 3 as some problems persist despite a decrease in prevalence of recent use.

Subgroups of months were selected to represent specific stages in the cocaine epidemic. For cocaine, three separate stages were defined. Stage 1 was defined at the 24 months from July 1984 through June 1986 when cocaine positive tests were first increasing among arrestees, signalling the introduction of a new pattern of drug abuse. Stage 2 was defined as the next 24 months from July 1986 through June 1988 when cocaine-related emergency room episodes began to rise sharply, indicating a spread to the general population and/or increasing chronic-use problems among early

Table 1

COMMUNITY DRUG INDICATORS BY YEAR: WASHINGTON, D.C. 1984-1990

	1984[a] mean (SD)	1985 mean (SD)	1986 mean (SD)	1987 mean (SD)	1988 mean (SD)	1989 mean (SD)	1990[b] mean (SD)
Arrestees Positive							
Cocaine	.20 (.05)	.33 (.03)	.39 (.04)	.50 (.05)	.64 (.02)	.65 (.04)	.57 (.03)
Opiates	.21 (.03)	.21 (.02)	.21 (.02)	.16 (.02)	.16 (.02)	.15 (.01)	.13 (.02)
PCP	.30 (.03)	.33 (.02)	.38 (.02)	.41 (.03)	.33 (.03)	.18 (.06)	.08 (.02)
Emergency Room Episodes							
Cocaine	55.0 (9.87)	74.4 (14.11)	126.3 (28.87)	279.3 (83.15)	450.1 (47.59)	399.6 (60.49)	273.4 (76.58)
Opiates	142.4 (32.91)	126.08 (25.88)	105.3 (17.24)	141.1 (30.68)	164.7 (16.61)	126.4 (19.60)	94.8 (18.87)
PCP	108.8 (26.61)	123.0 (28.17)	176.0 (21.96)	350.3 (96.89)	262.3 (40.11)	115.0 (55.35)	46.6 (19.38)
Overdose Deaths							
Cocaine	7.9 (2.31)	6.8 (2.95)	11.1 (2.75)	17.3 (5.43)	21.3 (8.64)	23.0 (8.62)	23.7 (5.51)
Opiates	14.0 (4.64)	13.8 (5.8)	13.8 (5.22)	17.1 (6.42)	15.7 (6.39)	13.8 (6.45)	8.7 (2.52)
PCP	6.3 (3.87)	6.2 (3.51)	9.25 (4.47)	12.3 (4.10)	10.4 (4.50)	6.1 (4.68)	2.3 (1.53)
Crimes							
Total	4450.8 (356.60)	4197.3 (408.02)	4369.3 (384.4)	4399.9 (418.74)	5143.4 (459.83)	5193.0 (538.01)	5151.1 (512.65)
Child Abuse & Neglect							
Total	522.8 (45.09)	519.3 (58.23)	632.8 (89.77)	678.17 (75.23)	690.1 (106.54)	814.5 (103.75)	791.9 (116.99)

[a] 1984 data for April- December.

[b] 1990 data on overdose deaths for January-March; on crimes for January-July; on all other variables for January-September.

initiates. Stage 3 was defined as the next 24 months from July 1988 through June 1990 when cocaine positive tests began to decline, indicating a fall in the number of users.

The results are shown in Table 2. Overall, cocaine positive tests among arrestees was a highly significant predictor of cocaine-related emergency room episodes, overdose deaths involving cocaine and the number of reported crimes, explaining 50%, 46%, and 19% of the variance in these indicators across the entire study period. This indicates a relatively high level of convergence among indicators. As expected, arrestee urinalysis results explained a much higher proportion of the variance in the drug-specific community problem indicators (emergency room episodes and deaths) than in crime--an indicator of events that could not be directly attributed to cocaine.

Although stages may be conceptually useful in describing a drug epidemic, grouping months using the approach described above did not generally improve the prediction of community drug problems. The prediction of emergency room episodes followed the hypothesized pattern--with the prediction strongest at stage 2 and not significant at stage 3. However, this is undoubtedly due to the fact that these two variables were used to define the stages. The within-stage models explained less of the variance in overdose deaths and crimes than the overall models.

Models using arrestee PCP positives to predict community drug problems are shown in Table 3. The three stages for PCP were defined using similar guidelines. Stage 1 was defined at the first 19 months from April 1984 to October 1985 when PCP positive tests were increasing among arrestees. Stage 2 was defined as the next 24 months from November 1985 through October 1987 when PCP-related emergency room episodes began to rise sharply. Stage 3 was defined as the next 24 months from November 1987 through October 1989 when PCP positive tests began to decline.

