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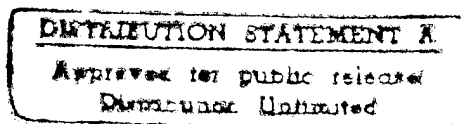
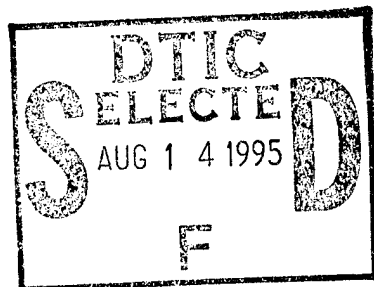
*Improving Data and Analysis to Support
National Substance Abuse Policy*

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EXECUTIVE SUMMARY

Until recently, no federal agency has had responsibility for coordinating the development of drug data systems or for synthesizing the results of the many different data collection efforts. However, in 1988 Congress created the Office of National Drug Control Policy (ONDCP), charging this agency with responsibility for developing a national drug control strategy with measurable objectives. This mandate placed increased - and very different - demands on existing data systems, originally created simply for monitoring and internal management purposes. Significant obstacles limit the ability to simply adapt existing data to serve a different role.

For over twenty years, various federal agencies in law enforcement, health, and other fields have sponsored data series that contain indicators of the nation's drug and alcohol abuse problems. While these data collection efforts have generated a considerable amount of information, there has been little coordination among agencies, and thus the data overlap in some cases and in others have failed to capture information on important subpopulations. In addition, different and seemingly inconsistent findings can be inferred from these data because the various indicator systems were designed for different purposes, focus on different populations, and often use different measures of drug abuse problems.

Another problem is that many of the agencies collecting the data have not intended for the information to be widely used outside government. Hence data documentation is rather limited at times, and even when the incentive to do so is present, converting to public access systems can be difficult.

The need to adapt and modify existing data systems to meet new demands has heightened over the past several years as Congress, federal agencies, and state legislatures around the country have called for greater rationality in the allocation of resources and greater accountability in the expenditure of public dollars for alcohol and other drug intervention programs. These mandates have also begun to

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shift the emphasis on data development away from prevalence indicators toward indicators of need for treatment and outcomes of interventions. Ever more systems are being added.

The purpose of this report is to provide ONDCP with an analysis of both the problems and untapped potential for existing data to be used more creatively in exploring drug policy issues and to suggest guidelines and a conceptual framework for identifying and evaluating data needs and analyses that will effectively support national substance abuse policy.

While we note general problems across current indicator systems and suggest modifications to make future systems more useful for policy support, we don't evaluate the strengths and weaknesses of every system. We use data from specific systems to illustrate that despite various problems there is tremendous untapped potential within existing databases to play a greater policy role. For example, we explore the potential of NHSDA data for calculating initiation rates for use in forecasting models.

While we conclude that many problems currently limiting the utility of drug data for policy support could be solved and that more potential exists than has yet to be exploited, we agree with Director Brown who has stated that sometimes the data sets "just ... don't measure the right things." Rather than continue to "measure what's measurable" as Dr. Brown¹ suggests has often been the practice, we argue that data improvement efforts should explore options to fill major data gaps using alternative systems. We examine disease reporting systems and registries used in public health injury and illness surveillance as models for developing drug policy data on special populations.

IMPROVING DATA SYSTEMS

Over the last several years, efforts have been made to make various data systems more responsive to the needs of the ONDCP and other federal agencies. The lessons of the past point to some guidelines that, if followed, will help ensure the success of these and future efforts.

¹Brown, 1993.

Systems should be designed to accommodate changing information needs

Drug policies and strategies must be continually evolving and changing to meet the changing nature of the drug problem. For example, when drug use surveys were first designed, the greatest concern was with young people using drugs, and so the government monitored such use through household and high schools surveys. Today, there is much greater concern about the crime and violence and other social ills associated with drug use in the inner city, and there is a corresponding need for more data on problem users. Policymakers will be better served if monitoring systems are flexible in their design and implementation, so that they can anticipate and meet changing data needs.

Systems should be designed to accommodate varying funding levels

It is likely, as occurred in the past, that we will see reductions in the current level of federal funding for data collection efforts. Thus, some data series may be severely curtailed or even eliminated. It would seem prudent for federal agencies to review the substance abuse data systems they sponsor, with an eye toward identifying the core systems that merit long-term maintenance and enhancement.

Systems should be evaluated for needed modification over time

In addition to changing demands and resources, as noted above, the data context is changing and data collection techniques are evolving. Existing data series must keep pace with these changes. For example, with the emergence of AIDS, the profile of emergency room patients in major metropolitan areas is quite different than it was when the Drug Abuse Warning Network (DAWN) was established. This may affect the ability of this data set to meet some of its original objectives. Likewise, data collection techniques have changed substantially since the initiation of most of the original drug monitoring systems. Hospitals have advanced data collection systems that collect information from a range of sources, including billing, medical records, and laboratory reports. Efforts to integrate substance abuse monitoring in these systems might prove a viable alternative to the current approach by DAWN.

Coordination across agencies and data systems should be built into the design of indicator systems

As noted earlier, a myriad of new data systems have been developed over the past three years alone. Others can be anticipated in the future. In the past, the lack of coordination among agencies has meant that findings across studies cannot be integrated, differences cannot be explained and duplications and redundancies persist. Opportunities for enhancing cooperation among agencies should be developed as part of any drug data improvement project, to focus on identifying common data needs, developing data standards for use in measurement and field operations; defining core data sets, sharing the cost of data acquisition and analysis and exchanging data across agencies to expand their utilization.

Systems should be designed to produce timely output

Some current data systems fail to capture contemporary or leading indicators of drug use; many others are slow to process and report findings. It is imperative that the research and policymaking communities have timely data that provide an accurate understanding of the current drug problem and its likely trends so that they can formulate effective strategies.

USING EXISTING DATA TO SUPPORT POLICYMAKING

Improving current data indicator systems will involve ongoing long-term efforts. In the meantime, there is a large amount of existing data, much of which has been underutilized in the past, that can be used to support policy decisionmaking. The current data have traditionally served a very limited policy role, for the most part simply providing policymakers with estimates of prevalence of drug use in the general population over time. In this report we provide several examples of how the data can be manipulated to provide more useful information. We also demonstrate how some of the data can be misleading.

Understanding Dynamics Within Trends

Prevalence data provide information on trends - whether drug use is rising or falling. However, additional data are needed to project what

trends will be in the future. The dynamics of initiation, retention and desistance during the course of an epidemic will be more predictive of future directions than prevalence rates. Some of these dynamics can be observed from exiting data and forecasting models using such data can be useful in the development of forward-looking drug strategies and policies.

There are nine or ten databases that contain information on year or age of first use, and current age could be used to analyze initiation. It would also be useful to know when former users quit using. An additional item in the cross sectional surveys about date last used would allow for this calculation.

Examining the Composition of the Drug Using Population

While the prevalence numbers are watched closely in surveys such as the National Household Survey on Drug Abuse (NHSDA) and Monitoring the Future (MTF), less use has been made of the other information available in these surveys. For example, NHSDA and MTF contain data on variation among current users in consumption; frequency of use; and proportion of new users versus long-term users.

Our analysis of the data showed that the quantities of drugs consumed among 30-day users is relatively low and that the majority of users accounted for only a slight amount of total quantity consumed. These results confirm other findings that the household population and in-school population are dominated by relatively casual users and that (among users who can be identified in these populations) the majority of the problems are associated with a minority of the individuals. Data analysis and policy support could be enhanced by improvement in the measures of consumption patterns in the NHSDA and MTF.

Estimating Drug Problems Among Special Populations

Many populations of particular policy interest due to the costs associated with their problem drug use are difficult to include in typical indicator systems, like general population surveys. Examples include, injection drug users, and pregnant users, whose representation in the general population is very low. Sampling frames for studying adequate samples of these users are difficult and costly to construct.

Alternative options for measuring use in these populations have been employed. Pregnant women, for example, have been tested for drug exposure at prenatal services centers and at the time of delivery. Yet these catchment points typically yield relatively little information about the drug user due to concern about confidentiality. The population based surveys, on the other hand, including the National Maternal and Infant Health Survey, provide much more detail about the population and its use characteristics. A challenge for policy analysis is to build bridges between such diverse data sources, to try to develop a more comprehensive analysis. We discuss several difficulties in trying to do this with data on pregnant users, which is sparse; but also with data on use among youth, which is relatively rich and still poses a number of problems for integrating different sources of information.

Demonstrating A Limitation of Household Samples

Some analysts have used household surveys to estimate need for publicly funded drug treatment. However, in our analysis of the NHSDA data we found that the vast majority of drug abusers identified as being "clearly in need of treatment" are not likely candidates for receiving publicly supported treatment. According to guidelines suggested by the Institute of Medicine, publicly supported treatment is justified when the treatment will considerably reduce the social costs of an individual's drug abuse or when the individual cannot afford the cost of treatment.

Our analysis showed that nearly two thirds of the "clearly in need" group abused only marijuana and alcohol. When we compared this behavior with that of a group of clients actually receiving treatment, we found just the opposite - about two thirds of the treatment clients were using the more serious drugs, such as cocaine and heroin. We also found a difference in the socioeconomic characteristics of the two groups: the majority of the data sample were far from destitute - only 18 percent of the group were unemployed, compared to 75 percent of the treatment clients.

Critiquing an Existing Data Series

Our analysis of the DAWN system, which collects retrospective drug-related emergency room (ER) data, suggests that the original objectives of this data collection effort may now be better served by other indicator systems. Effort to validate DAWN at single facilities have indicated very substantial undercounting, and hospital-based information systems might be able to provide much more detail about ER visits than does DAWN. In addition, this dataset has been used as an indicator of trends in "hard-core" drug use, but there is no empirical evidence to support such use.

Our critique leads us to believe that DAWN should be evaluated to determine what role it presently serves, what needs exist for it to be improved, and how, if at all, it can inform policymakers about hard-core drug use patterns. The evaluation should also consider whether alternatives to retrospective medical record review might not yield more valid data (for example, blood or urine screens of a random sample of patients within a facility).

DEVELOPING A DRUG SURVEILLANCE SYSTEM

One of the most important data gaps currently facing demand-reduction policy planners is the lack of information about hard-core users and, in particular, their outcomes in treatment. A number of alternatives to surveys, including networked drug data information systems and registries, could improve needs and outcome assessment for this population.

The Department of Health and Human Services has played a major role in the past in the development of epidemiological surveillance mechanisms for estimating the rate of chronic and infectious diseases requiring public health intervention. These models deserve further investigation to determine the feasibility of developing similar systems for detecting the need for substance abuse treatment, understanding chronic drug use careers, and the range of problems and consequences associated with problem use.

There may be many advantages in using reporting systems, as opposed to alternative methods such as surveys. It is likely, for example, that

most serious consequences of drug abuse will ultimately come to the attention of institutions, such as hospital emergency rooms, the criminal justice system, or treatment facilities, and these systems may be much more effective than surveys in identifying chronic users. While no one system could be expected to capture all of the heavy drug users, it is likely that if the databases were linked together, most heavy users over a short period of time would fall into at least one of the catchment nets.

By pooling their data, these systems could answer a wealth of questions that conventional surveys cannot. The data system would quickly become a longitudinal database. One would in effect have a panel dataset including virtually everyone of interest and thus could address questions of initiation, progression, treatment outcomes, relapse, and so on.

Many of the important criteria necessary for the successful implementation of such a system exist. First, there is already an infrastructure in place to capture the serious drug offender. Second, many institutions currently collect a wealth of information, such as employment data, that could be linked and used to answer important questions. Third, by housing such a system within a department of public health, there would already be vehicles in place to protect confidentiality. Finally, certain states, such as California and New Mexico, have worked on the implementation of a state-wide client identifier system, for use across multiple episodes and/or data systems.

ESTABLISHING A POLICY FRAMEWORK FOR IDENTIFYING DATA AND ANALYSIS NEEDS

Because policy issues change over time, public agencies such as ONDCP must assume a broad view of policy areas. While it is impossible to predict precisely the data requirements that lie in the future, it is possible, using a policy-based framework, to identify the major components of a policy decision data support system against which existing data and data gaps can be evaluated, and comprehensive data requirements identified.

We have identified five different domains of policymaking that ONDCP has responsibility for as the nation's primary agency for coordinating drug control efforts:

1. Monitoring the status of drug use and drug problems nationwide
2. Developing national policies and strategies for supply and demand reduction efforts
3. Allocating federal resources
4. Evaluating the effectiveness of federal drug control efforts
5. Coordinating federal agencies involved in drug control

Based on our review of these policy domains, our conclusion is that policy formulation at the national level requires a comprehensive and integrated decision support system, comprised of multiple data systems and analytic tools that would provide the basis for a wide range of policy analysis. Figure S.1 presents a model of this system.

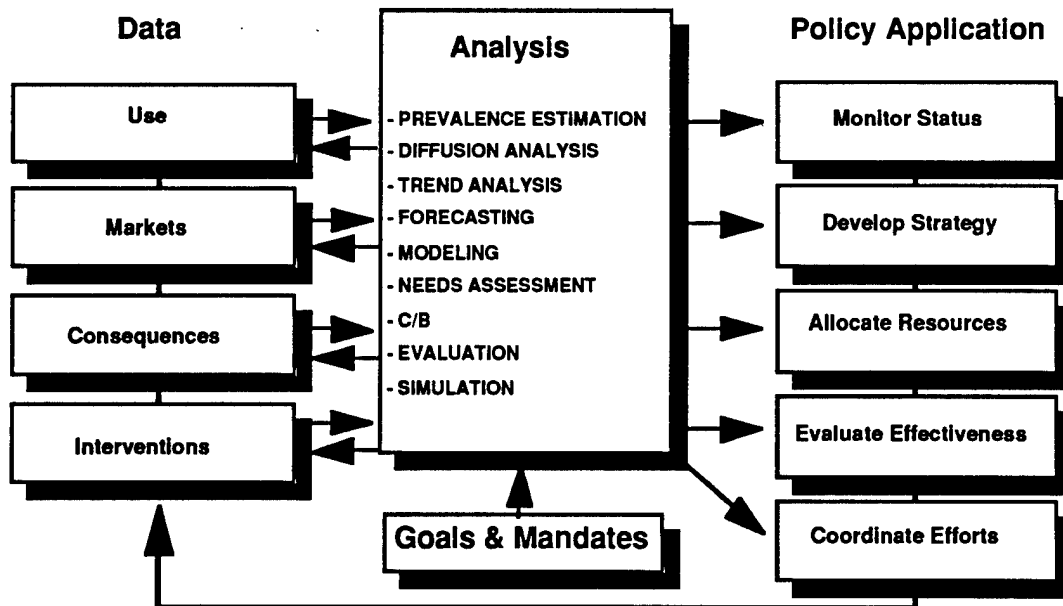


Figure S.1 - System to Support Policy Decisionmaking

As shown in the model, we have identified four categories of data that are needed to support policy decisionmaking. In addition to data on substance use, these include data on drug markets and production, consequences, and interventions. We have also identified a range of analytic techniques that should be applied to the data, including prevalence estimation, diffusion analysis, trend analysis, forecasting, and modeling. The system is designed to use feedback from analyses to modify data systems. The data and analysis we envision in this system would support the policy applications that are likely to be undertaken by ONDCP in carrying out its responsibilities.

Elaboration of such a framework should be a central component of future drug policy data improvement programs.

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1. INTRODUCTION

The Office of National Drug Control Policy (ONDCP) is required by its authorizing legislation to report on the overall status of the drug use problem in the nation, to develop a national drug control strategy, and to measure its effectiveness. It is not well served by the fragmented and untimely nature of existing drug monitoring systems. Neither are federal and state policy agencies in the various individual sectors of drug control, e.g. health, justice, education. What has been lacking, in spite of substantial federal investment in data expansion efforts during the past few years, is a comprehensive, systematic, and coordinated approach to analyzing drug data problems and prospects for their improvement.

As the major federal consumer of drug indicator data, and the agency charged with coordination of drug control efforts, ONDCP is uniquely positioned to identify drug policy data requirements, undertake objective, critical review of the whole array of existing data, and marshal efforts toward greater coordination and integration of data acquisition efforts within and across federal agencies. This report is intended to support this kind of broad data improvement effort.

APPROACH

We take a different approach from prior drug data evaluation efforts that have focused on improvements needed for specific kinds of data, e.g. prevalence,² or specific surveys, e.g. the National Household Survey on Drug Abuse (NHSDA),³ or specific data collection methods, e.g., self-reports of drug use.⁴ We focus instead on the role of national drug problem indicators in policy decisionmaking support, identifying the kinds of data that rational policy decisionmaking demands. We point out, for example, that information about future drug problems rather than current prevalence is more critical for developing

²Haaga and Reuter, 1991.

³General Accounting Office, 1993.

⁴Harrison, Haaga and Richards, 1993.

drug control strategies. With an orientation around the uses of data to support policy development and policy evaluation, we examine drug problem indicators from three perspectives: First, the common problems across indicator systems that currently present obstacles to using existing indicators in support of policy decisionmaking; second the untapped potential of existing indicators to have greater policy relevance when more creative analytic approaches are adopted; and third, the inadequacy of existing indicators to address certain policy relevant data needs and what alternatives might be considered to begin to fill data gaps.

METHODS

Our interpretation of drug policy data needs is based on three sources of information about ONDCP policy responsibilities and data requirements and our own conceptualization of data necessary to support rational decisionmaking across these national policy domains. Our sources of information included meetings and discussions with ONDCP officials who outlined their policy responsibilities and data needs; a review of the Congressional legislation which authorized this policy agency and defined its policy responsibilities; and each of the annual ONDCP strategy documents.

Other DPRC research on the history and content of drug problem indicators provided input for our evaluation of current indicator systems. In that study we catalogued all major federally sponsored drug use and problem indicators and documented their development and modifications over time; the contents of their databases; their sponsorship; and major reporting vehicles.

We conducted numerous statistical analyses in attempts to address salient policy questions using existing data. These analyses reported below produced not only evidence of the greater potential of most indicators to serve policy needs, but also information on the strengths and weaknesses of individual indicators that we also discuss below. Other analytic approaches and different variables and databases could be used in national drug policy analysis. Our purpose was solely to illustrate that more sophisticated analytic approaches, use of more of

the data than often are underutilized, and different presentations of existing data, can result in enhanced policy utility for existing indicators.

Our exploratory analyses used only data sets on individual level drug use and drug problem indicators. Similar efforts could be undertaken to explore the policy utility of existing data on interventions, e.g. treatment services, drug markets and community level drug problem consequences, such as mortality and crime rates.

To support our discussion of the potential of alternative approaches to fill important data gaps, we reviewed the existing literature on public health surveillance systems and the scant literature on drug abuse surveillance systems.

ORGANIZATION OF THE REPORT

We begin in Section II with a brief review of the development of drug problem indicators over the past twenty years, focusing on the evolution of policy demands on data and problems which limit the policy applicability of the indicators. In Section III we describe several analytic approaches with potential for enhancing the policy relevance of existing indicators. In Section IV we discuss the potential of surveillance systems based on public health models as a possible alternative for understanding policy relevant populations not sufficiently described in existing surveys. Finally, we provide in Section V a conceptual model for use in analyzing drug data needs from a policy perspective and suggest that orienting data improvement efforts around the range of national policy domains and the data needs they produce will result in a greater role for drug problem indicators in supporting policy decisionmaking in the future.

2. HISTORY AND STATUS OF DRUG PROBLEM INDICATOR SYSTEMS

DEVELOPMENT OF DRUG INDICATORS

Over the past two decades various law enforcement, health, and other agencies have developed and supported the collection of data useful for monitoring drug and alcohol consumption in the nation.⁵ The major data acquisition systems designed specifically for monitoring the nation's drug problems and programs were designed and implemented by the National Institute on Drug Abuse (NIDA) in the early 1970s. Two, Monitoring the Future (MTF) and the National Household Survey on Drug Abuse (NHSDA), focused on estimating the prevalence of licit and illicit drug use in the nation. The NHSDA was designed to capture drug and alcohol use among the household population and Monitoring the Future was designed to capture prevalence separately for the high school senior sub-population. Designed in conjunction with DEA in the early 70s, a third system, the Drug Abuse Warning Network (DAWN), was meant to identify substances causing emergency medical consequences and deaths and to detect new substances of abuse producing such consequences. More broadly, it was designed with the objective of "monitoring drug abuse patterns and trends" and "to assess health hazards associated with drug abuse." (NIDA, DAWN report). A fourth system, the Client Oriented Drug Abuse Profile (CODAP), system was focused on describing the treatment client population.

NIDA also sponsored the collection of drug data in surveys conducted for other purposes and sponsored mainly by other agencies. The National Youth Survey and the National Longitudinal Survey of Labor Market Experience Youth Cohort (NLS'S) are examples of this practice.

In the justice sector, a different approach dominated the development of drug problem indicators. Usually, existing monitoring systems for reporting crimes and arrests, (Uniform Crime Reports [UCR]), adjudications and convictions (Offender Based Transaction Statistics

⁵For a detailed description of existing federally sponsored databases see Ebener, et al., 1993.

[OBTs] and the Federal Justice Statistics Program [FJSP]), captured the incidence of drug arrests and convictions among the penal codes included in these systems. The Uniform Crime Reporting system was modified in an attempt to capture the involvement of drugs in homicide incidents. Surveys of criminal justice inmate populations were also modified over time to capture data on drug use history and problems of inmates and correctional facility surveys added items to identify treatment capacity and utilization in correctional facilities. The Drug Use Forecasting (DUF) system funded since 1987 by the National Institute of Justice is really the only criminal justice database designed solely for monitoring drug use among offenders. The DEA has long funded its own data systems for monitoring the price and purity of illicit drugs.

Other national health agencies, e.g. the Centers for Disease Control and Prevention (CDC) and the National Center for Health Statistics (NCHS) include questions about drug use in their epidemiological and health services monitoring systems.

Each sponsor, of course, has had its own purpose for the data it collects, its own target population(s) of interest, and different methods and measures for studying the behavior of interest. For many years, no agency had responsibility for coordinating the development of comprehensive information to describe the drug and alcohol abuse problems of the nation or for setting data standards, or synthesizing results from different efforts. Gaps and overlaps resulting from the fragmentation of efforts were never targeted for elimination and no systematic effort was made to identify what core data were necessary for a comprehensive description of drug and alcohol problems. Standardization of measures was achievable only within a single agency's databases. Not surprisingly, different, often seemingly inconsistent, findings sometimes emerge when attempts are made to compare results across these unrelated indicator systems. In addition to the problems arising from lack of coordination of federal substance abuse data, the diverse data collection systems provided information at infrequent and often erratic times. Long lag times between data collection and data reporting precluded their usefulness for assessing current trends and contributing to policy development.

Major changes in drug abuse funding levels in the early 1980s resulted in the demise and degeneration of some of the early drug data systems sponsored by NIDA. Others, like NHSDA and MTF, continued for many years to collect basically the same data on prevalence of use. Periodically, reports using univariate and bivariate statistics were published for new waves of data and little further demand was placed on the data. Indeed, since none of the data were in the public domain (except the cross-sectional sample from MTF), few ever used these data.

POLICY AGENCY CREATES NEW DEMANDS ON EXISTING DATA

However, in the mid to late 1980s new demands began to be placed on these core data systems. For example, the Anti Drug Abuse Acts of 1985 and 1998 mandated improved information on the size of the drug abuse problem and the effectiveness of responses to the problem. With the creation of the ONDCP (and similar state level agencies), for the first time an agency charged with overall policy responsibilities became a consumer of the existing data. Given the, by then, somewhat historical antecedents of the various systems, it is not surprising that the new users found the data systems inadequate for supporting emerging national and local policy needs. After all, the systems had been developed at a time when no data were available and merely monitoring patterns of use and consequences were admirable objectives for the new systems.

The creation of the ONDCP by Congress in 1988 and its mandate to develop a national drug control strategy with measurable objectives placed very different demands on existing data systems, created initially for monitoring or internal management purposes. ONDCP has been forced to rely on existing systems which have sometimes proved, in addition to being untimely, to be inadequate for addressing current policy issues, difficult to interpret, and impossible to use in forward looking analysis.

With changing policy concerns and Congressional mandates to produce quantifiable measures of the success of its strategy, ONDCP led the way in using the existing data in ways that certainly were unprecedented. For example, DAWN became a system that was tracked closely from quarter to quarter for evidence of gains in the "war on drugs." The Institute

of Medicine used the National Household Survey to estimate need in the general population for drug treatment. NDATUS was turned to for information about the gap between demand and availability of services.

RECENT EXPANSION OF INDICATORS

Obvious problems and inadequacies of the data systems for supporting policy decisionmaking⁶ in the 1990's produced several major changes and redesigns that have affected each of these ongoing surveys over the past few years. For example, the NHSDA began annual administration and expanded from a sample of 8,000, costing approximately \$1.4 million to administer annually, to a sample of over 30,000 costing approximately \$10 million. This modification was partly in response to congressional demands for information about the hard-core drug problems in urban areas and use in high-risk populations.

The DAWN hospital sample was redesigned over a period of years in the late 1980s. This system has been looked to by ONDCP for information about hard-core drug use, that is obviously not available from the household survey. Monitoring the Future now includes additional grade levels, as the high risk youth population is of continued policy interest. A survey of prevalence of drug use among pregnant women, another sub-population of present policy interest, is in the field and a survey of youth risk behaviors including alcohol and drug use has been launched by CDC. AIDS-related research has generated data on several thousand IVDUs (the National AIDS Demonstration Research Project: NADR) in selected sites around the country. Other efforts are underway to develop data on hard-core drug users, borrowing from some of the NADR approaches to this hard to reach population. In addition, the National Institute of Justice introduced (and has already expanded several times) a metropolitan area based survey of drug use among arrestees, the Drug Use Forecasting (DUF) system.

While former prevalence-focused indicators have been greatly modified, entirely new efforts have been introduced to provide expanded information about the substance abuse prevention and treatment services system. These include the Drug Services Research Survey and the Client

⁶Haaga and Reuter, 1991; General Accounting Office, 1993.

Treatment Data System (replacing the earlier CODAP system, dismantled when federal funding was eliminated). A new treatment outcomes survey is in the field, and a number of surveys of drug and alcohol program improvement efforts.

At the same time, at the state level, the Office of Treatment Improvement/Center for Substance Abuse Treatment (OTI/CSAT) has been urging states to develop data systems for improving the rationale for resource allocation and demonstrating the effectiveness of intervention efforts. Most of this work to date has focused on needs assessment for treatment. Future efforts will be directed toward prevention needs assessment. It is interesting to note that OTI/CSAT efforts have urged very different methodologies on the states than those used in NIDA's/OAS's data programs, e.g. telephone surveys of the general population versus personal interviews used in NHSDA. Resource constraints and CSAT's mandate to improve state level data, rather than meeting rigorous methodological survey standards, have guided these developments.

LESSONS FOR FUTURE DATA IMPROVEMENT EFFORTS

Several important lessons emerge from our relatively brief, twenty year history of drug data development efforts on the part of the federal government. Not unique to drug data, they relate to the various aspects of change that should be anticipated in developing data systems and to the need for coordination among sponsors and for systems to produce timely output in order to contribute to policy decisionmaking.

Systems Should be Designed to Accommodate Changing Information Needs

As noted above, the policy purposes for which drug use data are needed have been changing and evolving, driven by the changing and evolving nature of the drug problem and our improved understanding of its complexities. At the time when most of the drug use monitoring surveys were designed, the greatest policy concern was with use of drugs by young people in the general population - hence a household survey and a high school senior survey. By the mid-80s, when drug use in the general population appeared to decline and the crack epidemic and the associated increases in crime and violence associated with urban drug

problems had emerged, policy interest focused on the hard-core drug user population and the gap in data for this segment of the drug using population became evident, though policy itself only shifted much later. The question for future improvement efforts is how to anticipate changing needs for data so that they can be available in advance of crisis demand for them. The challenge is to design and implement monitoring systems that are more flexible and adaptable to changing data needs.

Systems Should be Designed to Accommodate Varying Funding Levels

In the past, federal funding for drug data rose and declined with national interest in the substance abuse problem. In the past few years funding has tripled for a number of different data collection efforts. But as in the past, this level of funding is unlikely to be sustained. When that occurs the huge expense of the data systems is unlikely to be born by state and local government and many series may be eliminated, or at best, severely cut back. Since this is an expected cycle, it seems that data systems planning for national data should involve the development of minimum core data sets that can expect long-term funding to sustain them. If the data they gather are of utility to state and local policymakers their chances of continuation after federal funds are withdrawn are much greater.

We may well be entering a period at risk of reduced funding and perhaps a second cycle of consequent demise of ongoing data systems. In preparing for future data improvements it may be wise to begin by calling for a systematic review by each of the federal agencies of the data systems they fund in the substance abuse area with identification of the core systems that deserve maintenance and enhancement for the long-term.

Systems Should Be Evaluated for Needed Modification Over Time

In addition to changing demands and resources for data collection, the context of the data, and methods by which it is collected, have frequently changed since the time when many of the major systems were first developed. For example, with the emergence of AIDS and the dwindling supply of primary health care providers, the profile of

emergency room patients in major metropolitan areas looks quite different today than it did when the Drug Abuse Warning Network was set up.⁷ The change in utilization patterns may significantly impact on DAWN's ability to meet some or all of its objectives. While its hospital sample was recently redesigned, no report evaluating the overall design was produced, in spite of the sharply increased budget that the new sample would require to maintain.

Data collection techniques have also undergone substantial change since the initiation of most of the original drug monitoring systems, which have not changed their methods, were introduced. As an example, a myriad of advanced data collection systems have been introduced in hospitals that can link patient information available from a range of sources including billing, medical records and laboratory reports and provide more comprehensive information on diagnoses treatment and costs. Rodewald, et al. describe a powerful but efficient and economic way to link existing hospital databases for improving clinical information.⁸ Efforts to integrate substance abuse monitoring with other purposes for these systems might offer an enriched, alternative data collection method to that of screening triage reports and reviewing emergency room charts that contain minimal information used by DAWN since it was first developed.

Telephone surveys have largely replaced in person interviewing for most social surveys, due to the rising costs and non-response problems associated with personal interviewing. While NIDA conducted its own test of telephone survey approaches (Gfroerer and Hughes, 1992) and has funded a series of methodological studies since 1989,⁹ we are unaware of a thorough independent design review evaluation of the NHSDA throughout its history. Nonetheless numerous modifications of the survey approach have been made, aimed at addressing problems that users have identified with the database.

⁷Rhee, K.J., et al., 1991.

⁸Rodewald, Wrenn and Slovis, 1992.

⁹Turner, Charles F., Judith T. Lessler and Joseph C. Gfroerer, 1992.

Newer data systems by contrast, have taken advantage of advances in monitoring drug use, such as urine testing. The DUF program uses this validation of self-report in its data collection, indeed, the self-reports themselves are rarely given attention. DUF also was designed with a core battery of items for use in all sites, but allows items to be added or changed to meet local and national need for ad hoc data. By collecting and processing data quarterly, DUF can produce timely reporting of results. A system for efficient online transmission of data from the field to its processing point speeds data processing. NIJ did commission a DUF evaluation study within the first five years of DUF data collection.

Coordination across agencies and data systems should be built into the design of indicator systems

As noted earlier, a myriad of new data systems have been developed over the past three years alone. Others can be anticipated in the future. In the past, the lack of coordination among agencies has meant that findings across studies cannot be integrated, differences cannot be explained and duplications and redundancies persist. Opportunities for enhancing cooperation among agencies should be developed as part of any drug data improvement project, to focus on identifying common data needs, developing data standards for use in measurement and field operations; defining core data sets, sharing the cost of data acquisition and analysis and exchanging data across agencies to expand their utilization.

Systems Should Be Designed to Produce Timely Output

Timeliness of data on trends is of high priority both for reporting the current status of the drug problem, forecasting trends, and for policy planning and budgeting purposes. Two problems currently limit the timeliness of data available for planning. First, some existing monitoring systems are driven by past behavior and drug use patterns, rather than capturing contemporary or leading indicators of drug use. Second, even those that capture contemporary behavior are often slow to process and report findings. Both situations create problems for forward looking policy analysis.

3. ENHANCING POLICY RELEVANCE OF EXISTING DATA

INTRODUCTION

While redesigning and modifying drug data systems can involve long-term efforts, there are short term benefits that might be obtained simply from making greater use of the bounty of existing data on drug abuse. In this section we investigate the potential of data from the existing indicator systems for developing more comprehensive analysis for supporting demand reduction policy decisionmaking.

The currently available drug use data have traditionally served a very limited policy role -- largely restricted to providing policy makers with estimates of prevalence of use of various substances in the general population over time. This is not especially useful for such tasks as determining resource levels and allocations, evaluating policies and planning, and developing effective and efficient strategies. Broad measures of prevalence describe the status of drug use, they do not inform the policy maker on how to change that status.

There are many reasons (discussed in Section 2) why the existing data have been used primarily as measures of the general status of drug use. Probably the most important is that the indicators were not designed for policy purposes; they were designed to simply measure current use. This presents certain methodological challenges to the analyst approaching the data for the first time. However, there is much more data than is typically used and most of the current data sources can be manipulated to provide information which is more useful than reporting of numbers of users alone. For example, the current data, while mostly cross-sectional, can also support analysis of drug use dynamics including initiation and continuation of use, which permits the development of forecasting tools. Also, there is much more information than is typically reported which allows for meaningful classification of users for monitoring particular use patterns and planning and evaluating policy interventions targeted at changing them.

Exploring existing data also identifies serious limitations that are sometimes overlooked. As discussed in Section II the development of indicators in the past focused on the prevalence of use in the general population, both because the policy concern resided with this group and because this population is easier to study than some of the critical sub-populations. While a wealth of data exist for youth, the existing data are very limited for informing policy in regard to seriously dysfunctional users and others of policy importance like pregnant users. These groups are excluded from the population captured in the major databases, or their representation in them is difficult to assess.

The following sections of this chapter discuss several examples of approaches to using the currently available data to address policy relevant questions. The examples demonstrate more useful analytical approaches to the data, the potential for using underutilized measures, databases not typically used in drug policy analysis and combinations of databases for comparative analysis. They also demonstrate limitations of the databases and offer some lessons that are important to consider in future data improvement efforts. Each set of analyses is documented in an appendix to this report.

They include:

1. An analysis of drug use dynamics suggesting that forecasting models might be developed using NHSDA and other databases which support analysis of initiation and persistence in use.
2. An analysis of the heterogeneity of use concealed in the broad general prevalence categories reported by NHSDA. Using data on expenditures, consumption and frequency of use, different patterns of use can be identified.
3. Comparative analysis across data sources for youth and pregnant users. These analyses shed light on important aspects of sampling data collection design and methods that limit integration of results.
4. Analysis of need for treatment among users in the household population.

UNDERSTANDING DYNAMICS OF USE CAN IMPROVE PLANNING TOOLS

Historically very little has been written about trends in initiation. Yet during the course of a drug use epidemic there will be major changes in rates of initiation that cannot be observed from prevalence data.

While knowledge of prevalence levels is clearly crucial for useful policy formulation and implementation, it only provides information about a single facet of what is in fact a constantly changing dynamic process. For example, while a downward trend appears in the more recent prevalence estimates of marijuana usage, the sources of that decrease are not indicated. It might be that heavier users of the drug are reducing their intake to more sporadic and lighter levels (e.g. bimonthly instead of monthly), or that earlier desistance from use is occurring among current users, or initiation into use is declining, or that some combination of these processes is reflected in the prevalence figure presented.

The ability to incorporate the dynamics of such movements and populations is relevant to the understanding and anticipation of trends over time. It also has implications for developing strategy and policy formulation for law enforcement strategies, provisions of treatment for users and appropriate targeting of prevention programs. Better policy planning can result from a better understanding of the current stage of a drug epidemic and the likely direction of future trends. For example, where initiation has declined but desistance is low, it might be appropriate to direct greater resources toward treatment.

Essentially any of 9 or 10 databases that contain information on year of first use or age of first use and current age could be used to analyze initiation. In our analysis (reported in detail in Appendix A), we calculated and compared initiation rates into marijuana and cocaine use over time, using both the NHSDA and data from MTF. In conjunction with these analyses we also examine prevalence rates and rates of retention or persistence in drug using behavior for recent initiates and other users. We present examples of useful potential short and medium range forecasting tools using these data systems and discuss alternative dynamics models.

To further analysis of drug use dynamics in the cross sectional surveys it would also be useful to know when former users last used. An additional item about date quit or last used would make calculations of desistance from use possible.

HETEROGENEITY AMONG CURRENT USERS CAN BE MASKED BY PREVALENCE

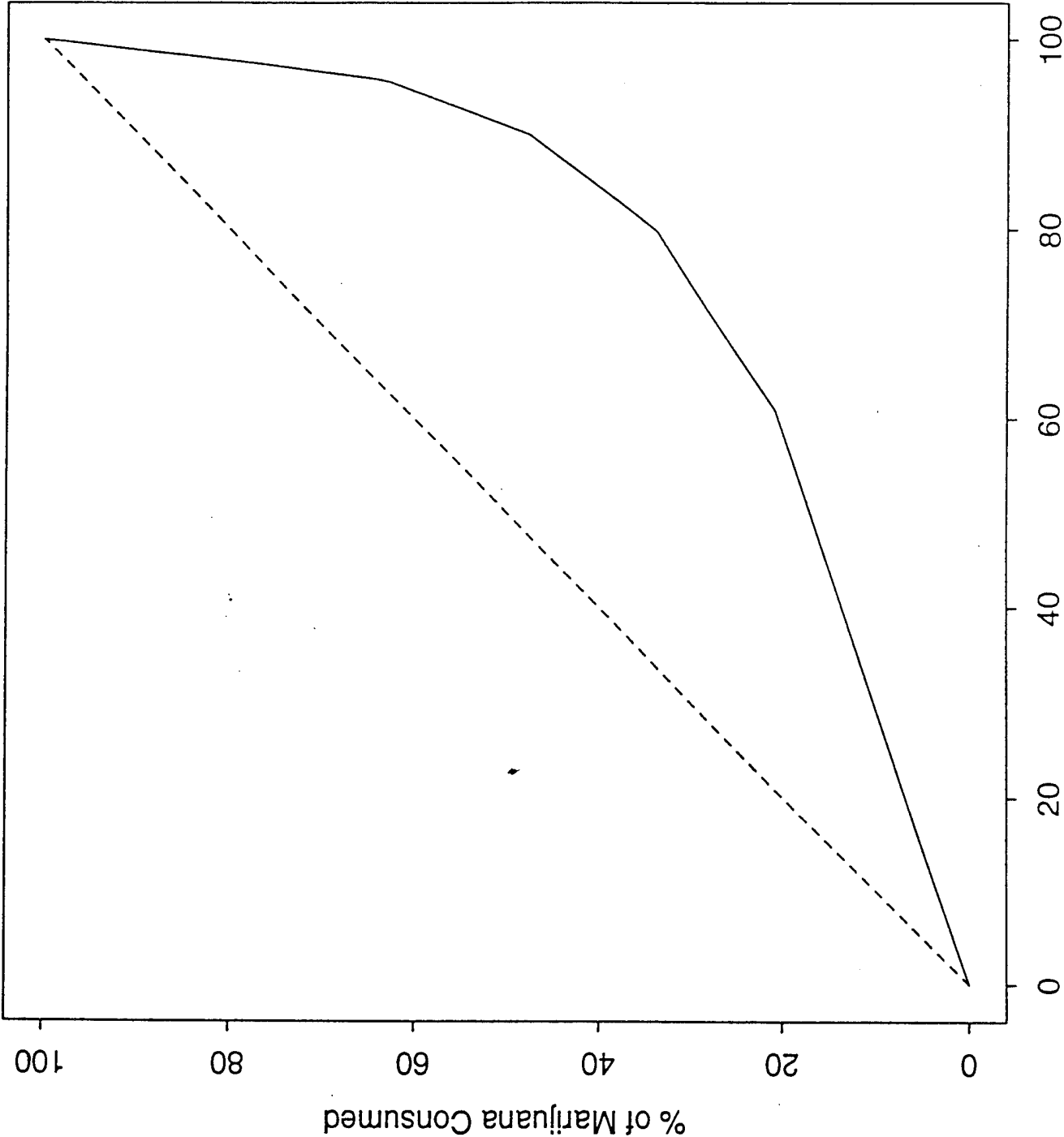
Detailed analysis of the characteristics and drug use behavior of recent users demonstrates great heterogeneity within this group. While trends in the number of current users are tracked closely, little use has been made of all the other information collected about these users. Using these data examined changes in the composition of this group over time, and variation in use patterns within the group. For example the survey contains data regarding variation among current users in consumption; frequency of use; the proportion of new users versus long term users; and how these proportions are changing. Data for supporting this analysis were long collected but have received little attention in the past.¹⁰ Appendix B describes our analysis of the heterogeneity among 30 day users surveyed in NHSDA and MTF.

That analysis shows that quantities consumed among 30 day users are relatively low and that the majority of users account for only a slight amount of total quantity consumed. These results confirm other findings that the household population and in school population are dominated by relatively casual users and that among users who can be identified in these populations the majority of the problems are associated with a minority of the individuals. The Lorenz curve shown in Figure 2 illustrates the tendency toward lighter use among the majority of the population. Sixty percent of the past 30 day users of marijuana account for only 20 percent of the marijuana consumed by all users. Similar patterns were found among various age groups and for different substances.

A classification scheme for distinguishing heavy and light users is given. Accurate evaluation of programs requires that use within each group be measured.

¹⁰Some variables of particular interest, having proved difficult to measure, have since been dropped from the NHSDA.

FIGURE 1
Marijuana Consumption Among Past 30 Day Users
All Ages



Source: 1990 NHSDA

As data on consumption, expenditures and frequency of use have a policy utility in sorting current users into various utilization categories, that can be monitored for particular policy purposes, the measures to support these analyses should be improved. Responses are very clustered and we believe that the response categories which are provided for the respondent may be influencing reporting. Open-ended items might make it easier to report amounts consumed. Better information on frequency of use and expenditures is also needed. The levels of inconsistent reporting of use behavior seem quite high,¹¹ suggesting that respondents find it difficult to proceed through the NHSDA response sheets on their own. While the response sheets and self administration have proved in methodological studies to enhance self-reporting,¹² confusion or misunderstanding by the respondent can produce other data problems.

ESTIMATING DRUG PROBLEMS AMONG SPECIAL POPULATIONS

Several sub-populations are of special interest to policy makers because of the large costs and high risks associated with their problem drug use. Such groups include injection drug users, offenders, pregnant women and adolescents. Yet the drug using behavior within some of these groups can be very difficult to study and as a result some are not well represented among the drug indicator systems. This is often because they are found so infrequently among the populations surveyed, such as households. When opportunities do arise to capture such groups it is usually from only a selected sub-set of the population, like injection drug users in treatment or pregnant women receiving prenatal care. For other special populations, like youth, a myriad of indicators exist, and comparisons among similarly selected populations on age, and gender is relatively easy. Whether the group is well or sparingly described by the data sources, comparisons across sources can be difficult to make and more difficult to interpret.

The following sections describe the problems of estimating drug use and consequences in special populations, using multiple data sources.

¹¹General Accounting Office, 1993

¹²Turner, Lessler and Devore, 1992.

Pregnant Users

Pregnant women are an especially important target group for drug abuse interventions. Federal Substance Abuse Block Grants regulations require a set-aside of 20 percent of resources for services for pregnant women. Despite the known health risks that a pregnant woman's use poses for her infant, and the efforts to target resources to meet needs for services, very little is presently known about the extent of substance abuse and harms resulting from substance abuse in this population. To make more meaningful resource allocations, policy makers must know the extent of the problem. Hence, any measure of use for pregnant women might be helpful.

But estimates often derive from anonymous urine testing done in the course of prenatal treatment or at the time of delivery. Often only some women are screened for the presence of drugs. Even when random samples of the entire population are selected, there is usually very little information about the user and indication of the presence of a drug doesn't provide information about drug use history or current use patterns. These drug tests, however, have sometimes found significant levels of drug exposure and heightened concern about substance abuse in this group. Survey data have been limited to those from the National Maternal and Infant Health Survey. This survey provides more detail on risk factors and pregnancy outcomes and also on changes in women's drug using behavior when they discover that they are pregnant. Comparing these data with survey data on drug use among child bearing age women can shed further light on potential behavior change. The analysis we conducted is documented in Appendix C.

In our analysis we compare prevalence estimates of drug and alcohol use between the NMIHS and NHSDA. For alcohol, marijuana and cocaine the rates, not surprisingly, were significantly lower in the NMIHS sample across all age and racial groups. The numbers across the two surveys are difficult to compare because of method differences, and because the NMIHS rate is not purely a use during pregnancy rate the survey used a window period of 12 months before delivery. Nonetheless, these numbers contribute an additional piece of information to the work of estimating substance abuse problems in this population.