Again, defining 3 stages of an epidemic did not consistently improve the prediction of community problems. The overall model explained 15% of the variance in emergency room episodes and 17% of the variance in overdose deaths; it did not significantly predict crimes. The stage-specific

Table 2

DRUG PROBLEMS PREDICTED BY SAME-MONTH ARRESTEE POSITIVE FOR COCAINE IN WASHINGTON, D.C.: OVERALL AND BY STAGE[a]

Weighted Proportion of Arrestees Positive for Cocaine

Number of:	Overall	Stage 1	Stage 2	Stage 3
	Regression Coefficients[b] (R^2)[c]	Regression Coefficients (R^2)	Regression Coefficients (R^2)	Regression Coefficients (R^2)
Cocaine Related Emergency Room Episodes	726.3*** (.50)	64.4** (.37)	1131.2*** (.73)	678.9 (.17)
Cocaine-Related Overdose Deaths	38.9*** (.46)	8.9 (.04)	31.1* (.24)	68.0 (.06)
Crimes	2353.8*** (.19)	-851.1 (.01)	904.3 (.03)	3043.3 (.06)

[a] Stage 1= 7/84-6/86; Stage 2= 7/86-6/88; Stage 3= 7/88-6/90

[b] *=p<.05; **=p<.01; ***=p<.001

[c] R^2 excluding control for auto regression.

Table 3

COMMUNITY DRUG PROBLEMS PREDICTED BY SAME-MONTH ARRESTEE POSITIVE FOR PCP IN WASHINGTON, D.C.: OVERALL AND BY STAGE[a]

Weighted Proportion of Arrestees Testing Positive for PCP

Number of:	Overall	Stage 1	Stage 2	Stage 3
	Regression Coefficients[b] (R^2)[c]	Regression Coefficients (R^2)	Regression Coefficients (R^2)	Regression Coefficients (R^2)
PCP-Related Emergency Room Episodes	485.1*** (.15)	330.3 (.12)	1758.1** (.36)	867.9*** (.79)
PCP-Related Overdose Deaths	25.0*** (.17)	45.8 (.14)	55.9* (.17)	27.3 (.15)
Crimes	-1477.7 (.05)	5336.5 (.16)	2414.4 (.05)	-987.5 (.02)

---

[a] Stage 1= 4/84-10/85; Stage 2= 11/85-10/87; Stage 3= 11/87-10/89

[b] *=p<.05; **=p<.01; ***=p<.001

[c] R^2 excluding control for auto regression.

models did slightly better for emergency room episodes, particularly at stage 3, when it explained 79% of the variance. This was because emergency room episodes declined with recent use among arrestees for PCP, unlike cocaine which is more likely to produce long-term dependence. However, the stages did not improve the prediction of deaths or crimes.

Tests of models in which arrestee opiate-positives were used to predict community drug problems found, as expected, no significant relationships across a period of slowly declining prevalence of recent use among arrestees--a period that would be described in terms of our conceptual framework as entirely stage 3.

Predicting Subsequent Community Drug Problems with Arrestee Urinalysis Results

The analysis was 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.

Our original plan for this analysis was to model the lagged relationship between community drug problems and arrestee drug use using a multivariate time series procedure to incorporate the moving average, autoreggressive, and error corrections for cointegrated systems (see Powers, 1990; Powers, Hannsens, Hser, and Anglin, 1991; Engle and Granger, 1987). This approach controls for long-term trends shared by indicators in order to isolate shorter term relationships among the community indicators.

However, results of testing bivariate models (shown below) indicated that long-term models requiring cointegration terms were not appropriate.

A Box-Jenkins univariate ARIMA model was developed for each time series. A Table 4 shows, many of the variables contained a unit root. When equilibrium equations were examined, we failed to find significant long-term relationships between arrestee urinalysis results and the indicators of other community drug problems. Therefore, we tested the models, shown in Tables 5 to 7, 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. The table entries are the regression coefficient for the selected arrestee urinalysis variable; the proportion of the variance in the dependent variable explained by the model exclusive of autoregression in parenthesis below the coefficient estimates.

In general, the arrestee urinalysis variables were not significant predictors of community drug problems in the models as specified. The models of the weighted proportion of arrestees testing positive as a function of drug-related emergency room episodes and overdose deaths, shown in Table 5, indicates only one point at which the arrestee urinalysis results were significant in predicting the community indicators. After differencing the variables and controlling for autoregression as needed, PCP urinalysis results predicted PCP deaths 12 months later. Similarly, arrestee urinalysis results were a significant predictor of crime twice and child maltreatment once.

Constructing Community Drug Indicators

Alternative measures of arrestee drug use were considered during the analysis. Three measures of drug use were compared: (1) the number testing positive for drugs in each month, (2) the percentage testing positive for drugs in each month, and (3) the percentage testing positive each month, weighted by charge categories to control for shifting patterns of law enforcement that would affect the probability of a drug users arrest. The weights adjusted the distribution of arrestees in each month by

Table 4

UNIVARIATE TIME SERIES ANALYSIS

	ARIMA model	Estimates
Arrestees Positive for:		
Any Drug	(0,1,1)	$(1-L)X_t = 0.00 + (1-0.37L)\alpha_t$
Cocaine	(0,1,0)	$(1-L)X_t = 0.00 + \alpha_t$
PCP	(0,1,0)	$(1-L)X_t = 0.00 + \alpha_t$
Opiates	(0,1,1)	$(1-L)X_t = 0.00 + (1 - 0.63L)\alpha_t$
Emergency Room Episodes Involving:		
Any Drug	(0,1,0)	$(1-L)X_t = -0.56 + \alpha_t$
Cocaine	(0,1,0)	$(1-L)X_t = 0.90 + \alpha_t$
PCP	(0,1,0)	$(1-L)X_t = -0.02 + \alpha_t$
Opiates	(2,0,0)	$(1-0.59L - 0.22L_2)X_t = 120.39 + \alpha_t$
Overdose Deaths From:		
Any Drug	(2,0,0)	$(1-0.26L - 0.30L_2)X_t = 25.54 + \alpha_t$
Cocaine*	—	—
PCP	(2,0,0)	$(1-0.31L - 0.28L_2)X_t = 7.84 + \alpha_t$
Opiates	(0,0,0)	$X_t = 14.47 + \alpha_t$
Total Index Crimes	$(2,0,0)(0,1,0)_{12}$	$(1-0.49L - 0.23L_2)(1 - L)_{12} X_t = 93.70 + \alpha_t$
Child Abuse and Neglect	(2,0,0)	$(1-0.49L - 0.31L_2)X_t = 643.27 + \alpha_t$

where: X = time series variable
L = lag of 1 month
L_2 = lag of 2 months
t = 1 to 77 months

* Could not estimate.

Table 5

HEALTH CONSEQUENCES PREDICTED BY EARLIER ARRESTEE URINALYSIS RESULTS

Regression Coefficients (R-Squared for Model)[a]

Model[b]	6-month lag	9-month lag	12-month lag	15-month lag
Any Drug				
$\Delta ANYER_t = \Delta ANYAWT_{t-m} + \Delta ANYER_{t-m}$	-3.71	-54.50	56.91	-175.24
	(.00)	(.00)	(.11)	(.02)
$ANYMED_t = \Delta ANYAWT_{t-m} + ANYMED_{t-m}$	8.87	-44.82	50.34	-39.53
	(.04)	(.03)	(.21)	(.02)
Cocaine				
$\Delta CER_t = \Delta CARWT_{t-m} + \Delta CER_{t-m}$	-6.38	225.22	-143.60	-298.22
	(.01)	(.03)	(.14)	(.04)
$CMED_t = \Delta CARWT_{t-m} + CMED_{t-m}$	.15	1.92	16.12	-9.03
	(.23)	(.03)	(.20)	(.05)
PCP				
$\Delta PER_t = \Delta PARWT_{t-m} + \Delta PER_{t-m}$	-113.39	-35.01	275.16	-33.42
	(.01)	(.01)	(.08)	(.04)
$PMED_t = \Delta PARWT_{t-m} + PMED_{t-m}$	17.31	-8.48	34.43*	6.45
	(.03)	(.03)	(.10)	(.24)
Opiates				
$OER_t = \Delta OARWT_{t-m} + OER_{t-m}$	62.61	135.67	-44.87	-104.16
	(.01)	(.07)	(.08)	(.04)
$OMED_t = \Delta OARWT_{t-m} + OMED_{t-m}$	17.98	41.40	-1.69	-33.39
	(.01)	(.07)	(.12)	(.02)

---

[a] R-Squared excluding control for autoregression.

[b] See variable names in Codebook in Appendix A. t=time; m=lag in months.