The inability to match NHSDA and NMIHS respondents on pregnancy status could be amended by making a simple addition to the NHSDA questionnaire, to ask female respondents of childbearing age about pregnancies and child births during the past 12 months. With this information in the NHSDA comparison between pregnant and non-pregnant would not be confounded by the effect of different data collection methods which exists between NHSDA and NMIHS. Further analysis could be done using NMIHS rates to calibrate the NHSDA rate for child bearing age women. Finally, information in the NMIHS about changes in drug use behavior after learning about pregnancy deserve further analysis to identify the characteristics of users who change their behavior and those who do not after learning of their pregnancy. Substantial improvements in information campaigns might be made based on this kind of analysis.

Adolescents

Use among adolescents is troubling because of its toll on our future. When young people turn to drugs and alcohol they become involved in risky behavior which can lead to diminished productivity throughout their life, a criminal record and maybe even death. Again there is strong commitment among policy makers to reduce drug use among this population. There is considerable information about drug use among American's youth available. The analysis we conducted reviewed those various sources of data, identifying similarities and difference among them in populations surveyed and data collection methods used. Our analysis reveals that while overall trends in prevalence rates have been in the same direction across all the studies, there are significant differences in rates, especially for heavy and current alcohol abuse.

We conducted a comparative analysis of four datasets - the High School Senior Survey, also known as Monitoring the Future (MTF); the National Household Survey of Drug Abuse (NHSDA); the national-level data component of the Youth Risk Behavioral Survey (YRBS); and the Partnership Attitude Tracking Survey (PATS) of the Partnership for a Drug-Free America (see Appendix D).

As shown in Table 1, we found substantial variation in levels of reported drug use across the surveys. We believe the differences result from variation in sampling frames, measurement differences, questionnaire context and data collection method. For example, the prevalence figures reported in the YRBS and MTF for lifetime use are essentially identical when taking sampling variation into account. On the other hand, the NHSDA figures are lower in almost every instance, especially in the case of alcohol use. We hypothesize that this is a "mode of administration" effect, in that MTF and YRBS are school-based surveys while the NHSDA relies on in-home interviews.

Also of interest, however, are differences between MTF and YRBS, which is consistently higher across all measures and is significantly higher in its estimate of current alcohol and heavy alcohol use. These differences could be explained by significant differences in the two questionnaires used in the different school-based surveys. The drug questions in the YRBS are only one of a series of risk behaviors that the survey asks about and are perhaps less threatening than they are when asked in isolation.

Table 1
Prevalence of Alcohol and Illicit Drug Use Among Adolescents
1990 Data from MTF, the YRBS and NHSDA
(Entries are percentages)

	Alcohol			Marijuana		Cocaine	
	LIFE	CURR	HVY	LIFE	CURR	LIFE	CURR
MTF (n=15,200)	89.5	57.1	32.2	40.7	14.9	9.4	1.9
YRBS (n=2,908)	92.4	65.6	44.0	42.2	18.5	9.3	2.3
NHSDA							
All*	75.4	43.5	NA	33.2	10.2	6.8	0.7
In school	74.3	40.3	NA	29.4	11.6	5.5	0.5
Not in school	80.3	54.1	NA	45.7	6.4	10.8	1.3

* The weighted NHSDA data includes members of the general population aged 17-18; that is, both students and dropouts are included.

In spite of the large variation in absolute prevalence levels observed in these numbers, the information about trends in use across drugs and over time is much more comparable. The data from all three sources confirm that huge majorities of high school youth have used alcoholism their lifetime, with substantial numbers reporting heavy use. Large numbers (between 30 and 40 percent) have initiated marijuana use, and a sizable number (between 6 and 10 percent) have used cocaine at least once. With regard to trends over time, lifetime use for all drugs is reported at higher levels than use in the past 30 days, and all four of the datasets we examined show a significant decrease from the high prevalence levels observed in 1985.

While our comparisons reveal how prevalence estimates are possibly affected by sampling frame, time of year in which a survey is administered, questionnaire and mode of administration (e.g., home vs. school vs. shopping mall, personal interview vs. anonymous survey

response), and choice of population to be sampled, they also underscore the importance of using multiple data sources to study policy issues, in this case validating and confirming observed trends of decreasing drug use within the adolescent population, while pointing out the importance of considering sample and method differences.

DEMONSTRATING THE INADEQUACY OF HOUSEHOLD SAMPLES FOR ESTIMATING NEED FOR PUBLIC SECTOR TREATMENT

Treatment is widely considered the most important tool for reducing use among dependent and abusive drug users. There are large social costs associated with abuse and dependent drug use. These costs include crime, lost productivity, healthcare and the spread of infectious diseases such as AIDS. Because of these costs, the government has supported treatment for drug abusers for at least the last 30 years. Policy makers need to know how many people need treatment and how many public resources are necessary to treat these people.

Federal block grant regulations require that states provide estimates of treatment needs within their general population. Unfortunately, suitable indicators of such needs often do not exist.

Some analysts have turned to household surveys as a basis for estimating need for publicly funded drug treatment. The Center for Substance Abuse Treatment, which is assisting states to meet federal data reporting requirements, has encouraged many states to develop their own household surveys. However, in examining the NHSDA data we found that the vast majority of drug abusers identified as being "clearly in need of treatment" or drug dependent in that data are not likely candidates for receiving publicly supported treatment.

Drug dependency does not necessarily translate into a policy-relevant indicator of need for treatment, especially public treatment. According to guidelines suggested by the Institute of Medicine, publicly supported treatment is justified when the treatment will considerably reduce the social costs of an individual's drug abuse or when the individual cannot afford the cost of treatment. By this criteria, any indicator of need for public treatment must not only identify drug dependence but must also demonstrate that the dependent users inflict high social costs or are too destitute to afford private treatment.

It is widely recognized that some drugs result in higher social costs than others. Heroin and other opiates are typically associated with significant social costs. The same is true for heavy cocaine use. On the other hand, marijuana use is generally not associated with large social costs.

According to the findings of the 1990 NHSDA, 13 percent of the household population used illicit drugs in the 12 months preceding the survey. However, nearly half of all those who used drugs used only marijuana. And even among those who used cocaine, heroin, and psychotherapeutics, most used only marijuana on a weekly basis (see Figure 2).

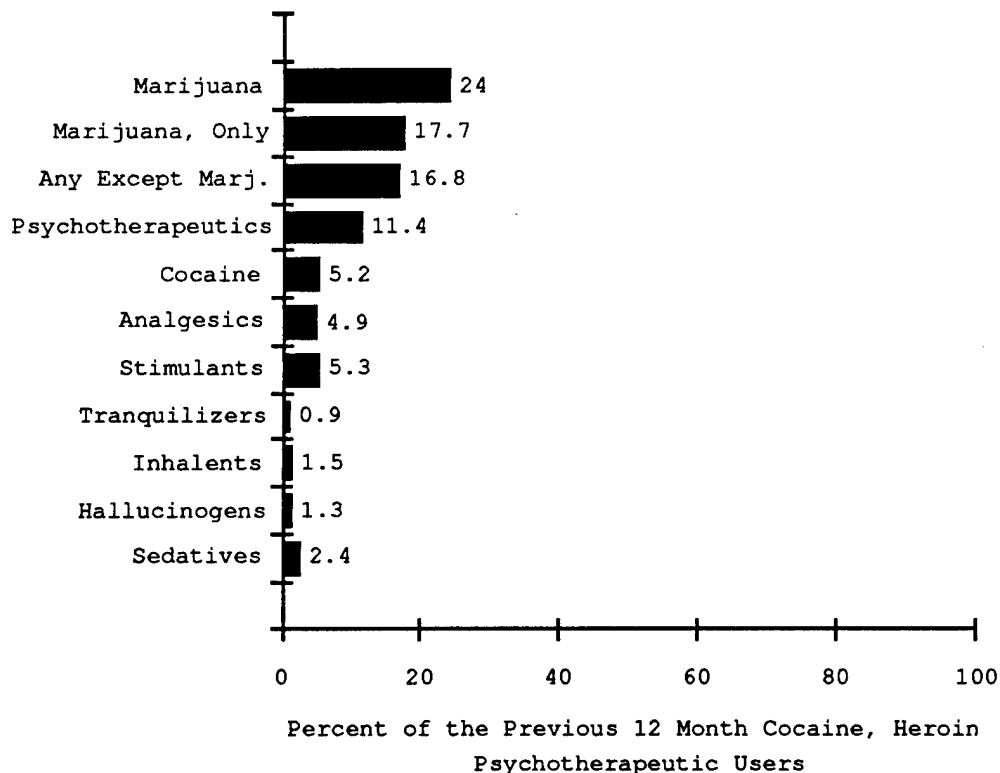


Fig. 2-Percentage of Previous 12 Month Cocaine, Heroin or Psychotherapeutic Users Using Various Substance Weekly

In identifying those in need of treatment we found that nearly two thirds of the clearly in need group abused only marijuana and alcohol. When we compared this behavior with that of a group of clients actually

receiving treatment, we found just the opposite -- about two thirds of the treatment clients were using the more serious drugs, such as cocaine and heroin.

We also found a difference in the socioeconomic characteristics of the two groups. Although those clearly in need of treatment tended to be poorer than the average member of the NHSDA household, the majority were far from destitute. Most were high school graduates and employed. Only one third did not graduate from high school and only 18 percent of this group was unemployed. In contrast, over 75 percent of the treatment clients were unemployed.

It would thus appear that only a small fraction of the drug users identified in the survey fit the profile of those who qualify for or receive publicly supported treatment, demonstrating that household samples are inadequate for identifying need for public sector treatment resources. This analysis is reported in detail in Appendix E.

EVALUATING THE DRUG ABUSE WARNING NETWORK (DAWN)

DAWN data are collected from a large sample of emergency rooms and medical examiners, but the information it contains does not come from surveys of patients or results of toxicology lab tests. Rather data on drug related episodes in the emergency room are generated from retrospective review of emergency department charts and/or hospital inpatient records. Identification of drug-related episodes depends entirely on what is contained in the ER chart reviewed by a DAWN coder.

In 1988 the sample of ERs was redesigned, from the opportunistic sample to which the system had degenerated over the years, to one that allows estimation of the total number of drug related visits to ERs in a metropolitan area or in the nation. A number of alternative approaches to collection of data, such as screens of blood or urine of a random sample of patients within each facility might be options worth considering to improve the rate at which DAWN captures drug-related ER episodes. Although efforts to validate DAWN at individual facilities have indicated substantial undercounting by DAWN the basic data collection method remained unchanged at the time of the sample redesign.

Several of the original objectives for DAWN may now be served better by other indicator systems. For example, studies of IDUs and chronic crack users as part of the National AIDS Demonstration Research Project provide a wealth of information on the health hazards associated with drug abuse that are far richer than that provided by DAWN. Yet this study does not provide regular, periodic reports like DAWN does. In addition, systems like the National Poison Control Index might do a better job of identifying new substances of abuse than DAWN. Improvements in hospital based information systems that link clinical, laboratory and financial records might provide much more detail about drug related emergency room visits than does DAWN.¹³

Lacking other indicators of heavy use, DAWN has been turned to as an indicator of hard core drug use. However, there is no empirical evidence to support that utilization. The relationship between DAWN trends and trends in heavy use in DAWN communities has never been examined and until this relationship is explored, the continued use of DAWN as a surrogate indicator of use patterns is unwarranted and perhaps misleading.

The problem is not that DAWN fails to capture heavy users. In fact, not all DAWN episodes involve heavy users, but many do. DAWN records show that many users are injection users, many report dependence as their reason for drug use and many use the ER for chronic problems associated with their use or as a route to obtaining treatment. These would all suggest that DAWN does serve a heavy use population. However, there are many factors, other than underlying use patterns, that can account for changes in DAWN figures. For example, crowding of ERs can impact on DAWN counts, the quality of the drugs available on the streets can impact on DAWN, deteriorating health status among heavy users, rather than changes in their number, can influence the direction in which DAWN moves. Further other influences that have made significant downturns in DAWN, at the same point in time across most DAWN cities, are unlikely to be mirrored in a heavy user population, simply because such a population is made of chronic users, unlikely to radically change

¹³Rodewald, Wrenn and Slovis, 1992.

their behavior in a short period of time, and at the same time in different communities. There must be other explanations for sudden drops across most DAWN cities at the same point in time.

The DAWN population is a highly self-selected sub-population of all users, including hard-core users, which if better understood might provide local policy makers with useful information about changing drug abuse patterns among this difficult to study sub-population.

In Appendix F we present a review of the various purposes for which DAWN has been used and a critique of those applications based on the DAWN system design. Several suggestions for modifications are provided. We believe that this review provides justification for the undertaking of an evaluation of DAWN to determine what role it presently serves, what needs exist for it to be improved and how, if at all, it can inform policy makers about hard-core drug use patterns. The evaluation should also consider whether alternatives to retrospective review of medical records on all patients might not yield more valid data.

4. ALTERNATIVE SYSTEMS TO FILL MAJOR DATA GAPS

Previous sections have focused on existing drug problem indicators and their strengths and weaknesses. In this section we discuss the major data gap across existing indicators, which is their failure to capture and describe heavy users, a group of increasing policy interest as use has declined among casual users and more is known of the costs associated with heavy use and greater mandates are given to intervene effectively with this population.

It is not a critique of existing indicators that they fail to capture heavy drug use. They were not designed to do that. Heavy drug use, for all its high risks and costs, is relatively rare in the population. Yet some sectors, notably, public treatment, law enforcement, children's services and public primary and mental health providers are reportedly inundated with members of this population. For example, DUF consistently reports in almost all cities that more than half of arrestees are using some illicit substance. To capture large numbers of heavy users for the purposes of: understanding their drug use characteristics and problems; identifying and providing resources to address their problems; and evaluating the interventions they receive, it might be wise to turn to the public systems with which these users come into contact in large numbers.

Our approach in this section is to examine the potential of alternatives to population based surveys for studying hard-core chronic drug users, their use patterns, consequences and costs associated with heavy drug use.

One of the most important data gaps currently facing demand reduction policy planners is the lack of information about the hard-core user population in need of or seeking substance abuse treatment and their outcomes in treatment. A number of alternatives to surveys, including networked drug data information systems and registries, could improve needs and outcome assessment for this population.

OVERVIEW

Reporting systems are useful tools for collecting epidemiologic data. They are distinct from population based surveys in that individuals or cases contained in their databases are generated from catchment points where individuals at risk, exposed or diagnosed are identified and entered into a monitoring system. They are information systems that utilize systematic reporting procedures, whereby reports on specific individuals or events are submitted to a central body (World Health Organization: WHO). These systems may be used to define the incidence, prevalence and specific characteristics of particular populations at risk. They can also continuously measure the trends and consequences of particular types of exposures, identify high risk populations and even assess the successes or failures of treatment and prevention efforts.

There may be many advantages for using reporting systems, as opposed to alternative methods, such as surveys. It may be argued, for example, that the most serious consequences of drug abuse will ultimately come to the attention of institutions, such as the criminal justice system, treatment facilities or hospital emergency rooms. Thus, these systems may be much more effective for identifying high risk populations, such as the chronic user.

Reporting systems may vary considerably in terms of their costs, their complexity and the types of issues they can realistically address. We describe surveillance networks and registries below.

In Appendix G we provide a description of the different types of reporting systems used in public health to monitor infectious diseases and chronic injuries. In this section we review their applicability as models for developing systems for monitoring problem drug use.

SURVEILLANCE NETWORKS

HHS has played a major role in the past, through the Centers for Disease Control and Prevention, in the development of epidemiological surveillance mechanisms for estimating the rate of chronic and infectious diseases requiring public health intervention. CDCP has also built systems for identifying individuals with these conditions and

linking their treatment episodes and outcomes. Legislation has been passed mandating reporting of certain diseases. National professional health associations have endorsed and help direct these systems. Funding for data collection, processing and systems support have been developed to maintain the surveillance programs.

ONDCP and other drug policy agencies could work with the public health sector to consider the possibility of including drug and alcohol dependence in the reportable diseases system or of establishing separate surveillance systems for these conditions.

There is ample evidence that a small minority of users consume the vast majority of the illicit drugs (or at least the non-hallucinogenic drugs) and cause the vast majority of the social harm. Furthermore, the vast majority of them make contact with the criminal justice system and health care systems. This suggests that rather than sampling particular populations, it might be easier to simply link the databases of various systems in which heavy drug users are already being identified on a regular basis.

The NIAAA has funded the development of epidemiologic laboratories, which are models that could be extended for this purpose. Several states have already begun to explore the feasibility of building these systems and desperately need the expertise of the Public Health Service in developing viable systems, that combine comprehensive networking with protections of privacy.

No population based sample survey, no matter how well administered, can be expected to capture the heavy users. Individual catchment areas, like ER's and police departments also cannot be expected to represent the universe of heavy users. Yet these individual catchment centers -- police, primary and mental health care providers, and treatment providers -- deal repeatedly with the very population of heavy drug users about whom better information is needed. While no one system can be expected to capture them all, and each self-selects its clientele, networked together into a substance abuse surveillance system, we would expect that most heavy users over a short period of time would fall into at least one of the catchment nets. Most individual catchment nets handle the problem of multiple capture very well, e.g. rap sheets record

multiple arrests, hospitals maintain patient identifiers to link multiple admissions, and treatment providers now often assign unique identifiers to their clients. The public health systems has been able to create linkable unique identifiers across a number of systems. The challenge for substance abuse surveillance would be to extend the network beyond health to link criminal justice and treatment providers (at a minimum). Legal mandates would need to be created to develop such a system and ensure the confidentiality protections that it would require. The state of New Mexico has recently developed an integrated drug abuse information system of the type outlined above for use in determining treatment outcomes. Understanding its experience in this process would provide a valuable lesson for pursuing the feasibility issues surrounding such a design. Indeed the New Mexico system is quite broad. In addition to health, justice and treatment it include DMV, welfare, and employment databases in its network. Information from these various systems has been linked with the records of individual treatment clients.

REGISTRIES

An alternative to networking the individual information systems of various service sectors into a community wide surveillance system is the use of a registry. The role of local registries, like those in place for cancer and other disease monitoring, and those developed in the 70s for substance abuse should be reevaluated. The feasibility of drug registries has already been demonstrated; New York City had one for quite some time, that was disbanded because of lost funding. European and Asian countries also have drug user registries.¹⁴ Knowing the upper bound on the size of the heavy user population is something like 2-5 million, advancing computer technology would make a registry of today much more capable than those of the past. Civil liberties concerns would be an important issue to address in terms of identification technologies that might be used such as fingerprints.

¹⁴The Addicts Register in the U.K. is a national system. Malaysia is an example of a country with a registry that combines multiple sources of input.

Both surveillance networks and registries can capture most of the universe of interest, by pooling input from multiple sources. For registries of drug users the chief problem is defining and identifying the registry eligible population. These systems can answer a wealth of questions that conventional surveys cannot because over time a longitudinal record is formed. In effect registries are panel data sets. Hence they can address questions of progression, initiation, relapse, and so on.

Of course some members of the universe of heavy users would never be reported, but within a year or two it would be pretty close to complete depending on the ability to broadly implement such a system. Most heavy users (except for marijuana) are arrested, enter treatment or detox, or obtain health or social services within any 12 month period, and heavy users who never commit crime, get sick, or demand treatment are in some sense less important to capture as their demands and impact on the system are low.

A substantial barrier to implementing a broad based registry is that our criminal justice and health care systems are both very decentralized, both across jurisdictions (several federal agencies, 50 state police, and thousands of county sheriffs and police department) and across functional levels (police, courts, corrections, etc.). Successful implementation also requires cooperation among service providers, who often see disincentives to reporting, are not aware of reporting requirements.

Advances in character and finger-print recognition technologies and pattern recognition techniques over the past few years have addressed some of the problems that reporting systems have faced in the past. Also communications and information technologies have reduced the burden of reporting and facilitated the query process for users of these systems.

Decisions would have to be made about the scope of the data base. For example, what range of drug related offenses would it include? If all arrestees were drug tested, it could also include people who were arrested for other offenses but who had positive drug tests. While testing is of course expensive it is already a regular procedure in

Washington, DC and takes place quarterly in all DUF jurisdictions. It is also not clear whether the system would record all arrests or just all convictions; many drug offenders, especially in big cities, have charges dropped from their criminal record.

Even thornier issues would need to be addressed for defining the scope of health system reporting. What kinds of symptoms, diagnoses, test results would trigger reporting to the registry? Again, regular testing for drugs and alcohol is conducted in some facilities. Existing trauma registries might be expanded to include information on drug and alcohol involvement.

The content of core data sets is another issue that affects both implementation and utility of the system as well as the cost. Developing a core data set to meet the needs of the system's constituents would be an important minimum requirement. Each reporting source would be required to provide that level of data. Then different sectors might each have their own expanded core and supplemental data or special project data could be provided for in the record.

Registries also require new funding for their start-up, implementation, maintenance and support; an appropriate institutional base for the registry is also needed.

SIMILARITIES AND DIFFERENCES BETWEEN THE DRUG AND HEALTH MODELS FOR SURVEILLANCE

In order to evaluate the feasibility of using the public health model approach for the surveillance of drug abuse, it is important to point out similarities and differences between the two fields.

There are a number of ways in which the problems for surveillance of diseases/exposures and drugs are quite similar. There is both a social stigma of being diagnosed or living with certain diseases and using drugs. Certainly AIDs and other sexually transmitted diseases are clear examples of diseases with social stigmas attached to them, and negative consequences are likely if confidentiality were breached. Therefore, the need for confidentiality to protect the individual from harms resulting from participating in the surveillance system is critical in both situations.

As in the case of disease, the more serious the case of drug abuse, the more likely the individual will be captured within the infrastructure of an institutional setting, such as health, treatment or criminal justice system. Even more importantly, the infrastructure currently exists in this country to capture these cases (unlike the situation in certain foreign countries). This allows for the capture of cases from a broad spectrum of designated locations and makes it less likely the case will be missed. While new cases will certainly be identified, it also makes it more likely that the more serious cases will be entered into surveillance. From a societal context, these are the people that are most important to capture, because they are the ones who incur and impose the greatest costs and are most in need of treatment.

Finally, the issue of testing is a common thread in both situations. There are many diseases and drugs where specific tests may be conducted in order to confirm their presence. Such tests offer some level of objectivity and consistency between diagnoses which helps improve the validity of the data collected about a particular case. However this is also an area where important differences arise. One of the major differences between evaluating diseases and drug abuse may also be defined as a testing issue. Perhaps the reason that many of the public health surveillance systems have been so successful in identifying diseases in the population is because there are generally very specific tests that may be conducted in order to identify the presence or absence of the disease in question. This is true in the case of many infectious diseases, cancers and birth defects. In the case of cancers, for example, a pathology report will not only verify the presence of disease, it will also describe the "stage", or how early the disease was detected. This type of information may be used, for example, to target screening and education programs more effectively so that areas in the country where the stage of disease tends to be more advanced can become the focus for intervention. Testing is generally part of a larger protocol that the physician follows in order to make a diagnosis and identify a particular disease.

This is where the crucial difference between the public health surveillance and drug model occurs. Except in specific cases, there is a sentinel health event that is diagnosed and entered into a disease registry. Each disease tends to have a high-risk population associated with it. For example, if one considers the case of melanoma, the high-risk population would be fair skinned people who have had serious sunburns, those with nevi (type of mole) of a certain size or coloration, etc. If a physician takes a proper case history, these risk factors will become apparent and the testing procedure, in this case a biopsy, may ensue. In the case of drugs, however, there is generally no clear cut adverse health outcome or high-risk population to be targeted. These are two very important differences between the public health and drug models. While there are certainly different drug using populations that may be identified, such as pregnant women, the homeless or criminals, these groups are too broad to be useful as a tool for case identification. Unlike certain high-risk populations for some diseases', the drug using population is not confined to a specific age group, race, sex, or geographic location. In addition, the adverse health outcomes that result from drug abuse may never be associated with the use itself. For example, accidents may occur because of altered mental states, but the health outcome to be treated might be a broken leg. Other health effects may be so diffuse, such as gastrointestinal problems, or changes in blood pressure, that there is never a "sentinel" health outcome specifically associated with drug use. However, there are some risk factors of serious drug abuse that are rather easily identified, especially in a clinical setting. These are the tell tale physical signs of injecting use, such as tracks, inflammation, scars, etc.

Perhaps the most obvious but important difference between disease and drug abuse surveillance is the simple fact that drugs are illegal and diseases are not. The population diagnosed with disease is likely to be interested in pursuing their health status because they clearly have a vested interest in doing so. This means they will continue to frequent the agencies (e.g. hospitals, laboratories) that will allow for continued reporting and surveillance. It is probably a fair

assumption that these people will be honest in their reporting behavior, because it will clearly benefit their treatment to do so. On the other hand, the fact that drug use is illegal makes for an entirely different behavior pattern than those diagnosed with disease. These people could try to avoid being captured by the agencies who want to track them and they may see less incentive to be honest about their drug use history. In fact, service providers may perceive the greatest disincentive for reporting because of the legal issue. This means that for a system to be successful, it must be able to absolutely guarantee that identities of individuals will not be released without their consent and that negative consequences will not result for these reported.

All of the similarities and differences between drug and disease testing should be considered in determining the feasibility of constructing surveillance systems. There are likely to be many situations when such efforts are inappropriate and where resource are better spent on alternative strategies. Still, there may be a number of areas, such as focusing on a particular drug, or a particular geographic region, where surveillance efforts will provide a useful alternative to population based surveys for studying heavy drug users and planning appropriate intervention strategies.

FURTHER RESEARCH REQUIRED

What could be gained by instituting local or state wide drug abuse surveillance system? Their utility may be much greater at the local and state policy level than at the national level, yet numerous local indicator systems already exist (DUF, CEWG) and are sponsored at the national level. Clearly there are a number of advantages that may be gained. There are currently many unanswered questions about the ability of our nation's criminal justice, health care and treatment systems to successfully deal with drug abuse. Greater emphasis is being placed on coordination of services for drug abusers across these systems. Sharing information would be a useful starting point. In addition, there is much to be learned about the different populations of problem users who come into contact with these systems.

There would be significant limitations of such systems too. They would be directed at problem use, but might well capture a great deal of casual use. They would not be useful for national estimates of problem use. They would certainly raise civil liberties concerns. Yet because they can so successfully target on populations of greatest public concern, indepth review of prior experience and the feasibility of implementation is worth considering.

A first step might be to select a particular city (perhaps a community Epidemiology Working Group [CEWG] city) or county to test the feasibility of conducting drug surveillance on a pilot scale. Should this be successful, a number of strategically selected communities could be targeted throughout the nation. This approach resembles the current DAWN system, and our national cancer surveillance system, where certain states, or cities have been selected as representative of our nation. Using this approach we might begin to characterize the drug abuser's array of problems and outcomes of interactions with service delivery in ways that previously have not been possible.

5. POLICY FRAMEWORK FOR IDENTIFYING DATA AND ANALYSIS NEEDS

INTRODUCTION

If federal policy begins to shift away from its strict emphasis on use reduction and enforcement approaches, include greater emphasis on reduction of the harms and costs associated with use, a greater emphasis will be placed on data that describe use and harms among sub-populations like problem users where the bulk of costs of use are incurred and imposed. But other possible policy shifts will have different implications for data development.

For example, during the past few years Congress, federal agencies, and state legislatures around the country have called for greater rationality in the allocation of resources and greater accountability for the expenditure of public dollars for alcohol and other drug abuse intervention programs. These mandates have also begun to shift the emphasis on data development away from prevalence indicators toward indicators of need for treatment and outcomes, data that will probably begin to be in much higher demand than they have in the past.

With expanding knowledge of the complexities of drug use the demand for more detailed data has also expanded. With greater emphasis on the policy support role of data and analysis we should expect that new data requirements will continue to emerge. For example, researchers have recently pointed out the high rates of TB among hard core drug users and in response to this federal policy makers have mandated that block grant recipients identify these cases among their clients. States are scrambling to modify their treatment client databases in order to respond to this new data requirement. TB is only one of a number of multiple problems that problem users present to service providers like hospitals, clinics, social and mental health services, jails and treatment centers. Information about the array of related problems could become in greater demand especially if policy shifts toward harm reduction.

While it is impossible to predict what additional data requirements lie ahead it is possible, using a policy-based framework, to identify the major components of a policy decision support data system against which existing data and data gaps can be evaluated.

To ensure that data will have applicability to policy decision the data system must be designed in terms of the policy issues the data consumers face. Given specific policy issues, research can be tailored to address them. However, because policy issues change over time in response to changing mandates, goals and environments, a broad view of policy areas provides a more flexible and dynamic framework within which to identify core data and analysis needs. Systems can then be designed with flexibility to adapt to changing data needs.

ONDCP POLICY DOMAINS

We have identified five different domains of policy making that ONDCP has responsibility for as the nation's primary agency for coordinating drug control efforts. These include:¹⁵

1. Monitoring the status of drug use and drug problems nationwide;
2. Developing national policies and strategies for supply and demand reduction efforts to curb drug use and combat drug problems;
3. Allocating federal resources across and within supply and demand reduction sectors, geographic areas, and populations to implement federal strategies;
4. Evaluating the effectiveness of federal drug control efforts;
5. Coordinating federal agencies involved in drug control.

DESIGNING A DATA SYSTEM TO SUPPORT POLICYMAKING

Based on our review of policy domains, our conclusion is that policy formulation at the national level requires an integrated, comprehensive decision support system, comprised of multiple data systems and analytic tools that would provide the basis for a wide range of policy analyses. The data collection will continue to be developed and sponsored by a variety of agencies, which necessitates the

¹⁵ONDCP, annual.

development of a mechanism for coordination of data development within a decision support framework.

We identified four categories of data required to address issues in these policy areas. In addition to data on population based substance use, these include data on drug markets and production, community level consequences, and interventions such as prevention, treatment and enforcement programs. A range of analytic techniques required to support decisionmaking from these data were also identified. These include prevalence estimation, diffusion analysis, trend analysis, forecasting and modeling. The product of this initial thinking is a preliminary design for a drug policy decision support system (DSS) and a new framework within which to evaluate the quality of existing data and the utility of current analysis.

The discussion in the remainder of this section, outlines what such a system would look like, what characteristics it would need to possess, and what data it needs as inputs. We outline the kinds of analytic capabilities it should have and what policy application the data and analysis could support.

OVERVIEW

Figure 1 illustrates what a decision support system would look like and where the links and integration would need to occur in the system. As discussed below, and shown in this figure, four integrated data systems are required to support ONDCP's policy. The first is used to describe drug use patterns and individual problem and needs for services associated with use. A second describes the supply and availability of drugs. The third data component supplies information on social and economic consequences of use, such as morbidity, mortality, crime and lost productivity. The fourth data system supplies information on the control system's response, in the form of interventions such as delivery of treatment services, interdiction levels, etc. The separate systems need to be linked on a number of levels, including jurisdiction, population characteristics, providers, and clients. Within a data system the various databases should have common measures, e.g. of use, history, or cross walks that enable comparisons to be made. For

example, a study among a heavy user population might collect more frequent use data than a household survey. But the frequent use measures should aggregate to those used in other population surveys. Also bridges across data sets are needed if it is important to sum across different populations captured in different databases.

The data systems serve as input to a variety of analyses, which should range from simple graphical presentation of univariate statistics to sophisticated simulation modeling used to project impacts of different policy options. An illustrative list of analysis tools is shown on Figure 3.

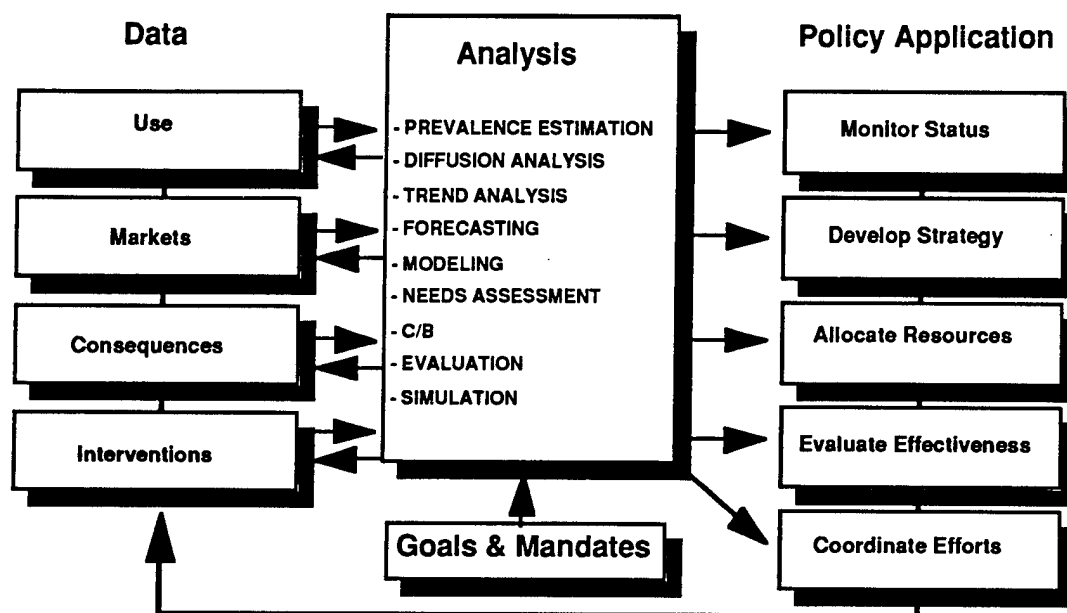


Fig. 3-System to Support Policy Decisionmaking

It is in various analyses that data from different systems, e.g. drug use and community consequences will need to be integrated. The development of policy based statistical models is an important source for information about data needs. For example, in Section III we described the need to incorporate data on quitting dates, or desistance from use into forecasting models.

The system we envision is designed to use feedback from analysis to modify data systems. The output from analysis is fed into the policy process. The structure is such that all policy domains can be served and the policy questions and needs are designed to drive the data system and analysis.

Policy applications for drug data compete with basic science needs and management information needs for data. Not all drug data can or should be incorporated into a policy decision support framework. But such a framework, if elaborated, could better articulate the kind of information that policy in different domains requires and evaluate existing data from a system perspective, rather than an individual database perspective. We believe this approach holds great promise for producing more comprehensive drug policy analysis, than approaches which use existing data, because that's all there is, whether or not they are appropriate to the policy need, or approaches which invent new databases in the isolation of only one specific policy data need.

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APPENDIX A

DRUG USE DYNAMICS

INTRODUCTION

Illicit drug use is widely perceived to be one of the nation's most pressing problems, and a great deal of research effort has been directed towards monitoring the number of drug users in the population. Estimates of prevalence have proliferated, and some have attracted considerable attention. For example, in 1990 the ONDCP estimated that there were 860,000 hard-core cocaine addicts in the United States. In contrast, the Senate Judiciary Committee (1990) estimated the same population to be almost three times as large, numbering about 2.2 million, and the Office of Technology Assessment (1990) estimated the number of intravenous drug users in the country to lie between 1.1 and 1.8 million.

While knowledge of prevalence levels (and more accurate estimates of those levels) is clearly useful to policymakers, it only provides information about a single facet of what is in fact a constantly changing dynamic process. For example, while a downward trend in use appears in the more recent prevalence estimates of marijuana usage, the prevalence rate provides neither insight on the sources of that decrease, nor of likely future trends. It might be that heavier users of the drug are reducing their intake to more sporadic and lighter levels, or that initiation into use is declining, or that some combination of the two processes is manifest in the prevalence figures which are presented.

The ability to incorporate the dynamics of such movements and populations is relevant to the understanding and anticipation of trends and changes over time, and has important implications for developing strategy, and policy planning for law enforcement, provision of treatment, and the appropriate targeting of prevention programs. Longitudinal data provide the best information about drug use dynamics, but there are few such data available. Turning to the existing national, cross-sectional data we identified several commonly unused variables in the major surveys and analytical approaches that shed more light on the dynamics of use than prevalence rates.

For some purposes a useful mental model of drug use concentrates on the flow from nonuse through initiation, from initiation into a regular or semi-regular continuing use, and then a progression back into nonuse. Reduction in overall prevalence of use may result from cutting the flow of initiates, increasing the likelihood that initiates never become continuing users, or increasing the flow from continuing users into nonuse. Each valve in this process is subject to different types of interventions, and will affect the evolution of the numbers of users over time in different ways. Looking only at overall prevalence implies that we can only gauge the effects and indicated changes for policy by a coarse measure. However, by examining the dynamic pieces of the process in greater detail, we can understand much better why prevalence changes the way it does, and hence how it may be manipulated by policy interventions.

In the following sections, we present a number of analyses which calculate initiation rates into marijuana and cocaine use over time, using both the NHSDA and MTF cross sectional data. In conjunction with these analyses, we also examine rates of retention or persistence in drug using behavior for recent initiates and other users. We then discuss potential short and medium range forecasting tools that could be developed using initiation, prevalence and retention data in combination. We conclude with a brief discussion of alternative models of drug use dynamics and the analytic approaches they suggest.

Initiation

Although decreases in the prevalence of drug use have been indicated over the past several years, several thousands of people, usually adolescents or young adults, start using drugs each year. Prevention or delay of initiation diminishes the difficult tasks related to reducing the numbers of people already using drugs on a regular basis, and can defer the sometimes severe health costs and consequences of intensive drug use. Much prevention literature suggests the benefits attached to targeting resources towards primary prevention efforts, particularly among young adolescents (see for example, Chassin, Presson, Sherman, Corty and Olshavsky, 1984; Ellickson, 1992). This section

examines initiation rates into drug use in various sections of the general population, using both the NHSDA and data from MTF. We also use the initiation analyses to aid in interpreting trends in prevalence over the same time periods.

NHSDA Analyses of Marijuana Use

We begin with initiation rates from the National Household Survey on Drug Abuse. Similar techniques have been used by Gfroerer and Brodsky (1992). Figure 1 shows the number of first-time marijuana users for the years 1964 to 1988. The numbers for this figure were generated from the 1990 NHSDA. In the 1990 survey each respondent who had used marijuana was asked his/her age at first use. Subtracting age at first use from age at the time of the survey gave years since initiation. Also, subtracting years since initiation from year of the survey yielded year of initiation for each respondent. If for each respondent, i , and any given calendar year, t , $y_{[it]} = 1$ if the respondent initiated in year t and 0 otherwise, then the estimated number of initiates for any year t is the weighted sum over i of the $y_{[it]}$. The responses to this survey are weighted to yield estimates which are representative of the 1990 household population. The plot shows an explosion of initiation in the later sixties and early seventies, followed by a leveling off and a decline from around 1978 onward.

Compared to the time pattern in marijuana prevalence as measured by use in the last year, (see Figure 2) it appears that changes in initiation tend to lead changes in overall prevalence of use. Figure 2 shows the number of past-12-month users by year. Prevalence numbers in these figures come directly from the Main Findings reports from various years of the NHSDA. The reports give the proportions and the estimates of the total number of users comes from multiplying these proportions by the size of the population. Population estimates come from the Main Findings or directly from the CPS reports, the Current Population Reports P-25 Issues 519, 614, 870, 1045 and 1057.

FIGURE 1

Marijuana Initiation Household Population
Over 12 Years Old at Time of Initiation

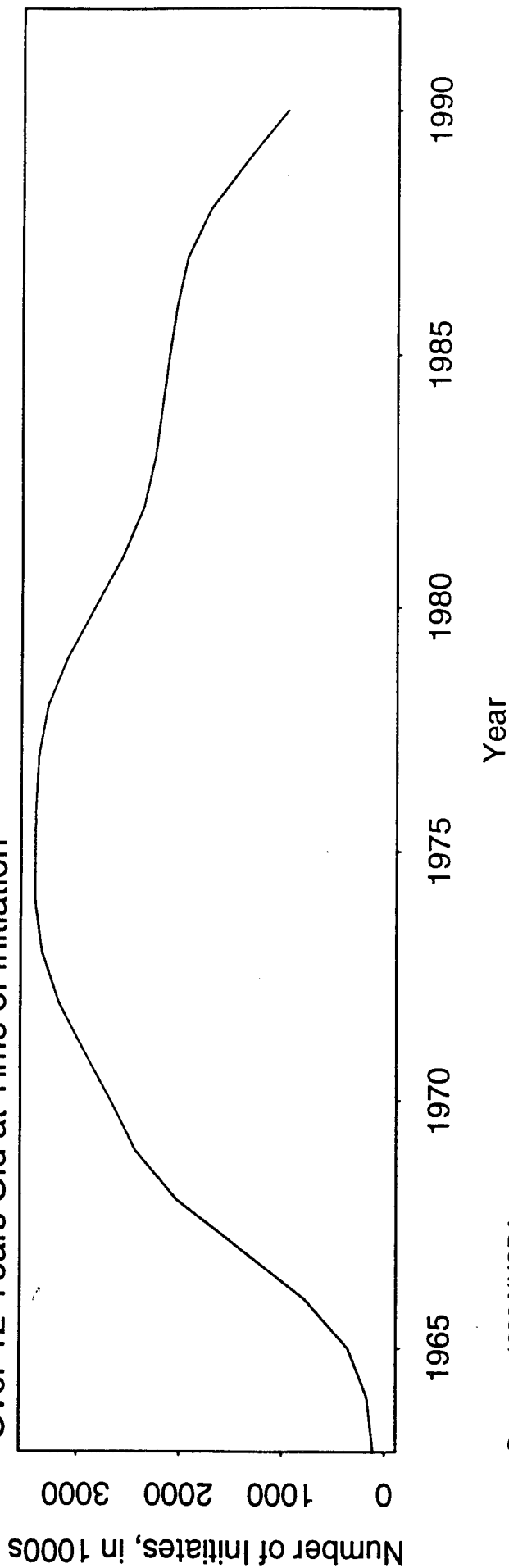
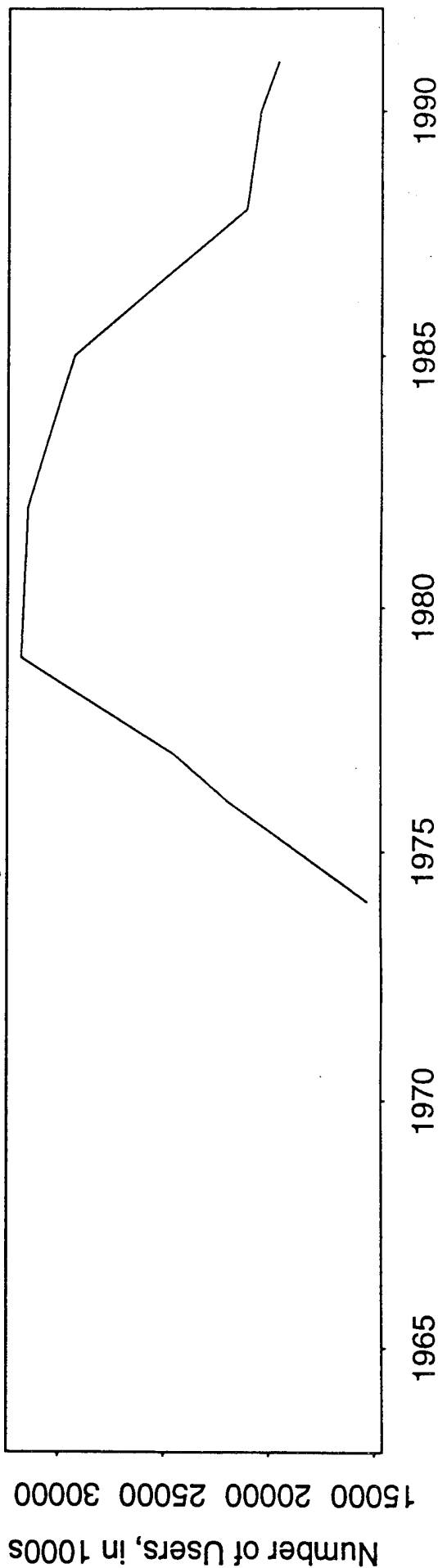


FIGURE 2

Marijuana Prevalence Household Population
Over 12 Years Old at Time of Survey



These plots of initiation are created by projecting initiates back to year of first use based on the 1990 respondents and then smoothing this data via a running median smoother to help remove some of the variability created by our estimation technique and the natural fluctuations in initiation. Figures 3, 4 and 5 show initiation curves from the NHSDA for various age categorizations. Both sets of curves confirm the findings for the aggregated data.