* = $p<.05$; ** = $p<.01$; *** = $p<.001$

Table 6

CRIME PREDICTED BY EARLIER ARRESTEE URINALYSIS RESULTS
Regression Coefficients (R-Squared for Model)[a]

Model[b]	6-month lag	9-month lag	12-month lag	15-month lag
Any Drug				
$\Delta VIOL_t = \Delta ANYWT_{t-m} + \Delta VIOL_{t-m}$	-103.61 (.02)	-134.41 (.01)	.56 (.00)	-443.93 (.04)
$\Delta PROP_t = \Delta ANYWT_{t-m} + \Delta PROP_{t-m}$	693.47 (.04)	798.50 (.01)	-890.21 (.23)	-1045.04 (.02)
Cocaine				
$\Delta VIOL_t = \Delta CARWT_{t-m} + \Delta VIOL_{t-m}$	.84 (.02)	116.64 (.01)	156.80 (.01)	-76.14 (.00)
$\Delta PROP_t = \Delta CARWT_{t-m} + \Delta PROP_{t-m}$	1153.54 (.06)	1238.73 (.03)	-515.28 (.23)	42.47 (.01)
PCP				
$\Delta VIOL_t = \Delta PARWT_{t-m} + \Delta VIOL_{t-m}$	-444.25 (.06)	-267.04 (.02)	-551.83 (.61)	-668.45* (.09)
$\Delta PROP_t = \Delta PARWT_{t-m} + \Delta PROP_{t-m}$	140.13 (.04)	551.50 (.00)	-1354.02 (.24)	-498.40 (.01)
Opiates				
$\Delta VIOL_t = \Delta OARRWT_{t-m} + \Delta VIOL_{t-m}$	311.34 (.03)	-129.25 (.01)	-268.03 (.01)	-108.83 (.00)
$\Delta PROP_t = \Delta OARWT_{t-m} + \Delta PROP_{t-m}$	3993.62*** (.21)	-2376.80 (.06)	653.39 (.23)	-1207.98 (.02)

[a] R-Squared excluding control for auto regression.

[b] See variable names in Codebook in Appendix A. t=time; m=lag in months.

* = p<.05; ** = p<.01; *** = p<.001

Table 7

CHILD MALTREATMENT PREDICTED BY EARLIER ARRESTEE URINALYSIS RESULTS
Regression Coefficients (R-Squared for Model)[a]

Model[b]	6-month lag	9-month lag	12-month lag	15-month lag
Any Drug $\Delta TOTAB_t = \Delta ANYWT_{t-m} + \Delta TOTAB_{t-m}$	715.75 (.04)	-999.35* (.08)	-644.25 (.29)	453.64 (.01)
Cocaine $\Delta TOTAB_t = \Delta CARWT_{t-m} + \Delta TOTAB_{t-m}$	237.36 (.00)	-642.30 (.04)	-334.47 (.28)	500.63 (.02)

[a] R-Squared excluding control for auto regression.

[b] See variable names in Codebook in Appendix A. t=time; m=lag in months.

* = p<.05; ** = p<.01; *** = p<.001

sex, age and charge to the distribution of the 1985 distribution of the arrest population by age, sex and charge. The weights were calculated by dividing the arrest population into six mutually exclusive and exhaustive categories: (1) males 18 to 25 years old arrested on nondrug felony charges; (2) males 18-25 arrested on nondrug misdemeanor charges; (3) males 18-25 arrested on drug felony charges; (4) males 18-25 arrested on drug misdemeanor charges; (5) males 26 or older arrested on nondrug felony charges; (6) males 26 or older arrested on nondrug misdemeanor charges; (7) males 26 or older arrested on drug felony charges; (8) males or older arrested on drug misdemeanor charges; (9) females arrested on nondrug charges; and (10) females arrested on drug charges.

The proportions of the arrest populations in 1985 were calculated. The arrest population total or subgroup) within each month was adjusted to this distribution, prior to producing the estimates of the number and proportion testing positive by drug within each month.

Our objective was to select the measure of use most useful in predicting other drug-related problems in the community. Figure 14 compares the three measures for use of any of the five drugs, cocaine, opiates and PCP. The results show that the number of arrestees testing positive showed a much more dramatic and sustained upward trend than the proportion testing positive. The number testing positive reflects a combination of factors, including prevalence, the rate of criminal activity among users, enforcement choices, and changes in the law which combined resulted in very large increases in the number of recent users arrested. Because the number is influenced by both drug use and community responses to drug use, we decided to focus on the proportion testing positive. As the smoother line of the weighted proportion measures indicates, controlling for enforcement responses to drug use appeared to produce a smoother trend line, one we expected to reflect the prevalence of problem behavior in the community more consistently.