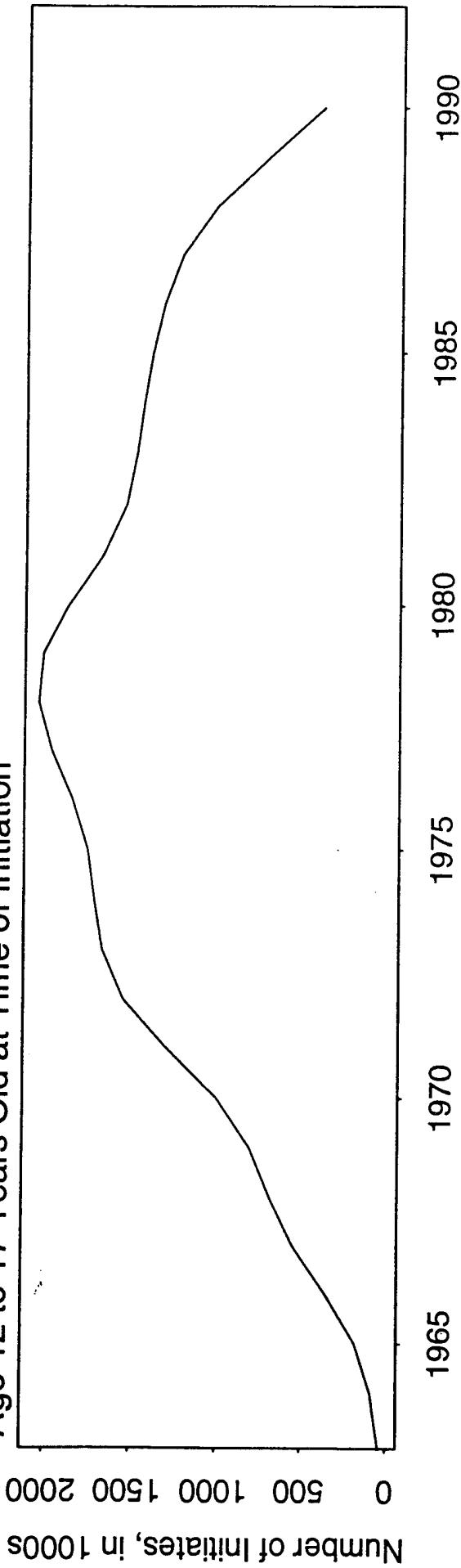
MTF Analyses of Marijuana Use

We examined trends in initiation of marijuana use in the MTF data sets in two quite distinct ways. In one method, we combined initiation information from multiple years of the survey in attempting to assess trends in incidence over time. In the second analysis, we concentrated on reports of incidence from the 1990 senior cohort, allowing for comparison across drug types for the same respondents.

Every year since 1975 high school seniors have been asked to report at which grade they had begun to use various drugs - alcohol, marijuana and cocaine in particular. Their options for response were : "Never", "Grade 6 or below", "Grade 7 or 8", "Grade 9 (freshman)", "Grade 10 (Sophomore)", "Grade 11 (Junior)", and "Grade 12 (Senior)". We linked these options back to the appropriate chronological year, and added the raw numbers reported for each year. These results (together with a running median-smoothed version) are presented in Figures 6 and 7. The focus here is on the shape of the curve, rather than on the actual magnitude of the counts, since these figures are completely sample-based and have not been extrapolated to refer to the target population of high school seniors. Once again, though, these curves based on a sample of high school students, confirm the findings from the general population NHSDA analyses. They show a sharp increase in initiation rates in the mid - to late-70's, with a peak around 1978 or 1979, followed by an equally sharp decrease in initiation over the last decade. This decrease appears to have been particularly evident in the early 80's, tapering off (but still trending down) over the course of the decade.

FIGURE 3

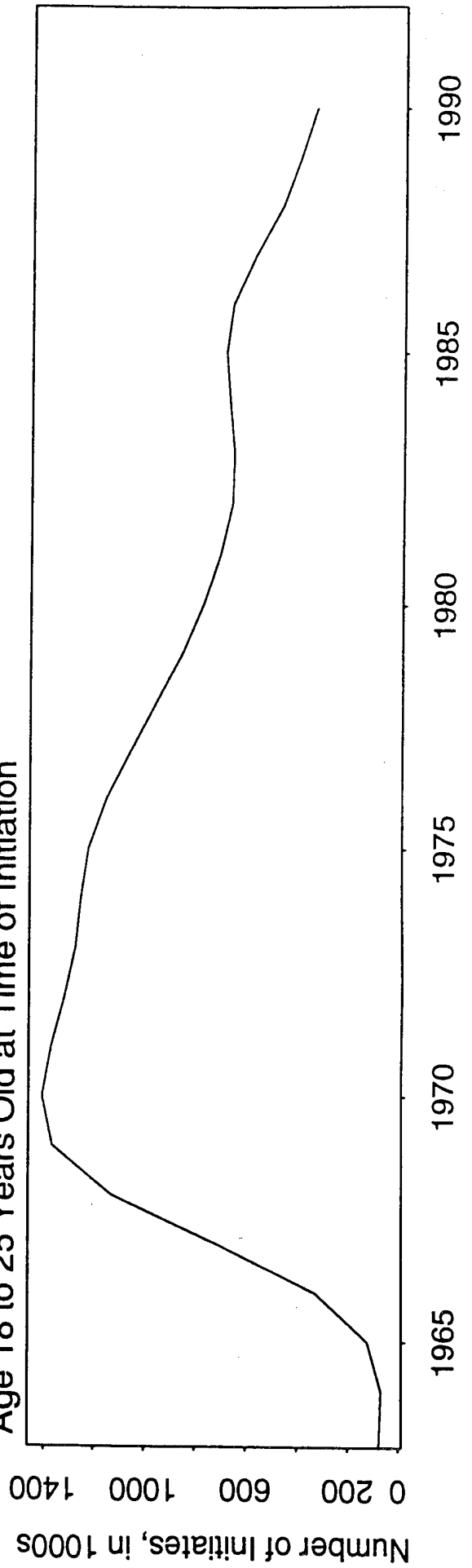
Marijuana Initiation Household Population
Age 12 to 17 Years Old at Time of Initiation



Source: 1990 NHSDA

FIGURE 4

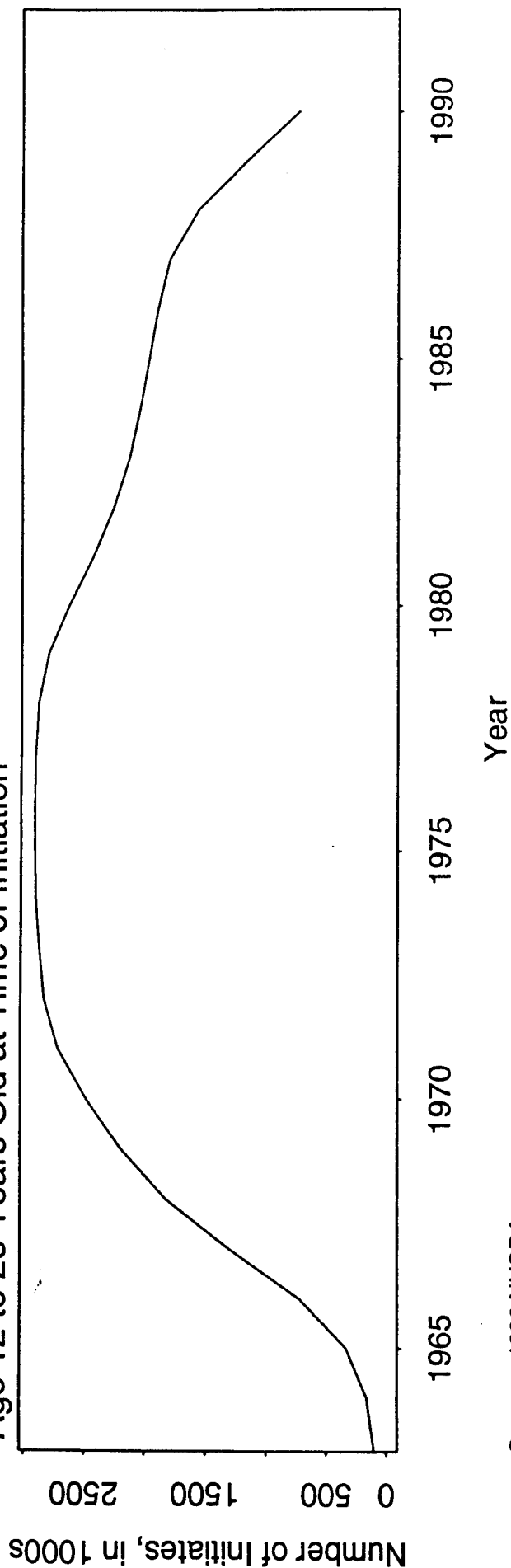
Marijuana Initiation Household Population
Age 18 to 25 Years Old at Time of Initiation



Source: 1990 NHSDA

FIGURE 5

Marijuana Initiation Household Population
Age 12 to 25 Years Old at Time of Initiation



Source: 1990 NHSDA

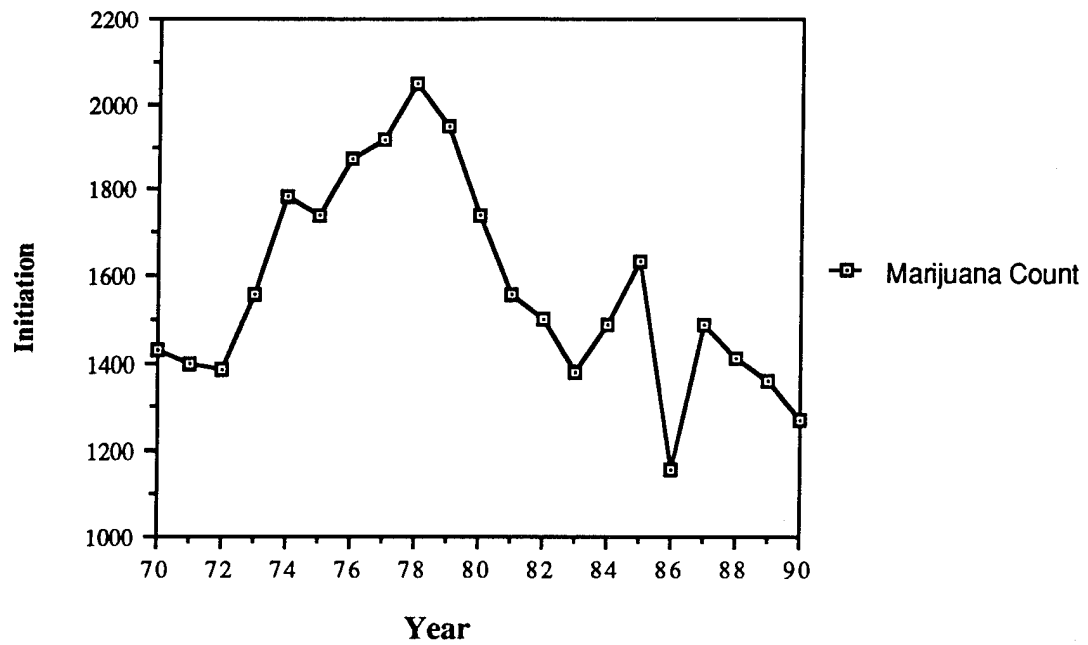


Fig. 6-High School Seniors Initiation of Marijuana Use Over Time

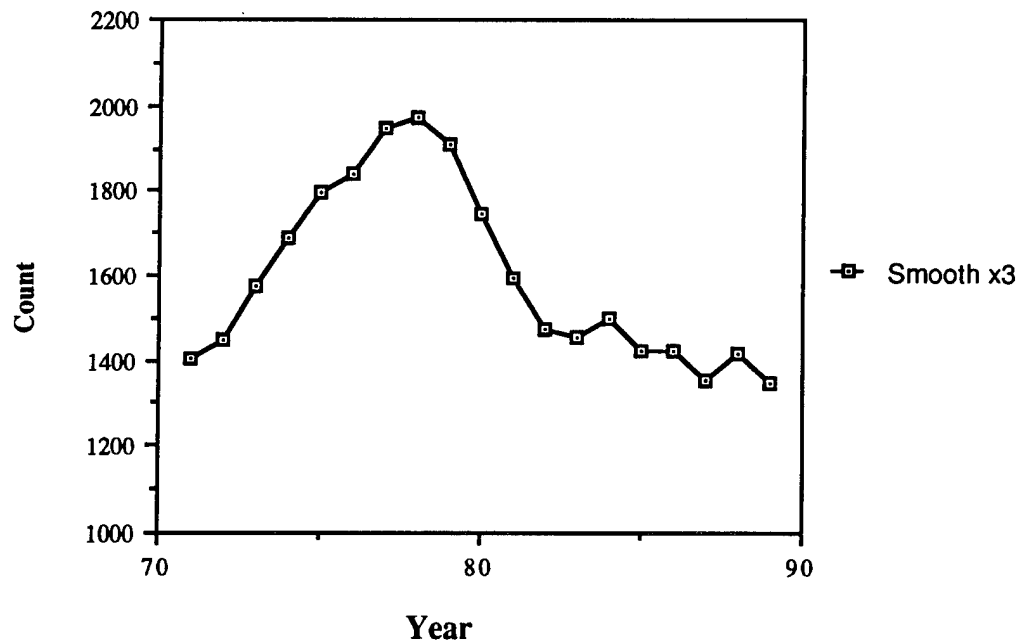


Fig. 7-Smoothed Initiation of Marijuana Use Over Time

This pattern is mirrored in the lifetime prevalence trends over the same period, although this close resemblance is to be expected for a young age group where lifetime prevalence may almost be considered a reasonable proxy for initiation. This is particularly true for the harder drugs such as cocaine.

In Figure 8, we show the time of initiation of use for different drugs as reported by the class of 1990. This graph is particularly useful for planning and intervention purposes, since it demonstrates very clearly that the age of peak risk for initiation of both alcohol and marijuana falls around the 7th and 8th grades, strongly suggesting the utility of early and ongoing prevention and intervention programs. As expected, the peak risk period for cocaine initiation occurs much later for this age group, in the 11th grade, although in fact other evidence suggests that, in the longer view, the highest risk ages for cocaine initiation are slightly later, in the college-age 18-25 year bracket (Kandel, 1980).

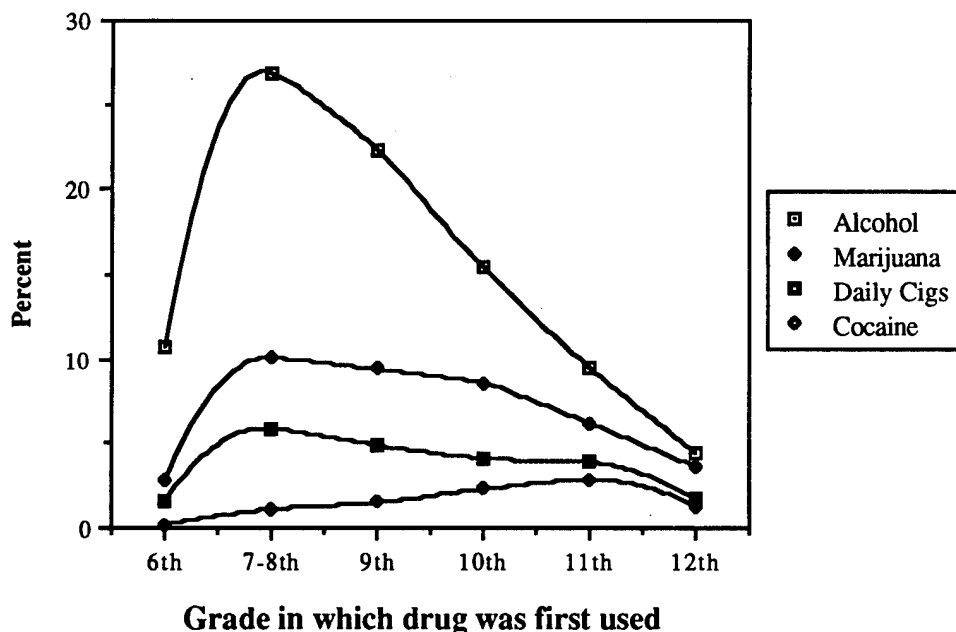


Fig. 8-Incidence of Use by Grade For Class of 1990

All four lines in Figure 8 decrease towards Grade 12. We hypothesize that this occurs for different reasons, depending on the

drug type. In the case of alcohol, since such a large percentage of respondents had already initiated before Grade 12, we interpreted this continuing downward trend as a "topping-out" phenomenon - almost everyone had already initiated by their senior year, so the numbers had to decrease. In the case of cocaine, however, there is evidence indicating that the likelihood of downward biases due to under- or non-reporting increases as the time of occurrence of the illegal or undesirable event in question becomes more recent (National Institute of Drug Abuse, 1992). This suggests that some of the downtrend in the reported cocaine initiation may be due to under-reporting and time-of-survey factors rather than a reflection of a true downward trend in cocaine incidence at Grade 12.

In Figure 9 we show a reanalysis of this initiation data for 1990 high school seniors, which removes from the denominator in the calculation the numbers of students who had already reported initiation for each drug. The effects are especially striking in the case of the alcohol curve where large numbers of students reported initiation in the earlier grades. In the cases of marijuana and cocaine, the numbers reporting initiation are so small relative to the whole sample, that removing them from the denominator has very little discernible effect on the shape of the curves for those drugs.

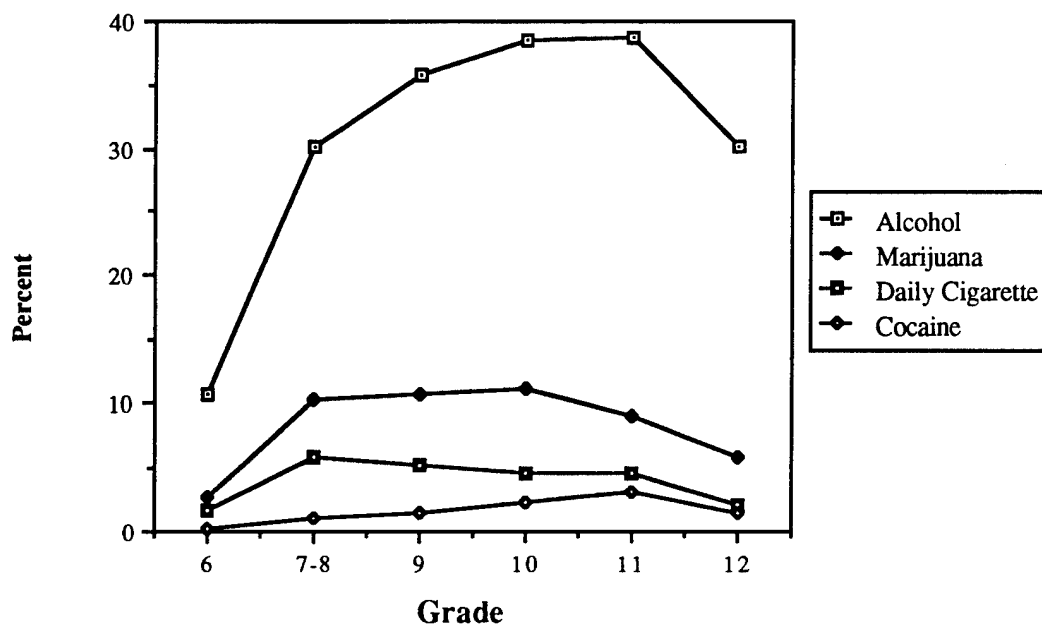


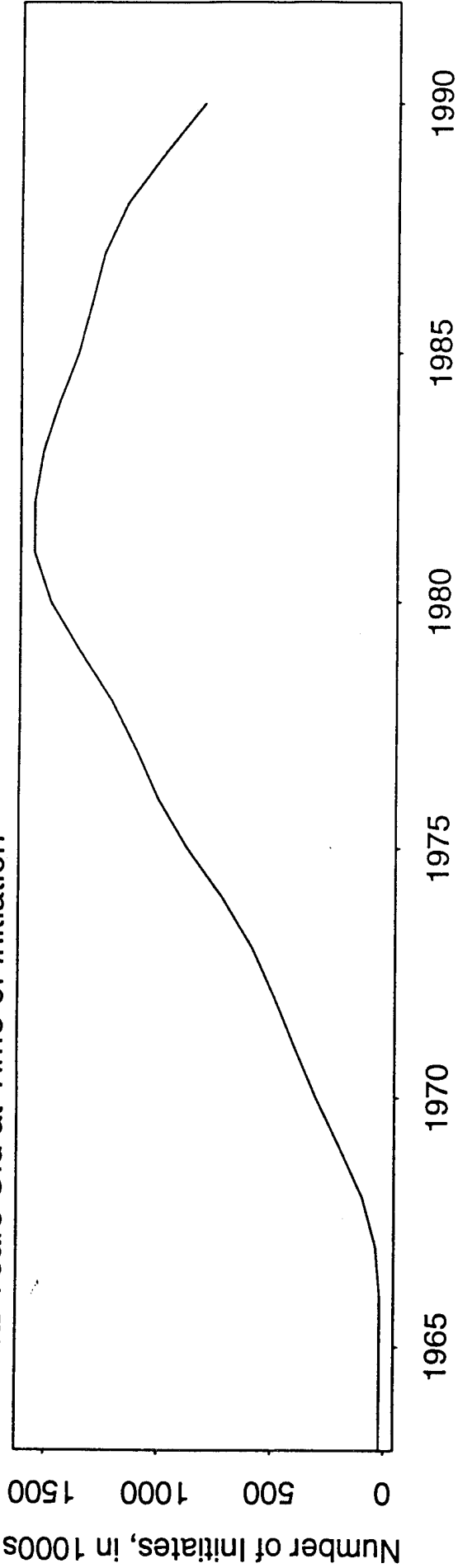
Fig. 9-Incidence of use, not counting those who have already initiated

NHSDA Analyses of Cocaine Use

Figures 10 and 11 are analogous to Figures 1 and 2 with data on cocaine rather than marijuana initiation, using data from the 1990 NHSDA. In contrast to the marijuana initiation curves for the general household population over 12 years of age, where sharp increases in initiation are seen in the late 1960's and into the 1970's, cocaine initiation began to climb steadily through the 1970's to peak almost a decade later, in the early 1980's. After this peak the trend is down until 1990, where the initiation numbers are comparable to those of the early 1970's. Again in a similar fashion to the marijuana comparisons, increases in the prevalence curve for cocaine lag behind those in the initiation curve, and show a sharp decrease after the 1985 peak, to levels comparable to the prevalence numbers of the late 1970's for cocaine.

FIGURE 10

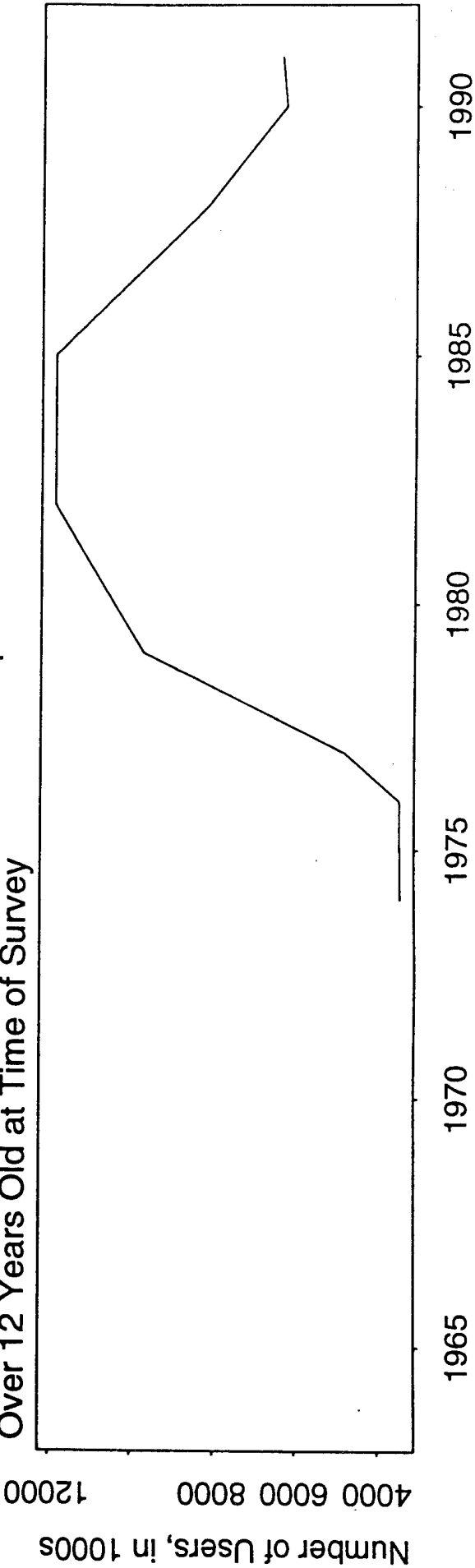
Cocaine Initiation Household Population
Over 12 Years Old at Time of Initiation



Source: 1990 NHSDA

FIGURE 11

Cocaine Prevalence Household Population
Over 12 Years Old at Time of Survey



Source: NHSDA, Various Years

Changes in Attitudes as Predictors of Changes in Initiation Among Youth

A number of recent studies has identified the correlates and potential causes of drug use in the general population, and in particular in the adolescent group. For example Johnston (1985)¹ found that the rise and decline in marijuana use among high school seniors over the period of the late 1970's to the middle of the 1980s was signaled by changes of variables asking about concerns with risks associated with drug use, and attitudes (approval or disapproval) towards drug use. In addition, preceding the decline in marijuana use in the 80's, seniors tended to report concerns about the health and psychological consequences of extended drug use. Indeed, in their analyses of the MTF data, Bachman, Johnston, O'Malley and Humphrey (1988) conclude that "a very strong association exists between perceived risk and rate of self-reported use of marijuana" (Bachman, et al., 1988, p. 104). A companion study examined the relationships between cocaine use and attitude changes (Bachman, Johnston and O'Malley, 1990). Once again, they found that declines in use of cocaine among high school seniors were accompanied or preceded by increases in perceived risk and disapproval, but no decline in perceived availability.

We reproduce here some of the results found in the papers cited above, as well as the NIDA report (1991). Because "Lifetime use" is a reasonable proxy for "Initiation" in this young population, we show trends in lifetime use, and perceptions of risks for marijuana, cocaine and binge drinking (defined as five or more drinks on a single occasion). All three sets of plots (Figures 12 - 17) demonstrate the strong relationship between shifts in attitudes and drug use patterns.

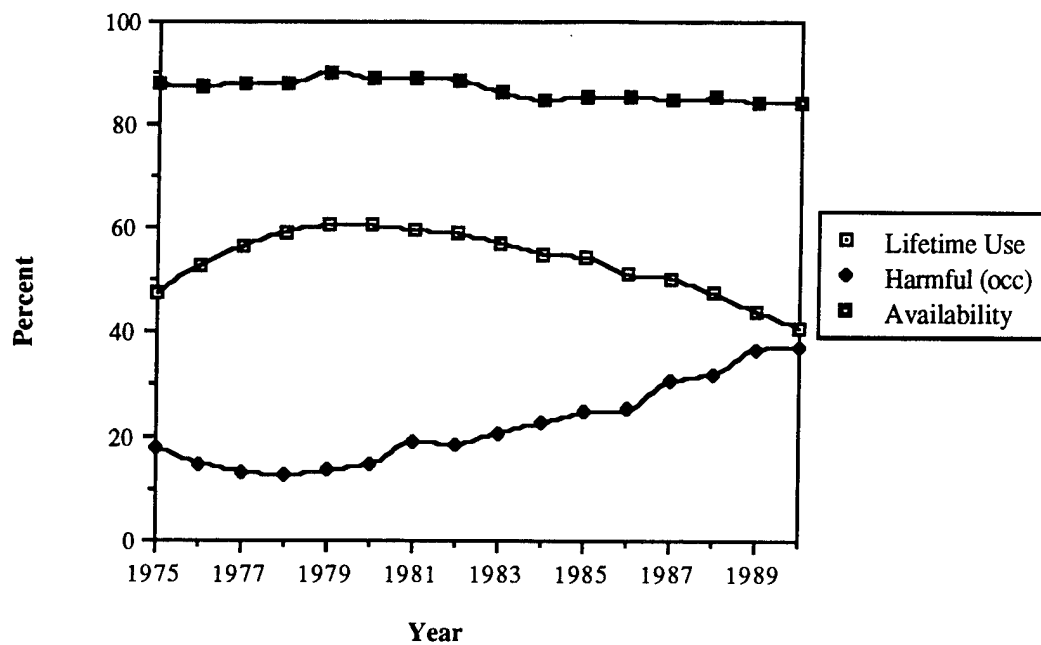


Fig. 12-Marijuana: Trends in lifetime use, and perceived availability and harm

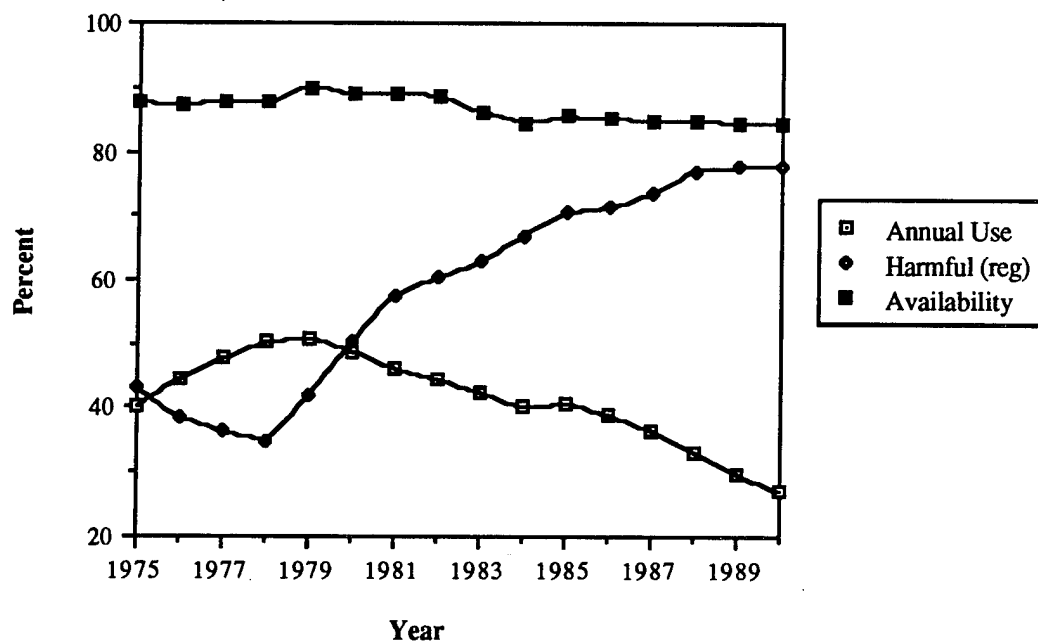


Fig. 13-Trends in annual use, availability and perceptions of harm

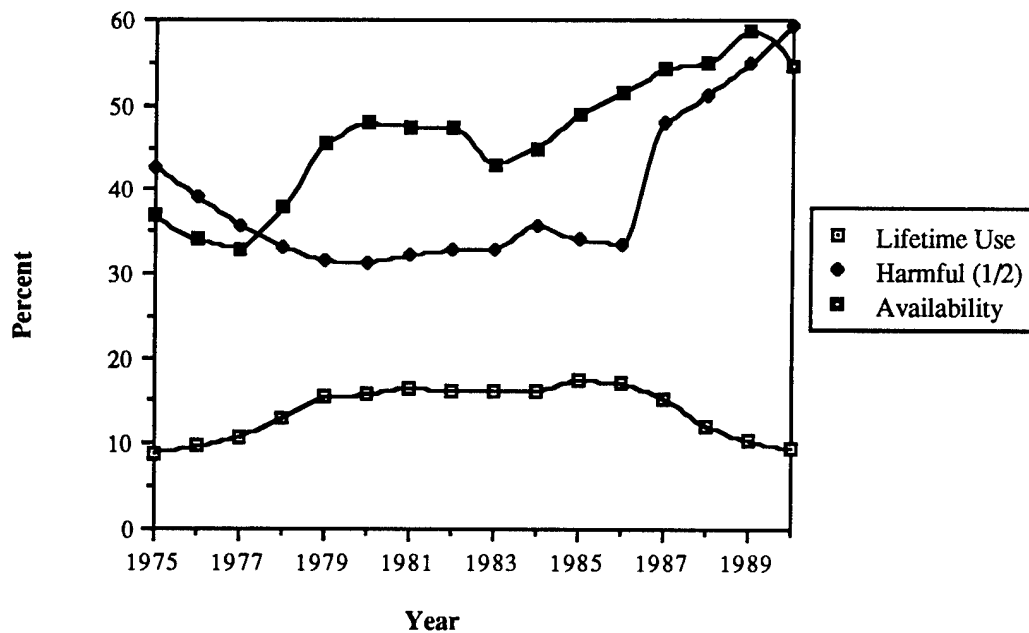


Fig. 14-Cocaine: trends in lifetime use, perceptions of availability and risk in use once or twice

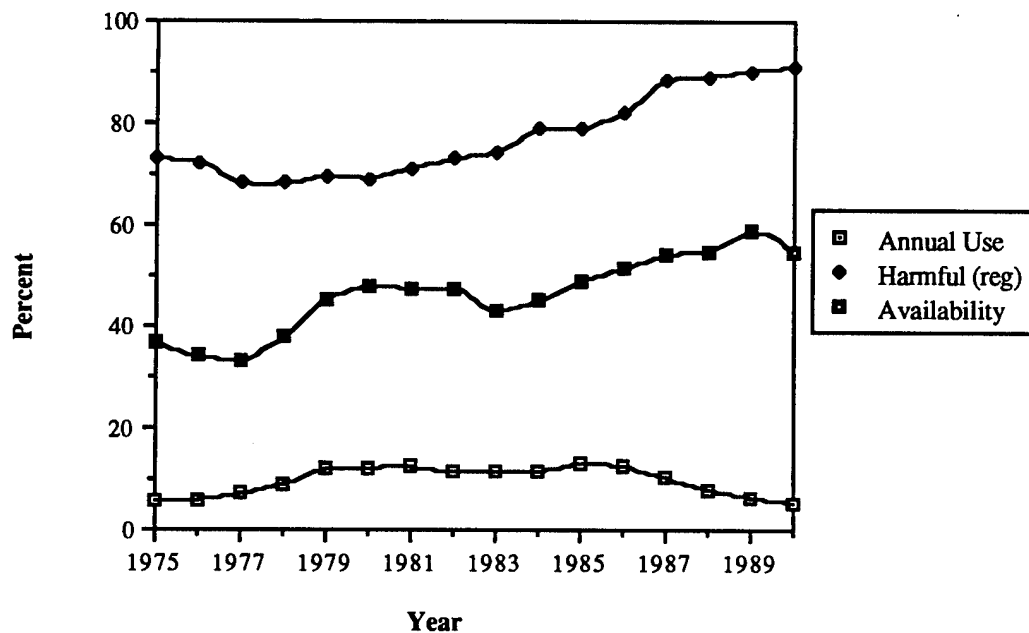


Fig. 15-Cocaine: trends in annual use, perceptions in availability and risks in regular use

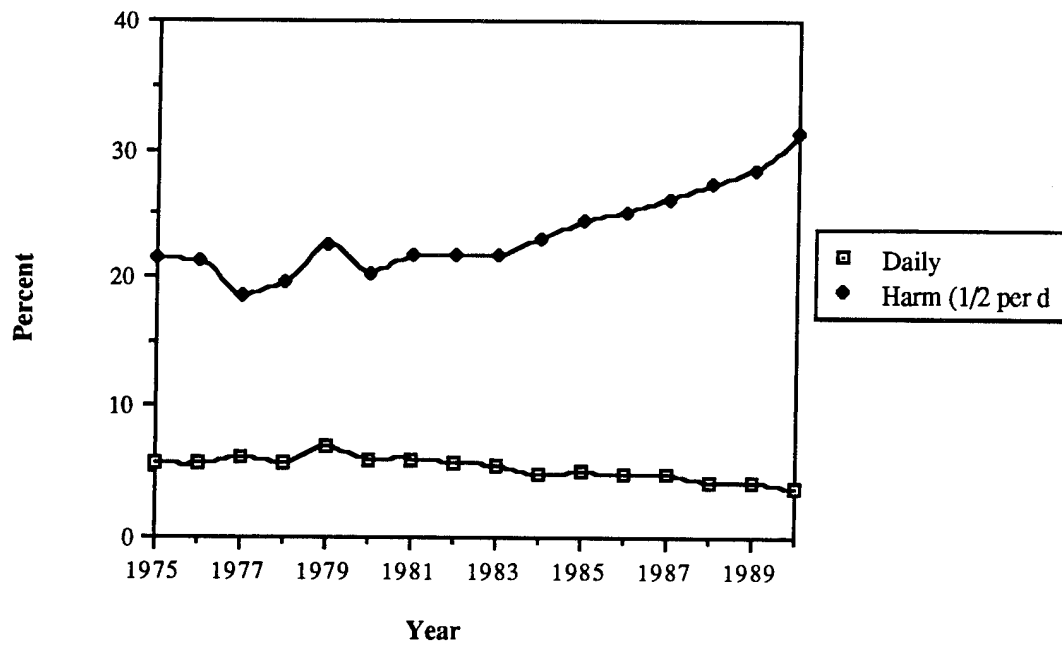


Fig. 16-Alcohol: trends in drinking 1/2 drinks per day and perception of harm

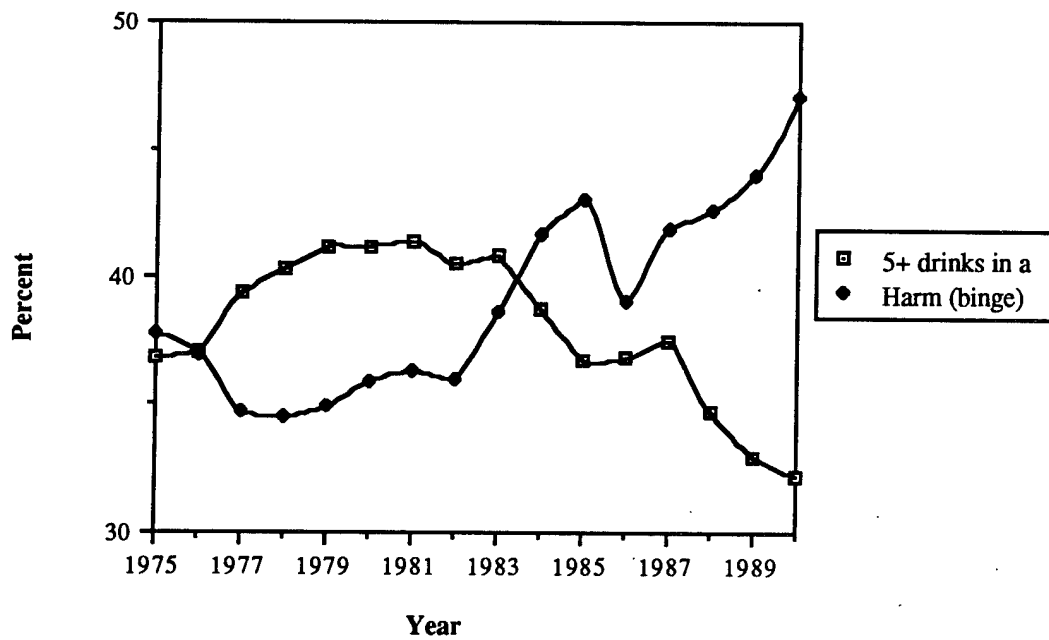


Fig. 17-Alcohol: trends in binge drinking and perceptions of risk

Retention and Persistence

This section examines retention or persistence in drug use, or its opposite coin, desistance or exit from drug use. Although this aspect of use is less frequently discussed, retention (or desistance) is in some sense more important for present policy purposes than initiation for the simple reason that initiation rates into use have already demonstrated a strong decreasing trend over the last few years. Hence, the rapidity with which current users exit use is what will determine in large part how quickly our current drug problems are alleviated.

At present it is not at all clear how quickly current cocaine users will desist. One school of thought draws an analogy with heroin and argues that current users will continue to use for years and hence the quantity consumed will not fall appreciably for quite some time. To understand this analogy recall that heroin use soared in the late 1960's and early 1970's, but initiation fell off sharply by 1973 both because of successful supply side interventions (the Turkish opium ban and the French connection case) and falling demand as heroin became associated with addiction and unhealthy use. Nevertheless heroin use continued to be a problem throughout the 1970's and 1980's because so few users quit. Certainly there was some turnover, but using careers on the order of ten years were the rule not the exception.

Another school of thought argues that ten and more year addiction careers will be rare for cocaine users. They argue that cocaine is a stimulant; it induces binge behavior and therefore compulsive cocaine use is not conducive to a stable lifestyle that can last a decade. Further they maintain that when cocaine users hit bottom they cannot continue to scrape along, following a daily routine of property crime and drug use the way heroin users do. Hence within a year or two of hitting bottom cocaine users will be off cocaine. They may be rehabilitated, substituting with alcohol or other drugs, or they may be dead, but either way they would no longer be using cocaine.

These two different schools make radically different predictions for the future course of the cocaine problem. The first school predicts that the need for treatment, enforcement against property crime, and care for cocaine-affected babies will be stable if not increasing for

the foreseeable future. The second school suggests that since initiation is low and people cannot maintain compulsive cocaine habits for long periods, the cocaine problem will ease if we just hold the line for a few more years.

One way to resolve the debate is to sit back, wait, and watch. Another is to examine the data. Reasonably definitive answers can only come from a fairly large study, probably involving new data collection, possibly prospective data. Such changes go well beyond the scope of this project, but we will once again use data from the NHSDA and MTF to illustrate some of the approaches one might use to examine these questions.

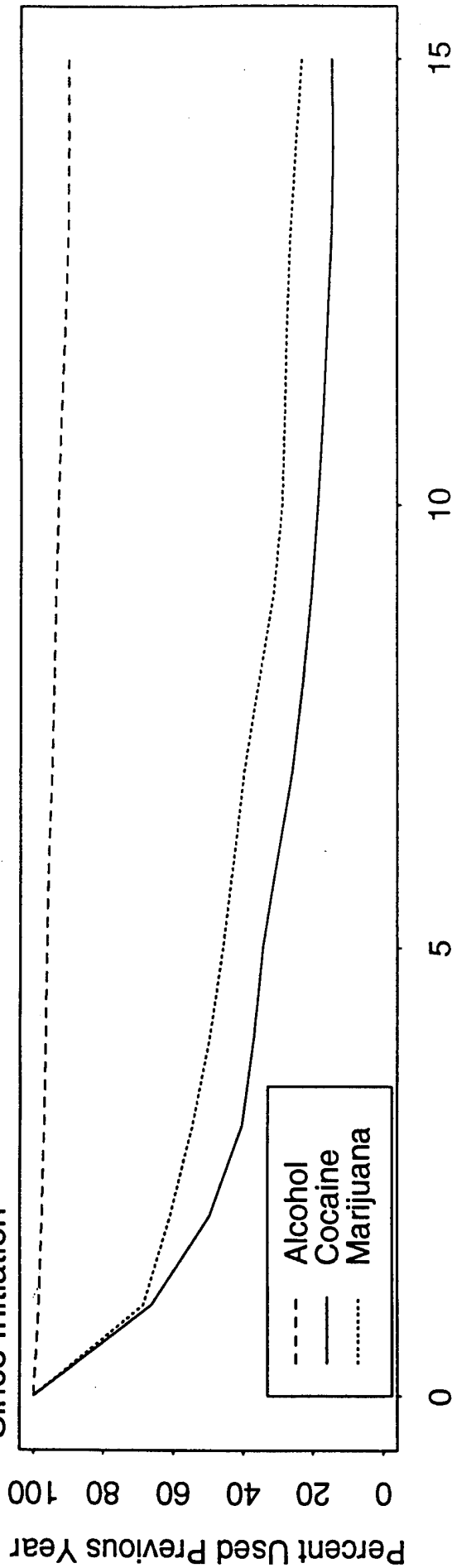
Using the NHSDA, we can look at the retention rate for use for all users, not only recent initiates. Figure 18 demonstrates that the likelihood of use declines as one progresses away from initiation, for marijuana and cocaine. The exception here is alcohol, where persistent use remains extremely high once initiation has taken place. The curves were created by doing a crosstab on use in the last year by years since initiation. Years since initiation was found by subtracting age at initiation from age at the time of the survey. This may represent a loss of interest in the drug because of some sort of diminishing returns over time or it may represent an aging-out effect. Most people initiate drug use while they are young, pre-teens and teens for marijuana, later teens and twenties for cocaine, and then as they mature their use curtails. Thus, that fewer people use 15 years after initiation may represent the fact that most of those fifteen-year users are now in their mid-thirties and have simply matured away from drug use.

Figure 19 replicates Figure 18 using the 1990, 1988 and 1985 NHSDA data on cocaine use. These curves indicate that retention patterns have changed somewhat over time, although the noise in the data makes assessment of whether these changes are significant in a statistical sense very difficult. However, the trend over time does show retention rates decreasing from 1985 to 1990, possibly demonstrating that the fall in prevalence over this same period is due both to the increase in desistance of drug use as well as to slowing initiation into use.

FIGURE 18

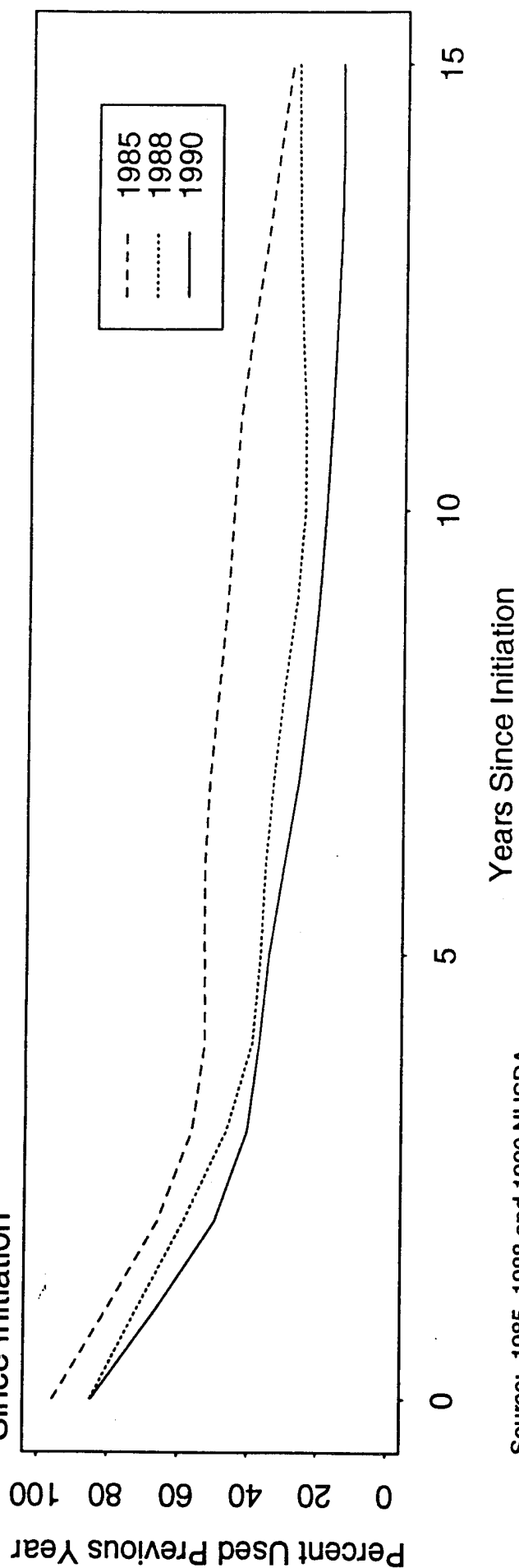
Percent of Initiates Continuing Substance Use By Years

Since Initiation



Source: 1990 NHSDA

FIGURE 19
Percent Cocaine Initiates Continuing Use by Years
Since Initiation



The data from MTF allowed us to examine retention for this population in a slightly different way. At each year of the survey administration, the numbers of seniors who indicated lifetime use of a particular drug were cross-tabulated with those who also reported not having used that drug in the last 12 months. For alcohol, these numbers remain very low - most people who begin using alcohol continue to do so, and this trend appears fairly constant over time. However, in the case of marijuana (which most seniors who had used reported having initiated before their senior year) the number of students who reported not having used the drug in the past year has been steadily increasing over time (please see Figure 20). We did not repeat this analysis for cocaine - since most seniors who had used reported having initiated use very recently, the two cross-table dimensions would be confounded.

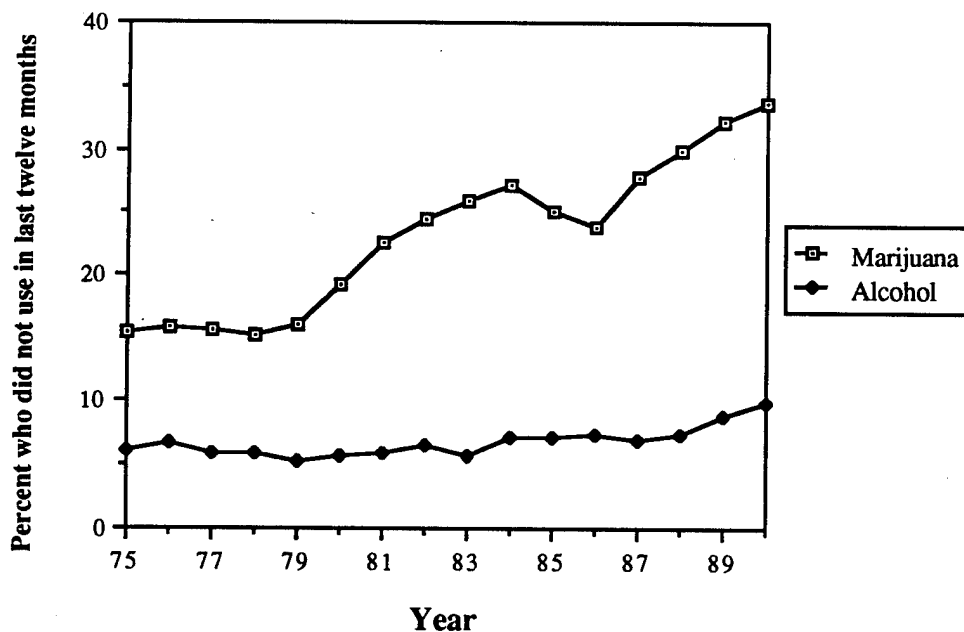


Fig. 20-Trends in Noncontinuation Rates Among Seniors Who Reported Lifetime Use

Combining Initiation, Prevalence and Retention to Forecast Drug Use

Forward looking policy analysis is greatly hampered by the lack of tools to forecast the future course of a drug use epidemic. At this point in our understanding of drug-related phenomena, predicting when

the next epidemic will commence is probably best left to the tarot cards and crystal balls, but it is possible to make short to medium term projections for substances that are already in the plateau stage of the boom and bust cycle, as we suspect that cocaine is today. In this section we discuss more specifically how desistance curves can be used in forecasting. We do not give any numerical results because the desistance curves we have computed in the above exercises are very rough, and because the forecasts also depend on one's expectations for initiation rates in the future.

One way to make such projections is simply to look at prevalence over the recent past and numerically extrapolate out into the future. Such simple curve fitting may be reasonable for very short term predictions, but it can easily go awry. However, given cohort-level, not just aggregate, data on the current stock of users and information about patterns of initiation and desistance, one can easily create a simple model that supports medium range prevalence forecasts.

For example, if

$N(t, a, t) = \#$ of a year old people who have been using for t years at time t ,

$d(a, t) =$ historical fraction of a year olds who have been using for t years who quit in the next year, and

$i(t, a) =$ forecast of the number of a year olds who will initiate in year $t > 0$,

then

$$N(t+1, a+1, t+1) = [1 - d(a, t)] N(t, a, t) + i(t, a)$$

and the forecast of prevalence is simply

$$N(t) = \sum_a \sum_{\tau} N(t, a, \tau).$$

Thus given detailed data on the stock of current users, a forecast of future initiation, and desistance curves, one can project prevalence for the medium term. One would not want to use such a simple model to forecast prevalence ten years in the future since it cannot anticipate exogenous changes and because over that time horizon historical desistance patterns might break down. But for intermediate term forecasting, it could be quite useful.

Furthermore, the model can be used to perform various "what if" analyses assessing the impact of various interventions. For example, one can readily assess the impact on future prevalence of reducing initiation by 50% simply by substituting in appropriate values for $i(t, a)$. Hence once one views drug use as a dynamic process and explicitly models cohort effects discussed below, it becomes possible to perform a variety of policy relevant analyses ranging from interpreting aggregate data more intelligently, to producing reasonable forecasts of future use, to anticipating the impact of various kinds of interventions.

Policy Implications

From analyses using information about the general household population as well as the more specific high school senior population, we see that initiation is declining for both marijuana and cocaine. Thus, the flow of people in both these populations into drug use is waning. This is encouraging news. The climate in which policy is being activated is one of declining initiation. Thus, any policy designed to reduce initiation should be measured against a counterfactual which adjusts for this secular trend. Two other flows are of interest. One is the rate of initiates that continue use beyond initial experimentation and the other is the flow from continuing use into nonuse.

We see that of all initiates who were one year older at the time of the survey than at the time of initiation, 68 percent used marijuana in the last 12 months and only 23 percent used in the last 30 days. This gives us a proxy for the number of initiates who go beyond initial experimentation into a more continuous use. This measure may exaggerate continuation for a number of reasons but it may be useful for cross-time comparisons. The proportion who used in last 12 months given that age at initiation and age at time of survey differ by one year may exaggerate the retention rate for initiates because even though the ages differ the survey respondent might have only first initiated in the last 12 months. Also a person may try a drug once or twice in a short period of time (say within 12 to 15 months) and we may not really want to

consider this person a continuing user. Again, a person may stop out of use but return to use in the future. This may be especially true of young initiates who go through an on-off pattern of experimentation over a year or so before settling down to a more stable use pattern of either no use, periodic but not regular use, or regular use. This would tend to bias the measure downward.

The long-term health and social consequences of using drugs become progressively more severe as the user persists in this behavior. Furthermore successful treatment of long term users becomes increasingly difficult. The retention curves for marijuana and cocaine suggest that between 18 and 25 percent of users of these drugs have not matured away from use but are still using 15 years after they first initiated.

Caveats and Suggestions For Further Analyses

Only people 12 or older when they initiated were included in these analyses to avoid censoring in the later years of the data. Because we have a sample of people age 12 or older in 1990, we have a sample of people 11 and older in 1989 and 10 and older in 1988 and so on. However, because of mortality and the limitations of the household population a representative sample of people from the 1990 household population is a sample of people 12 and older in earlier year but it is not representative. People who initiate drug use early may be at greater risk for early mortality and not living in a household as they age. Thus we may systematically have selected people in 1990 who were less likely to have initiated in the past. This will create a downward bias in our initiation estimates. This bias should grow larger as we project back further in time. Another source of downward bias is that as people age, they increasingly tend to underreport ever having initiated. Also, as we project back too far, mortality will censor the population. Thus we limit our focus to 1964 to 1988.

Biases may creep into the early data even when limited to the years proceeding 1963, however, it is doubtful that the bias would change the qualitative feature of the plot, the dramatic increase in initiation in the late 1960s. Furthermore, the leveling off of initiation is not likely to be an artifact of the bias because the bias should shrink for

years closer to 1990. Thus if anything we may suspect that the plot understates the fall off in initiation.

The data stops at 1988 because of censoring due to time the survey was taken. This will tend to truncate the population of people who initiated during both 1990 and 1989. The calendar year assigned to each respondent as his year of initiation is not necessarily the correct year. People may have given the wrong age. That is there may be error in the measurement. Also, subtracting one age from another and then subtracting this difference from 1990 is not a precise means of determining calendar year of initiation. A person who is say 18 today and first used marijuana when she was 14 may have started anywhere from 3 to 6 years ago depending on the proximity to her birthday of the day of the survey and her first use. Also because of the spread over the calendar this first use could have been in 1985, 1986 or 1987. Thus the point estimates for number of initiates in each year will be somewhat imprecise. The split over years should tend to balance out as the misplaced 1985 initiates should counter misplaced 1984 and 1986 initiates. Also even with precise estimates one would expect considerable year to year variation in the number of initiates regardless of longer term patterns. Thus, to provide a clearer picture of the long term pattern, the data were smoothed using a running median smoother.

The analysis is for the total population but could be done for various subpopulations. This might show more of the true dynamics of use. It would also be useful to examine the rates of initiation by dividing the prevalence numbers by population estimates for each year. In extending the analyses of retention in drug use, it may be possible to do some more sophisticated survival hazard type analyses on these data looking at the retention curve over years and for different age groups. While we consider this to be beyond the scope of this report, nevertheless it is an interesting application, which could be usefully returned to in future work. In addition, seeing if retention rates are influenced by opinions would be a nice companion to looking at how initiation responds to opinions.

Alternative Dynamic Flows

Although one model of dynamic drug use is to follow the patterns of use through individuals, one may also consider dynamic flows of use across time and space. Some of these may operate as useful "early warning" systems for new types of drugs and use patterns. In this section we briefly examine several such systems. The first example offers an alternative to analyses of drug use by age of the users, to incorporate cohort effects. In so doing, we demonstrate that observed increases in lifetime use prevalence among certain age groups of the general household population may be substantially overestimated by the age-by-use analyses. Second, we present data from MTF showing trends in attitudes towards various types of drug use from 1975 to 1990, in conjunction with actual reported use trends and perceptions of availability of the drug in question. We find that often the changes in attitudes among high school seniors are strong presages of both increases and decreases in their reported use of substances such as cocaine and marijuana, as well as serious or binge drinking bouts. The final example contains no new analyses, but we discuss in general terms the geographic percolation of use of different drugs across the country and across sections of the population over time. We also offer some suggestions for future analyses using the Drug Abuse Warning Network, which may be useful in infusing this general discussion with some relevant data.

Age Cohort versus Birth Cohort Reporting of Data

Between 1985 and 1990 the lifetime prevalence of marijuana use among adult (35 years and older) members of the household population grew by 6% from about 16% to 22%. Similarly, over the same period the lifetime prevalence of cocaine grew from 4% to 6%. Is this a cause for concern? Is there a new epidemic of illegal drug use brewing among adults?

The answer is no, but one would never know that from data reported by age cohort, which is the usual practice. Another facet of understanding the dynamic evolution of drug use in a population is recognizing cohort effects. A birth cohort may be defined as "those

persons born in the same time interval and aging together" (Ryder, 1965). To put it simply, the drug using experiences of different generations are different. Hence data reported by birth cohort paint a much different picture than data reported by age cohort. Both views are useful, but at present one rarely sees data reported by birth cohort. This section will illustrate its value by example.

Before turning to the actual data we will show through a stylized example that this problem did not arise solely because of the use of "lifetime prevalence" as the variable to be analyzed. One might think that the problem could have been avoided even with age cohort data by using past year prevalence, but one would be wrong. In fact, when data are reported by age cohort it is possible to see dramatic increases in annual prevalence even if not one person initiates drug use and 50% of all past drug users in every age cohort cease use.

To see how this can happen, observe the following table of hypothetical 12-month prevalence for 1985. For simplicity assume a stable age structure with 3 million people of every age 1 - 80; this assumption is not instrumental to the paradox.

Table 1

<u>Age</u>	<u>N</u>	<u>Prevalence</u>	<u>Number of Users</u>
30-34	15,000,000	12.0%	1,800,000
35-75	120,000,000	0.5%	600,000
76-80	15,000,000	0.0%	0

Note that 0.6 million of the 135 million people 35 years and older were users, so the prevalence among that age group is $0.6/1.35 = 0.44\%$.

Now suppose that over the next five years half of all these people stopped using and no one started. What would the prevalence of 35+ year olds be in 1990? There would then be $0.5 * (1.8M + 0.6M) = 1.2$ million users, yielding a prevalence of $1.2/1.50 = 0.80\%$, almost double the previous value.

Hence even though half the people stopped using the prevalence among 35+ year olds doubled because of the influx of users into that age

category . This sort of apparent paradox arises when data are reported by age cohort instead of birth cohort. This example used hypothetical data, but the same problem arises with actual data.

In the table below, we present actual data from the NHSDA for the years 1985 and 1990, showing the lifetime prevalence for marijuana and cocaine, desegregated by age groups for people between 20-44.

Table 2

Age Group	Marijuana 1985 (%)	Marijuana 1990 (%)	Cocaine 1985 (%)	Cocaine 1990 (%)
20-24	62.8	56.1	26.2	21.9
25-29	62.4	64.3	27.3	26.8
30-34	55.8	56.6	22.1	24.5
35-39	40.2	52.9	13.1	18.1
40-44	26.3	40.0	3.2	10.3

Table 2 demonstrates the lesson of the above hypothetical example very clearly. Consider the age group of 40-44 year-olds. If the cohort effect is not taken into consideration in these data, the increases in use from 1985 to 1990 in this age category may seem truly alarming - from 26% to 40% for marijuana, and from 3% to 10% for cocaine. But when one considers that the 40-44 year olds in 1990 are the 35-39 year-olds in 1985, in fact the figures tell a slightly more comforting story - almost identical percentages for marijuana, and only slightly lower 1990 prevalence figures for cocaine. Similarly, the principal reason that lifetime prevalence of 35+ year-olds rose between 1985 and 1990 is not because of new use but because the lifetime prevalence of 30-35 year

olds in 1985 who aged into the 35+ year old category by 1990 exceeded the lifetime prevalence of their seniors in 1985. Thus the unexpected jump in cocaine prevalence is not primarily due to any dramatic surge in initiation among the middle aged, but rather due to the familiar process of aging.

Geographic and Demographic Flows of Drug Use

A focus on the dynamics of use within an individual or a population is a natural starting point for discussion of these use processes. However, there are several other ways of viewing the diffusion of drug use, both geographically, and across different populations over time, which may inform the development of useful policy, particularly in formulating forecasts of future trouble spots, types of drugs, or subgroups of the population.

For example, newspaper reports seem to indicate a burgeoning use of heroin among underground rock groups originating from the Seattle area. Similarly, DAWN reports from the Newark area suggest that heroin use among inner city youth is on the increase in that region as well. There are unsubstantiated reports of increased LSD use on college campuses around the country, and mentions of ecstasy use have been increasing in areas such as Southern California.

All these examples embody "bellwether" groups or regions of the country which bear watching as forecasters of possible trends in the general population. The diffusion of drug use across spatial boundaries or across population groups has not been investigated in depth. We suggest that in particular the DAWN data system may be utilized to examine the first of these questions. DAWN tracks a large numbers of substances in emergency rooms in many regions of the country. A careful analysis of these various substances could reveal increases in unusual substance use. It may also be possible to monitor the flows to surrounding cities over time. However, because small changes in use as indicated in DAWN may be the triggers which point to large or important changes in use patterns, this analysis would be time-consuming and costly, and thus would depend heavily on validation of DAWN as a useful indicator of warning for new substance use.

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APPENDIX B

DIFFERENTIATING THE DEMAND FOR DRUGS

Effective policy planning requires an understanding of potential response to policy options so that programs can be targeted and expectations of their impact can be realistic. Identifying the target of a program is especially important for programs designed to disrupt the drug market. The goal of such programs is to disrupt supply so as to shift the supply curve and increase cost. According to the most basic of economic principles, increasing cost will decrease demand. While this might be true, if there are many different demand curves, changing price will have various levels of impact of use. Dependent users might be totally unresponsive to price and thus increasing cost will have no effect on these users. Very light users might be highly responsive to price and small increases in price might cause them to stop their use. Or very light users may be social users and as long as drugs are fashionably available they will continue to use regardless of price. Also depending on the nature of demand, disrupting supply might have overall negative effects.

If, for example, most heroin users are drug dependent and will use heroin at any price, i.e., they are very price inelastic, then increasing the price of heroin will most likely not decrease use but could greatly increase crime associated with obtaining money to purchase heroin. In such a case measuring the effectiveness of heroin supply reduction programs by monitoring prevalence rates could be greatly misleading. Prevalence could decline simply because initiation is low and the hard-core user population is dying off.

On the other hand, measuring policy effectiveness using only a general prevalence indicator could understate the positive effects of a policy. If, for example, many people who use marijuana are highly cost conscious and willing to substitute alcohol for marijuana, increasing the cost of marijuana may greatly reduce the amount of marijuana consumed. However, if these people still use irregularly or if regular users make up only a small fraction of total users then prevalence levels may remain high even though there was a substantial reduction in marijuana consumption.

These hypothetical examples illustrate both the complexity of the drug use patterns that challenge policy planners and the inadequacy of

standard measures such as prevalence rates for monitoring the impact on use behavior that policies achieve. Yet, in the NHSDA there is much more information collected about drug demand that could be used to improve understanding of variation in demand, and to monitor program impact.

This paper reports on the results of two exploratory analyses using NHSDA measures that help differentiate the demand for drugs. Unlike prevalence, these measures are not commonly monitored, but could make the survey more relevant for evaluating the effectiveness of policies aimed at reducing use by manipulating the drug market.

The first analysis investigates variation in market participation using information about drug purchasing and consumption patterns. The second, suggests that more policy relevant classification of users can be made to shed some light on heavy use captured within the household population.

THE MARKET DEMAND FOR ILLICIT DRUGS

Introduction

As noted above, understanding the market demand for drugs is essential for evaluating policy designed at reducing use. Information on drug markets is also valuable because many policies are aimed at contracting the markets simply because the black markets for illicit drugs have their own negative social costs. These markets are violent, they funnel money into the hands of criminals and the outdoor markets significantly disrupt the quality of life in many neighborhoods.

To begin understanding the demand side of these drug markets, this example investigates market participation of cocaine and crack users in the household population. It finds that most self reported users do not report purchasing these substances. The example also looks at consumption patterns of cocaine users and reveals that only a small fraction of users account most of the cocaine consumed and therefore a majority of the market. A brief but analogous review of marijuana consumption is also given.

Material and Methods

Information on cocaine consumption and purchases was obtained from the 1990 National Household Survey on Drug Abuse (NHSDA). The NHSDA is a survey of drug use behavior given to a probability sample of the U.S. household population. (See GAO, 1993, for a full description of the survey and the sample.) This survey yields estimates of drug use for the entire nation and select subpopulations.

A section of the NHSDA asks respondents about their experiences with cocaine. For those who used cocaine, in any form, in the 30 days prior to completing the survey, the survey contains specific questions about money spent on cocaine other than crack and money spent specifically on crack. There are also questions on the number of grams of cocaine (excluding crack) used in the last thirty days and the number of vials of crack consumed in the last thirty days. The respondent is asked to recall the number of days in the last thirty that he or she used cocaine (in any form) and the frequency of cocaine use for the entire year. (Frequency of use is measured as daily, almost daily, a couple of times a week, and so on down to once or twice a year, see NIDA 1990 for a couple list of possible responses.) The survey also asks previous thirty day users of marijuana to recall the amount of marijuana consumed. These questions provide the basis for all analyses in this example.

The analyses in this example are basically descriptive. Disparity in consumption, however, is demonstrated using a Lorenz curve. The Lorenz curve plots the percentage of users ordered in ascending order of consumption against the percentage of total substance consumed. If all users consumed the same amount of substance then the Lorenz curve would be a forty-five degree line. The more the Lorenz curve bows away from the diagonal the more there is a disparity in use; a very bowed curve implies that a small percentage of users consume a large percentage of the total amount consumed.

Results

According to the NHSDA data from 1990, only 48 percent (650 thousand out of 1.36 million) of the people reporting that they had used

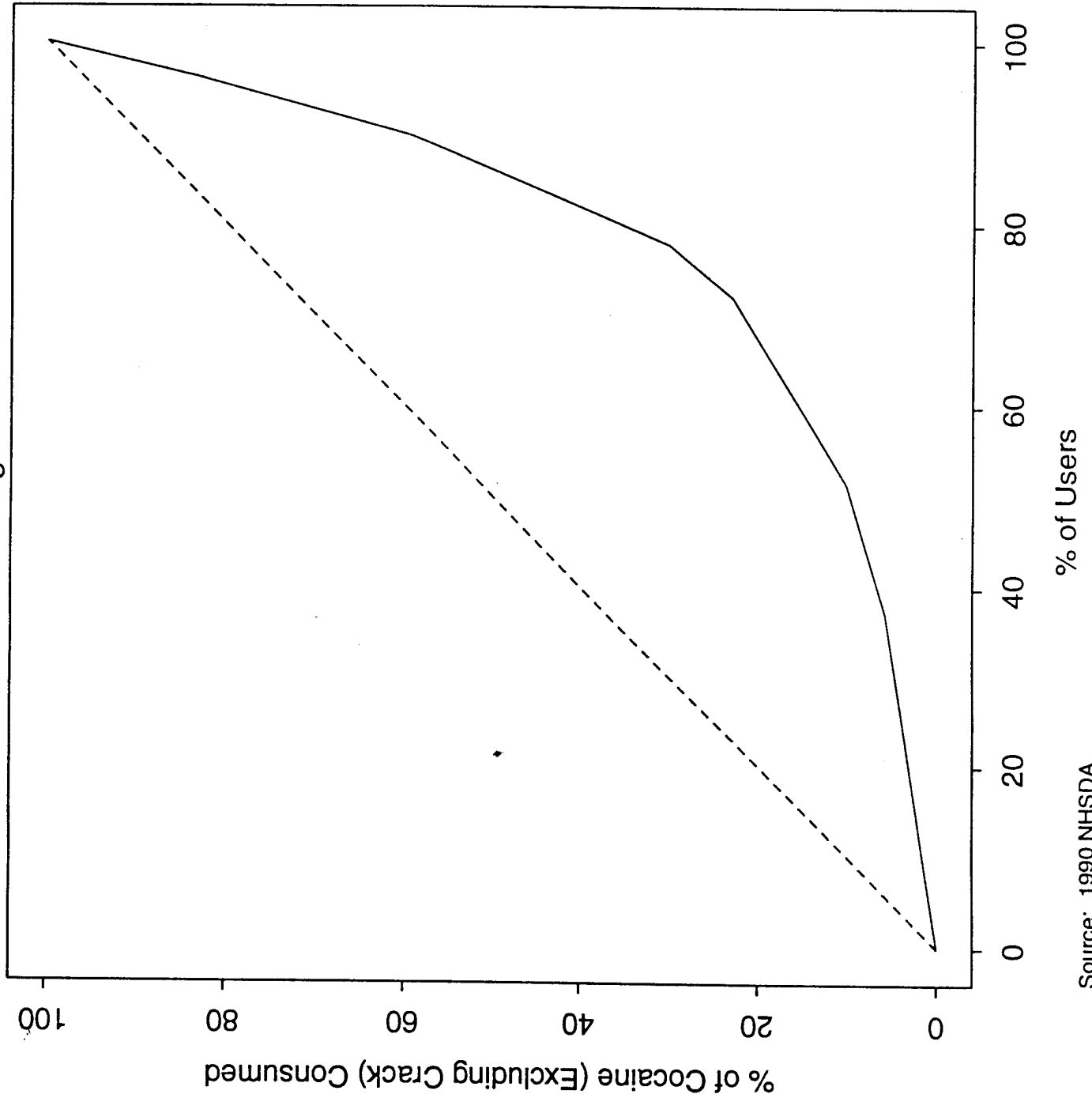
powder cocaine in the last 30 days reported having spent some positive (nonzero) amount of money on powdered cocaine. The comparable number for crack was 49 percent. It seems plausible that the fraction is even lower among the 4.65 million who used cocaine (in any form) in the last year but not in the last 30 days, because users are probably even less likely than regular users to make their own purchases. Hence, it appears that a significant fraction of users do not, of at least do not always, purchase their own supply.

Exploratory analysis with NHSDA data reveals that the survey captures enormous heterogeneity of drug use behavior. This is especially true for consumption patterns. A somewhat common pattern of regular cocaine use is to use a quarter of a gram every weekend or so in a social setting. At the other extreme Waldorf et al. (Cocaine Changes) describe individuals whose consumption reached -- grams per week, or -- times the previously mentioned rate of consumption.

Our review of consumption patterns by current (past 30 day) users of cocaine in the household population supports the adage of great heterogeneity in consumption. Figure 1 shows a Lorenz curve for quantities consumed among past 30 day cocaine users, as self reported in the NHSDA. It clearly shows disparity in consumption. For example, the ten percent heaviest users consumed over 70 percent of all cocaine consumed. Furthermore, each member in the highest use group consumed at least 3 grams of cocaine in the last 30 days. Three grams is sufficient for weekly or more frequent. This contrasts sharply with the bottom 50 percent of users who claim to have used no more than a quarter gram during the last 30 days. A single use session of a couple of lines of powder cocaine typically requires about a quarter gram. Thus, 50 percent of the current users used no more than about once or twice in the entire month.¹

¹The measure of days used reveals that about 44 percent of previous 30 day users only one or two days and roughly 56 percent used three or more days in the past 30. Thus, the consumption figures might be slightly understated. Or the standard guess of about 1/4 gram per use session may not be accurate for casual social users who sample very small amounts of cocaine at various occasions.

FIGURE 1
Cocaine (Excluding Crack) Consumption Among Past 30 Day Users
All Ages



These results are interesting, but the reliability of self-reported data on expenditures and quantities consumed is not great. Hence one might wonder whether the bow in the Lorenz curve is real or an aberration of poor data. To bolster confidence in the findings we conducted the same analysis with different data.

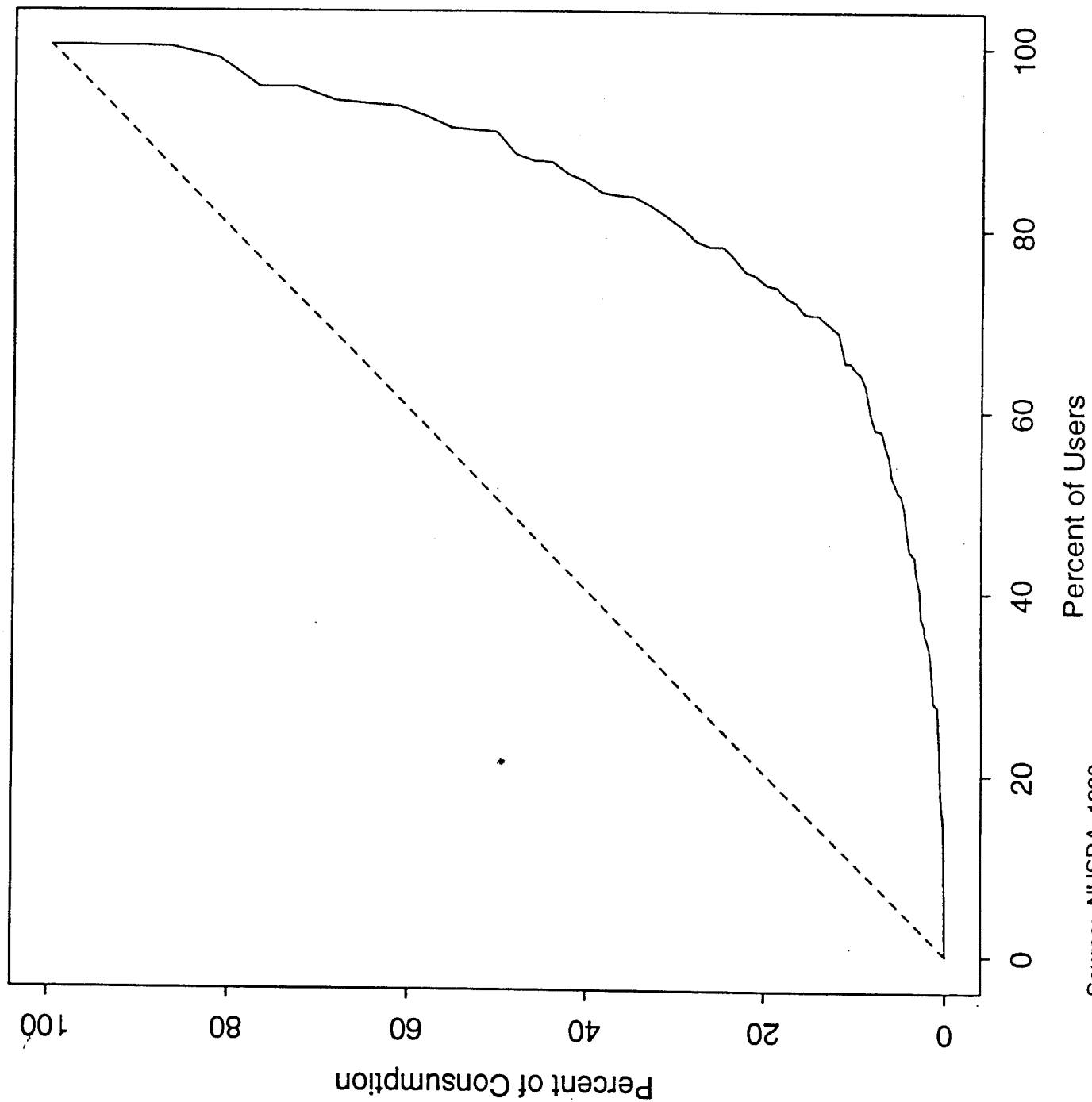
The NHSDA contains other question on cocaine use that provide information about variation in consumption patterns. We examined these measures and created alternative cocaine consumption Lorenz curves and find that they too demonstrate heterogeneity of consumption among those who have used during the 30 days prior to the interviews.

The NHSDA asks not only about the quantity consumed, but also about the number of days the individual used in the last 30 days. If one makes the assumption that all use sessions involve nearly the same quantity of drugs, then one can equate days used with quantity consumed and create a Lorenz curve from this data. Of course, not all use sessions involve the same quantity of cocaine. However, as long as heavy users do not systematically use less cocaine per day of use than do light users, any bow in this Lorenz curve will not overstate the true disparity of consumption. This Lorenz curve is given in Figure 2.

The Lorenz curve drawn from this alternative measure of consumption portrays a similar picture of consumption as did Figure 1. Most of the cocaine is consumed by a small fraction of the users.

Another alternative and similar measure of consumption derives from the NHSDA's measure of frequency of use of all past year users. Each user classifies her use frequency in the past year along a scale that ranges from daily to once or twice a year. If this measure is converted to days used, then under the assumptions made above frequency of use yields a measure of consumption. The Lorenz curve drawn from this measure of consumption (Figure 3) again shows great heterogeneity of consumption. This curve has an even greater bow than the curve for the past 30 day users. This may stem in part from the fact users who used in the last year but not the last 30 days are the lightest of all cocaine users.

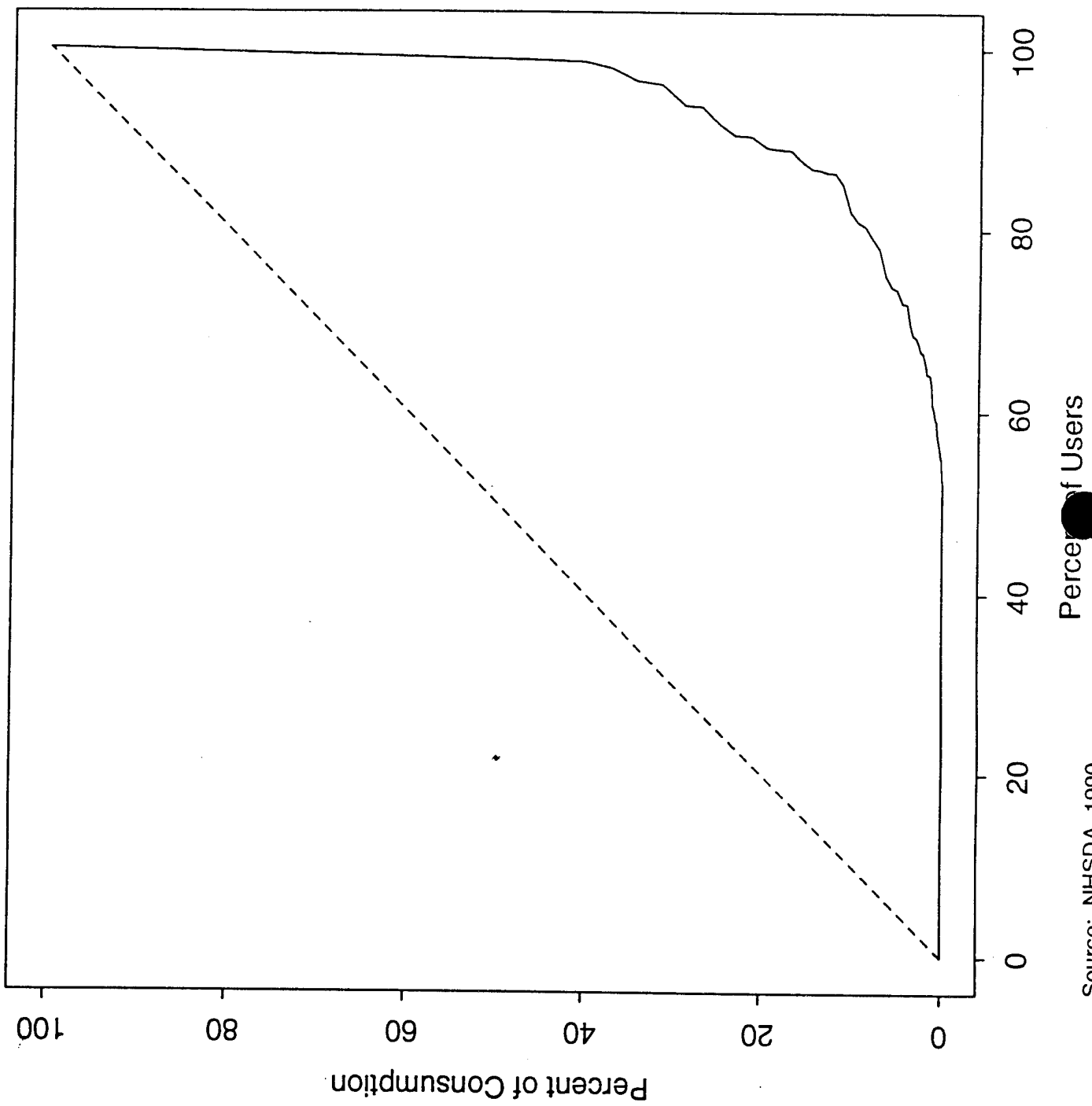
FIGURE 2
Cocaine Consumption for Previous 30 Day Users



Source: NHSDA, 1990.

FIGURE 3

Money Spent on Cocaine by Previous 30 Day Users*



Source: NHSDA, 1990.

A Lorenz curve drawn from the spending data (Figure 4) shows a great disparity in the amount of money spent on cocaine. Because many users consume but do not report purchasing, expenditure is not equivalent to consumption. There must, however, exist some correlation between consumption and expenditure and the disparity in expenditures offers still further confirmation of our initial cocaine consumption results.

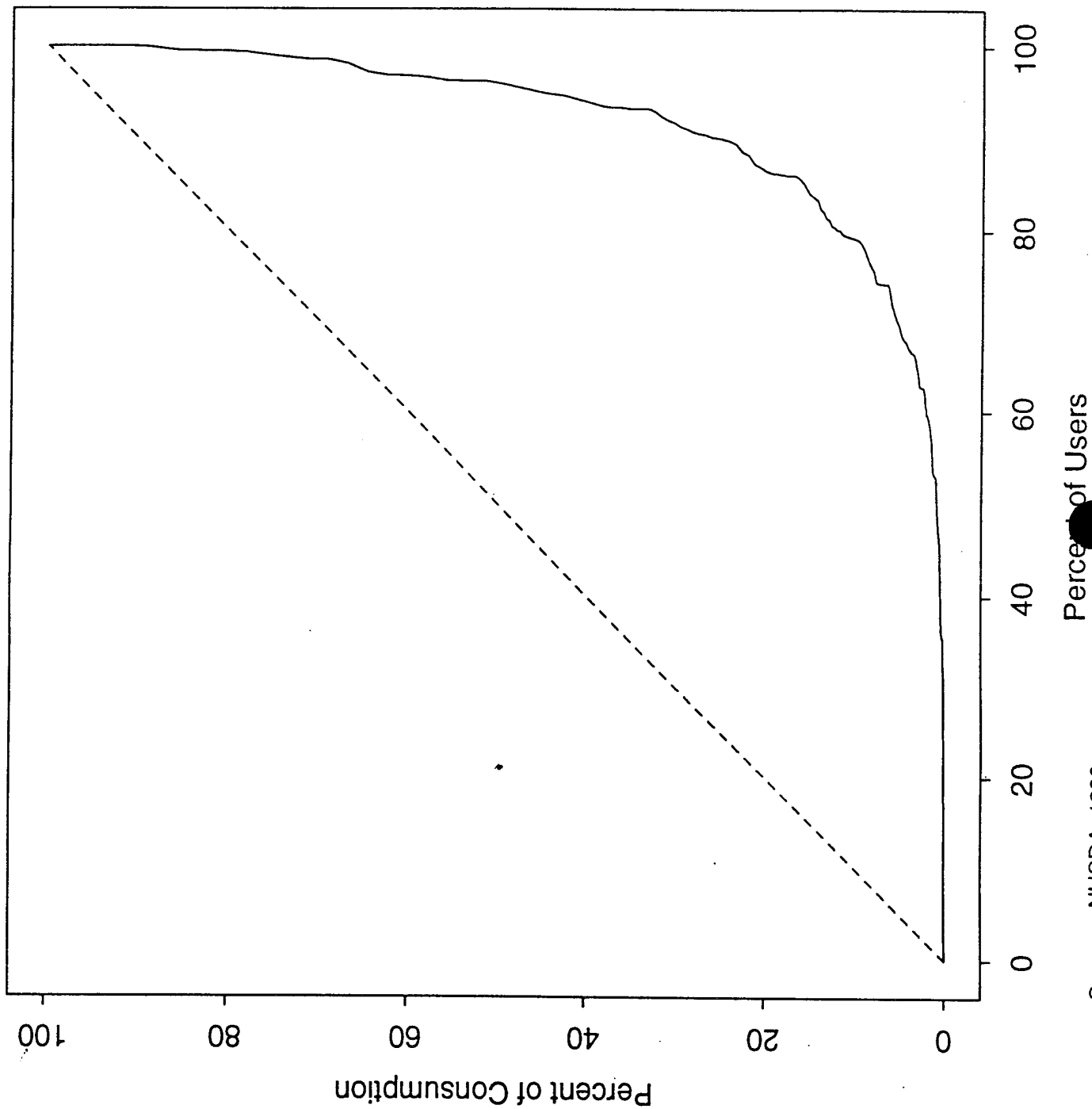
A similar heterogeneity of consumption exists among marijuana users. Figure 5 show a Lorenz curve for marijuana. Again the curve is significantly bowed indicating that a small portion of the users use a large portion of the marijuana. The 20 percent heaviest users use almost 55 percent of the all the marijuana consumed. The bar chart (Figure 6) accompanying the marijuana Lorenz curve gives information on the magnitudes of marijuana usage. The Lorenz curve only demonstrates relative amounts of usage with any indication of amount consumed. Figure 6, however, shows that the largest block of past 30 day users of marijuana used less than 10 joints. The 20 percent heaviest users were those people using roughly an ounce or more during the 30 days prior to the survey.

An ounce of marijuana is a quantity sufficient for smoking marijuana on at least a daily basis.² The data from the 1990 household survey indicate that as many as one fifth of all past 30 day marijuana users use daily. This is approximately 1.9 million users. This figure is roughly corroborated by frequency of use data (also from the NHSDA) which indicate that about 1.2 million users used marijuana at least once a day and about 2.9 million smoked 3 to 6 times a week or more. These people may be considered heavy marijuana users. On the other hand, over 60 percent of the past 30 day users smoked less than 10 joints during those 30 days. This is less than about two joints a week. Although "a joint" is not equivalent to "a use session" and a few "hits" from a joint may be sufficient to produce a high so that a single joints lasts

²Some calculate that the average joint contains about 1/2 gram of marijuana. This implies nearly 60 joints per ounce, definitely enough for one joint a day.

FIGURE 4

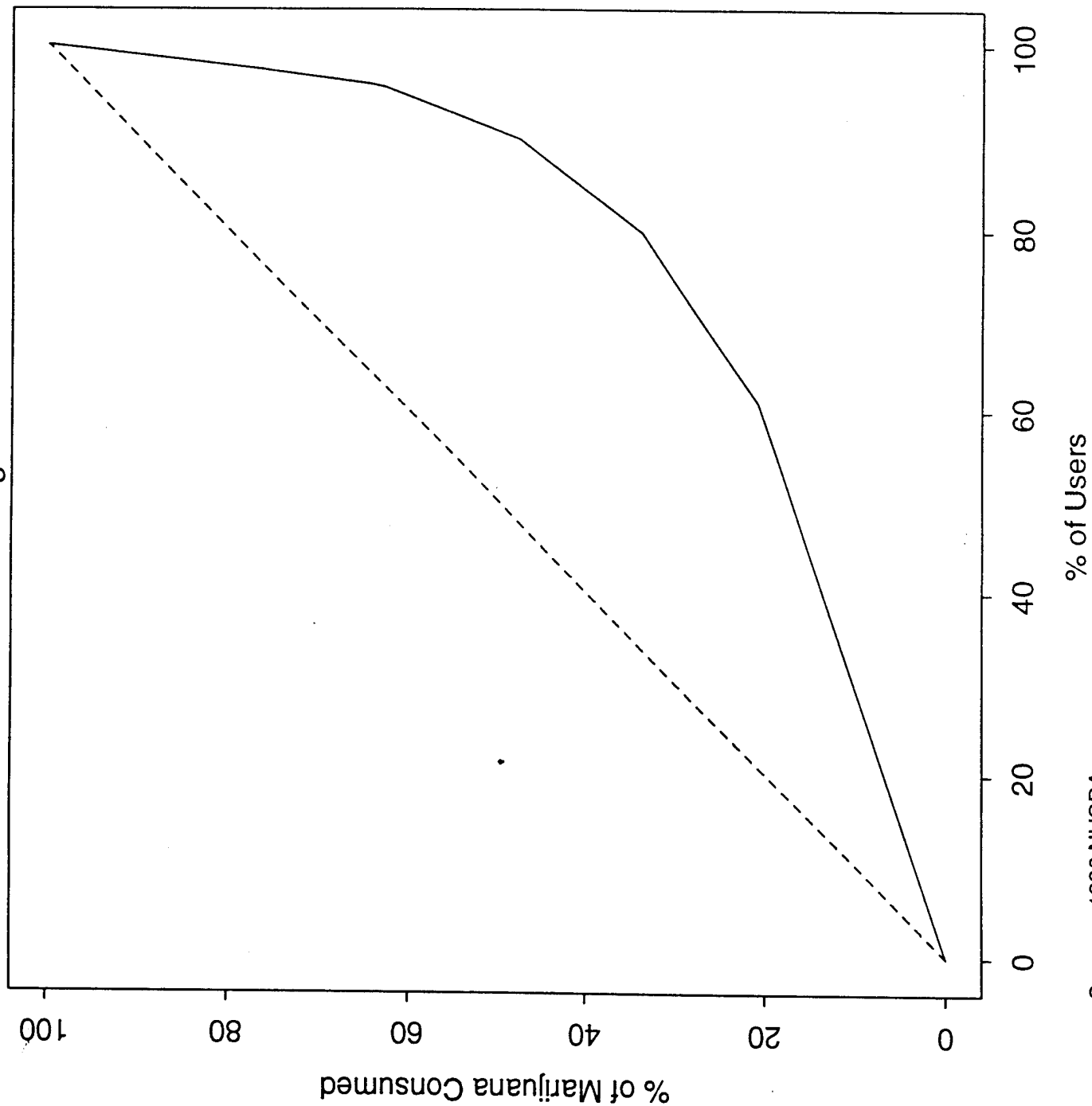
Cocaine Consumption for Previous Year Users



Source: NHSDA, 1990.