A second observation was that combining drug positives into a single index, positive for any of five drugs, tended to mask the contradictory trends in specific drugs, especially the downward trend in

PCP. This would result in a failure to detect declines in PCP-related problems and, to the extent that these problems differ from those associated with the use of other drugs, would be expected to be less sensitive predictors of other community drug problems. Comparative analyses showed drug-specific indicators to be better at reflecting the relationship between arrestee drug use and other community drug problems. Overall, the trends in drug-specific health problems and trends in arrestee use of specific drugs showed similar patterns, rising together (cocaine), rising and falling together (PCP), or staying stable.

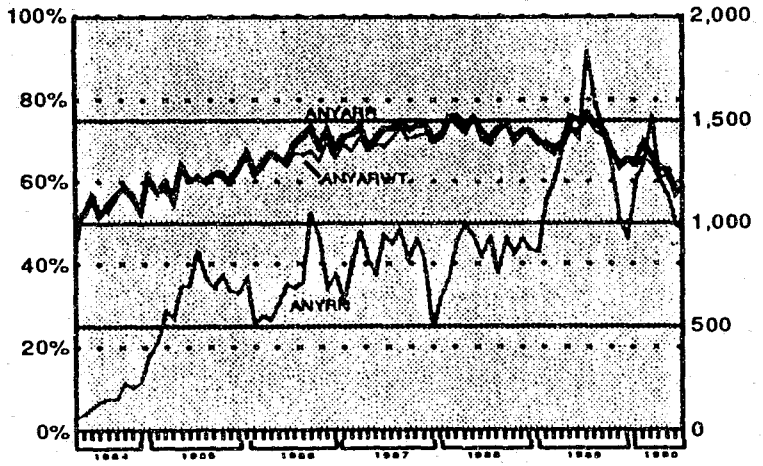
The combined index further masks the extent to which multiple drugs are being used. We constructed a measure of multiple drug use by scoring the average number of drugs for which arrestees were positive in each month. This indicator of multiple drug use provides a measure of drug use intensity and perhaps could account an increase in problems such as crime, child abuse and health emergencies, although again it would not be sensitive to drug-specific problems. However, analyses did not indicate that multiple drug use was a significant predictor of the community drug indicators considered in this analysis.

Although the large number of arrestees tested in Washington, DC, permitted the construction of monthly indicators for specific age and sex categories, we chose to focus on monthly indicators based on all arrestees. Age and sex specific data on other community indicators are not generally available and, unless selected age/sex groups are expected to fuel either the diffusion process or the specific problem, these are expected to be no more sensitive than the monthly indicators selected. Analysis of age-specific differences in community problems is currently underway by the authors under another grant from the National Institute of Justice.

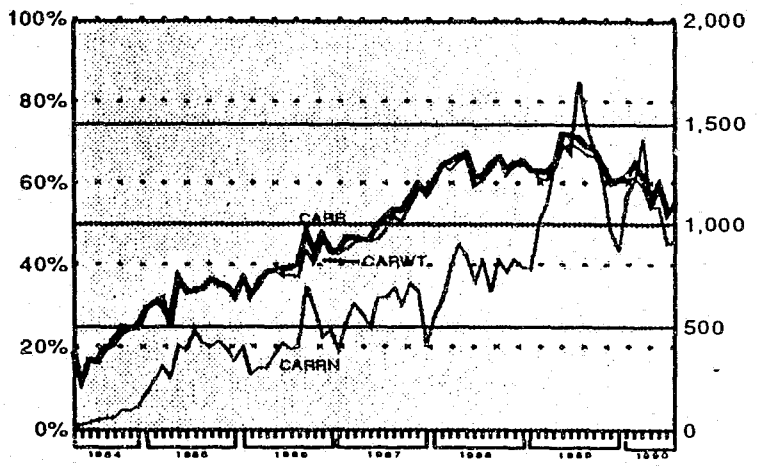
Measurement issues also arose in looking at the emergency room episodes. The relationship between emergency room data and arrestee urinalysis results may depend in part on how the episode indicator is defined. If emergency room episodes are classified by reason for the visit, the number of

A Comparison of Measures of Arrestee Drug Use by Drug Category: Washington, DC 1984-1990