FIGURE 5

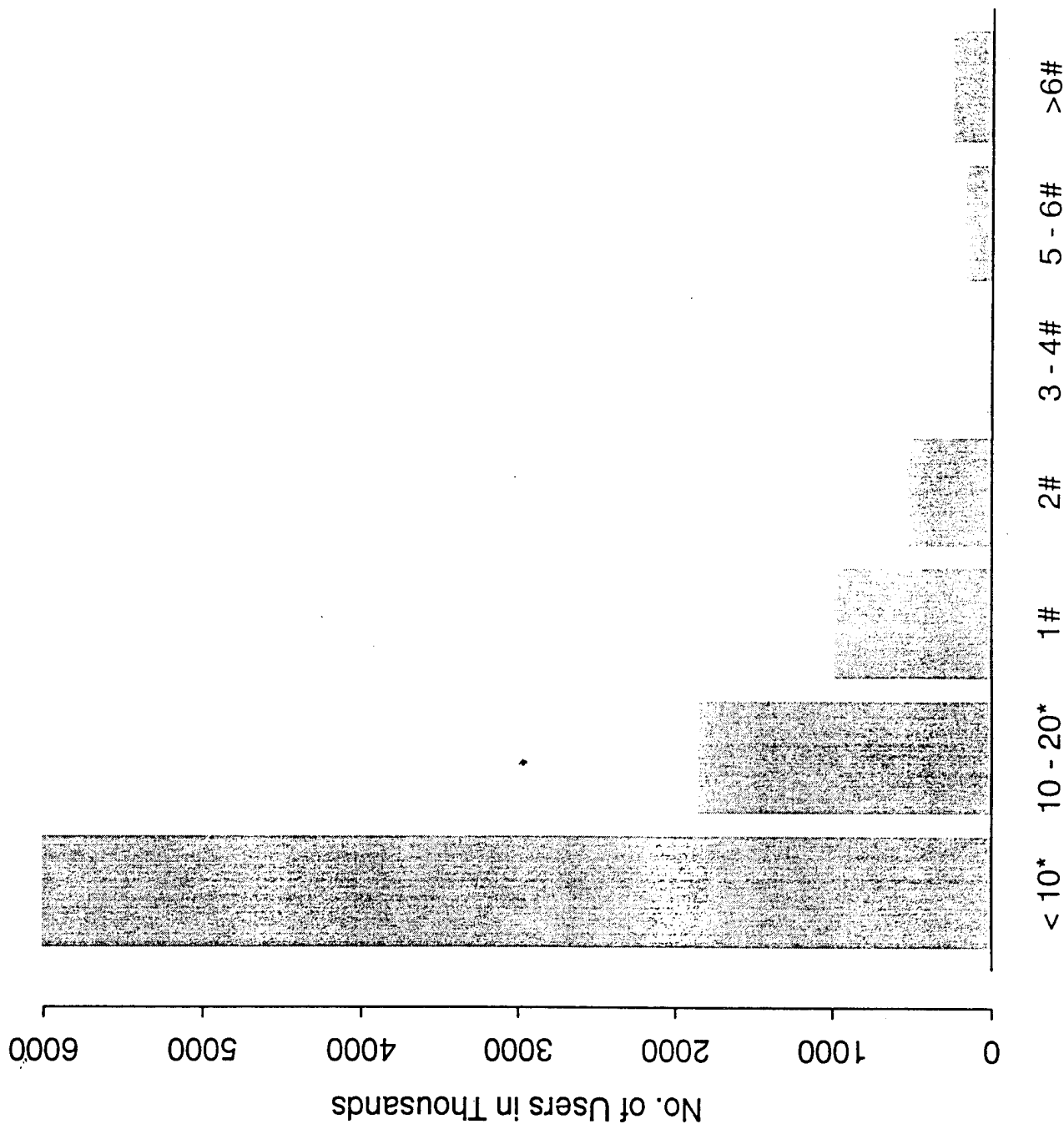
Marijuana Consumption Among Past 30 Day Users All Ages



Source: 1990 NHSDA

FIGURE 6

Marijuana Consumption Among Past 30 Day Users
All Ages



Amount of Marijuana Consumed, in * = Joints, # = Ounces
Source: 1990 NHSDA

several use sessions, it is clear that people consuming less than 10 joints are consuming far less than those smoking over an ounce a month.

The data in Figures 8 and 9 are drawn from the 1988 version of the HSSS (Monitoring The Future), and replicate for this special subpopulation of high school seniors the findings for the general household population - namely that over 60 percent of those respondents who had used marijuana in the 30 days preceding the survey administration reported using less than 10 joints during that time, while a small percentage of very heavy users had consumed much larger amounts of the drug. Figures 10 through 14 present similar curves for the NHSDA data disaggregated by age. Taken together, these analyses present a very robust confirmation of the notion that casual users of marijuana do not use anything like the quantities of the drug as do their more intensively-involved peers.

Implications

The heterogeneity of consumption implies that monitoring a single prevalence indicator, such as past 30 day users, could provide misleading information for evaluating policies directed at reducing consumption. There are obviously different demand curves for various groups of cocaine users. (This is also true for marijuana users.) The differences in these curves will lead to different responsiveness to changes in price or supply. A single measure of change could tend to distort changes that occur in each sub-market.

The actual difference in the demand curves for heavy versus light consumers are currently unknown. Heavy users might be most price responsive because they invest the greatest amount of money on drugs. Or heavy users may be mostly dependent and willing to acquire drugs regardless of price. Similarly light users might have little enduring interest in drug use and respond to even the slightest increase in price or they may spend so little money on drugs that even large price changes are relatively insignificant to the light users and so their consumption is little affected by price.

Marijuana Consumption from the 1988 HSSS

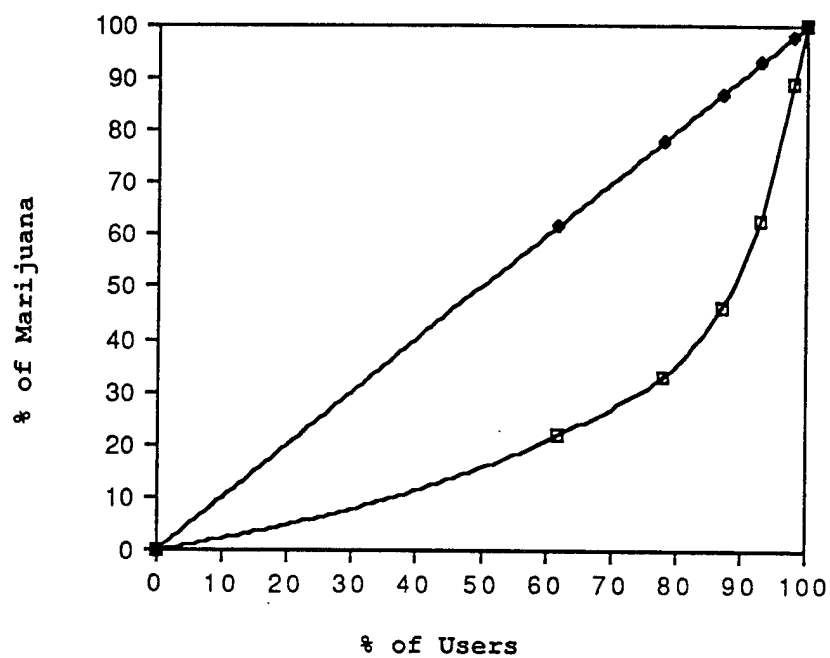


FIGURE 7

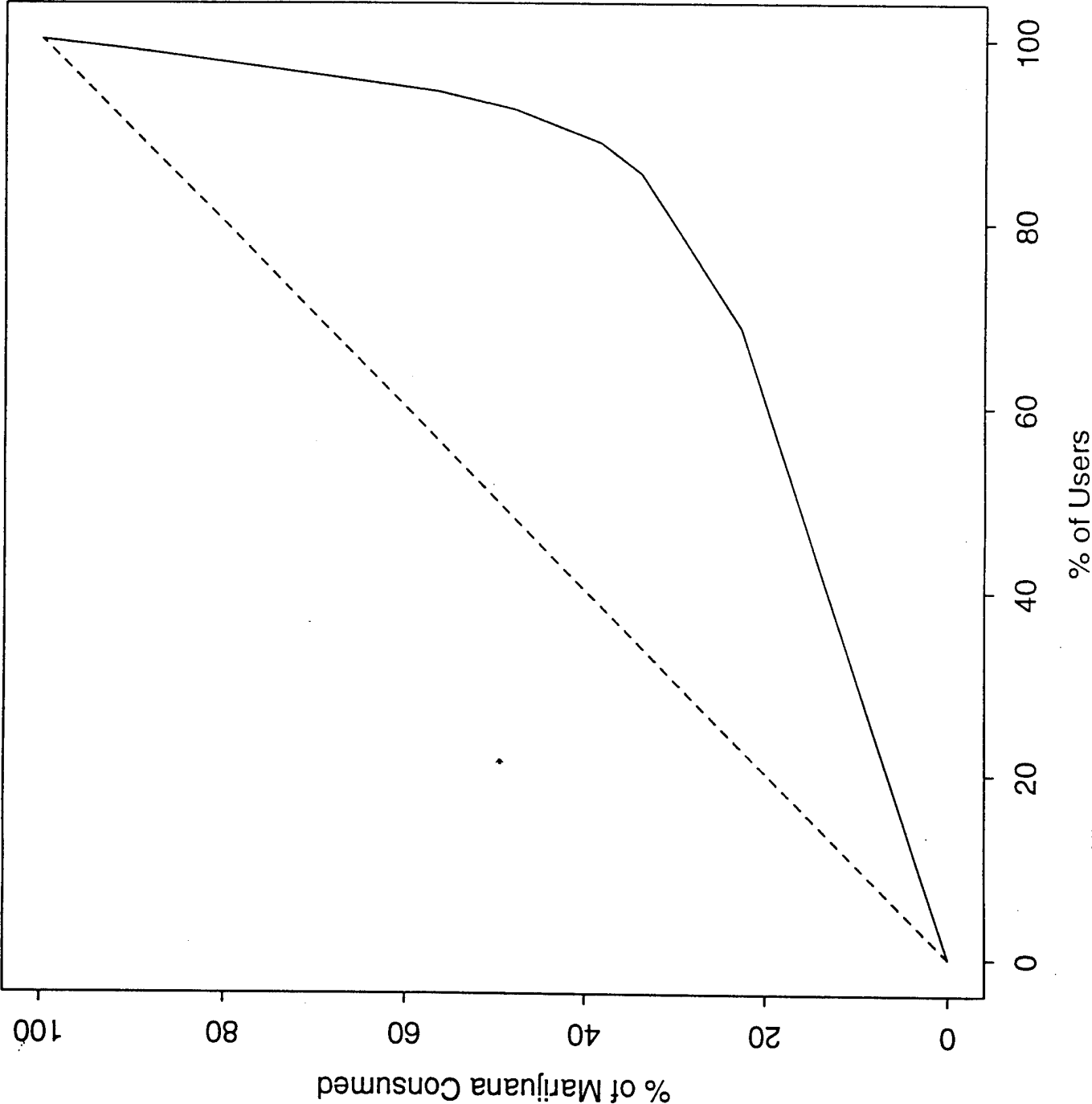
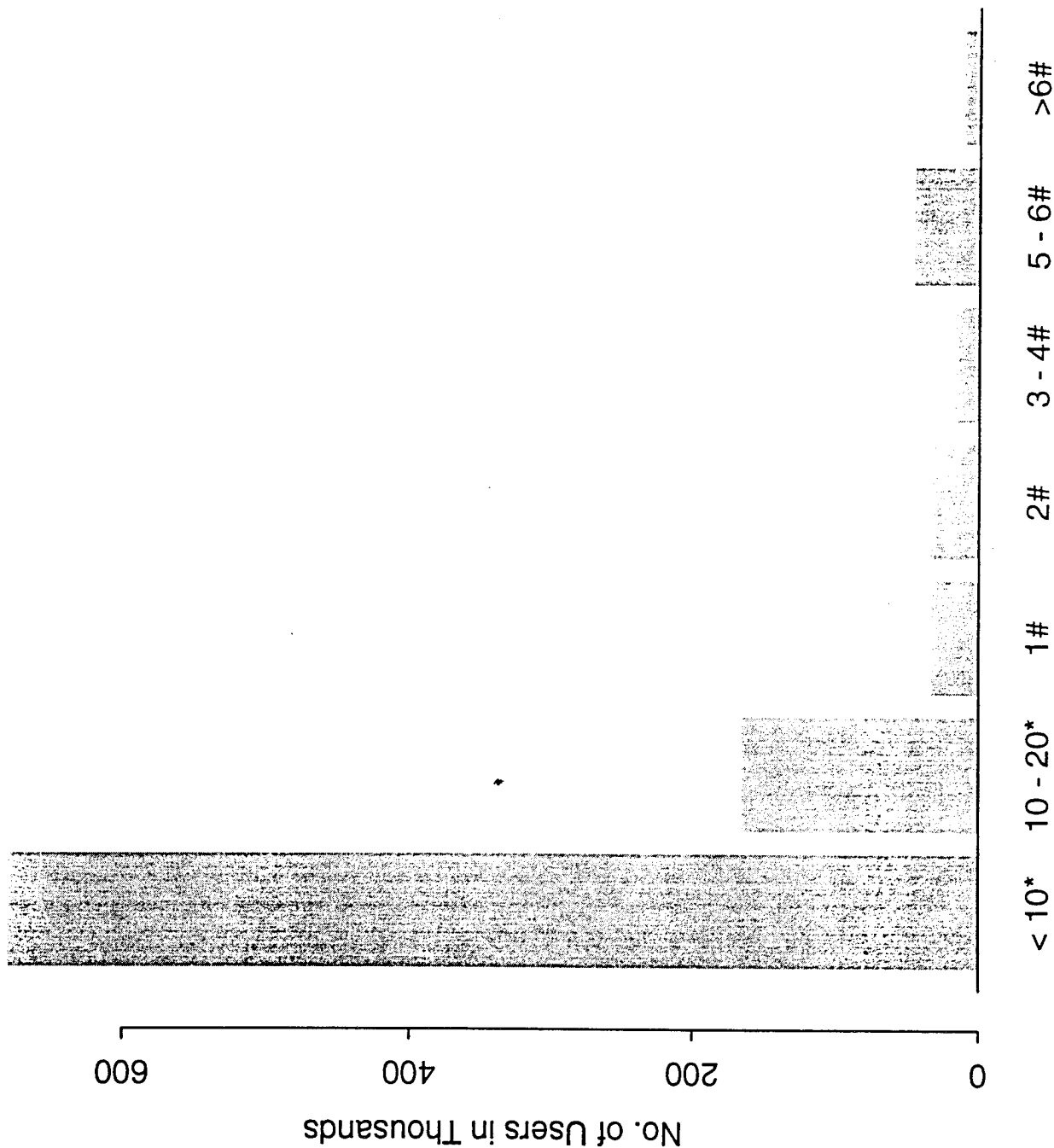


FIGURE 9

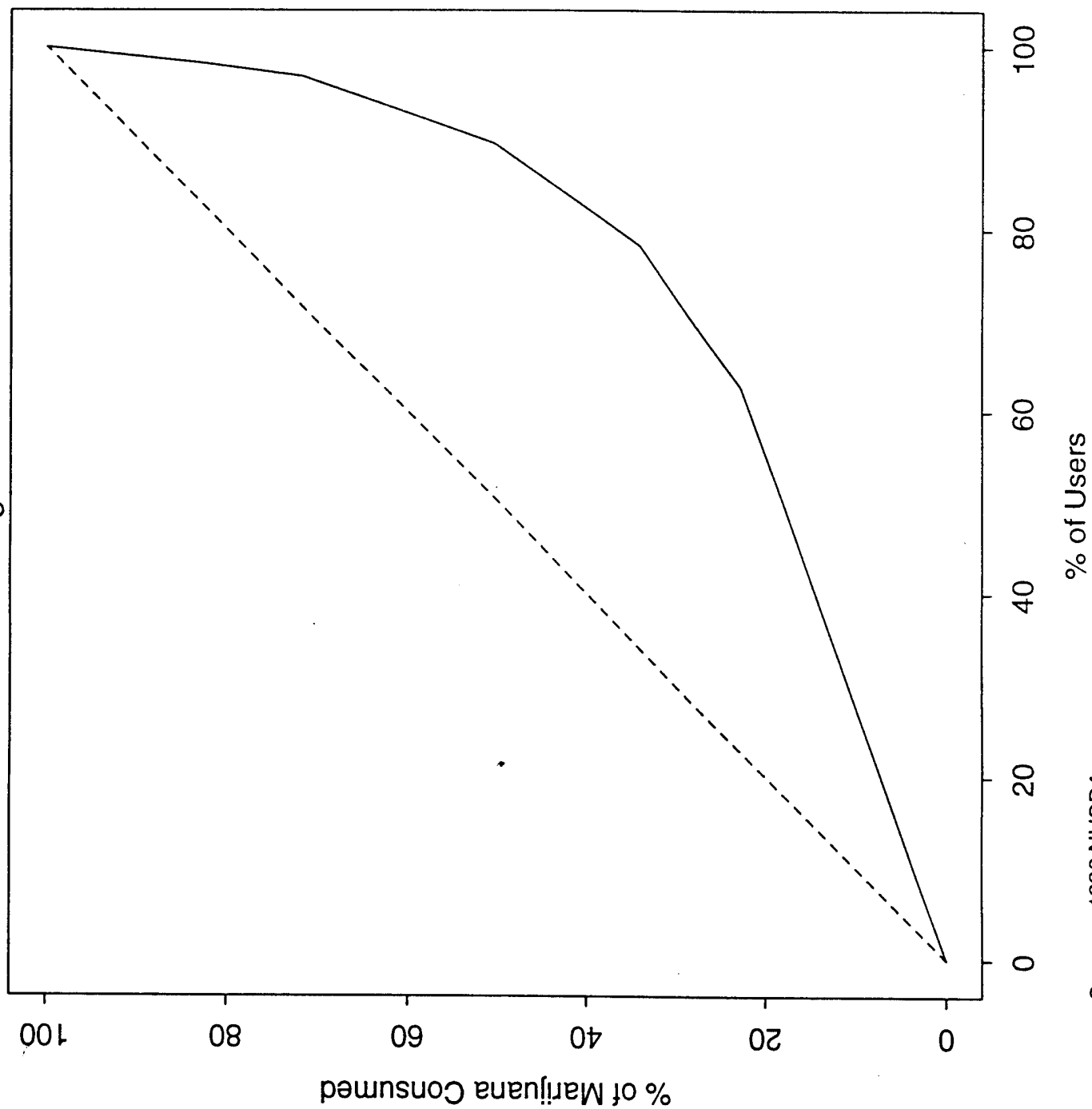
Marijuana Consumption Among Past 30 Day Users Users Age 12 to 17



Amount of Marijuana Consumed, in * = Joints, # = Ounces

Source: 1990 NHSDA

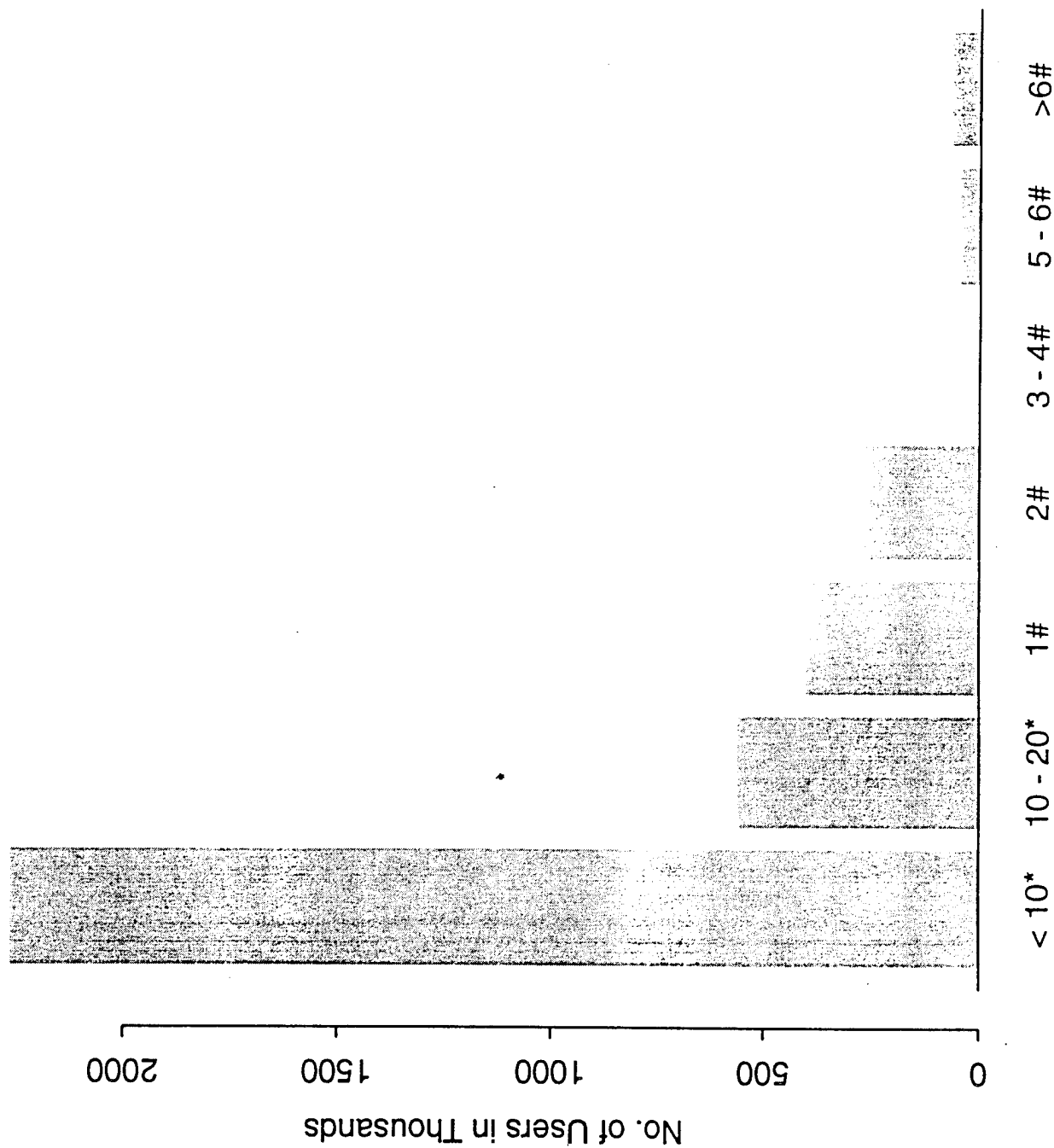
FIGURE 10
Marijuana Consumption Among Past 30 Day Users
Users Age 18 to 25



Source: 1990 NHSDA

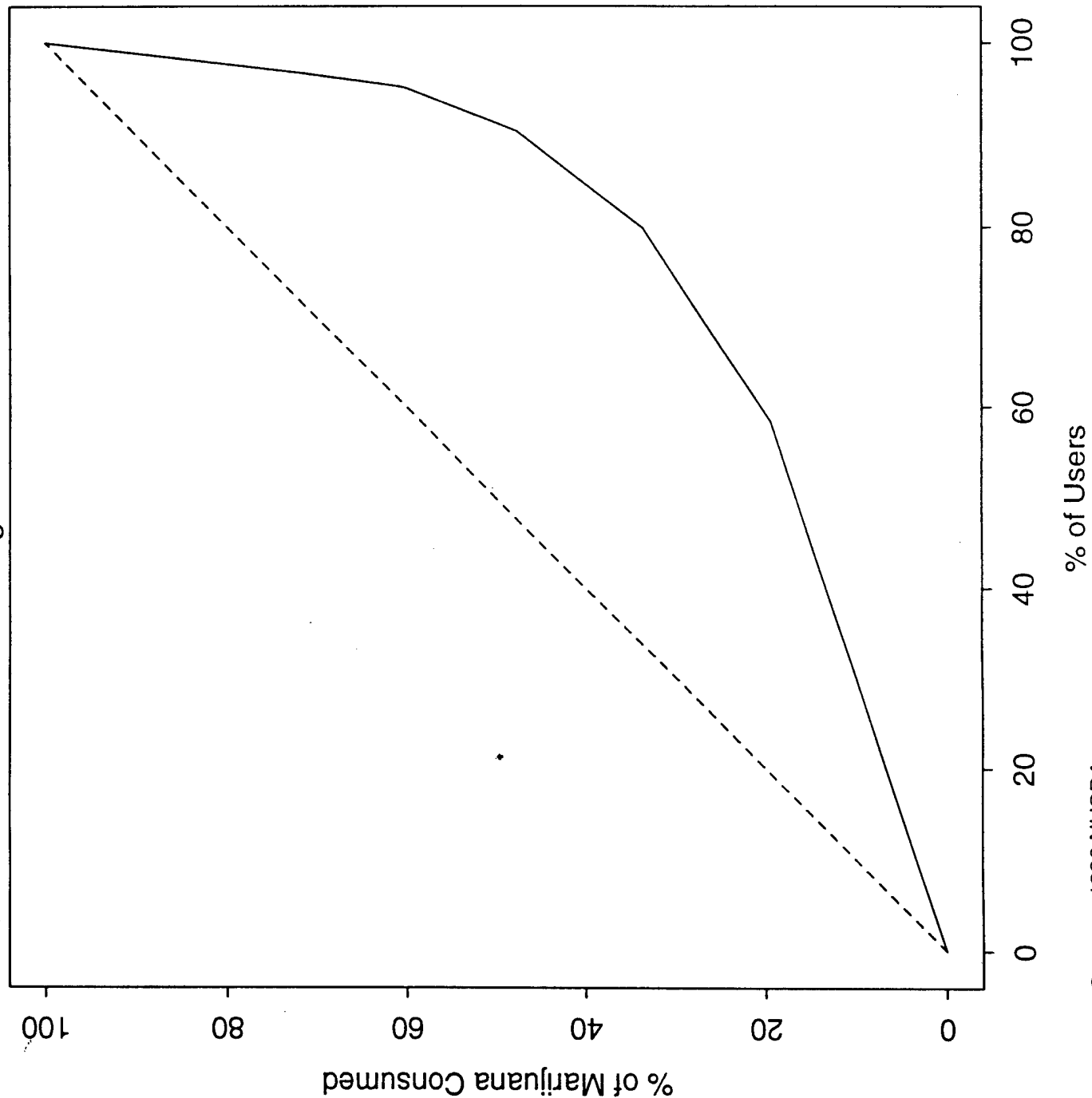
FIGURE 11

Marijuana Consumption Among Past 30 Day Users Users Age 18 to 25



Amount of Marijuana Consumed, in * = Joints, # = Ounces
Source: 1990 NHSDA

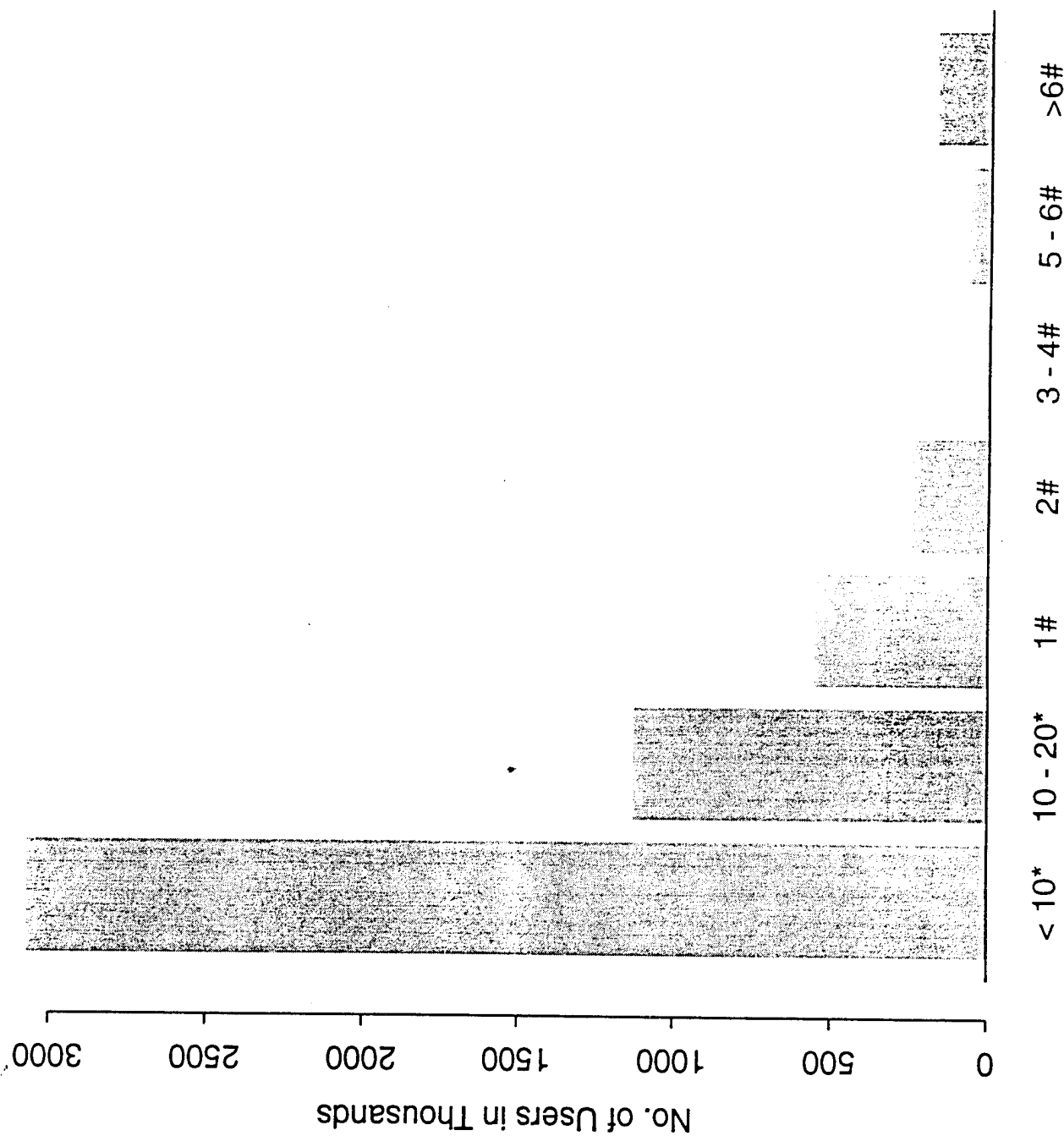
FIGURE 12
Marijuana Consumption Among Past 30 Day Users
Users Age 26 or Older



Source: 1990 NHSDA

FIGURE 13

Marijuana Consumption Among Past 30 Day Users Users Age 26 or Older



Amount of Marijuana Consumed, in *Joints, #= Ounces
Source: 1990 NHSDA

Any empirical effort to determine elasticity's for these sub-markets would be of great value. Also, the heterogeneity of use patterns within a household population suggests that policies need to be targeted to specific segments of the market.

The disparity in consumption and expenditures has positive implications for policies aimed at reducing the drug market. Because such a small proportion of users accounts for much of the market (most of the expenditures and most of the consumption) well placed resources and policies which reduce use in the group of heavy consumers can have a disproportionately large reduction in the overall market. For example if the ten percent heaviest users of cocaine were convinced to stop using cocaine, say through treatment, this would reduce 70 percent of household demand for cocaine and significantly reduce the cocaine market, effectively putting many dealers out of business.

Data Limitations

The data for the Lorenz curves for marijuana consumption came from asking past 30 day users how much marijuana they consumed. The answer sheet gave the respondent seven choices: less than 10 joints, 10 to 20 joints, about one ounce, about 2 ounces, 3 to 4 ounces, 5 to 6 ounces, and over 6 ounces. To obtain a total amount consumed we used a conservative estimate that an ounce contributed 40 joints and that over 6 ounces meant 6.5 ounces. However, if we assumed more joints to the ounce or gave over 6 a variety of values, then we would change the shape of the curve, but not the qualitative end result. The data for the curves regarding cocaine use come from a question which asked past 30 day users of cocaine, excluding crack, about how much cocaine they consumed. The response categories here required less assumptions on our part in estimating amounts of cocaine consumed - they were: less than 1/4 gram, about 1/4 gram, about 1/2 gram, about 1 gram, about 2 grams, about 3 grams and more than 3 grams.

Another problem with these data is that the wording of the response categories may limit and influence respondents' answers. Again this may alter the shape of the curve somewhat but we would need to assume large

bias to discredit the qualitative result of heterogeneous use patterns with a predomination of lighter users.

Another concern is that the data used to generate these plots in general constitutes a small subset of a small sample of the household or high school senior populations. There is assuredly some instability and imprecision in the estimates, which again argues against over-emphasizing the particular shape of the Lorenz curves rather than concentrating on the qualitative results obtained. By considering just three categories -- less than 10 joints, 10 - 20 joints and an ounce or more -- the events are far less rare and the estimates are more stable. Finally, because the survey captures only householders, the curves exclude the variation on consumption among users not resident in households.

IDENTIFYING HEAVY USERS WITHIN THE HOUSEHOLD POPULATION

Introduction

This analysis expands on the previous findings that consumption levels are quite heterogeneous among the past 30 day users. This finding reiterates the paradox of the current substance user in the household population (those who used in the last 30 days). These people are in one sense similar: they all used drugs in the last 30 days. In other ways, however, they are disparate. Some users used in the last 30 days because they are heavy addicted users who use almost constantly. Given any thirty day window these people would have used drugs. At the other extreme are people who use a substance only once in their lives and it happened to be in the previous 30 days. Although these people were current users during the thirty days studied, they would not be during any other thirty day period. There are current users using at all levels between these two extremes.

The heterogeneity of past thirty day users calls into question the usefulness of previous thirty day users as a drug use indicator. Changes in total number of users does not necessarily imply proportionate changes across the entire distribution of users. The total may fall 30 percent, say, while the number of heavy users remains constant. (This type of shift could occur if by chance the light users

surveyed had an especially light month.) Therefore, a more informative characterization of the current users is needed, especially when trying to use NHSDA to understand heavy use behavior.

Materials and Methods

The Institute of Medicine in its 1990 report *Drug Treatment* provides such a characterization scheme. Using only information from the National Household Survey on Drug Abuse (NHSDA), the IOM offers an algorithm for determining the treatment needs of all current users. (See Appendix E for a complete discussion of the IOM algorithm.) Although the validity of the IOM scheme as identifier of treatment need is questionable (see Appendix E for discussion of the validity of the IOM scheme), the IOM procedure appears to yield a somewhat valid classification of casual to serious users.³

The IOM classification scheme has face validity because it mimics the DSM-III-R and the ICD-10 classification schemes for diagnosing clinical drug dependence. On the basis of a drug users use frequency and behavior and problems the users encounters because of drug use, both the DSM-III-R and ICD-10 provide diagnostic criteria for classifying people as drug dependent or as a drug abuser (or harmful user for the ICD-10). (See Table 1 for the complete DSM-III-R and ICD-10 criteria.)

The NHSDA asks several questions which parallel the criteria used in DSM-III-R and the ICD-10 schemes. The IOM offered a means of combining these NHSDA questions into an approximation of a composite of both the DSM-III-R and the ICD-10 evaluation procedures. To the extent that the IOM algorithm approximates these two clinical diagnostic schemes, it yields a valid criteria for determining drug use severity among current users. Tables 2, 3 and 4 give the IOM classification for current users of any illicit substance, cocaine and marijuana respectively.

³This may seem inconsistent with the discussion on the validity of the IOM given in Section 4.3. In that section, the general validity of IOM methodology for identifying drug dependence and need for treatment was attacked. However, there is a distinct difference between differentiating casual and heavy users and accurately identifying the medically recognized syndromes of drug dependence and abuse.

Table 1
ICD-10 and DSM-III-R Criteria for Identifying Drug Dependence

ICD-10	DSM-III-R
Progressive neglect of alternative pleasures or interests in favor of substance use	Important social, occupational or recreational activities given up because of substance use.
Persisting with drug use despite clear evidence of overtly harmful consequences.	Continued substance use despite knowledge of having a persistent or recurrent social, psychological, or physical problem that are caused or exacerbated by the use of the substance.
Evidence of tolerance such that increased doses of the substance are required in order to achieve effects originally produced by lower doses.	Marked tolerance: need for markedly increased amounts of the substance in order to achieve intoxication or desired effect, or markedly diminished effect with continued use of the same amount.
Substance use with the intention or relieving withdrawal symptoms and subjective awareness that this strategy is effective.	Substance often taken to relieve or avoid withdrawal symptoms.
A physiological withdrawal state.	Characteristic withdrawal symptoms.
Strong desire or sense of compulsion to take drugs.	Persistent desire or one or more unsuccessful efforts to cut down or control substance use.
Evidence of an impaired capacity to control drug taking behavior in terms of its onset, termination, or level of use.	Substance often taken in larger amounts or over a longer period than the person intended.
A narrowing of the personal repertoire of patterns of drug use, e.g., a tendency to drink alcoholic beverages in the same way on weekdays and weekends and whatever the social constraints regarding appropriate drinking behavior.	Frequent intoxication or withdrawal symptoms when expected to fulfill major role obligations at work, school, or at home or when substance use is physically hazardous.
Evidence that a return to substance use after a period of abstinence leads to a rapid reinstatement of other features of the syndrome than occurs with nondependent individuals.	A great deal of time spent in activities necessary to get the substance, taking the substance, or recovering from its effects.

NOTE: A dependence syndrome is present if three or more criteria are met persistently (DSM: continuously) in the previous month or some time (DSM: repeatedly) in the previous year

Table 2
Distribution of Previous 30 Day Drug Users by Need for Treatment

Classification	Estimated Number of	
	Users (1000s)	Percent
Clearly	1335	14
Probably	2883	31
Possibly	2415	25
Unlikely	2818	30
Total	9451	100

Table 3
Distribution of Previous 30 Day Cocaine Users by Need for Treatment

Classification	Estimated Number of	
	Users (1000s)	Percent
Clearly	400	26
Probably	504	33
Possibly	466	30
Unlikely	172	11
Total	1542	100

Table 4
Distribution of Previous 30 Day Marijuana Users by Need for Treatment

Classification	Estimated Number of	
	Users (1000s)	Percent
Clearly	1289	15
Probably	2677	31
Possibly	2195	25
Unlikely	2470	29
Total	8631	100

Further support for the validity of the IOM measure arises from the high correspondence between the IOM classification and other measures of use severity, i.e., consumption levels, use frequency and polydrug use. Table 5 shows that marijuana users who were classified as the most serious users by the IOM were largely the most frequent users throughout the previous year, consumed the largest quantities of marijuana and involved more polydrug users. Table 6 demonstrates that analogous results hold for current cocaine users.

A final argument in favor of the IOM classification scheme stems from its objectivity. This classification scheme is not relative to the spread in the distribution. There are precise criteria for assigning a user membership into each use level. If all users were identical they would all be identified as falling into only one class and the IOM scheme would identify the homogeneity of the current users. If, on the other hand, users were heterogeneous then users would be classified at all use levels and the IOM scheme would correctly identify the variability in the current user population. Also because the IOM algorithm is objective, sensible comparisons can be made across survey years.

Results

Tables 2, 3 and 4 clearly show the variability in use behavior captured in the current users category. Each use level contains a significant proportion of the current users. This holds for users of marijuana, cocaine, any illicit substance. Table 7 shows that heterogeneity even exists for people who use only marijuana. Table 8 shows how the socio-economic and demographic characteristics vary across these groups of users. Of interest in Table 8 is that the people in the various classes of use tend to differ on important socio-economic and demographic characteristics like age, income and education status. It seems highly likely that the users in each group will have distinctly different demand curves and could be expected to respond differently to programs aimed at cutting consumption by increasing price. Because of the different levels of functioning problems, the people from the various classes of use will most likely also respond differently to drug treatment and counseling programs.

Table 5
 Drug Use Patterns for Previous 30 Day Marijuana Users, by IOM
 Classification
 (Percentage of All Previous 30 Day Marijuana Users)

Use Pattern	IOM Classification			
	Clearly	Probably	Possibly	Unlikely
Marijuana Consumed				
• 10 Joints or less	18	34	82	92
• 10 Joints to 1 oz.	41	38	12	2
• 1 oz. or more	41	28	6	6
Number of Days Used Marijuana During the Previous Month				
• 1 Day	0	0	10	64
• 5 or Less Days	7	18	81	100
• 10 or Less Days	31	37	100	100
• 20 or Less Days	68	77	100	100
• 30 or Less Days	100	100	100	100
Used Cocaine During:				
The Previous Year	61	46	28	21
The Previous Month	27	15	15	3
Used At Least One Substance Other than Marijuana During:				
The Previous Year	87	62	49	37
The Previous Month	54	33	26	8
Used Two or More Substances Other than Marijuana During:				
The Previous Year	54	46	21	8
The Previous Month	16	8	5	2

Table 6
 Drug Use Patterns for Previous 30 Day Cocaine Users, by IOM
 Classification
 (Percentage of All Previous 30 Day Cocaine Users)

Use Pattern	IOM Classification			
	Clearly	Probably	Possibly	Unlikely
Cocaine Consumed				
• Less than 1/4 Gram	18	34	82	92
• 1/4 to 1 Gram	41	38	12	2
• 1 Gram or more	41	28	6	6
Number of Days Used Cocaine During the Previous Month				
• 1 Day	18	11	38	71
• 5 or Less Days	44	62	94	100
• 10 or Less Days	74	82	100	100
• 20 or Less Days	100	85	100	100
• 30 or Less Days	100	100	100	100
Used At Least One Substance Other than Cocaine During:				
The Previous Year	100	89	98	100
The Previous Month	88	88	70	51
Used Two or More Substances Other than Cocaine During:				
The Previous Year	70	60	45	55
The Previous Month	47	38	22	33

Table 7
Distribution of Previous 30 Day Marijuana Only Users by Need for
Treatment

Estimated Number of		
Classification	Users (1000s)	Percent
Clearly	597	9
Probably	1798	29
Possibly	1618	26
Unlikely	2273	36
Total	6286	100

Table 8
Characteristics of Prior 30 Day Drug Users, Listed by Need for Treatment Classification

Trait	IOM Treatment Classification				All 30 Day Household	
	Clearly	Probably	Possibly	Unlikely	Users	Population
Used Cocaine	30	17	19	6	16	1
Used MJ	97	93	91	88	91	5
Used MJ Only	47	62	67	81	67	5
Had 5+ Drinks	74	60	56	54	59	13
% White	80	80	73	76	77	78
% Under 25	56	53	54	49	50	24
% Male	77	66	64	49	62	48
% Income < \$12,000	30	17	18	18	19	16
% Income < \$30,000	61	53	66	58	59	49
% Unemp.	18	14	15	1	11	5
% H. S. Grad	67	71	78	79	75	74
% Large Metro Area	42	49	51	47	48	43

Implications

The IOM classification scheme provides further evidence of heterogeneity among the current users. However, it also appears to provide a reasonable method for developing indicators which consider this heterogeneity. Users classified as clearly in need of treatment (i.e., heavy users) differ from those designated unlikely to need treatment (i.e., the lightest users) in important characteristics such as drugs used, consumption patterns, use of polydrugs, demographics, socio-economic status, drug related problems and tendency to abuse alcohol. The IOM algorithm is simple to implement with the NHSDA and could create a new multivariate indicator that could be traced over time. Although such an indicator would be limited to the household population it would be significantly more informative and policy relevant, than the current user category.

The multivariate IOM based indicator would serve as a more precise indicator with policy decisions and has almost no additional cost if the questions it relies on will be included and the sample size remains high. Scaling back the size of the sample could increase significantly the sampling error component.

Data Limitations

Scheme depends on multiple items and large sample size. The IOM user classification scheme and our ability to validate it depend on the inclusion of over twenty different items in the NHSDA questionnaire. The multiplicity of items makes the scheme a fairly costly one to employ and vulnerable, should any of these items be modified or eliminated in efforts to reduce the length of the survey interview. A protection of the needed items might be achieved through development of a critical items list for the NHSDA. These lists identify the core items which must be retained in the instrument over time and items which are used in combination for developing important scales or indices.

Multiple item indicators are also vulnerable to increased error if the sample sizes on individual items are very small. With the recently increased size of the NHSDA this has not been a problem, but if future

modification reduce the sample size again, the indicator could become more error prone.

Missing Heavy Users

Identifying and characterizing heavy users within the much broader category of current users, offers some additional insight about this important group, but it does not solve the main problem which is that heavy use is very rare among the household population and therefore difficult to capture in NHSDA. When it is captured, as we demonstrate in a separate analysis, the characteristics of heavy users in the household population are quite different from those of heavy users found elsewhere, e.g. in public sector treatment programs. Altogether different data collection approaches are needed to develop information on the heavy drug user, or hard-core user group. With such data in place, they could be supplemented with that available from NHSDA using the IOM classification scheme.

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APPENDIX C

MEASURING DRUG USE AMONG PREGNANT WOMEN

INTRODUCTION

Licit and illicit substance use by pregnant women is considered to be a significant risk factor for medical complications during and after pregnancy. For example, research on pregnant women who have used cocaine during pregnancy has shown increased rates of spontaneous abortion or premature labor (Chasnoff, Burns, Schnoll, and Burns, 1985). The subsequent effects on cocaine-exposed infants may include low birth weight, growth abnormalities, decreases in their ability to interact with others, and poor organizational responses to environmental stimuli. As a further example, methamphetamine use during pregnancy has been linked to congenital abnormalities; the drug is also considered to have an anorectic effect on the mother, which may delay fetal growth (Little, Snell, Gilstrap, 1988).

In spite of rising concerns about the harmful effects of maternal drug use, good data at the national level concerning the prevalence of use in this special population has not been readily available. Precise estimates of women who use drugs during pregnancy and the number of drug-exposed births are not available. The few studies which estimate the number of exposed infants, or report proportions of use among women who are actually pregnant, present a broad range of estimates. In a recent review of the literature (Zellman, Jacobsen, Duplessis, and DiMatteo, 1992), it was reported that the National Hospital Discharge Survey estimates that 13,765 drug-affected infants were born in 1988 [out of a total of 3,898,000 estimated live births nationwide - about 0.4%]. Other studies place the national estimate of drug use during pregnancy at 11 percent (Chasnoff, Chisum, and Kaplan, 1988). National hospital survey estimates range from 0.4 to 27 percent, with an overall prevalence of 11.9 percent (Chasnoff, 1989). In a local study in Pinellas County, Florida, the prevalence of illicit drug use among women seeking prenatal care was estimated at 14.8 percent (Chasnoff, Landress, and Barrett, 1990).

Several issues complicate the estimates of drug use among pregnant women, including sources of data, techniques used to determine drug use, and problems defining drug use (Horgan, Rosenbach, Ostby, and Butrica,

1991). Many estimates rely in some manner on hospital reports of births in which there is some evidence of drug exposure, or in which the mother reports having used drugs during pregnancy. Thus these estimates are biased downward to the extent that mothers who use alcohol or drugs may underreport the extent of use during pregnancy at the time of delivery. Furthermore, before prenatal substance use can be treated or even acknowledged, it must be detected. However identification of illicit substance use is often a difficult and sensitive issue. Toxicologic assays for the presence of drug metabolites in mothers' body fluids are considered the most objective measures of drug abuse. However these do not allow for an accurate description of an individual's pattern of drug use over an extended period of time; the accuracy of the test depends on the actual timing of drug use, as well as the specific assay technique used. Diagnostic methods which do provide accurate information about a longer history of exposure (e.g. radio immunoassay of hair) are costly and unavailable for routine use (Zellman, Jacobsen, DuPlessis, and DiMatteo, 1992). Problems in defining use during pregnancy may relate to difficulties in defining when conception actually occurred. Many women may decrease use or cease to use drugs during their pregnancy, but may have continued to use drugs between conception and positive pregnancy determination (Horgan, Rosenbach, Ostby, and Butrica, 1991).

Because of these difficulties, estimates have often focused on women of child-bearing age rather than on pregnant women. For example, information from the National Household Survey on Abuse in 1988 (NIDA) indicated that of the 60 million women in this country of childbearing age (between 15 and 44), 9% had used illicit drugs in the past month (Horgan, Rosenbach, Ostby, and Butrica, 1991). However it is not enough simply to know the extent and nature of alcohol and drug use in the general population of women of child-bearing age. Levels, correlates, and even trends of substance use by pregnant women may differ from those of nonpregnant women of similar sociodemographic characteristics. There is some evidence that pregnant women have lower rates of addictive behaviors widely known to be harmful to the fetus. For example, a lower prevalence of smoking overall among pregnant than

among nonpregnant women has been found using data from several states (Williamson, Serdula, Kendrick, and Binkin, 1989).

In an effort to address some of these problems, the National Maternal and Infant Health Survey (NMIHS) was conducted in 1988 by the National Center for Health Statistics, with a follow-up in 1991 (Sanderson, Placek, and Keppel, 1991). The survey is a nationally representative study of mothers, their prenatal care providers, and their hospitals of delivery. It was designed to study factors related to poor pregnancy outcome, such as adequacy of prenatal care; inadequate and excessive weight gain during pregnancy; maternal smoking, drinking, and drug use; and pregnancy and delivery complications. This survey has a considerable advantage over surveys of the household population in that it samples mothers who had recently been pregnant rather than the more diffuse population of women of child-bearing age. It also provides rich information about prenatal care and health habits, delivery and hospitalizations, previous and subsequent pregnancies, baby's health and a wide variety of sociodemographic measures. Despite the better quality of information about drug use during pregnancy obtained from a recently pregnant population, however, the data collection methods used in this survey to capture self-reports of sensitive behaviors eliminate many of the protection-of-privacy guarantees which are well-established and maximized in other household data collection efforts such as the National Household Survey of Drug Abuse.

In this paper, we compare prevalence estimates of alcohol and drug use among women from different age and population groups from the NMIHS with estimates of substance use among women of child-bearing age in the 1988 National Household Survey of Drug Abuse (NHSDA). In doing so, we demonstrate the utility of the NMIHS as an additional source of information about substance use among pregnant women.

Methods

The National Household Survey of Drug Abuse (NHSDA)

This survey, administered periodically since 1972, and annually since 1990, is designed to assess the level and consequences of drug use among the general household population aged 12 and older. The sample

design is a multistage area probability sample - the country (excluding Alaska and Hawaii) is divided into counties, or primary sampling units (PSU), and within each selected PSU samples of subareas and households are further selected. From each selected household a roster recording age, race and gender of all residents is completed. Using a random sampling procedure either two, one or no respondents are selected from the household roster; the sample is conducted in such a way as to stratify along the dimensions of race and age as well as the geographical dimensions outlined above.

Based on this sampling plan, weights are developed so that each response can be correctly weighted to be representative of the population from which it was drawn. In this way the survey yields estimates of use for the entire household population. We use the results of the 1988 survey in this discussion. The sample size in that year was relatively small ($n=8814$), so that many responses to the survey items about behaviors believed to be quite rare in the general population receive very large weights. For example, many forms of drug abuse occur very infrequently, so that very few instances of these behaviors are reported in the sampled population. This can result in imprecise estimates and misleading inferences being drawn from the data. For this reason, analyses based on small samples (before weighting) reporting specific characteristics may be especially subject to these small sample instabilities, and should be interpreted with due caution.

The National Maternal and Infant Health Survey (NMIHS)

The NMIHS is a nationally representative sample of new mothers, their prenatal care providers and their hospitals of delivery. The sample consisted of 13,417 women who had live births, 4772 who had late fetal deaths, and 8091 who had infant deaths (at less than 4 months) in 1988. The survey drew stratified random samples from calendar year 1988 vital records from 48 states, the District of Columbia, and New York City. Mothers were mailed questionnaires based on information from certificates of live birth, reports of fetal death, and certificates of infant death. Unlike previous surveys of its kind, the NMIHS includes unmarried as well as married mothers. In addition, low- and very low-

birthweight infants and black infants were oversampled in the survey to ensure sufficient numbers of high-risk births for adequate analysis (Sanderson, Placek, and Keppel, 1991).

In Tables 1, 2 and 3 below, we report the demographic characteristics of the sample of women, including their outcome of pregnancy, age and race. As mentioned, low birthweight and black infants were oversampled in the NMIHS, because black infants have rates of low birthweight and infant mortality about twice those of white infants. Weights are based on the probability of selection into the sample, adjustment for nonresponse, as well as post-stratification adjustments. Use of the sample weights can (and should) drastically change the frequencies, since they are calculated to reflect national counts. Hence we have included both the unweighted and the weighted frequencies in these tables.

Table 1
Outcome of Pregnancy in the NMIHS

Outcome	Unweighted (sample) (%)	Weighted (population) (%)
Live births	51.1	98.6
Fetal deaths	18.2	0.4
Infant deaths	30.8	1.0

Table 2
Age of the Mothers in the NMIHS

Age of mother	Unweighted (sample) (%)	Weighted (population) (%)
Under 15 years	0.2	0.0
15-19	17.5	12.3
20-24	29.7	27.4
25-29	27.3	31.7
30-34	17.6	20.5
35-39	6.5	6.9
40-49	1.2	1.1

Table 3
Race of the Mothers in the NMIHS

Race	Unweighted (sample) (%)	Weighted (population) (%)
White	34.6	78.6
Black	33.5	16.5
Asian/Pacific Islander	1.7	3.7
Eskimo/Aleut/Native American	0.7	1.3

The overall response rate to the mailed questionnaires was about 71%; it was 74% for live birth mothers, 69% for fetal death mothers, and 65% for infant death mothers. Response rates differed according to mother's age, race, marital status, and educational attainment within the three outcomes. Mothers were more likely to respond if they were

over 30 years old, white, married, and had at least a high school education.

Drug and Alcohol Items in the NHSDA and the NMIHS

Both questionnaires includes a number of items asking about the respondent's drug and alcohol use. In Table 4 below we present these items, grouped by the drug to which they refer.

Table 4
Drug Related Items in the NMIHS and the NHSDA

Alcohol

NMIHS

Did you drink any alcohol in the 12 months before your delivery?
How many drinks did you have in the 3 months before you became pregnant?
How many drinks did you have after you found out you were pregnant?
Did you reduce your drinking during pregnancy?
Why did you reduce your drinking of alcohol?

NHSDA

Age of first use
Most recent use
Frequency of drinks during the past 30 days
Quantity (and maximum) of drinks during the past 30 days
Binge drinking during the past 30 days
Initiation to monthly drinking
Frequency of drinks in the last 12 months
Number of times been high in the last 12 months
Number of times drugs were used in conjunction with alcohol in the past 12 months

Cigarettes

NMIHS

Did you smoke cigarettes during the 12 months before your delivery?
How many cigarettes did you smoke a day during the 3 months before you became pregnant?
How many cigarettes did you smoke a day after you became pregnant?
Did you quit smoking for at least a week during your pregnancy?
Do you smoke cigarettes now?
How many cigarettes do you smoke a day now?

NHSDA

Age of first use
Age of first daily use
Number of years smoking daily
Smoked as many as five packs in your life?
Most recent time to smoke
Average number of cigarettes per day during the past 30 days
Length of time you have smoked

cont.

Table 4 continuedMarijuanaNMIHS

Did you smoke marijuana or hash during the 12 months before your delivery?

How often did you smoke marijuana or hash during the 3 months before you became pregnant?

How often did you smoke marijuana or hash after you became pregnant?

NHSDA

Age of first opportunity to try marijuana

Age of first use

Amount of lifetime use

Time of most recent use

Frequency of use during the past 30 days

Average daily use during the past 30 days

Total amount used during the past 30 days

Polydrug use during the past 30 days

Frequency of use during the past 12 months

Polydrug use during the past 12 months

Cocaine or crackNMIHS

Did you use cocaine or crack during the 12 months before your delivery?

How often did you use cocaine or crack during the 3 months before you became pregnant?

How often did you use cocaine or crack after you became pregnant?

NHSDA

Age of first opportunity to try cocaine

Age of first use

Lifetime use

Most recent use of cocaine/crack

Use of cocaine/crack during the past 30 days

Polydrug use during the past 30 days

Frequency of use during the past 12 months

Polydrug use during the past 12 months

Methods of using cocaine

Amount spent on crack

Results

In this section we compare prevalence estimates of drug and alcohol use between the two surveys, in the cases where the items are similarly framed. In addition, the results of some further preliminary analyses from the NMIHS are presented, demonstrating some of the possible extensions to information about behavior change with respect to substance use during pregnancy available from this source.

Comparisons between the NMIHS and the NHSDA in 1988

In the tables below we show the national prevalence estimates of proportions of women who used alcohol, marijuana or cocaine "in the last 12 months" (NHSDA), or "in the 12 months prior to the delivery of your baby" (NMIHS). The results are disaggregated by age and racial categories.

Increasing evidence suggests that the problem of drug use by pregnant women cuts across sociodemographic lines (Chasnoff, Landress, and Barrett, 1990). In Table 5, we present prevalence estimates disaggregated across age categories. The patterns of use across different ages varied by type of substance, although reported levels of alcohol use were much higher for all age categories than use of either marijuana or cocaine. The proportion of women who reported using alcohol in the 12 months prior to delivery increased with age, peaking in the late twenties and mid-thirties, and decreasing slightly thereafter. By contrast, in both surveys the proportion of women younger than 24 who reported using marijuana or cocaine was substantially higher than that of women in their forties.

Table 5**12 month Prevalence Drug Use by Age in the NMIHS and the NHSDA (%)**

Age	Alcohol		Marijuana		Cocaine	
	NMIHS	NHSDA	NMIHS	NHSDA	NMIHS	NHSDA
Under 15	20.5	21.19	6.9	4.42	0.0	0.65
15-19	31.4	64.00	8.5	25.34	1.5	6.00
20-24	39.0	79.04	7.2	20.14	2.4	9.50
25-29	50.3	77.79	4.7	15.09	1.9	7.25
30-34	52.5	79.02	3.7	9.03	0.9	3.81
35-39	49.6	76.07	3.2	6.94	1.7	1.54
40-49	48.7	66.89	2.2	1.71	0.4	0.90

The percentage of mothers who report using any substance in the NMIHS is much lower than the prevalence of use in the general population of child-bearing women as indicated by the NHSDA. This holds across all age groups reported here. However, results from both surveys indicate that while younger women are more likely to report marijuana use than their older counterparts, the rates of alcohol use are more than three times higher than those for marijuana or cocaine in both surveys.

When the data were disaggregated into racial categories (see Table 6), it was found that reported prevalence levels were much higher in the NHSDA across drug type and racial group. Both surveys indicated highest prevalence levels for drinking across all groups, and showed that among groups white women reported drinking more in the prior 12 months. However the ordering among the other three groups changes across the two surveys. For example, in the NHSDA Asian women reported alcohol use at almost the same levels as white women, whereas in the NMIHS they report the lowest levels of drinking of any group (20.1%). While levels of marijuana use were higher in the NHSDA for all groups, this was particularly true for the Eskimo/Native American group. There the proportion of users in the NHSDA was 20.1% versus 8.2% prevalence in the NMIHS. This group also reported relatively high levels of cocaine use in the NHSDA, as compared to the other three categories.

Table 6

Use in the Past 12 Months for Women of Different Race in the NMIHS and the NHSDA (%)

Drug Type	White		Black		Asian/Pacific Islander		Eskimo/Native American	
	NMIHS	NHSDA	NMIHS	NHSDA	NMIHS	NHSDA	NMIHS	NHSDA
Alcohol	50.6	65.6	26.5	48.7	20.1	61.6	33.7	54.0
Marijuana	5.8	11.2	4.7	10.8	2.5	7.7	8.2	16.1
Cocaine	1.6	3.9	2.7	3.8	0.0	2.1	1.8	7.4

Further Analyses of the NMIHS

The proportions of those mothers reporting substance use in the 12 months prior to delivery, for alcohol, cigarettes, marijuana and cocaine are presented in Table 7.

Table 7
Proportions of Women Reporting Substance Use, and Decreasing Use in the
NMIHS

Substance	Percent Reporting Use in 12 Months Prior to Delivery (Weighted)	Decreased Use During Pregnancy
Alcohol	45.3	91.5
Cigarettes	30.1	54.7
Marijuana (3 or more times a week)	5.5	76.0
Cocaine (3 or more times a week)	1.7	69.1

While any drug use among this population may be cause for concern, many women indicated substantial change in their drug using habits during their pregnancy. For example, of those mothers who had used alcohol in the 12 months prior to delivery, 92% reported decreased use during their pregnancy. Of the mothers who reported using marijuana 3 or more times a week in the 3 months before they became pregnant, 34% had stopped their use of marijuana after they found out they were pregnant. Similarly, almost 50% of the mothers who had used marijuana once or twice a week prior to pregnancy indicated quitting after they became pregnant. The reported changes in cocaine use were also substantial. 48% of those women who reported using cocaine 3 or more times a week prior to pregnancy reported using no cocaine once they found out they were pregnant. These changes are also summarized in Table 7; responses were dichotomized to reflect a decrease in use subsequent to becoming pregnant, versus a stable or increasing level of use.

The women in the NMIHS were sampled according to their pregnancy outcome - live birth, fetal death or infant death (death within the first three months). In the following analyses we examined the univariate relationships between pregnancy outcome, reported levels of substance use, and reported changes in substance use during pregnancy. It is very important to note that these results must be considered

preliminary - any full-scale examination of the relationship between pregnancy outcome and drug or alcohol use would include numerous other factors as controls in the analysis, such as socio-economic status, education, level of pre-natal care, psychological variables, and delivery information.

Over all three types of pregnancy outcome, the majority (between 50% and 60%) of women reported not having used alcohol in the past 12 months. Furthermore, of those who did report alcohol use in the past year, about 90% indicated that they had decreased use during their pregnancy. We hypothesized that women who had experienced poor outcomes (fetal death or infant death) would be more likely to use drugs than those who did not (live birth). Table 8 shows the levels of use of tobacco, marijuana and cocaine across the three types of outcome.

Table 8

Prevalence (%) of Substance Use in 12 Months Prior to Delivery by Outcome of Pregnancy in the NMIHS

Pregnancy Outcome	Alcohol	Cigarettes	Marijuana	Cocaine/Crack
Live Birth	45.3	30.0	5.5	1.7
Fetal Death	42.0	32.6	6.4	1.9
Infant Death	42.7	36.8	7.2	2.9

While the differences are small across the three groups, they are all consistently in the expected direction; women who had live births tended to report less use than women in the other categories. The reported *changes* in substance use behavior during pregnancy were also different across the outcome categories. For example, of women who had a live birth, and who had used marijuana 3 or more times a week in the three months before they found out they were pregnant, 76% decreased their use during pregnancy. The comparable proportions for women who had fetal deaths or infant deaths were 78% and 68% respectively. The trends for frequent cocaine users were more dramatic. Of women who had

live births and who had used cocaine three or more times a week in the three months before they found out they were pregnant, 70% indicated that they had decreased levels of usage during pregnancy. For women who had fetal deaths or infant deaths, the comparable proportions of women who indicated decreased levels of use were 57% and 40% respectively.

Discussion

In this paper we have presented some preliminary analyses of data about drug use by pregnant women from the National Maternal and Infant Health Survey, conducted in 1988. Since previous estimates of substance use among this population have often been derived from surveys of women of child-bearing age in the general household population, for comparative purposes we have also reported estimates from the 1988 administration of the National Household Survey of Drug Abuse.

Our results point to large differences in prevalence estimates derived from two nationally representative surveys. There are several differences in the administration and sampling frame of the two surveys which could account for these observed disparities. First, the NMIHS is a mail survey, while the NHSDA is administered in a face-to-face interview. Since the items of interest here deal with relatively sensitive issues, the mail-in methodology may increase the risk of underreporting or nonresponse on these questions. Second, the mean interval between delivery and survey for the respondents in the NMIHS was about 17 months. This may lead to substantial recall bias on the part of the women surveyed. Finally, we would expect the differences to be authentic. That is, women who are pregnant, or who are trying to fall pregnant, in general may be expected to reduce their drug and alcohol use substantially, and these differences in levels of use would be reflected in the numbers we report. The incorporation of a short series of items asking women interviewed in the household population for the National Household Survey about recent pregnancy would greatly enhance the opportunities for comparison and validation across the two survey instruments.

The exploratory analyses of the NMIHS found varying levels of use of alcohol, cigarettes, marijuana and cocaine in women of different ages

and racial groups. In addition, the age distribution for the licit versus illicit drugs were quite different. The alcohol distribution peaked for women in their thirties and forties. By contrast, women younger than 25 were much more likely to report marijuana or cocaine use than their older counterparts. With respect to race/ethnicity, white mothers were more likely to use alcohol than any other group.

The reported decreases in use during pregnancy, particularly with respect to alcohol, are encouraging. Nevertheless the numbers of women who reported stable or increasing use of marijuana or cocaine are disturbing, and point to the need for increased resources to be targeted towards intensive treatment services for this high risk population. However, patterns of drug use vary across region, by rural, suburban and urban populations, and by socioeconomic status. This variation must be taken into account if we are to collect better information which clarifies the scope of this problem across these diverse communities and populations.

The discussion above merely serves as a reminder of the many difficulties and sources of bias that must be taken into account in estimating prevalence of drug use among women who are pregnant. Self-report measures, especially on mail surveys, where women have few assurances of confidentiality, may lead to non-response or serious underreporting of drug use by mothers. Measures based on medical records may also be biased downward, due to the difficulties in identifying use and to unwillingness to record data which may be perceived as potentially incriminating (Zellman, Jacobsen, DuPlessis, and DiMatteo, 1992). The most objective measures of drug use are assays of body fluids. However, toxicologic studies of urine samples have limitations (Chasnoff, Chisum, and Kaplan, 1988). A positive test result only indicates that a particular substance was used within a certain period of time prior to testing. The test does not indicate the amount used or the frequency of use. In particular alcohol use is very difficult to document because of its rapid metabolism.

In spite of these limitations, we believe that these analyses confirm the importance of the NMHIS as an important and welcome resource of information about pregnant women, and as new surveys become available

(such as the National Pregnancy and Health Survey from NIDA), they will further inform this important issue. Future analyses will incorporate multiple control variables in multivariate examinations of the relationships between drug use during pregnancy, changes in use, and outcome of the pregnancy. Outcomes will extend the categorization used here to incorporate low birth weight as well. We anticipate that these analyses will serve to further illuminate and inform our understanding of the mechanisms and policy issues surrounding perinatal substance use.

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APPENDIX D

**MEASURING DRUG USE AMONG YOUTH:
COMPARISONS OF ESTIMATES ACROSS FOUR NATIONAL DATA SETS**

INTRODUCTION

Drug use among adolescents has been shown to carry especially high associated health and social costs (Mensch and Kandel, 1988; Elliot, Huizinga and Menard, 1989; Ellickson, 1992). Because of these costs, monitoring the status of use in this population, with a view to the practical issues of resource allocation, and evaluation of prevention or intervention efforts has assumed great significance to policy makers at federal, state and local levels. The strong commitment among policymakers and practitioners to reduce drug use in this population has been evident in the amount of data collected to assess the extent of the problem. There is a relative plenitude of relevant information concerning prevalence rates and consequences of use, as well as attitudes and perceptions about use of different substances among adolescents and young adults. However, when policy makers ask questions such as "What does the research add up to?" or "What is known about the magnitude of the problem in this population?", the responses are usually complex and often contradictory. This lack of consistency in research findings, along with the difficulties in reconciling different conclusions, can hinder appropriate and timely formulation of policy.

In this paper we describe overall patterns of use of alcohol and other drugs among youth, including prevalence levels and trends over time, as observed through four different lenses, or data collection efforts, designed to determine the extent of drug use in the general noninstitutionalized population of young Americans. We examine data from the High School Senior Survey (or Monitoring The Future - MTF), the National Household Survey of Drug Abuse (or NHSDA), the national-level data component from the Youth Risk Behavioral Survey (YRBS), and the Attitude Tracking Survey from the Partnership For A Drug-free America (the Gordon S. Black Corporation - PATS). This is not an exhaustive look at the data available. There are other survey instruments used to collect this type of information from teenagers, such as the National Longitudinal Survey of Youth, as well as many regional and state-level school-based surveys, such as the Fourth Biennial Statewide Survey of Drug and Alcohol Use among California Students in Grades 7, 9 and 11,

Project ALERT in California and Oregon, and Project STAR in Kansas and Missouri. Rather than cataloging all available information, however, we concentrate on those sources which produce cross-sectional information at the national level. The purpose of the paper is not to reproduce prevalence rates found in abundance elsewhere, but to compare and synthesize results from different surveys and identify important issues in using, integrating and interpreting data from multiple sources.

The studies/surveys we have chosen to discuss here include a broad range of populations and methodologies, which allow us to highlight issues to be taken into account in synthesizing information from different sources. The NHSDA and MTF are both sophisticated and well-designed surveys which have been fielded since the early 1970s. The YRBS, which replicates the MTF in its youth focus, asks about drug use in a context of multiple other health risk behaviors. The PATS uses a very different sampling frame than the other surveys included here, and has also been in the field for a number of years. All four surveys are cross-sectional, and rely on self-report measures of drug use. We will use them to explore whether different surveys of youth are measuring the same thing. We know that in any collection of studies, the outcomes or estimates will vary to some degree. This may be simply due to sampling error, since each survey is based on a small sample from a large population. However, conflicts may also arise as a result of variations in the research process, and measurement differences between the studies. We assess the consistency of information obtained from these various data sets, and use them as exemplars to lay out the methodological differences which may contribute to observed variation in estimated prevalence levels and trends across the data sets. Where possible, we use the information from one source as a supplement to data from another, to provide a more complete picture of substance use in this population.

We review our four data sources briefly, to highlight their individual strengths and limitations, and to identify areas of overlap or additional information among them.

DATA SOURCES

The National Household Survey of Drug Abuse (NHSDA)

This survey, administered periodically since 1972, and annually since 1990, is designed to assess the level and consequences of drug use among the general household population aged 12 and older. The sample design is a multistage area probability sample - the country (excluding Alaska and Hawaii) is divided into counties, or primary sampling units (PSU), and within each selected PSU samples of subareas and households are further selected. From each selected household, a roster recording age, race and gender of all residents is completed. Using a random sampling procedure either two, one or no respondents are selected from the household roster; the sample is conducted in such a way as to stratify along the dimensions of race and age as well as the geographical dimensions outlined above.

Based on this sampling plan, weights are developed so that each response can be correctly weighted to be representative of the population from which it was drawn. In this way the survey yields estimates of use for the entire household population. The sample sizes prior to 1991 were relatively small (less than 9300 in 1990), so that many responses to the survey items about behaviors believed to be quite rare in the general population receive very large weights. For example, many forms of drug abuse occur very infrequently, so that very few instances of these behaviors are reported in the sampled population. This can result in imprecise estimates and misleading inferences being drawn from the data. For this reason, analyses based on small samples (before weighting) reporting specific characteristics may be especially subject to these small sample instabilities, and should be interpreted with due caution. In addition, the survey is limited by the exclusion of groups at very high risk for drug use, and problematic measurement of heroin and cocaine use.

The High School Senior Survey - Monitoring the Future (MTF)

Data from high school seniors have been collected during the spring of each year, beginning with the class of 1975. These data are designed to shed light on changes in many important values, behaviors and

lifestyles in contemporary American high school seniors. Each wave of data collection takes place in about 125 to 135 public and private high schools selected in a multistage procedure. Stage 1 is the selection of particular geographic areas, Stage 2 is the selection of one or more high schools in the area, and Stage 3 is the selection of seniors within each high school. One limitation in the design is that it does not include in the target population those young men and women who drop out of high school before graduation. This excludes between 15 and 20 percent of each cohort, and will tend to bias (in a conservative direction) the estimates of drug use and other delinquent behavior among this age group, since it is known that these types of behaviors tend to occur at higher rates than average in the dropout group (Mensch and Kandel, 1988). The sample responses are also weighted in this survey. Therefore the caveats mentioned above in relation to the NHSDA are applicable in this instance as well.

Youth Risk Behavior Survey (YRBS)

The national-level school-based YRBS is a component of the Youth Risk Behavior Surveillance System, which periodically measures the prevalence of priority health-risk behavior among youth at different levels of the system, through comparable national, state and local surveys. Here we refer to the national-level data. A three-stage sample design was used to obtain a representative sample of 11,631 students in grades 9-12 in the 50 states, the District of Columbia, Puerto Rico and the Virgin Islands. Students were asked whether they had used alcohol, marijuana, and any form of cocaine during their lifetime and during the 30 days preceding the survey. Students were also asked whether they had five or more drinks of alcohol on one occasion during the 30 days preceding the survey and how old they were when they first consumed alcohol or used marijuana or cocaine.

Like the MTF surveys, this school-based survey does not capture certain subpopulations of youth at high risk for drug use. Another limitation has been the lack of detailed reporting of results from the surveys. Although public use data tapes are scheduled for release, the

delays in making these data available has limited the utility of this data source.

The Partnership Attitude Tracking Study (PATS)

The Partnership for a Drug-Free America was formed in 1986, when, using both print and broadcast media, the Partnership launched an anti-drug campaign. The Partnership Attitude Tracking Study is intended to address questions concerning the relationship between attitudes towards drugs and behavioral change. The data have been collected annually, from 1987 to 1991, and in general show trends which parallel those found in the MTF and the Youth Risk Behavioral Survey. However, the methodology employed by PATS is quite different from either MTF or the YRBS, and the population surveyed covers young children and adults over 18 as well as teenagers. The "mall-intercept technique" is used to select the sample of respondents in PATS. This technique employs a two-stage sampling method; the first stage consists of the selection of about 100 primary sampling units, usually shopping malls, located across the country. Each site is assigned a quota that specifies the respondents to be selected at that location. Quotas are established for age, race and gender, designed to guide interviewers in their recruitment of respondents. (In 1990 and 1991 Blacks and Hispanics were over sampled.) The questionnaires are designed to elicit information about attitudes towards and use of both licit and illicit drugs.

The PATS data are weighted by age, gender and race by region. The sample distributions of these variables are compared to population projections from the Census Bureau to compute weights for each case. The results are reported by age category, for children aged 9-12, teens aged 13-17, and adults over 18.

The primary limitation of this survey lies in the fact that it is a survey of mall shoppers, and not a general population survey. This makes the results from this study particularly difficult to interpret, because of the huge selection effects due to the way the sample is constructed. In spite of the use of quotas and post-survey weighting, inferences cannot be made to a more general population from this sample, because of the lack of a well-defined sampling frame. In addition, the

results are not reported in ways that allow for comparisons with other surveys. For example, the PATS reports prevalence estimates by age categories of 9-12, 13-17 and young adults. By contrast, the NHSDA reports results for youth aged 12-17, the MTF reports for seniors (say aged 17-18), and the YRBS reports for ninth, tenth, eleventh and twelfth graders.

OVERLAPS AMONG THE DATA SOURCES

Overlaps in Time

Patterns of drug use vary over time; hence in any comparisons, the year of data collection must be taken into account. The NSHDA and MTF have been fielded regularly since the early 1970s. The YRBS was collected in 1989 and 1990, and every two years starting in 1991. The PATS began annual data collection in 1987. We report on years 1985 to 1991 in this paper, using data from each survey where available.

Overlaps in Populations

The NHSDA is targeted at the household population over 12. In our analyses we use data from people aged 12 to 18 in various combinations, as appropriate to the comparisons being made. Until 1991, MTF sampled seniors only; however, in 1991 samples of 8th and 10th graders were also asked about their drug use attitudes, beliefs, and behaviors. The YRBS sampled students in public and private high schools at grades 9 through 12, and the PATS reports results for children aged 9 through 12, teens aged 13 to 17, and young adults over 18.

Overlaps in Geographic Representation

All the surveys used in this paper are designed to yield nationally representative samples of youth. Until 1991, Alaska and Hawaii were not represented in the samples drawn for the NHSDA. MTF samples only in the contiguous United States, while the YRBS sample is drawn from the 50 states, Puerto Rico and the Virgin Islands. The PATS samples from shopping malls across the country, and then employs a post-stratification weighting technique to bring the samples into line with projected regional census figures.

Overlaps in Sampling Frames

The NHSDA uses multistage probability sampling to interview people over 12 years of age in households in the U.S. As such, it is the most general of the surveys considered here. Respondents can be categorized by age and in/out of school status. The YRBS draws a 3-stage probability sample of high school students in grades 9 through 12. Likewise, the MTF employs a 3-stage probability sampling design to survey high school seniors (and in 1991, to survey eighth and tenth graders as well).

These three surveys satisfy two very important and basic requirements needed to make valid inferences about population parameters of interest, such as prevalence rates of illicit drug use. First, they draw probability samples, in which each element of the target population has a known and non-zero chance of being included in the sample. Second, each survey begins by constructing a sampling frame that lists the sampling units encompassing all elements of the population (Lee, Forthofer and Lorimor, 1989). By contrast, the PATS estimates are not based on a probability sample; that survey does not have a clearly-defined sampling frame, and as such is limited in its inferential utility.

Overlaps in Measurement Methods

Measurement error in survey responses arise from multiple sources, including the method of data collection; errors in responses due to respondent confusion, carelessness, or dishonesty; errors attributable to the wording of the items in the questionnaire, and the order or context in which the questions are presented. The consequences of these errors in surveys are results which may be quite inaccurate and misleading (Biemer, Groves, Lyberg, Mathiowetz, and Sudman, 1991). They may also account for some of the differences observed in estimates obtained across different surveys.

Methods of Data Collection

The basic data collection method for the NHSDA is the face-to-face interview. However, when sensitive questions (for example, concerning illegal drug use) are reached, the interview procedure shifts to the use

of self-administered answer sheets. Extensive procedures to assure respondents of the confidentiality of their responses are also used (Groefrer, Gustin and Turber, 1992). In spite of these measures, it is possible that when the topic of the survey is sensitive, and the respondent is an adolescent, the quality of the data collected in this way may be affected by the presence of other members of the household, or by reluctance on the respondent's part to report socially undesirable behaviors or attitudes (Biemer, Groves, Lyberg, Mathiowetz, and Sudman, 1991).

Both the MTF and YRBS use self-administered questionnaires in a classroom setting. Self-administered surveys have been found to produce more accurate reporting of drug use than interviewer-administered surveys, although some research indicates that this may vary by ethnic group (Schober, Caces, Pergamit, and Branden, 1992). However, in classrooms students may be tempted to overreport their drug use to impress their peers (a "bragging" effect), which could inflate the prevalence estimates obtained in these surveys.

The PATS collects data by asking selected respondents to complete a self-administered questionnaire in a private location in the mall where the survey is being conducted. Although little is known about the efficacy of mall surveys in terms of eliciting truthful responses, the true anonymity and lack of peer pressure may in fact yield better quality data on sensitive topics than the methods mentioned above. To our knowledge, this issue has not been examined in any methodological work to date.

Reliability of Responses

Respondents are asked many different types of questions in these surveys, but our interest lies in their answers to sensitive drug use items. All four surveys discussed in this paper are based on self-report methods; common sense suggests that respondents may be less than candid in their responses, or will recall their past behavior imperfectly. Surprisingly, there is a great deal of evidence to indicate that most young people, regardless of the frequency of their drug use, tend to report their use reasonably honestly (Smart and Blair,

1978; Ellickson and Bell, 1991; Oetting and Beauvais, 1990). Although some students may exaggerate their drug use, rates of endorsement of a fake drug are likely to be very low (Oetting and Beauvais, 1990). Inconsistencies in reporting are also likely to be negligible (Ellickson and Bell, 1991; Oetting and Beauvais, 1990).

Recall error does occur in these data. Bachman and O'Malley (1981) note quite large discrepancies between monthly and annual reports of drug use - either the annual reports are too low, or the monthly frequencies are too high. They hypothesize that memory of, and reporting of events declines quite rapidly as time elapses, and conclude that estimates of drug use during the past year, and possibly also lifetime use, will be systematically underestimated. However, since the biases are expected to be fairly constant over time, analyses of trends should still be valid (Bachman and O'Malley, 1981).

Questionnaire Items

While all the surveys contain questions about different types of drug use, the actual items are framed in different ways, and allow for different categories of responses. For example, while the MTF asks the respondent at which grade he/she began to use drugs, the YRBS asks the respondents to give their actual age of initiation, thus allowing for a slightly more fine-grained analysis of initiation. Both surveys ask about use of various drugs in the past 30 days, and both ask about heavy alcohol use, characterized as having had 5 or more drinks within a couple of hours on one or more occasions. In contrast, the PDFA mall surveys do not ask specifically about alcohol or cigarette use, but offers a wealth of information about attitudes towards drugs, as well as the impact on respondents of anti-drug commercials. The NHSDA includes items about age of first use, most recent use, frequency and quantity during the past 12 months and the past 30 days, as well as frequency of polydrug use during the last year.

Context of the questions

Order and context effects remain a problematic aspect of survey research. The order in which questions are presented, and the focus of questions in the survey may each create variation in the responses given

to the items. The NHSDA and MTF surveys are both heavily focused on drug use, although both include items regarding attitudes, perceptions and beliefs about use. The PATS is also primarily an instrument designed to assess drug use and attitudes among its respondents. By contrast, the YRBS has a much broader scope, and includes questions about many other health risk behaviors besides drug use, such as behaviors that result in HIV infection, other sexually transmitted diseases, and unintended pregnancies, dietary behaviors and physical activities. This context for asking questions about drug use may reduce any tendency to underreport such behavior; thus we may expect to see slightly higher estimates of use prevalence on this survey.

All these data systems are ongoing, and thus also provide information about trends in use over time among youth and adolescent subpopulations. By focusing on general samples, rather than more extreme groups in treatment programs, juvenile detention centers, or continuation schools, these surveys provide normative information about substance use. By generally excluding, or not targeting individuals most likely to be involved in deviant behaviors, all four surveys discussed here underestimate the prevalence of less frequently used drugs, and the heaviest and highest risk use patterns.

As noted, these data sources vary substantially in terms of their target populations, their sampling and measurement methodologies and the periods of questionnaire administration. In spite of these differences, different pieces of information obtained from each set of data can be used to confirm, validate, or extend our knowledge about, and ability to interpret, trends in use and attitudes towards use in this subgroup. If similar levels of use and directions of change are reported from different data sources, this is evidence which allows one to place some faith in those numbers, and in doing so can strengthen the conclusions to be drawn from the results of analysis of these data. A more problematic scenario is one in which levels of reported use may be quite different, depending on the sample and the methodology of the survey, while information regarding trends in increase and decrease of prevalence from different data sources is more comparable. In this case, consideration of the differences among the surveys may go some

distance towards explaining the varying prevalence levels, while again confidence is increased in the directions shown in the trends of use over time.

COMPARING PREVALENCE AMONG YOUTH OF HIGH SCHOOL SENIOR AGE

The prevalence rates for high school seniors obtained from the MTF, NHSDA and YRBS databases for the year 1990 are presented in Table 1.¹ While the YRBS overlaps with MTF in terms of its school-based questionnaire methods, and some of the items used to ask about drug and alcohol use, it extends the MTF sample by including Hawaii, Alaska, Washington D.C., Puerto Rico and the Virgin Islands in its geographic sampling base. Also, although the YRBS does not coincide exactly with the coverage of the school population provided by MTF, we compare the data from both surveys by restricting our attention in YRBS to the prevalence rates reported for the 12th graders only for alcohol, marijuana and cocaine. As an additional source of comparative data, prevalence figures from the NHSDA for members of the household population aged 17-18 are included.

¹ This is the only year for which the YRBS data is available disaggregated into results by grade.

Table 1
1990 Data from MTF, the YRBS and NHSDA for Youth of High School Age
(All entries are percentages)

	Alcohol			Marijuana		Cocaine	
	LIFE	CURR	HVY	LIFE	CURR	LIFE	CURR
MTF (n=15,200)	89.5	57.1	32.2	40.7	14.9	9.4	1.9
YRBS (n=2,908)	92.4	65.6	44.0	42.2	18.5	9.3	2.3
NHSDA							
In school	74.3	40.3	NA	29.4	11.6	5.5	0.5
All*	75.4	43.5	NA	33.2	10.2	6.8	0.7
Not in school	80.3	54.1	NA	45.7	6.4	10.8	1.3

* The weighted NHSDA data includes members of the general population aged 17-18; that is, both students and dropouts are included.

In spite of the fact that the substances, measures of use, the age group included, and the year of survey administration are being held constant across the three sources of data, the picture that emerges is complex. The ranking of the various substances is identical in all three surveys for both lifetime and current use. Lifetime alcohol prevalence is more than twice that of marijuana, and ten times the rate of cocaine. These trends occur in all three surveys, in spite of variations in mode of administration and sampling frames, serving to indicate their robustness to these methodological differences, and reflecting real differences in the underlying phenomena.

The prevalence rates reported by MTF and YRBS on the stable lifetime use measure of alcohol (92% versus 89.5%), marijuana (42.2% versus 40.7%) and cocaine (9.4% versus 9.3%) are very similar. However, this consistency between MTF and YRBS is not as clear when comparing the estimates of more recent behaviors. In general the YRBS shows higher prevalence figures than MTF for all categories; the biggest variation occurs in the recent binge drinking area, where the YRBS figure is 44%

as compared with 32.2% from MTF. The more current substance use items are more subject to response bias, but we would expect the bias to be in the same direction in both surveys. The variation could also be due to the different sampling schemes used by the two surveys, or to geographic differences in prevalence of drug use (the YRBS includes several places not sampled in MTF). Another possible explanation for the consistently higher reporting in YRBS may have to do with the questionnaire context. In YRBS a number of other risk behaviors are included in addition to substance abuse. YRBS respondents may have been less sensitive to reporting substance abuse given that other types of risk behavior were also included.

Almost all the NHSDA prevalence estimates are lower than those from the MTF and the YRBS. This is particularly noticeable in the case of the alcohol use estimates, which are between 10 and 20 percent lower than those obtained in either the MTF or YRBS. We hypothesize that this is a "mode of administration" effect, in that MTF and YRBS are school-based, whereas the NHSDA relies on in-house interviews with these youth, where parental influence may result in biasing the estimates downwards. As noted by Oetting and Beauvais (1990), differential response rates in the NHSDA may also be contributing to this discrepancy - more dysfunctional households may be less cooperative in the data collection phase, or may be difficult to include in the survey. On the other hand, it is possible that the MTF and YRBS data are upwardly biased, as juveniles in the presence of their peers may be more tempted to exaggerate their experiences.

COMPARING TRENDS IN USE OVER TIME

Both MTF, the NHSDA and the PATS have data available from multiple years, and thus may be usefully examined for trends in use over time. We compare trends in available data from these three surveys in lifetime use of alcohol, marijuana and cocaine. We also include trends in current use from the three data sources. Table 2 shows lifetime use of alcohol, marijuana and cocaine from the MTF and NHSDA, for high school seniors (MTF) and youth aged 17-18 who indicate that they are currently enrolled in school (NHSDA). (Comparisons between PATS and the NSHDA, for 13 to 17 year-olds are presented below.)

Table 2**Lifetime Use of Alcohol, Marijuana and Cocaine in MTF and NHSDA**

ALCOHOL	1985	1988	1990	1991
MTF	92.2	92	89.5	88.0
NHSDA All	82.7	78.4	75.4	78.9
Enrolled	81.7	78.9	74.3	77.8
Not Enrolled	84.6	76.3	80.4	83.8

MARIJUANA	1985	1988	1990	1991
MTF	54.2	47.2	40.7	36.7
NHSDA All	44.4	38.9	33.2	33.6
Enrolled	37.1	36.5	29.4	31.5
Not Enrolled	57.9	46.9	45.7	43.5

COCAINE	1985	1988	1990	1991
MTF	17.5	12.1	9.4	7.8
NHSDA All	14.9	9.3	6.8	7.3
Enrolled	9.4	9.0	5.5	6.0
Not Enrolled	25.0	10.2	10.8	13.3

There are several items of note in this table. First, almost without exception, both studies converge in documenting that trends for reported lifetime use in all three drugs are down from 1985 through to 1990. For MTF, this declining trend continues through 1991, but the NHSDA rates have increased in each substance category in 1991. These increases are small, however, and are well within the bounds of sampling error. The declines in illicit drug use over this period are quite sharp. For example, in the MTF, lifetime use of marijuana has declined by almost one third, from 54% in 1985 to 36% in 1991. The declines also appear to be steeper in the MTF than the NHSDA, bringing the 1991 prevalence figures for the two surveys into quite close accord (36.7% versus 31.5% for marijuana, and 7.8% versus 6.0% for cocaine). These declines may be the result of more underreporting due to increased social disapproval of drug use over this time period. They may also be characteristic only of this particular population - youth in school - and may not hold for other populations. We examine trends for youth who are not enrolled in high school in a later section of this paper.

Note that the PATS prevalence rates are only reported for ages 13 to 17, and do not allow for disaggregation to include only those respondents who were currently enrolled as seniors in high school. In Table 3, we present lifetime use estimates from the PATS, for adolescents aged 13 to 17, and include similar data on people from the general household population of the same age from the National Household Survey on Drug Abuse.