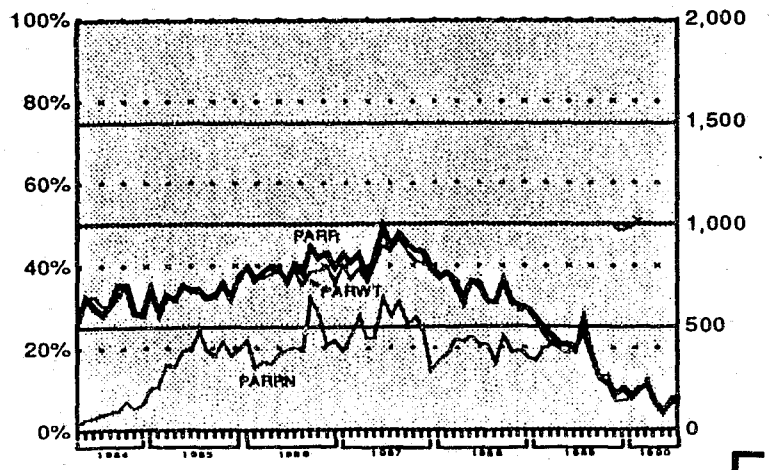
The Number, Percent, and Weighted Percent of Arrestees Positive for Any of Five Drug Categories



The Number, Percent, and Weighted Percent of Arrestees Positive for Cocaine



The Number, Percent, and Weighted Percent of Arrestees Positive for PCP



The Number, Percent, and Weighted Percent of Arrestees Positive for Opiates

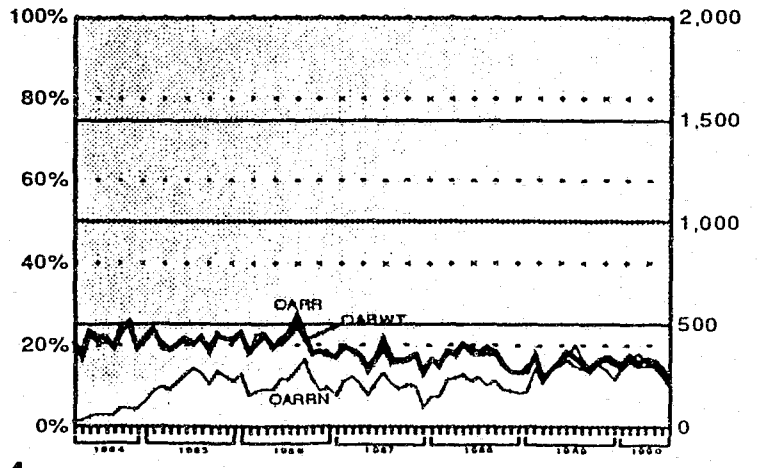


Figure 14

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--such as the one used in this analysis which 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. This suggests that future DAWN estimates for localities should consider producing drug-specific data on episodes by reason for visit.

CHAPTER 5
DISCUSSION

Better data and better methods for integrating data from multiple sources have been a continuing concern for local policymakers and planners, keenly aware that illicit drug use has become a driving force behind increasing demands for services from public health, community safety, and child welfare agencies. The last several years has seen considerable expansion in the availability and quality of data on drug problems at the community level, including the implementation of the Drug Use Forecasting System in major cities, expansion and revision of the Drug Abuse Warning Network, and increased development of local data by Community Epidemiology Work Groups and local coalitions like the Oregon Regional Drug Initiative.

Despite more and better data in many areas, systematic needs assessment using multiple community indicators of drug problems remains an elusive goal. Our analysis of Washington, DC, trends from April 1984 to mid-1990 in multiple indicators of community drug problems--arrestee urinalysis results, drug-related emergency room episodes, overdose deaths, crimes, and child abuse and neglect cases--suggests several guidelines for producing and using drug indicators.

Drug indicators need to be drug specific 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. Combining arrestee urinalysis results into an index of positive for any drug will reduce the sensitivity of the indicator as a predictor if, as in the case of PCP and cocaine trends are moving in opposite directions.

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.

Drug indicators provided information on the introduction of a new drug, but did not yield significant month-to-month predictions of trends. 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. 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.

Beyond the initial phase, the tests of bivariate time-series models failed to find consistent relationships. Declines in arrestee drug use sometimes predicted immediate and clear declines in problems (e.g., PCP emergency room episodes) and sometimes did not (e.g., cocaine-related emergency room episodes). Neither long-term trends nor shorter-term relationships (lags of 6 to 15 months) were found between arrestee urinalysis results and community drug indicators, as illustrated by Tables 5-7 in Chapter 4, even for drugs that showed considerable change across the study period.