Table 3
Lifetime Use Over Time in PATS and the NHSDA
(Entries are percentages)

	Lifetime Marijuana Use		Lifetime Cocaine Use	
	PATS	NHSDA	PATS	NHSDA
1985		44.4		14.9
1987	35.4		12.9	
1988	36.2	19.8	13.9	3.8
1989	35.4		13.2	
1990	29.3	17.1	8.2	3.0
1991	27.2	14.9	8.2	2.7

Both studies reflect higher marijuana than cocaine lifetime use for this population. This is in line with findings from other research on the progression through various types of drug use, in which marijuana is often considered the gateway drug, and certainly the first illicit drug used by many young people. Otherwise there are large discrepancies between the two studies. In 1985, the NHSDA lifetime rates for both drugs are somewhat higher than those reported by PATS in 1987 (the first year of that study). While both surveys show downward trends, these are of very different magnitudes: between 1985 and 1991 the NHSDA marijuana lifetime rate falls by two thirds; from 1987 to 1991 (the most comparable period) the PATS figure falls by only one third. For cocaine the difference is still greater. Similar observations can be made in

the trends in past 30-day use for marijuana and cocaine in the two surveys.

Table 4
Trends in previous 30 day Use in PATS and the NHSDA
(Entries are percentages)

	Current Marijuana Use		Current Cocaine Use	
	PATS	NHSDA	PATS	NHSDA
1985		19.6		6.3
1987	20.2		8.3	
1988	21.6	7.3	8.4	1.2
1989	19.2		7.7	
1990	14.9	6.0	4.4	0.7
1991	13.5	5.1	4.1	0.5

Several factors may be contributing to these inconsistencies. First, we would expect the NHSDA rates to be lower than the PATS figures due to differential location effects - adolescents are likely to report less drug use at home (Zanes and Matsoukas, 1979), and may exaggerate their use or take the questions less seriously at the mall. In addition, the sharper decline in NHSDA numbers may reflect the increases in social disapproval, and perceptions about the harms associated with drug use, which may be most acutely felt and expressed in the home from parents or other adults. While these shifting norms also may be linked to the downward trend in the PATS, their effects could be muted by the location of the survey administration (a mall) and the pressure of peers. Also, mall surveys may capture some youth at particularly high risk for drug use not observed in the household population, such as

runaways. On the other hand, we have also suggested that young people in malls may be less constrained by parental presence, and may be inclined to respond more accurately about their drug use. Since so little is known about how conditions in mall surveys affect the responses, clarification of these differences must remain hypothetical.

Our "best guess" at a more accurate rate (and rate of decline) is shown in the central lines of Figures 1 and 2. These lines represent a simple and a weighted average of the two studies, in which the NHSDA is given double the weight of the PATS. This is an arbitrary weighting scheme, but it attempts to account for some of the downward bias in the household survey, while giving those figures the heavier emphasis in the pooled estimate due to the sophisticated and clearly-articulated methodology on which they are based. The simple average would yield a 1991 prevalence level of about 21% for lifetime marijuana use, and 5.5% for lifetime cocaine use among 13 to 17 year olds. The weighted averages for 1991 lifetime marijuana and cocaine use are 19% and 4.5% respectively.

While the rates obtained from these two surveys cannot be directly compared to the estimates of use among high school seniors obtained from MTF or the YRBS, some of the same trends can be observed. Current and lifetime use of both marijuana and cocaine have either plateaued or declined over the seven years of the study, from 1985 to 1991, although the absolute levels of current use for these drugs reported in the PATS tend to be somewhat higher than prevalence estimates reported in other surveys, in spite of the fact that the PATS sample includes younger teens. Levels of heavy alcohol use reported from PATS, at around 18%, are similar to those found in the other surveys of this population group. The higher levels of other drug use observed in the PATS may indicate that the population of teenagers to be found in shopping areas is different from that found in high schools, at least in either their patterns of use, or in their willingness to admit to use. Unfortunately, no information is requested from the respondents in PATS about their school attendance or household residence. Including these essential pieces of demographic information would substantially aid in providing bridging opportunities across these different data sets.

COMPARISONS OF TRENDS ACROSS GRADES/AGE GROUPS

There are striking differences to be observed in the rates of drug use at specific ages. Age-specific rates are more likely to reflect maturational patterns than historical factors (Kandel 1991), and these are again reflected in the increasing rates of use at each age, apparent in the NHSDA (1990 and 1991), the MTF (1991) and YRBS (1990), presented in Table 5. The rate of increase also appears to be similar across all three surveys. As expected from our earlier results on prevalence levels among seniors in these data, substantial differences are also observed in the earlier grades/age groups, with the highest levels reported in YRBS, consistently lower rates from the NHSDA, and the MTF in between.

Table 5
Past Month Marijuana Use Across Grades
(Entries are percentages)

	8th Grade	9th Grade	10th Grade	11th Grade	12th Grade
NHSDA					
1990	0.4	2.1	7.7	8.7	10.2
1991	0.4	2.3	5.1	7.6	12.3
MTF					
1991	3.2		8.7		13.8
YRBS					
1990		9.6	12.3	14.1	17.9

COMPARISONS OF PREVALENCE AMONG OUT-OF-SCHOOL YOUTH

Comparisons between the NHSDA, MTF and YRBS indicate ways in which different data sources may complement one another, and allow for estimates of drug use to be made in generally difficult-to-reach groups. We refer to the results from the three surveys in Tables 1 and 2 to further illustrate this point. Those results showed higher levels of use reported in the YRBS and the MTF, and consistently lower rates in the NHSDA, reflecting a downward bias due to survey administration in the home. However, the NHSDA provides information on a population not

covered by the MTF or YRBS - namely those youth who are not currently enrolled in school, but are still members of the household population. Thus the ratio of use between those in school versus those young people not enrolled in school may be obtained from the NHSDA, and used to extrapolate the MTF estimates to dropouts or those not in school (Y. Hser, D. Anglin, T. Wickens, M. Brecht and J. Homer, 1992). For example, the ratio of "Not in school lifetime alcohol use" to "In school lifetime alcohol use" from the NHSDA in 1985 is $84.6/81.7=1.04$. When this number is applied to the comparable in-school figure from the 1985 MTF, we may estimate that $1.04*92.2\% = 95.5\%$ of 17-18 year olds who are not enrolled in school have used alcohol in their lifetime.

This is a very simple synthetic estimate, and we can take the process further in several ways. Consider the following example of the use of these methods to obtain an overall estimate of prevalence of lifetime alcohol use among all youth of high school senior age, including both those in school, and those not currently enrolled, for the year 1990, when we have data from three sources - the MTF, YRBS and the NHSDA. We begin by observing (from Table 2) that the discrepancy between the NHSDA estimates and those from MTF appear to remain quite stable, except for sampling error, over time - 10.5% in 1985, 13.1% in 1988, 15.2% in 1990 and 10.2% in 1991 (with an average over the four years of 12.25%). These differences may give a measure of the extent of the systematic bias downwards in the NHSDA. We use the average of 12.25% to adjust the 1990 in-school figures upward for the NHSDA: thus 74.3% is increased to 83.4% for in-school youth aged 17-18, and 80.3% increases to 90.14% for out-of-school youth. Repeating the above algebra for the NHSDA out-of-school/in-school ratio with these numbers gives an out-of-school inflation factor of 1.08. When this is applied to the MTF and YRBS numbers, we have three estimates of lifetime prevalence among youth in school (89.5% from MTF, 92.4% from YRBS and 83.4% from NHSDA), and three estimates of lifetime prevalence of alcohol use among youth who are not in school (96.7% from MTF, 99.9% from YRBS and 90.14% from NHSDA). A simple average of these gives an overall prevalence rate for youth aged 17-18 of 92.02%. (An improvement on this estimate would be a weighted average in which the relative precision

associated with each estimate is taken into account. Unfortunately, this information is not available for the YRBS.) The point here is that these numbers can be combined to yield one single estimate, under certain assumptions about the ways in which data collection methodology has affected the individual estimates obtained.

DISCUSSION

In this paper we have presented data on drug use prevalence and attitudes about drug use among young people from several different data sources. Substantial variation in absolute prevalence levels was observed across the studies. Yet the direction of trends in use, over time and across drugs, is much more comparable.

While these comparisons serve to validate and confirm the observed trends of decreasing use in the adolescent population in recent years, they also indicate how the sampling frame, period or year in which the surveys are administered, mode and place of administration such as mall interview versus home versus school-based questionnaires, differences in questionnaire content and choice of population to be sampled can radically affect the prevalence estimates obtained by any data collection effort. However, given all these differences, the key question of policy relevance remains the integration of this information to obtain a reasonable estimate of the size of the problem in this population. There are two main issues here. The first concerns pooling information to arrive at one composite estimate, and the second is targeted at finding estimates for hard-to-reach populations in indirect ways. We have provided examples of both, in quite simplistic ways. Refinements to our examples would include weighting the estimates by their variance, to obtain a more precise pooled estimate, making more use of the information about systematic biases and discrepancies over time to improve the pooling techniques, and to explore the use of other surveys, such as the PATS, which may incorporate special populations, but which has some severe limitations, to provide input to calculations of bounds around the pooled estimates.

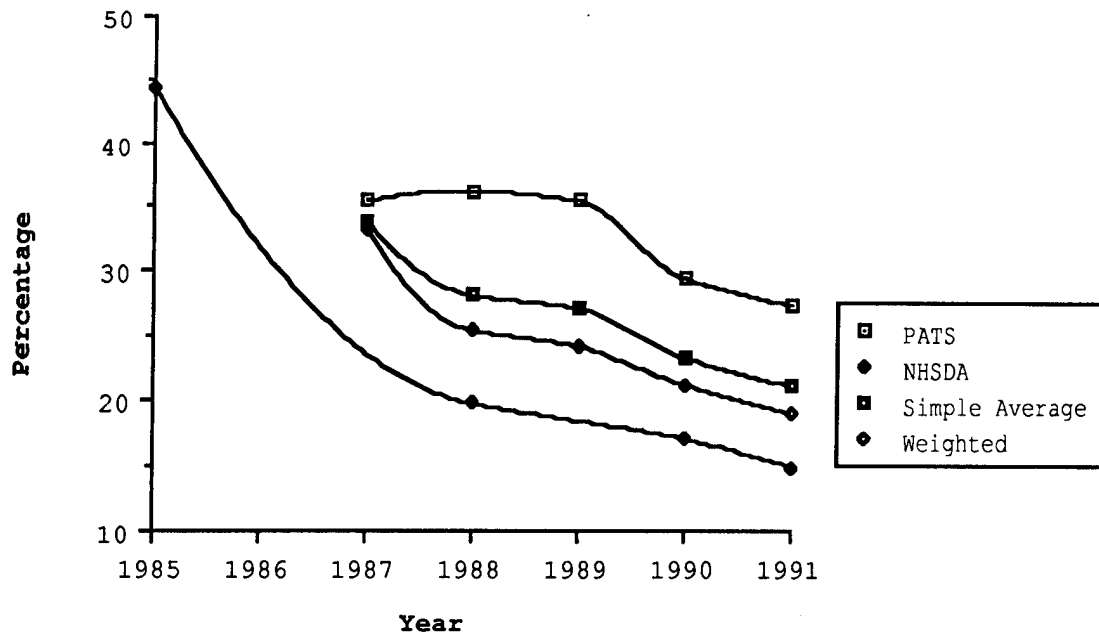


Fig. 1-Lifetime Use of Marijuana in PATS and NHSDA

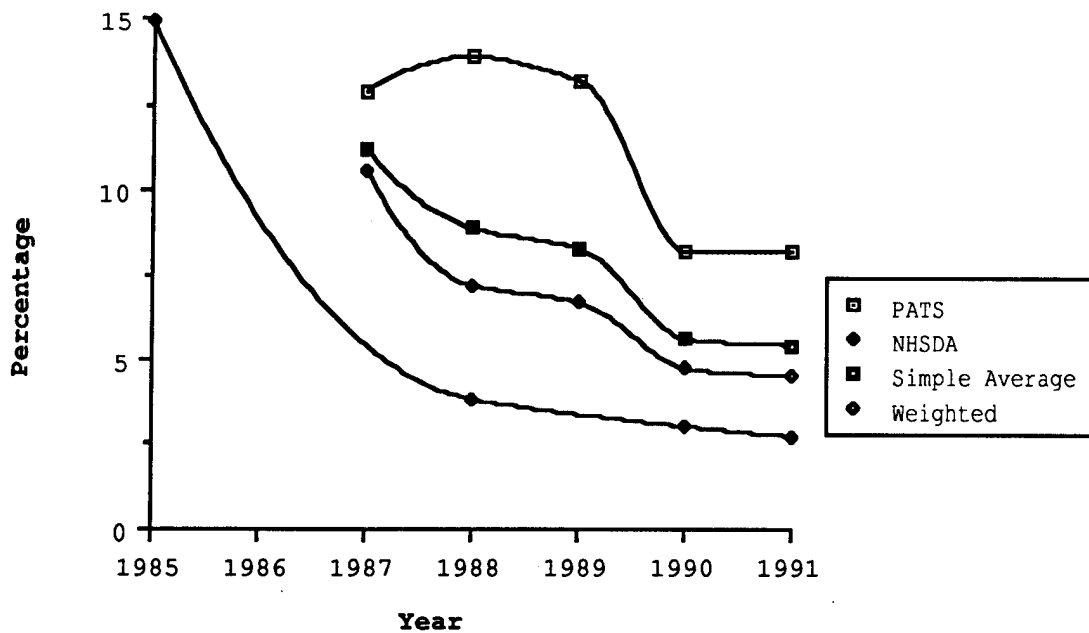


Fig. 2-Lifetime Use of Cocaine from PATS and NHSDA

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APPENDIX E

**ESTIMATING TREATMENT NEEDS IN THE UNITED STATES
HOUSEHOLD POPULATION**

INTRODUCTION

This paper demonstrates the pitfalls associated with using a household survey as the basis for estimating need for publicly funded drug treatment. We explore the demographic, socio-economic and drug use characteristics of those members of the household population who use drugs. We demonstrate that the vast majority of these people are not likely candidates for receiving publicly supported drug treatment. Using methodology developed by the Institute of Medicine for its 1989 study of treatment needs we identify those users in the household population who need drug treatment. Only a small percentage of all drug users are likely candidates for drug treatment, and among those who are only a small fraction fit the profile of those who receive publicly supported treatment.

Background

The household population includes those members of the population who are not quartered in military barracks, institutions (e.g., prisons, jails and hospitals) and college dormitories and those who are not homeless (NIDA, 1990). Household surveys provide valuable measures of general drug use prevalence because the vast majority of Americans belong to this population. For example in 1990 over 97 percent of all Americans belonged to the household population.

Household surveys are typically designed to provide precise estimates of the number of drug users in the entire household population during a given time period. The NHSDA, for example, provides estimates of the number of people who used drugs in either the 12 months or 30 days prior to completing the survey. Also the NHSDA estimates the number of users who used drugs on a weekly or monthly basis and it provides additional information on the patterns and consequences of that use for those people who used drugs.

Several authors have used such surveys to estimate treatment needs in the household population (Regier, et al., 1988; IOM, 1990; ONDCP, 1989; Presidential Commission on Human Immunodeficiency Virus Epidemic, 1988). In these studies the authors have generally equated need for

treatment with drug dependence or chronic abuse. The conditions of drug dependence and abuse are diagnosed according to the criteria given in either the 10th edition of the International Statistical Classification of Diseases, Injuries and Causes of Death, ICD-10, (1991) or the 3rd revised edition of the Diagnostics and Statistical Manual of Mental Disorders, DSM-III-R, (1987). These two diagnostic systems provide similar, but distinct, criteria for determining both drug dependence and drug abuse. (See Table 6 for the complete list of symptoms.) Drug dependence is the more severe form of these two syndromes of problematic use.

Several of the estimates of need for treatment are based on the NHSDA (IOM, 1990, ONDCP, 1989; Presidential Human Immunodeficiency Virus Epidemic, 1988). These estimates generally use measures of heavy or frequent use to identify drug dependence or abuse. The 1989 National Drug Control Strategy (ONDCP, 1989) defined dependent users as users who had taken drugs 200 times in the past 12 months, thus estimating that approximately 4 million members of the household population needed treatment. The Presidential Commission on Human Immunodeficiency Virus Epidemic found that 6.5 million members of the household population needed treatment in 1985.

The IOM (1990) estimated need for treatment in the general U.S. population--the household population, criminal justice clients and the homeless--and found that in 1988 about 5.5 million Americans needed drug treatment. The IOM estimates for treatment needs for the household population derive exclusively from the 1988 NHSDA. Although the NHSDA contains neither ICD-10 nor DSM-III-R diagnostic questions, it does contain questions which closely parallel these diagnostic measures. (See Table 6 and Tables 7 and 8 of the Technical Note for a comparison of NHSDA items to the ICD-10 and DSM-III-R criteria.) The IOM attempted to use questions from the NHSDA to identify which users met the ICD-10 or DSM-III-R criteria for drug dependency or abuse. On the basis of this approximation to the ICD-10 and DSM-III-R the IOM identified that 1.5 million members of the household population had a clear need for treatment (were drug dependent) and 3.1 million had probable need (were drug abusers).

The Epidemiologic Catchment Area studies (Reiger, et al., 1988) also used household surveys to estimate the number of drug dependent users. However, these studies used a survey specifically designed to provide the information necessary for a valid diagnosis using the DSM-III-R criteria. This survey was extensive and was given to representative samples in five metropolitan areas. These studies estimated that during the period from 1981 to 1983 roughly 2.3 million members of the household population needed treatment in any given month and 3.4 million would have needed treatment during any 6 month interval.

As noted above these studies operationalized need for treatment by equating treatment needs and drug dependency. Although this operational definition has intuitive appeal and may be appropriate for medical or moral considerations, it may not be sufficient for creating a policy-relevant indicator of need for drug treatment. In determining need for publicly supported treatment one must distinguish between those who need or want treatment, e.g., all dependent and chronically abusive users, and those whose treatment the taxpayer is required to supply. If, as suggested in the IOM report (IOM, 1990), the principles which justify publicly supported treatment are: a) reducing external social costs associated with drug abuse; and b) remedying constraints caused by inadequate income, then the public is responsible for paying for treatment when that treatment will greatly reduce the social costs of an individual's drug abuse or when the individual cannot afford the costs of treatment. Thus any indicator of need for drug treatment must not only identify drug dependence but it must also demonstrate that the dependent users inflict high social costs or are too destitute to afford private treatment.

It is widely recognized that the drugs that a user abuses have differential social costs. Heroin and other opiates are typically associated with high social costs. (AIDS, crime, debilitating, opportunity costs.) Heavy cocaine use is also considered costly. These drugs associated with dependent lifestyles drug seeking and using often consume all users energies (Harrison and Gfroerer, 1992). Marijuana abuse is generally not associated with large social costs. Many heavy

and regular users hold jobs with reasonable incomes and crime and health problems are not generally associated with marijuana use.

Methods and Materials

The 1990 National Household Survey on Drug Abuse (NHSDA) serves as the basic data source used in this study.¹ The National Institute on Drug Abuse (1990) describes the NHSDA in detail, so it will be reviewed only briefly here.

The NHSDA is a multiple stage probability sample, of the household population age 12 and older. In 1990 the survey was administered to over 9000 respondents. The survey gathers self-report data on drug use behaviors of these respondents and provides sample weights which can be used to estimate prevalence in the entire household population. We use this survey to estimate use in the 12 months or 30 days prior to the survey and also to estimate the number of users in need of treatment.

The methodology used in determining need for treatment is nearly identical to the algorithm used by the IOM in its 1990 study.² The details are given here (fully in the Technical Note) for completeness (and correctness since there were some mistakes in the IOM's reporting).

The IOM estimated need for treatment by analyzing the drug use behaviors of survey respondents who, in the 30 days prior to completing the survey, used any of the illicit drug recorded by the NHSDA. (A complete list of these drugs is given in the Technical Note.) Using NHSDA questions on drug dependency and drug related problems, the IOM methodology classifies each user according to his or her score on a composite drug problem and dependency scale and by the user's drug use frequency. This creates a matrix classification scheme (see Table 9 of the Technical Note). People with the highest frequency of use and the highest score on the drug dependency-problem scale are classified as "clearly in need". People with high use but low dependency-problem

¹1990 is the most recent NHSDA that is currently accessible to the public. The 1990 survey is also the most appropriate survey to use for this study because in 1991 the NHSDA sampled beyond the household survey. However, the --- Commission recommended that states survey the household population to identify treatment needs.

²The methods differ only in treatment of records which lack sufficient data for proper classification.

scores or high dependency-problem scores and moderate use are denoted "probably in need." People with moderate use and low dependency-problem scores or low use and high dependency-problem scores are considered "possibly in need" and people with low use and low dependency-problem scores are designated "unlikely to be in need."

The IOM expected, without confirmation, that the "clearly in need" class would correlate with drug dependency as defined by the ICD-10 and the DSM-III-R. Also the "probably in need" class is expected to contain mostly those people who would be classified as drug abusers by either the ICD-10 or the DSM-III-R³. Complete details of the IOM classification scheme are given below in the Technical Note.

Results

This section contains a discussion of drug use among the general household population. We discuss both the substances abused and the frequency of use among users who consumed drugs in the 12 months preceding the 1990 NHSDA, the previous 12 month users. We also discuss the substance abuse patterns of those users identified as "clearly in need of treatment" by the IOM algorithm⁴. The drug use behavior of this group is then contrasted with the use patterns of a drug treatment clients. Finally this section compares the socio-economic characteristics of those identified as "clearly in need of treatment" with the other drug users in the household population.

³Drug abuse is called "harmful use" by the ICD-10.

⁴We concentrate on those identified as "clearly in need of treatment" because these are the most problematic users. The IOM considered both the "clearly in need of treatment" and "probably in need of treatment" as in need of treatment. This maybe true but we find that most of the "clearly in need" do not meet the criteria or profile of public sector drug treatment. The "probably in need" contain even fewer candidates for such treatment and so we do not specifically analyze this group of users.

Drug Use in the Household Population, Previous 12 Month Users

According to the results of the 1990 NHSDA, 13 percent of the household population used illicit drugs in the 12 months preceding the survey. Marijuana was the most widely used substance with 76 percent of all user using marijuana and nearly half, 47 percent, using only marijuana. Psychotherapeutics⁵ were the second most widely used substances with 32 percent of all users using at least one psychotherapeutic substance during the year. Roughly 23 percent of the users consumed cocaine and few users used any of the remaining substances, see Figure 1.

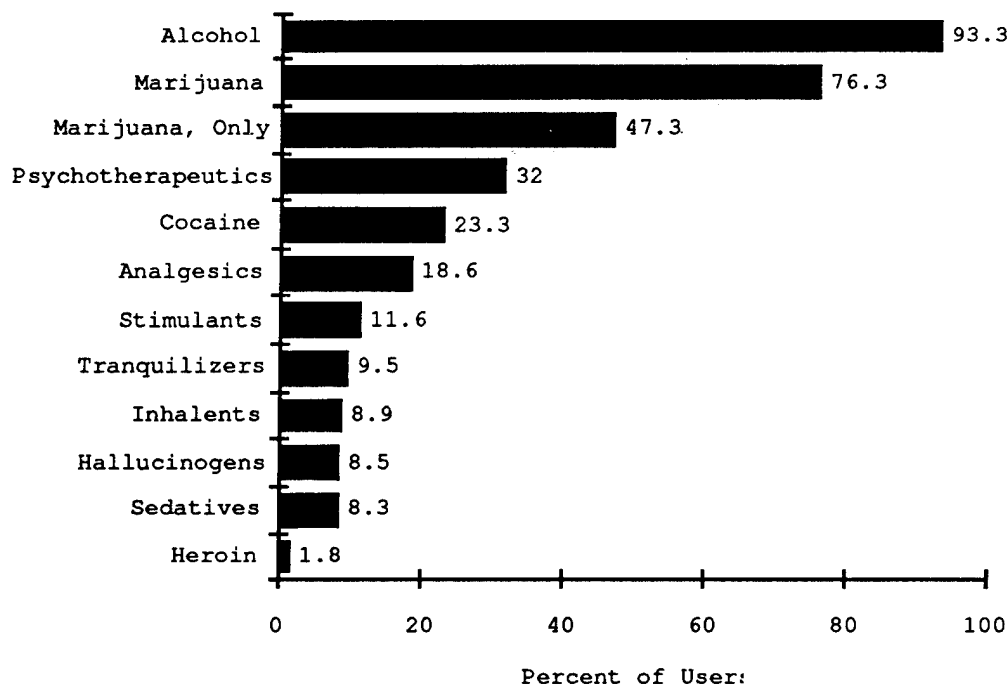


Fig. 1-Percentage of Previous 12 Month Users Using Various Substance

For the most part, the patterns of use among this population are contrary to what one might expect of dependent cocaine, heroin or psychotherapeutic users. As noted above, nearly one half of all these

⁵Psychotherapeutics include: opiate and non-opiate analgesics, stimulants, sedatives and tranquilizers.

drug users consumed only marijuana during the year. The majority of use, especially use of drug other than marijuana was infrequent, see Figures 2 to 5. As shown in Figures 4 and 5, only 45 percent of all previous 12 month users used drugs as frequently as on a monthly basis and only 26 percent used drugs weekly or more often. Even among users of cocaine, heroin and psychotherapeutics frequent use of drugs was rare. Furthermore, as shown in Figure 6, for cocaine, heroin and psychotherapeutic users who consumed drugs frequently, most used only marijuana on a weekly basis.

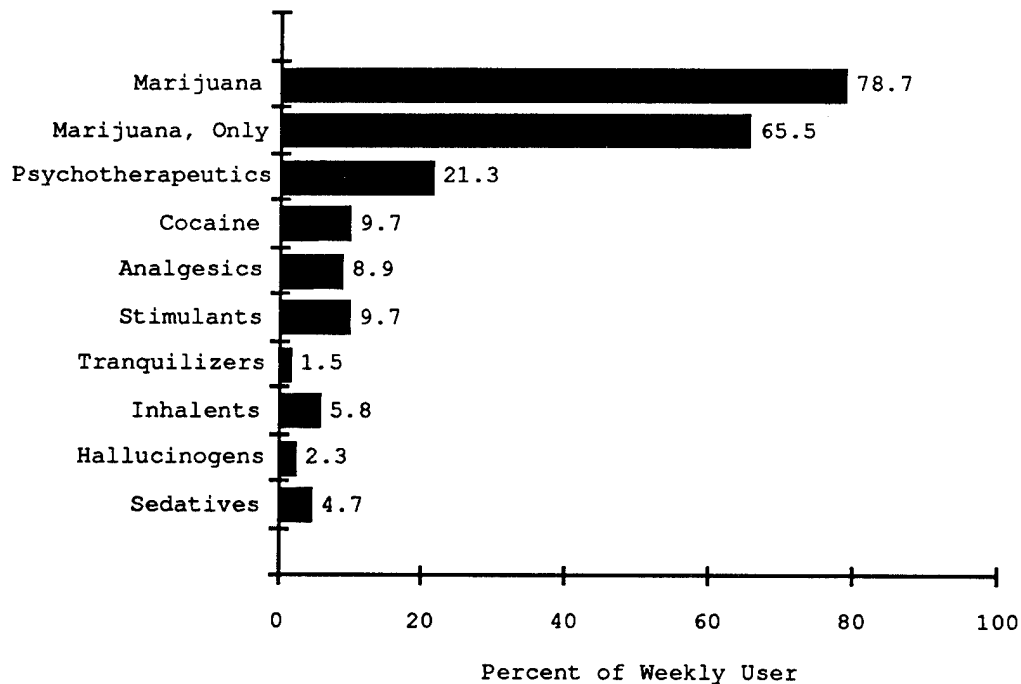


Fig. 2-Percentage of Weekly Drug Users Using Various Substances Weekly

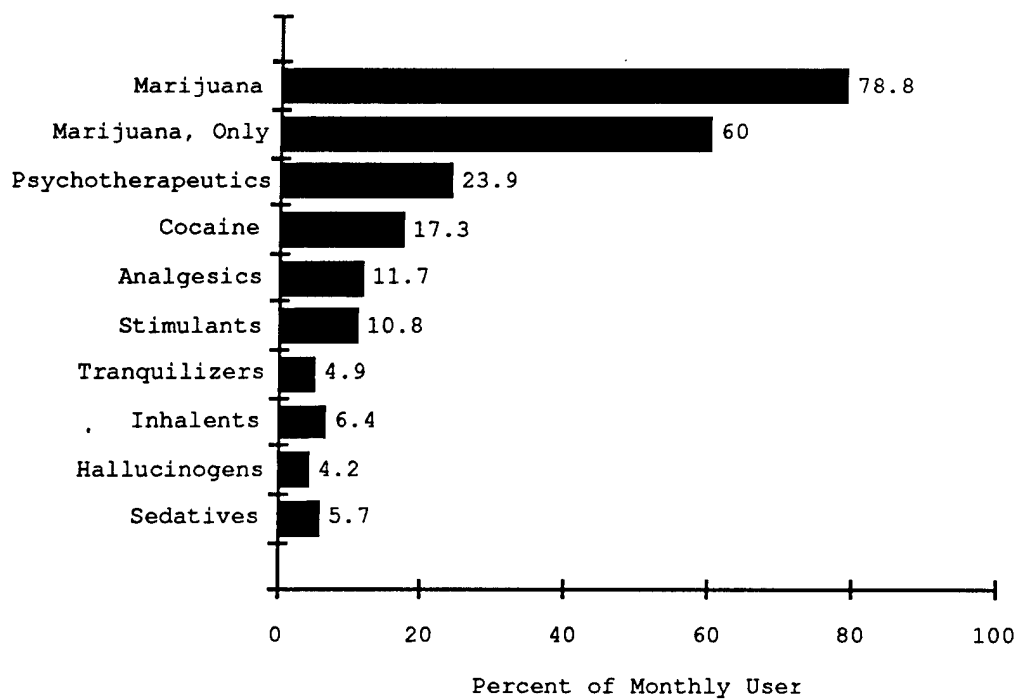


Fig. 3-Percentage of Monthly Users Using Various Drugs, Monthly

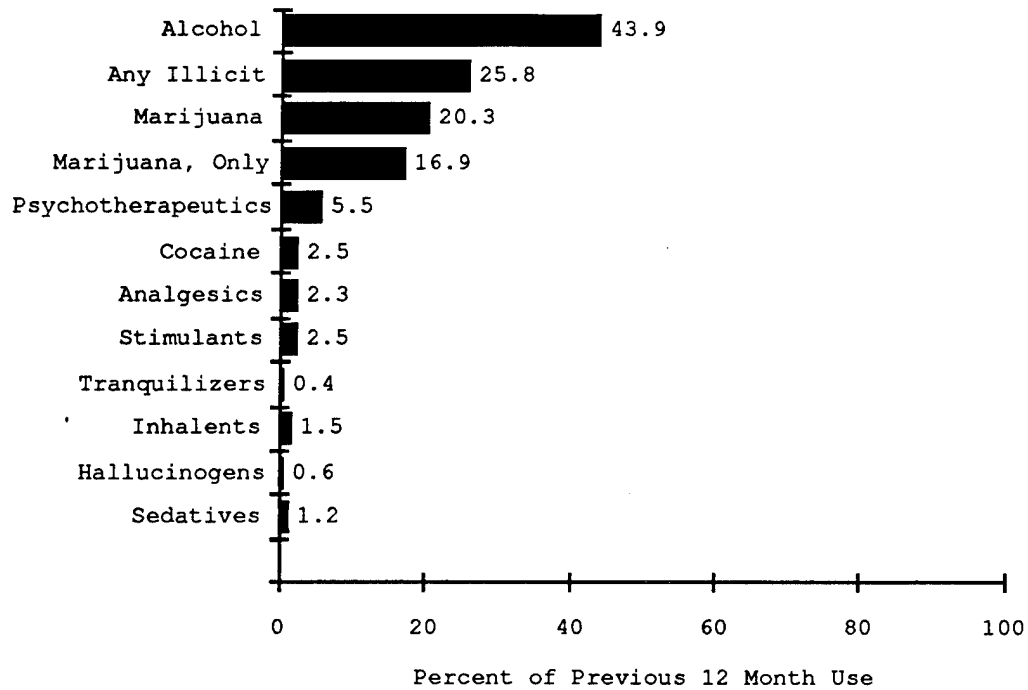


Fig. 4-Percent of Previous 12 Months Users Using Various Substance on a Weekly Basis

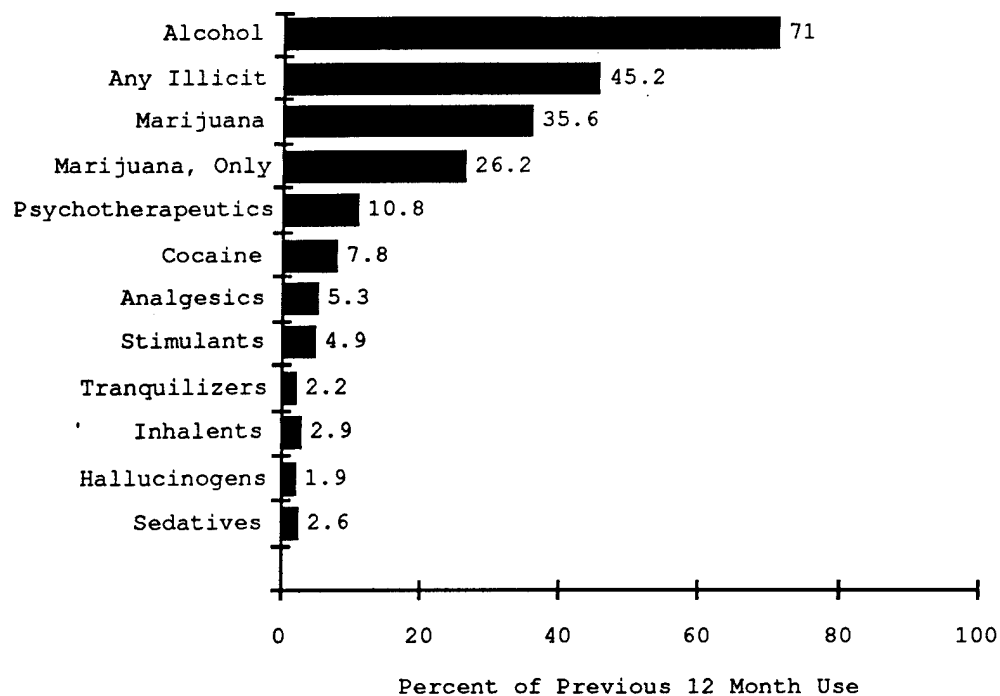


Fig. 5-Percent of Previous 12 Month Users Using Various Substance on a Monthly Basis

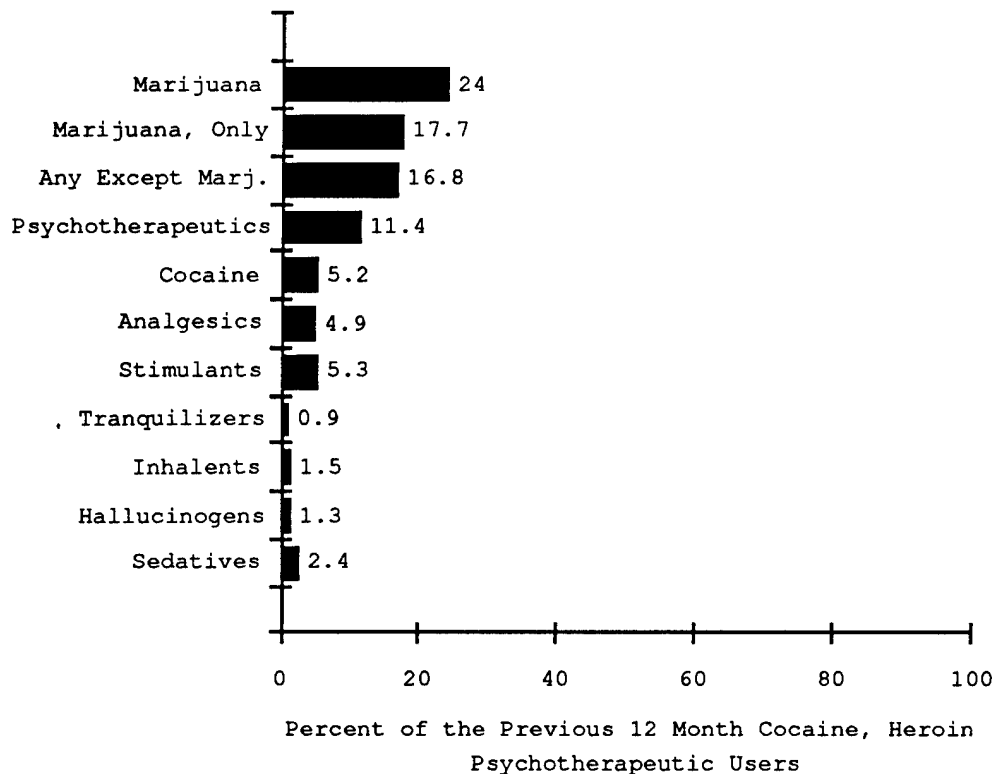


Fig. 6-Percentage of Previous 12 Month Cocaine, Heroin or Psychotherapeutic Users Using Various Substance Weekly

As a consequence of the small number of frequent of cocaine, heroin or psychotherapeutic users and the relatively larger number of weekly marijuana users (see Figure 2), a smaller proportion of users consumed drugs other than or in addition to marijuana sometime in the 30 days preceding the survey (40 percent, see Figure 7) than in the 12 months before the survey (53 percent, see Figure 1). It seems likely that dependent users of cocaine, heroin and psychotherapeutics would use these drugs frequently and be likely to use these drugs in any 30 day period including the 30 days before the survey. Thus, the majority of household users (at least 67 percent), even those who use cocaine, heroin and psychotherapeutics do not appear to be dependent on these drugs. Rather, most household users appear to be infrequent marijuana users with a small fraction occasionally using other substances and a small fraction using marijuana on a regular basis.

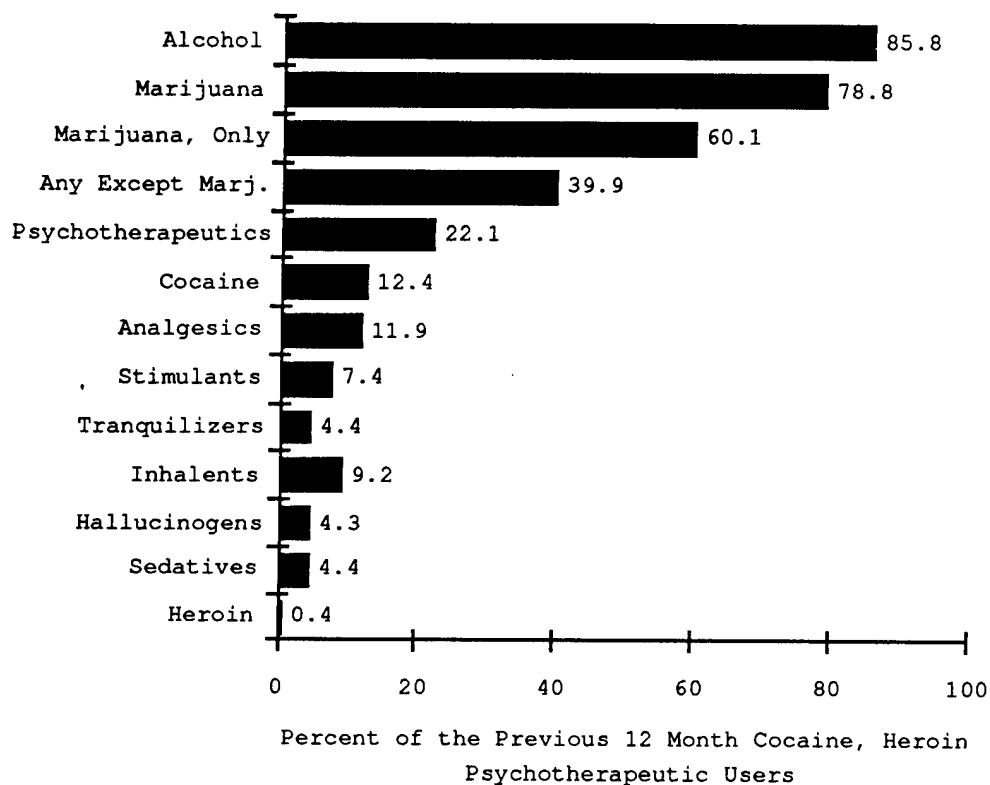


Fig. 7-Percentage of Past 30 Day Users Using Various Substances

Drug Use Among those Identified as "Clearly in Need of Treatment"

Tables 1 to 4 give the distribution across treatment classifications of all previous 30 day drug users, all previous 30 day cocaine users, all previous 30 day marijuana users and all previous 30 day marijuana only users. As show in these tables relatively few users were identified as "clearly in need of treatment." Also users of cocaine appear to be at greater risk for experiencing problematic drug use than the general drug user or the marijuana user. Users who use only marijuana appear to be a have a lower risk of needing treatment.

Table 1

Distribution of Previous 30 Day Drug Users by Need for Treatment

Classification	Estimated Number of	
	Users (1000s)	Percent
Clearly	1335	14
Probably	2883	31
Possibly	2415	25
Unlikely	2818	30
Total	9451	100

Table 2

Distribution of Previous 30 Day Cocaine Users by Need for Treatment

Classification	Estimated Number of	
	Users (1000s)	Percent
Clearly	400	26
Probably	504	33
Possibly	466	30
Unlikely	172	11
Total	1542	100

Table 3
Distribution of Previous 30 Day Marijuana Users by Need for Treatment

Classification	Estimated Number of	
	Users (1000s)	Percent
Clearly	1289	15
Probably	2677	31
Possibly	2195	25
Unlikely	2470	29
Total	8631	100

Table 4
Characteristics of Prior 30 Day Drug Users, Listed by Need for Treatment Classification

Trait	IOM Treatment Classification				All 30 Day Household	
	Clearly	Probably	Possibly	Unlikely	Users	Population
Used Cocaine	30	17	19	6	16	1
Used MJ	97	93	91	88	91	5
Used MJ Only	47	62	67	81	67	5
Had 5+ Drinks	74	60	56	54	59	13
% White	80	80	73	76	77	78
% Under 25	56	53	54	49	50	24
% Male	77	66	64	49	62	48
% Income < \$12,000	30	17	18	18	19	16
% Income < \$30,000	61	53	66	58	59	49
% Unemp.	18	14	15	1	11	5
% H. S. Grad	67	71	78	79	75	74
% Large Metro Area	42	49	51	47	48	43

However, contrary to the popular conception of drug users in need of treatment, Figure 8 shows that only a small fraction of those identified as "clearly in need of treatment" used cocaine, heroin or psychotherapeutics. Many, 45 percent, of those "clearly in need of treatment" used only marijuana in the 30 days preceding the survey.

Only 30 percent used cocaine, less than one percent used heroin and 23 percent used psychotherapeutics. This is not necessarily a reflection of the relative risk of each drug. Rather it reflects the disproportionately large number of past 30 day marijuana users and the small number of users of other drugs, i.e., over two thirds of all users who used drugs in the 30 days before the survey used only marijuana.