Drugs which exhibited little long-term trend across the study period, opiates in Washington and cocaine in Portland, appeared uncorrelated with other community drug problems, even when measured by drug-specific indicators. The month-to-month variance in arrestee urinalysis results, and to a

greater extent, in other community indicators suggested considerable fluctuation in the consequences to the problem, the measurement of the indicator, and/or the prevalence of use. This points to a need for additional information on other events and trends that impact these measures.

This also 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.

Problems in interpretation of drug indicators remain at both the methodological and conceptual level. The conceptual framework developed for this study represents an effort to begin 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. We know that the indicators measure distinctively different events, sample different portions of the population, and use a variety of data collection procedures, rules and definitions. There is also extensive literature on two primary processes driving the demand for drug-related services at the local level--the process of diffusion of drugs in a community and the course of individual drug use careers.

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. 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 laid out in Chapter 3, 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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APPENDIX A

CODEBOOKS

CODEBOOK FOR WASHINGTON, DC: 1984-1990

The file contains 78 records, one for each month from April 1984 through September 1990.

I. ARRESTEE DRUG TEST RESULTS

These variables are the proportion of tested arrestees with positive EMIT results. The variables are monthly results by drug categories and subgroups of arrestees as described below. The data were provided by the Pretrial Services Agency of Washington, DC and are based on those arrested in the city, regardless of place of residence.

A. Proportion of all tested arrestees with positive EMIT results:

ANYARR	Positive for any of five drug types cocaine, opiates, methadone, amphetamines, PCP)
CARR	Positive for cocaine
OARR	Positive for opiates
PARR	Positive for PCP
NUMARR	Intensity of drug use measured by the total number of positive tests divided by the number tested

B. Number of all tested arrestees with positive EMIT results:

ANYRN	Positive for any of five drug types cocaine, opiates, methadone, amphetamines, PCP)
CARRN	Positive for cocaine
OARRN	Positive for opiates
PARRN	Positive for PCP
NUMRN	Intensity of drug use measured by the total number of positive tests

C. Proportion of all tested arrestees with positive EMIT results weighted by the 1985 distribution of arrest population):

ANYARWT	Positive for any of five drug types cocaine, opiates, methadone, amphetamines, PCP)
CARWT	Positive for cocaine
OARWT	Positive for opiates
PARWT	Positive for PCP

NUMARWT Intensity of drug use measured by the total number of positive tests divided by the number tested

II. DRUG-RELATED EMERGENCY ROOM EPISODES

These variables are the number of persons over age 12 for whom hospital records indicated drug-involvement at the time of the emergency room visit. The numbers are based on reports of facilities in the Washington, DC metropolitan areas including facilities in suburban locations in VA and MD) that reported every month. About 4% of the total number of cases in the metropolitan area across this period were reported by facilities that did not report consistently. These cases are not included. The data were provided by the National Institute on Drug Abuse Drug Abuse Warning Network DAWN) system.

Number of persons age 12 and older with drug involvement noted at time of emergency room admission

ANYER Record of any opiate, cocaine, PCP, methadone, or amphetamine

CER Record of cocaine

OER Record of opiates

PER Record of PCP

III. DRUG-OVERDOSE DEATHS

These variables are medical examiner reports of the number of overdose deaths from use of opiates, cocaine, amphetamines, PCP or methadone separately or in combination with other drugs). Deaths from use of other drugs are not included. The deaths occurred in Washington, DC not suburban areas), and are reported regardless of place of residence. The data were provided by the National Institute on Drug Abuse Drug Abuse Warning Network DAWN) system.

Number of persons with drug use identified as a cause of death

ANYMED Death due to opiate, cocaine, PCP, methadone, and/or amphetamine use

CMED Death due to cocaine use

OMED Death due to opiate use

PMED Death due to PCP use

IV. CRIMES REPORTED TO THE DC POLICE DEPARTMENT

These variables are the number of incident reports filed by the DC Police. The data were provided by the DC Office of Criminal Justice Planning and Statistics. The offense categories conform to the Uniform Crime Reporting definitions of Part 1 index crimes. The offenses occurred in the DC, not in suburban areas.

Number of offenses

MURDER	All types of homicide
RAPE	Part 1 Sex offenses
ROBBERY	
ASSAULT	Aggravated assault
BURG	Burglary
LARCENY	
AUTO	Auto theft
ARSON	
VIOLENT	Sum of MURDER, RAPE, ROBBERY, ASSAULT
PROPERT	Sum of BURGLARY, LARCENY, AUTO, ARSON
CRIMES	Sum of MURDER, RAPE, ROBBERY, ASSAULT, BURGLARY, LARCENY, AUTO, ARSON

V. CHILD MALTREATMENT

The variables are the number of substantiated incidents of child maltreatment reported to the DC Department of Human Services. The incidents involve children residing in DC.

ABUSE	
NEGLECT	
OTHER	Incidents involving joint response from the Dept. of Human Services and the DC Police Dept.
TOTABUS	Sum of ABUSE, NEGLECT, OTHER

VI. OTHER VARIABLES

YEARS	84-90 for 1984-1990
MONTHS	1-12 for January-December

NOTES ON WEIGHTING

The weights adjust the distribution of arrestees in each month by sex, age and charge to the distribution of the 1985 calendar year) distribution of the arrest population by age, sex and charge. The weights were calculated by dividing the arrest population into six mutually exclusive and exhaustive categories: 1) males 18 to 25 years old arrested on nondrug felony charges; 2) males 18-25 arrested on nondrug misdemeanor charges; 3) males 18-25 arrested on drug felony charges; 4) males 18-25 arrested on drug misdemeanor charges; 5) males 26 or older arrested on nondrug felony charges; 6) males 26 or older arrested on nondrug misdemeanor charges; 7) males 26 or older arrested on drug felony charges; 8) males or older arrested on drug misdemeanor charges; 9) females arrested on nondrug charges; 10) females arrested on drug charges.

The proportions of the arrest populations in 1985 for which estimates are produced all arrestees, male arrestees, female arrestees, younger arrestees, drug-charged arrestees and nondrug-charged arrestees) were calculated. The arrest population total or subgroup) within each month was adjusted to this distribution, prior to producing the estimates of the number and proportion testing positive by drug within each month.

CODEBOOK FOR PORTLAND, OREGON: 1984-1990

The file contains 24 records, one for each month from January 1988 through December 1989.

I. ARRESTEE DRUG TEST RESULTS

These variables are the proportion of tested arrestees with positive EMIT results. The variables are monthly results by drug categories and subgroups of arrestees as described below. The data were provided by the Multnomah County Community Corrections Division, OR and are based on those arrested in the city, regardless of place of residence.

Proportion of all tested arrestees with positive EMIT results:

ANYARR	Positive for any of five drug types cocaine, opiates, methadone, amphetamines, PCP)
CARR	Positive for cocaine
OARR	Positive for opiates
AMARR	Positive for amphetamines

II. DRUG-OVERDOSE DEATHS

These variables are medical examiner reports of the number of overdose deaths from use of cocaine, opiates or methamphetamine separately or in combination with other drugs). Deaths from use of other drugs are not included. The data were provided by the Deputy Medical Examiner for Multnomah County.

Number of persons with drug use identified as a cause of death

ANYMED	Death due to cocaine, opiate, or methamphetamine use
CMED	Death due to cocaine use
OMED	Death due to opiate use
MEMED	Death due to methamphetamine use

III. CRIMES REPORTED TO THE MULTNOMAH COUNTY POLICE DEPARTMENTS

These variables are the number of incident reports filed by the DC Police. The data were provided by the Gresham Police Department, Multnomah Sheriff's Office, and the Portland Police Department. The offense categories conform to the Uniform Crime Reporting definitions of Part 1 index crimes.

Number of offenses

MURDER	All types of homicide
RAPE	Part 1 Sex offenses
ROBBERY	
ASSAULT	Aggrevated assault
BURG	Burglary
LARCENY	
AUTO	Auto theft
ARSON	
VIOLENT	Sum of MURDER, RAPE, ROBBERY, ASSAULT
PROPERT	Sum of BURGLARY, LARCENY, AUTO, ARSON
CRIMES	Sum of MURDER, RAPE, ROBBERY, ASSAULT, BURGLARY, LARCENY, AUTO, ARSON

IV. CHILD MALTREATMENT

The variables are the number of substantiated incidents of child maltreatment reported to the State of Oregon Department of Human Services, Children's Services Division.

ABUSE	
NEGLECT	
OTHER	Incidents involving any one of the following: mental injury, fatality, abandonment, sexual abuse/exploitation or threat of harm
TOTABUS	Sum of ABUSE, NEGLECT, OTHER

VI. OTHER VARIABLES

YEARS	88-90 for 1988-1990
MONTHS	1-12 for January-December