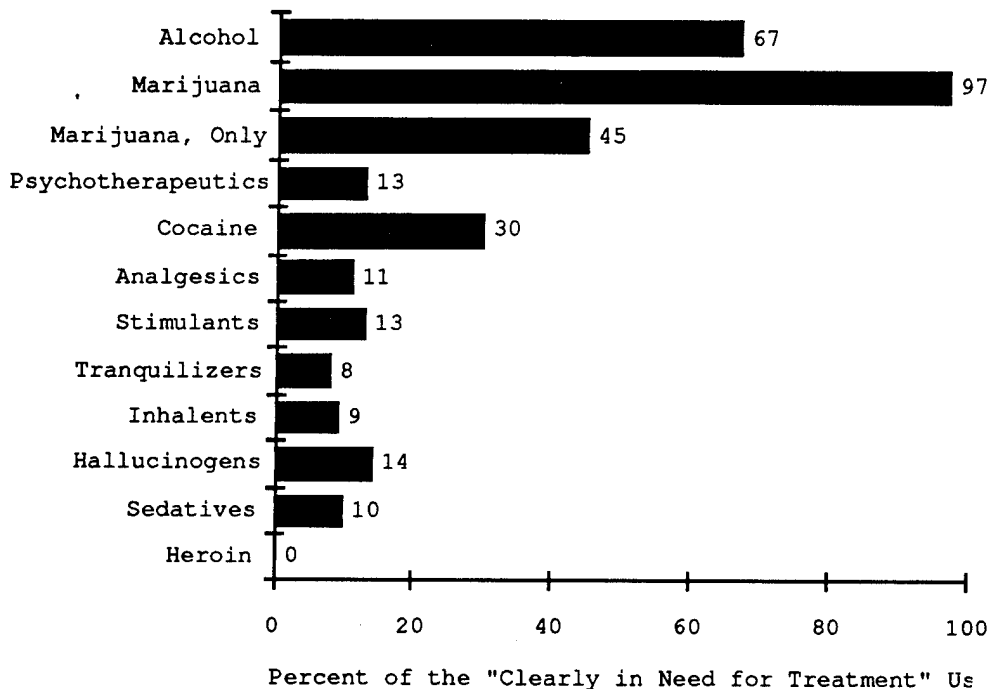


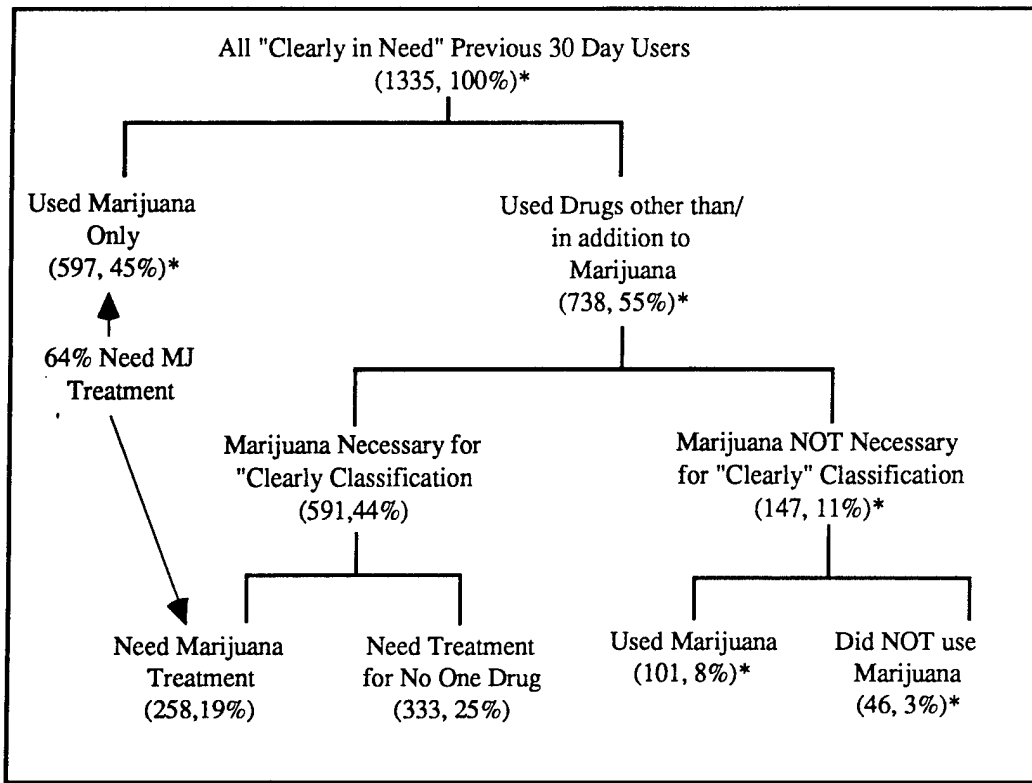
Fig. 8-Percentage of the "Clearly in Need of Treatment" Using Various Drugs

Of those users who used drugs in addition to marijuana many need treatment for marijuana problems rather than problems associated with those other drugs. For example, as shown in Figure 9, 64 percent of all those clearly in need of treatment (66 percent of the marijuana users in need of treatment) require marijuana treatment, i.e., would be classified as clearly in need even if only marijuana problems were considered⁶. Only 10 percent of those in need of treatment (34 percent

⁶The IOM algorithm could over state the extent of marijuana problems because only marijuana, cocaine, heroin, hallucinogenic and inhalant use is used in the algorithm. These are the only drugs for

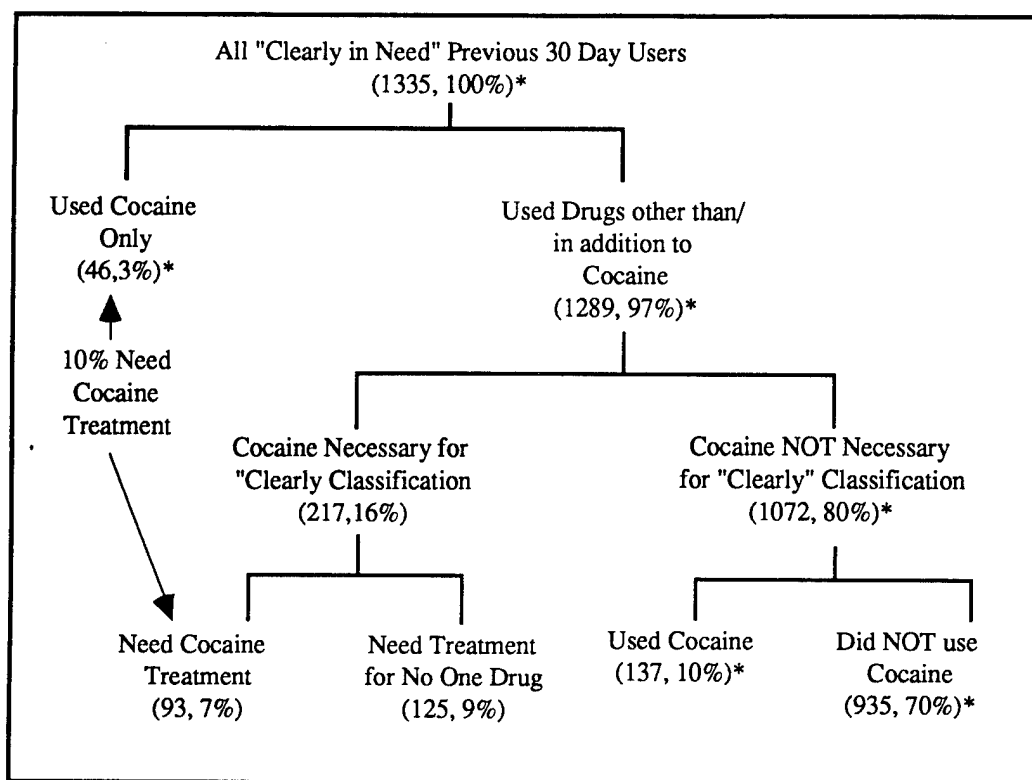
of the cocaine users in need of treatment) need cocaine treatment, see Figure 9. Furthermore, another 15 percent of all people classified as clearly in need of treatment would not be so classified if they did not have problems (including frequent use) with marijuana. That is, only 11 percent of those "clearly in need of treatment", an estimated 147,000 users, clearly need treatment for drugs other than marijuana. Similar results hold for those identified as probably in need of treatment--an estimated 596,000 users probably need treatment for drugs other than marijuana, see Figure 10.

which the NHSDA gathers past 30 day use frequency. See the Technical Appendix for details.



*(Estimated Number of Users in 1000s, Percent of Total)

Fig. 9-Marijuana's Influence on the "Clearly in Need" Classification



*(Estimated Number of Users in 1000s, Percent of Total)

Fig. 10-Cocaine's Influence on the "Clearly in Need" Classification

Although those identified as "clearly in need of treatment" do not appear to be likely candidates for publicly supported treatment, the IOM identification scheme, as demonstrated by the results in Table 4, has created a classification of drug users that is consistent with common sense notions of drug use⁷. Drug use tends to be greatest among those most in need of treatment and least among those "unlikely to be in need of treatment."

People clearly in need of treatment are five times more likely to use cocaine than those unlikely to be in need (this is 30 times more likely than the average member of the household population). Also people clearly in need were most likely to use both marijuana and other drugs--50 percent of the clearly group used this combination of drugs,

⁷The estimated percentages contained in Table 6 are based on very small samples and are therefore most likely rather imprecise. Thus, most differences will not be statistically significant.

while only 29 percent of the probably group, 24 percent of the possibly group and 7 percent of the unlikely group used this combination. Conversely, those with a less obvious need for treatment were more likely to use only marijuana.

The tendency to abuse alcohol is also greatest among those who are clearly in need and is in general much greater for past 30 day drug users than for the average member of the household population. The average person clearly in need of treatment is 1.4 times (or 20 percentage points) more likely to have had five or more drinks at one setting in the past 30 days than the average person in the unlikely category. The average person in the clearly group is almost 6 times more likely to abuse alcohol than the average member of the household population. The tendency to abuse alcohol is about 4.5 times higher for a past 30 day user of any drug than it is for the average member of the household population.

Comparison with Treatment Clients

National data on the drug use characteristics of treatment clients are very scarce. There are several new data gathering efforts currently in progress (e.g. Client Data System, Drug Abuse Treatment Outcomes Survey), but none of these has published any results. The most recent report on treatment client behavior is given by Hubbard and his colleagues (1989) in their report from the TOPS study. This study gathered data from treatment centers in 10 cities during the years 1979 to 1981. All clients at the sampled facilities were included in the study. The chosen centers do not constitute a representative sample of treatment facilities but as noted in the report the characteristics of the sampled facilities and clients "reflect adequately the range of treatments available and the different types of clients entering treatment between 1979 and 1981," (Hubbard et al., 1989, p. 18).

The combinations of drugs used by the clearly in need for treatment group are distinctly different from the drugs used by people receiving treatment in the TOPS study. Table 5 shows weekly drug use of the treatment clients from the TOPS study (Hubbard et al., 1989, Bray et al., 1982). This can be compared to Figure 11 which shows weekly drug

use for those identified as clearly in need of treatment. The clearly in need group from the household survey uses very little heroin, cocaine or psychotherapeutics relative to the pervasive use of these drugs in the treatment group⁸. In fact, most, nearly two thirds, of the "clearly in need" abusers are abusing only marijuana (and alcohol). This is distinctly different from the treatment group in which roughly two thirds or more of all treatment clients abused more serious drugs⁹.

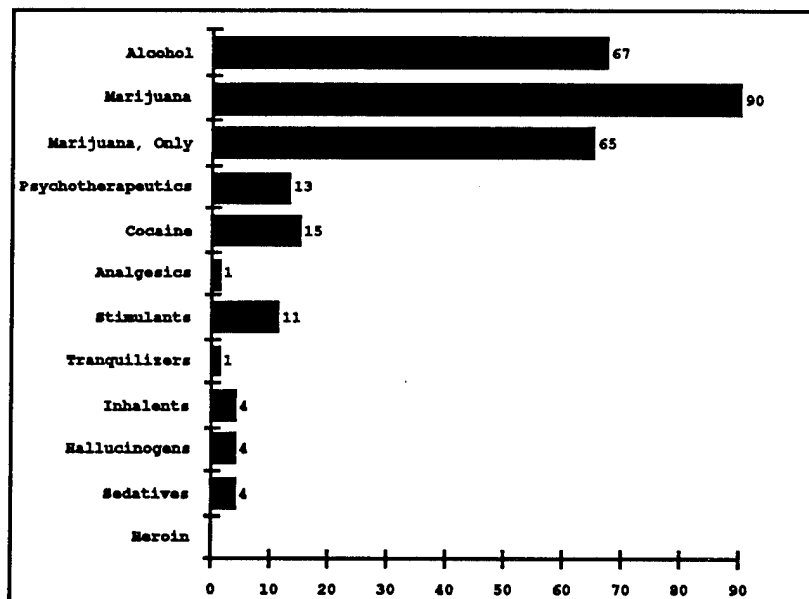


Fig. 11-Percentage of the "Clearly in Need of Treatment" Using Various Drugs on a Weekly Basis

⁸The heroin comparison is conservative because weekly heroin use was not measured by 1990 NHSDA and so weekly use in the clearly in need of treatment group was estimated by the upper bound of previous year heroin use.

⁹Again this is a conservative comparison because weekly marijuana/alcohol use in the TOPS study may include individuals who used alcohol but not marijuana on a weekly basis. The 2/3 reported for those clearly in need of treatment does not include individuals who used alcohol but not marijuana on a weekly basis.

Table 5

Weekly Drug Use in Year before Admission by Treatment Modality for TOPS
Treatment Clients (Percentage of all Clients)

Drug	Outpatient	Residential	Outpatient
	Methadone		Drug-Free
	%	%	%
Heroin	66.55	30.9	10.3
Analgesics (Nonheroin			
Opioids & Methadone)	47.0	34.8	17.0
Cocaine	27.6	30.0	16.8
Tranquilizers (Major and			
Minor)	26.2	31.9	19.2
Sedatives (Sedatives and			
Barbiturates)	11.9	32.5	21.8
Stimulants (Amphetamines)	9.0	30.0	22.7
Hallucinogens	0.9	9.7	5.8
Inhalants	0.4	1.8	1.5
Psychotherapeutics	14.4	45.6	44.2
Any Other Than Marijuana	85.6	78.1	55.4
Only Marijuana (or Alcohol) ^a	9.0	15.1	35.7
Marijuana	55.0	65.0	68.1
Alcohol	47.4	65.0	61.7

^aSome of these users may have used alcohol but not marijuana on a weekly basis.

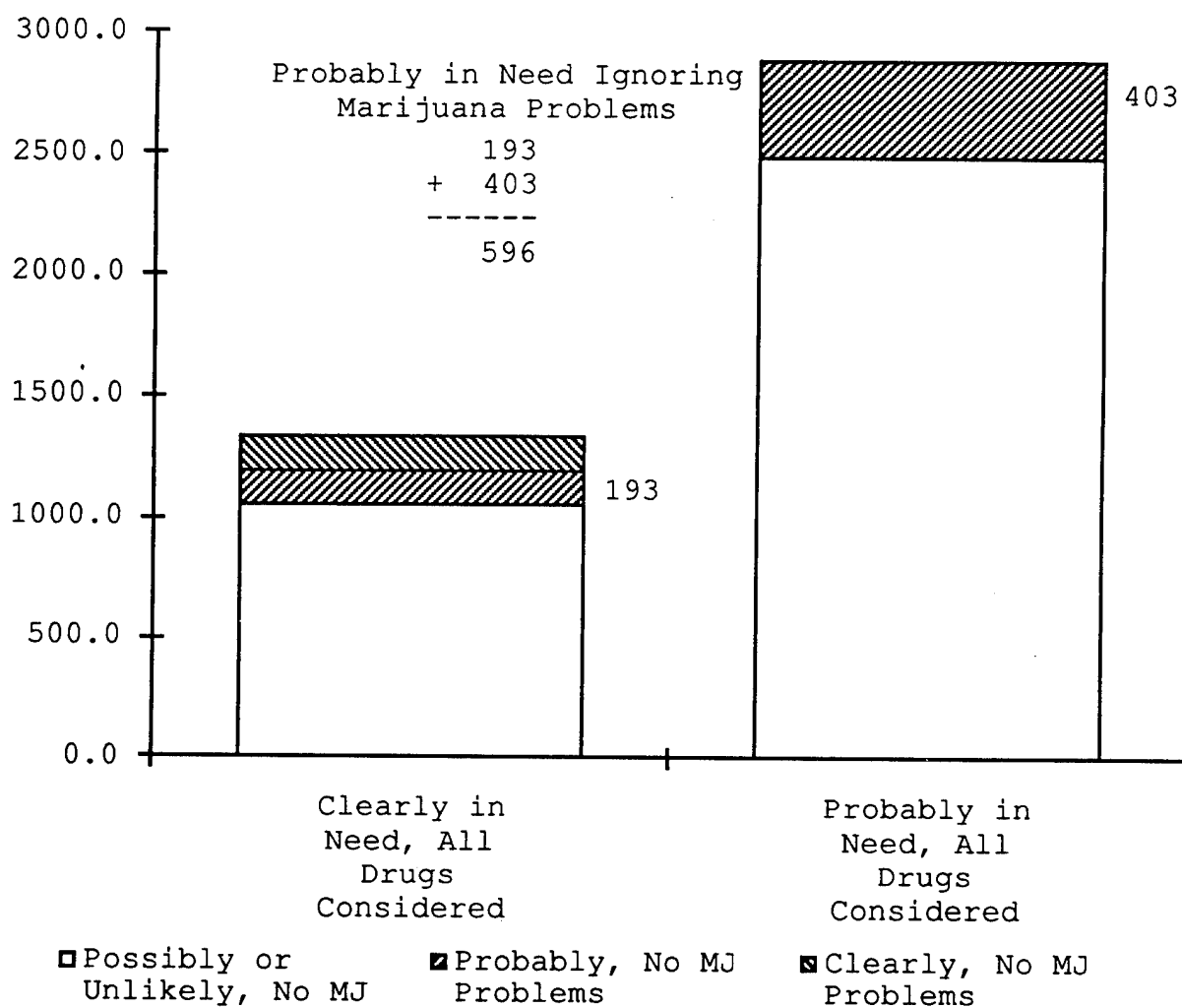


Fig. 12-Probably in Need of Treatment for Drugs Other Than or in Addition to Marijuana

Socio-Economic and Demographic Characteristics of Drug Users

As shown in Table 4 drug users, even problematic users, in the household population are not predominantly poor, unemployed or uneducated. Only 30 percent of the clearly in need came from families with below poverty level income (approximately \$12,000 in 1990) and 61 percent came from below median income (approximately \$30,000 in 1990) families. In comparison, about 18 percent of the other past 30 day users and about 16 percent of the general household population lived below the poverty line and 59 percent of all past 30 day users came from

below median income families. Although those clearly in need of treatment tend to be poorer than the average member of the household, the majority of these drug users are far from destitute.

A large majority of those clearly in need of treatment were high school graduates and employed. Only one third did not graduate from high school and only 18 percent of this group was unemployed. This unemployment rate is very low compared to the treatment recipients studied by Hubbard and his colleagues (1989). In that study, over 75 percent of those receiving treatment were unemployed.

However, when compared to the other drug users and the household population, the unemployment rate and the drop-out rate are high for those "clearly in need of treatment". Those "clearly in need" were over three times as likely to be unemployed as an average household resident. People unlikely to be in need, on the other hand, were more likely to be employed and to have graduated from high school than the average household resident. These unlikely for treatment people, however, tended to earn below the median income. Thus, they might have tended to be under employed, even though they had a job.

There are some interesting differences between the age and sex of drug users and the age and sex of the general household population. As to be expected, drug users are predominantly male. This is especially true for those "clearly in need of treatment" where males outnumber females 3 to 1. However, in the "unlikely" group the proportion of males is roughly equal to the proportion of females. Thus, women may not only be less likely to use drugs but they also appear to be less likely to seriously abuse them.

In all treatment classes roughly half of the people are 25 or younger. This is about twice as many as in the general population. Thus, it is far more likely that a young person will use drugs but both young and old users have about equal likelihood of needing treatment

Discussion

According to the results in the previous section the household population does not primarily use drugs. Of the small fraction that uses drugs only a smaller fraction need drug treatment. Those who need

treatment by and large need treatment for marijuana abuse and do not appear to be indigent or suffering great socio-economic hardships as a result of their drug dependencies. Thus only a very small proportion of the household population is likely to need publicly funded drug treatment.

Using a survey designed to measure prevalence among the general household population to identify treatment needs is an inefficient method for measuring such needs. The estimate will be based on a very small fraction of the total sample. For example in the 1990 NHSDA, roughly 9,000 people were surveyed but only 89 were identified as being clearly in need of treatment, and as shown above most of these would not be eligible for publicly supported treatment. Thus to obtain precise estimates of need for treatment very large household surveys must be conducted and the information from almost all respondents will not be used in estimating need.

Also household surveys will tend to under estimate need because a nontrivial fraction of those in need of treatment do not live in a traditional household. Drug abuse and dependency is disproportionately large among the homeless and transients, the institutionalized (imprisoned, mentally ill) and other populations difficult to capture in household surveys. In estimating prevalence of use this bias is small because of the relatively large size of the household population. However, for estimating treatment needs, this bias could be substantial because the need for publicly supported treatment is so rare among the general household population.

Wiesner and her colleagues (1993) found that drug use among the recipients of certain health and social services occurs at a far greater rate than among the general household survey. Surveys of health and social service recipients estimated greater use of all illicit substances with the greatest increases found in the percent of users using heroin.

Not only do the studies conducted by Wiesner et al. (1993) demonstrate that household surveys can under estimate drug use, but their methodology, as discussed in Section V of this report, provides a possible alternative to using household surveys for identifying need for

treatment. Service recipients provide a more efficient population for identifying treatment needs. Also this population includes users who are not included in the household population. However, these methods also pose some problems. Use rates and presumably abuse rates vary greatly among the service recipients depending on the service. This may in part be do to the nature of the service. For example, heroin use is greatest among drug treatment recipients, however, this is likely the result of the availability of heroin treatment. Thus these service recipients populations are efficient because of the concentration of heavy drug users among them, but selection effects and duplication across service sectors must be adjusted for.

The household survey, however, provides useful information on the general prevalence of drug use among the household population. It also provides useful other information and can even be used to find the treatment needs in the household population.

Technical Note on the Algorithm for Determining Need for Treatment

Stage I. Determine the use level for each person who used any drug in the last 30 days. Drug use is classified into one of seven categories. The levels are:

0. Did not use the drug during the past 30 days.
1. Used the drug on one day in the last 30 days.
2. Used the drug on 2-4 days in the last 30 days.
3. Used the drug on 5-8 days in the last 30 days.
4. Used the drug on 9-16 days in the last 30 days.
5. Used the drug on 17-24 days in the last 30 days.
6. Used the drug on 25-30 days in the last 30 days.

Use level is determined for marijuana, inhalants, cocaine, heroin and hallucinogens; analgesics, sedatives, stimulants and tranquilizers are not included. Attention is restricted to these substances because these are the only substances for which use frequency is measured on the NHSDA instrument.

The use level of each of these five substances is calculated and the maximum is used for determining need for treatment. If the maximum is zero, the user used only analgesics, sedatives, stimulants or

tranquilizers, then this person is not classified. In its report, the IOM classified people with maximum use level of zero as unlikely to be in need of treatment.

Table 6

ICD-10 and DSM-III-R Criteria for Identifying Drug Dependence

ICD-10	DSM-III-R
Progressive neglect of alternative pleasures or interests in favor of substance use	Important social, occupational or recreational activities given up because of substance use.
Persisting with drug use despite clear evidence of overtly harmful consequences.	Continued substance use despite knowledge of having a persistent or recurrent social, psychological, or physical problem that are caused or exacerbated by the use of the substance.
Evidence of tolerance such that increased doses of the substance are required in order to achieve effects originally produced by lower doses.	Marked tolerance: need for markedly increased amounts of the substance in order to achieve intoxication or desired effect, or markedly diminished effect with continued use of the same amount.
Substance use with the intention or relieving withdrawal symptoms and subjective awareness that this strategy is effective.	Substance often taken to relieve or avoid withdrawal symptoms.
A physiological withdrawal state.	Characteristic withdrawal symptoms.
Strong desire or sense of compulsion to take drugs.	Persistent desire or one or more unsuccessful efforts to cut down or control substance use.
Evidence of an impaired capacity to control drug taking behavior in terms of its onset, termination, or level of use.	Substance often taken in larger amounts or over a longer period than the person intended.
A narrowing of the personal repertoire of patterns of drug use, e.g., a tendency to drink alcoholic beverages in the same way on weekdays and weekends and whatever the social constraints regarding appropriate drinking behavior.	Frequent intoxication or withdrawal symptoms when expected to fulfill major role obligations at work, school, or at home or when substance use is physically hazardous.
Evidence that a return to substance use after a period of abstinence leads to a rapid reinstatement of other features of the syndrome than occurs with nondependent individuals.	A great deal of time spent in activities necessary to get the substance, taking the substance, or recovering from its effects.

NOTE: A dependence syndrome is present if three or more criteria are met persistently (DSM: continuously) in the previous month or some time (DSM: repeatedly) in the previous year

Stage II. Determine signs of dependency.

Signs of dependency were also measured. A sign of dependence was recorded by the survey respondent answering positively to any of the acts listed in Table 7 for any of the following drugs: analgesics, cocaine, hallucinogenics, heroin, inhalants, marijuana, sedatives, stimulants, tranquilizers and other opiates. The survey respondent noted whether he or she committed any of these acts for each of the previously mentioned drugs. This yields 50 possible signs of dependency--10 drugs crossed with 5 acts. The total number of dependency signs was determined. The level of dependency was then designated as:

0. no signs;
1. one sign--one act for only one drug; or
2. two or more signs--one act for each of two or more drugs, two or more acts for one drug, or multiple acts for multiple drugs.

Table 7

Signs of Dependence

<p><i>trying to cut down usage</i></p> <p><i>using an increased dosage to achieve the same effect</i></p> <p><i>using a single drug daily for two consecutive weeks</i></p> <p><i>feeling dependent on a drug</i></p> <p><i>feeling withdraw symptoms when usage was curtailed.</i></p>

Stage III. Determine number of drug use related problems.

Each previous 30 day users was classified according to the number of problems he or she experienced. Problems considered are listed in Table 8. (The IOM lists six additional problems which it supposedly used in its determination. However, the eleven problems listed in Table 8 are the only problems for there are responses on the NHSDA data tapes, and the only choices mentioned on the Survey Answer Sheet.) For each problem the respondent could list all the drugs which caused this problem. If the only substances causing problems were alcohol or cigarettes then the problem was not counted as a drug problem. The total number of problems was tallied and the level of problems was classified as:

0. no problems;
1. one problem; or
2. two or more problems.

Table 8
Drug Related Problems

Became depressed or lost interest in things
Had arguments or fights with family or friends
Felt completely alone or isolated
Felt very nervous and anxious
Had health problems
Found difficult to think clearly
Felt irritable and upset
Got less work done than usual at school or on the job
Felt suspicious and distrustful of people
Found it harder to handle my problems
Had to get emergency medical care

Stage IV. Determine the likelihood of need for treatment.

The dependency rating was combined with the problem rating to create a four point dependency-problem scale. This joint rating was the sum of the dependency and the problem scale. The level of the dependency-problem scale were:

0. no signs of dependency and no problems;
1. either one sign of dependency or one problem;
2. two (or more) signs of dependency or two (or more) problems or one of each;
3. two (or more) signs of dependency and one problem or two (or more) problems and one sign of dependency; or
4. two (or more) signs of dependency and two (or more) problems.

The dependency-problem scale was crossed with the frequency of use rating to create frequency-dependency-problem scale matrix. The cells in this matrix are assigned to the need for treatment scales of clear, probable, possible or unlikely. The matrix with the with need for treatment classification are given in Table 9.

Table 9
IOM Classification Matrix

Frequency	Dependency-Problems				
1 Day	UNLIKELY	UNLIKELY	UNLIKELY	POSSIBLE	POSSIBLE
2 - 4 Days	UNLIKELY	POSSIBLE	POSSIBLE	PROBABLE	PROBABLE
5 - 8 Days	POSSIBLE	POSSIBLE	POSSIBLE	PROBABLE	PROBABLE
9- 16 Days	PROBABLE	PROBABLE	PROBABLE	CLEAR	CLEAR
17 - 24 Days	PROBABLE	PROBABLE	PROBABLE	CLEAR	CLEAR
25 - 30 Days	PROBABLE	PROBABLE	PROBABLE	CLEAR	CLEAR

The IOM adds another row called Undetermined and all cells are considered "Unlikely". The IOM's approach is a conservative. It yields conservative percentages, but gives the same counts in the Clear, Probable and Possible cells.

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APPENDIX F

EVALUATING THE DRUG ABUSE WARNING NETWORK

1. INTRODUCTION

The Drug Abuse Warning Network (DAWN) -- a drug abuse indicator series that captures data on the incidence of emergency room episodes related to drug abuse was established in 1972 by the Drug Enforcement Administration. From 1980-1992 the National Institute on Drug Abuse (NIDA) administered the DAWN system and since October, 1992 the Substance Abuse and Mental Health Administration has taken over as sole administrative agency. The system was designed to serve a number of competing purposes including to identify substances associated with emergency room episodes; to assess health consequences associated with drug abuse; and to monitor trends and patterns in drug abuse. In recent years, drug abuse policy makers at the national, state, and local level have used its data for many other purposes. This paper describes for which of its intended and extended purposes DAWN data are and are not appropriate.

Initially designed as a representative sample of hospitals, maintaining hospital participation levels over time proved difficult and the sample degenerated to what for many years amounted to a convenience sample of hospitals in 26 major metropolitan areas. Monitoring national trends and making comparisons across metropolitan areas was not possible because the sample of hospitals was not representative of all emergency rooms although trends were generated from consistently reporting panels of hospitals. In spite of its limitations, pundits and policy makers at all levels, perhaps because of the paucity of alternative indicators, often used DAWN as a barometer of drug abuse problems for the nation.

In recent years a major redesign of the DAWN sample was undertaken to create stratified random probability samples of emergency rooms in each of 21 major jurisdictions and a separate sample of hospitals representing the remainder of the country (called the national panel). The redesign was conducted to permit calculation of national estimates. Since the redesign was fully implemented in 1989, DAWN has been using counts of episodes recorded at sampled facilities to calculate weighted estimates of total episodes in each region and the national panel.

These changes made possible comparisons between national trends and those of individual sites.

Already enormous attention has focused on short-term changes in drug related emergency episodes reported by DAWN and implications of these changes for national drug control efforts. For example, government officials argued that decreases in the number of episodes reported between 1989 and 1990 signaled progress in the "war on drugs".¹ Headlines indicated a setback for the war on drugs when increases between 1991 and 1992 were reported. In May 1992 both the New York Times and Washington Post concluded based on DAWN data that hard core drug abuse was increasing.² Federal officials claimed that changes in DAWN indicated changes in both the composition of drug abusing populations and patterns of drug use.³ In May, 1992 DHHS allocated 5 million dollars for expanded treatment services in direct response to increased numbers of heroin episodes reported by DAWN, demonstrating the sponsoring agency's confidence in the new DAWN.⁴

Proponents cite as evidence that the costly redesign has increased the utility of DAWN. Critics, however, argue that the new DAWN continues both to under report grossly the incidence of drug abuse tended to by emergency rooms and to distort systematically the health consequences and patterns of drug abuse.⁵ They conclude, therefore, that even the redesigned DAWN is not a valid basis for policy analysis.

The most accurate statement we've seen in the press since the redesign was the Dallas Times Herald headline that drops in cocaine overdoses "may mean use in Dallas declining."⁶ They may or they may not. They may mean something else entirely. This paper explores the extent to which these competing claims are true. The next section describes DAWN and its recent changes. Section 3.0 discusses the nature of the DAWN sampling and resulting data. Section 4.0 reviews ways, both

¹Walsh, 1990, p. A7; Feldkamp, 1991, p. 1.

²Treaster, 1992; Isikoff, 1992, p. A1.

³Criminal Justice Newsletter, 1991, p. 5.

⁴Swan, 1992, p. 9.

⁵Walsh, 1990, p. A7; Drugs and Drug Abuse Education Newsletter, 1992, p. 57.

reasonable and less advisable, that the DAWN episode estimates have been used in the past. Section 5.0 discusses other, potential applications of DAWN, and Section 6.0 suggests options for augmenting DAWN to enhance its utility.

⁶Taylor, 1990, p. A1.

2. DESCRIPTION OF THE NEW DAWN

DAWN seeks to monitor the number of drug-related emergency room (ER) episodes by retrospectively examining hospital ER records. A census of all hospitals would be prohibitively expensive, so a subset of hospitals is sampled. Specifically, DAWN estimates the number of drug related episodes in eligible emergency rooms in 21 metropolitan areas and for the entire coterminous US. These 21 sites (a subset of the original 26) are all among the 50 largest US metropolitan areas, and together they represent 28 percent of the US population.

In each metropolitan area, a sample of all non-federal, general care, short-stay hospitals which operate a 24-hour emergency department participate in DAWN. These sampled facilities provide the basis for estimating the number of drug-related episodes in each site. This sample of metropolitan facilities is augmented by a national panel of facilities located throughout the remainder of the US, and the complete sample is used to estimate the national total of drug-related emergency room episodes.

DAWN uses a stratified sampling scheme to select facilities to participate. The sample is stratified according to the size of the facility; whether the facility is located within or outside the center city of one of the 21 metropolitan sites or outside of these areas entirely; whether the hospital operates an outpatient clinic; and whether the hospital has an inpatient chemical dependency or alcoholism treatment unit. Enough hospitals in each stratum are sampled to obtain estimates of total drug episodes which achieve a desired precision. For the stratum within the metropolitan sites, in 1991 a total of 534 facilities were sampled from the population of 844 eligible ER's. However, only 112 of the 4,259 facilities in the remainder of the U.S. are sampled, even though they serve 72 percent of the population.

The estimates for each site and the national total are a weighted sum of the episodes occurring in the region's sampled facilities, where the weights are recomputed each quarter. Not all strata are sampled equally, so the weights vary. In particular, although the weights on

facilities in the over-sampled metropolitan areas are typically not greater than 6, in 1990 more than half of the national panel facilities had weights greater than 40 in a typical quarter. The adjustment procedure also adjusts for non-response.

For each recorded drug-related episode, DAWN gathers up to four substances of abuse, demographics of the user, the user's reason for using the drug and visiting the ER, the route of administration, and the source of the substance. Thus, DAWN provides estimates of the total drug-related episode count, drug specific episode counts, and counts by demographic and other characteristics of the user and the episode.

The objective of DAWN's sampling plan is to provide estimates which are representative of all episodes occurring at DAWN-eligible facilities and to achieve the greatest precision without introducing obvious biases. By and large it achieves this objective and certainly represents a significant improvement over the previous design. It enables better comparison among sites, provides a national total, and allows for trend analysis over time.

Further modifications, addressing other design problems, for example, data collection procedures, are under consideration by SAMHSA and may be introduced in the future.

3. INTERPRETING DAWN ER EPISODE COUNTS

The DAWN data are used in many ways. The next section discusses the extent to which DAWN data are and are not appropriate for each of these applications. The key to determining appropriateness is understanding three issues. The first issue is, which ER episodes are deemed "drug-related" and which ERs are "eligible" in the sense that they belong to the subset of ERs for which DAWN estimates the number of drug-related episodes. The second is how the estimates DAWN produces can differ from the actual number of drug-related episodes in DAWN-eligible facilities, given these definitions. The third is the rather loose relationship between the true number of drug-related episodes at DAWN-eligible facilities and other aspects of drug abuse, such as the size and composition of the user population. These three issues are discussed in turn.

WHAT DAWN SEEKS TO COUNT

DAWN seeks to count drug-related ER episodes, but there are many different notions of drug-relatedness. For instance, to forecast the change in the number of ER episodes attributable to a change in heroin consumption, the appropriate notion of relatedness would focus on causality. On the other hand, if one wished to investigate the nexus between drugs and injuries associated with violent crime, a broader definition of relatedness might be appropriate. Operationalizing any of these notions is extremely difficult.

Pragmatically, the DAWN recording manual lists four criteria for determining whether an ER episode is a drug-related episode:⁷

1. The patient must be treated in the hospital's emergency department.
2. The patient's presenting problem(s) must be induced by or related to drug abuse.
3. The case must involve the non-medical use of a legal drug or any use of an illegal drug.

⁷NIDA, 1987.

4. The reason for taking the substance was for psychic effects, dependence, or a suicide attempt or gesture.

According to these criteria, if an automobile driver who used drugs seeks treatment after having an accident, that should be recorded as a drug-related episode -- even if the accident was not the driver's fault. On the other hand, if there were a passenger car in the car who had not used a drug and received treatment in an ER, that should not be counted as a drug-related episode -- even if the driver's drug use caused the accident.

DAWN does not try to estimate the total number of drug-related episodes in the U.S. DAWN restricts its attention to emergency care facilities associated with non-federal, general care, short-stay hospitals in the coterminous United States which operate 24-hour emergency departments. Thus, health care provided outside the ER is not considered in DAWN, nor are episodes at Veteran's Administration hospitals, for example.

WAYS DAWN'S ESTIMATES CAN ERR

DAWN is not a census; it surveys a subset of ER facilities chosen in such a way that one can infer what the total count is. Hence, like all estimates based on a probability sample, DAWN estimates are subject to sampling error. Sampling error refers to changes in the value of the estimate that would result from selecting alternate samples of eligible facilities. In other words, sampling error measures the extent to which the estimate reflects the specific facilities chosen for the sample, rather than the population of all facilities. Given the heterogeneity among hospitals and the populations they serve, sampling error can be significant. For example, DAWN reports that the margin of error for the 1991 estimate of cocaine episodes in Newark is 35% of the total of 4,318 episodes. On the other hand, the margin of error for the estimated 102,727 cocaine episodes nationwide is only 7%.⁸ So, although sampling error can be significant, non-sampling errors, particularly facility non-response and measurement errors, may be of greater concern.

⁸NIDA, 1991.

Facility non-response refers to instances in which a sampled ER fails to report its episode count. When this happens, a correction is derived from the ERs that do report. If, however, non-reporting facilities differ systematically from reporting ERs, then the correction will not adequately represent the non-reporting facilities. Suppose, for example, that ERs in areas where drug abuse is relatively rare are less consistent in their reporting because the drug problem in general is perceived to be of less importance. Then DAWN would overestimate the number of episodes. This issue may be more than academic nitpicking because non-response is common; in 1991, 22 percent of sampled facilities did not respond.⁹

Measurement errors occur when ER episodes that meet the criteria for being drug-related are not recorded or contain inaccurate information. Measurement error can bias DAWN estimates. For example, drug-related trauma cases are supposed to be included in DAWN episode counts. Nevertheless, Brookoff et al. (1993) found that not one of the 82 trauma patients in the population studied who tested positive for cocaine was recorded by DAWN -- even though the hospital in question had recently been formally audited by DAWN and found to be in complete compliance with DAWN guidelines. DAWN procedures do not call for the use of toxicology reports if they are not attached to the ER record.

DAWN not only misses drug episodes, it also reports inaccurate information for episodes that are reported. One study (Ungerleider, 1980) compared DAWN records to toxicology studies and found that only 20 percent of DAWN reports were verified by the toxicology tests. Eleven percent were found to be incorrect and 69% to be partially incorrect. These measurement errors may be an inevitable consequence of relying on ERs to detect drug use. ER staff are under enormous time pressure, and their first priority is caring for the patient. Determining and accurately recording which drugs the patient may have used, why, in what form, how the drugs were obtained, etc. is not always a prerequisite to delivering the best possible medical care.

⁹NIDA, 1991.

On the other hand, some of the problem may be with the procedures DAWN recorders follow to retrospectively identify episodes. For example, in most hospitals only the emergency department charts are screened; separate inpatient records and toxicology reports are not used. Hence, DAWN would not identify a case in which drug use manifests itself only in blood analyses that were reported after the patient was transferred to inpatient status. Furthermore, the details of the recording procedures can vary from hospital to hospital.¹⁰

RELATIONSHIP BETWEEN DRUG USE AND ER EPISODES

Obviously, a count of drug-related ER episodes, even a correct count, is not a count of drug users. Perhaps less obviously, there is no reason to believe that the ratio of the number of users (or heavy users, or users in need of treatment, etc.) to the number of episodes is a universal constant that holds for all time and in all locations. That is, there is not evidence to support statements such as "There are 100 drug users for every ER episode." Despite this, assertions dependent on the assumption of a constant ratio are common. For example, the ONDCP states that "DAWN statistics are generally used to measure the health consequences of drug use from which one can infer trends in frequent or addictive use."¹¹ Similar statements appear in the media.¹²

It is easy to imagine reasons why the ratio of episodes to users might vary over time and location. Many factors might influence whether and how frequently users visit ERs, including: the drugs used, the mode of administration, use patterns, the user's socio-economic and demographic characteristics, the location and availability of ERs, ER policy, availability of alternative sources of care, etc.

The effects of these factors can vary from location to location because of differences in the composition of the using population. For example, indigent Injecting Drug Users (IDUs) with AIDS may be more likely to visit the ER than are other IDUs. Roughly 60% of IDUs in New York City are HIV positive, whereas only 5% in Los Angeles are. Thus,

¹⁰NIDA, 1991, p.9.

¹¹ONDCP, 1992, p. 23; Isikoff, October, 1992.

¹²Treaster, 1993; Isikoff, October 1992.

there might be more DAWN ER episodes per IDU in New York than in Los Angeles. Hence, one should be cautious when interpreting differences in the number of ER episodes as representing differences in the number of users.

The composition of the drug using population as it relates to factors influencing ER use can vary over time as well as location. For instance, users age and advance in their drug using career. If people's medical problems worsen the longer they use drugs, then the number of episodes per user should increase over time, particularly if initiation of young users is low. Such an effect may partially explain the increase in the number of heroin episodes recorded by DAWN. On the other hand, emergency room usage for all reasons increased sharply in the 1980s. The resulting increased waiting times at ERs might have induced some drug users to seek alternative sources of care, e.g., outpatient clinics. If so, this might have reduced the average number of episodes per user.

Relatively little research has been done on ER usage by drug users, and the research that exists does not indicate how the factors listed above affect ER usage. Furthermore, even if rates by type of user were known, little is known about the composition of the drug using population and how that composition varies over time and location. Thus, there is no way to infer numbers of users from episode counts, and even inferences about trends are predicated on dubious assumptions about the invariance of population composition.

An added complication is that ER usage by drug users is a rare event. In the 1991 National Household Survey on Drug Abuse, less than 2% of people admitting to having used an illicit drug in the last year said that they had to get emergency medical help in the past year because of that use. Researchers report that while heavy drug users experience a range of serious health consequences and frequent overdose, they typically do not seek out health services.¹³ Drawing inferences from such a small subset of users is problematic because the subset may

¹³Dinwiddie, et al., 1992; McCoy and Miles, 1992; Pottieger, et al., 1992.

differ from the larger population with respect to demographics, drug use, and/or health problems.

A hypothetical example reinforces these arguments about why it is difficult to draw inferences from trends in DAWN episode counts. Suppose that between 1985 and 1990 the number of heroin mentions increased from 19,567 to 33,667 (a 72% increase) and then fell to 26,000 by 1995. One interpretation might be that heroin use increased in the late 1980s and then fell in the early 1990s. Table 1 suggests, however, that a completely different story is plausible.

Suppose that heroin users with AIDS are in worse health, on average, than other heroin users are and, as a result, have a 1 in 3 annual chance of generating a DAWN ER mention, as against a 1 in 50 chance for other heroin users. Then even if the total number of heroin users remained constant between 1985 and 1990, the number of heroin mentions might increase if the number of heroin users with AIDS increased. Suppose further that in the 1990s access for people with AIDS to health care outside emergency rooms improved, e.g. through hospices, so that the annual chance a heroin user with AIDS would generate a DAWN ER mention fell to 1 in 10. Then even if the heroin population remained stable and the number of heroin users with AIDS continued to grow, the number of heroin mentions recorded by DAWN might fall between 1990 and 1995. This particular scenario may not come to pass. The point, however, is that it is easy to imagine circumstances under which trends in the number of DAWN mentions differ markedly from trends in use.

Table 1: Hypothetical Heroin User Population

USER TYPE		1985	1990	1995
With AIDS	Number of Users	5,000	50,000	100,000
	Chance of DAWN Mention	1 in 3	1 in 3	1 in 10
Without AIDS	Number of Users	895,000	850,000	800,000
	Chance of DAWN Mention	1 in 50	1 in 50	1 in 50
Total	Number of Users	900,000	900,000	900,000
	Number of DAWN Mentions	19,567	33,667	26,000

In summary, DAWN estimates are not directly related to all things about which one might want to draw inferences. Only a small and probably not representative fraction of users seek ER treatment. In only a fraction of the instances in which a drug user seeks treatment in an ER does he or she meet the definitions for a drug-related episode in a DAWN-eligible facility. And, finally, only a perhaps small and possibly not representative fraction of these episodes which meet the definitions for inclusion are actually recorded.

4. WAYS DAWN EPISODE COUNTS ARE USED

This section reviews a variety of ways DAWN has been used. For each, it comments on the extent to which the issues raised above impact DAWN's utility. The discussion is divided into five subsections which correspond to the five objectives NIDA lists for DAWN.¹⁴

IDENTIFY SUBSTANCES ASSOCIATED WITH DRUG ABUSE

The official statement of DAWN's first objective is, "To identify substances associated with drug abuse episodes that are reported by DAWN-affiliated facilities." When interpreted narrowly, DAWN can hardly but help meet this objective. For several reasons, however, one should not automatically assume that DAWN meets the broader objective of identifying substances associated with drug abuse.

For example, the need for emergency care is only one manifestation of drug abuse. Some substances can be abused while generating few if any ER episodes. For example, millions of Americans abuse tobacco products, but even if nicotine were covered by DAWN, it is unlikely that it would generate many ER episodes.

It is even possible that DAWN could miss a substance that manifests in ER visits. After all, not all ERs are eligible to be included in DAWN's sample, and DAWN only records episodes at a subset of eligible facilities. If a drug became popular among a geographically concentrated ethnic group that was served primarily by ERs that did not participate in DAWN, DAWN might fail to identify that substance. An availability bias could also lead to systematic recording errors; health care workers might be more likely to identify well-known substances, such as cocaine and heroin, than substances which have not attained such notoriety.

Nevertheless, overall one would expect DAWN to be successful at identifying the most common substances whose abuse generates acute health problems that demand immediate medical attention.

¹⁴NIDA, 1991, p. 7.

DETECT NEW ABUSE ENTITIES AND COMBINATIONS

One characteristic of U.S. drug use and drug problems is that specific drugs wax and wane in popularity.¹⁵ Another characteristic is that it is much less costly to detect and respond to a new drug quickly than it is to control a drug whose use has already become widespread.¹⁶ Hence, there is a need to identify new drugs of abuse quickly.

The large number of substances covered helps DAWN fulfill this role, but there are also limitations. Many of these limitations are the same as those noted in Section 4.1, but, in addition, the nature of DAWN's reporting practices can be problematic. Published DAWN reports are often only available after an appreciable delay. For example, when NIDA Acting Director Richard Millstein released the July-September, 1991 DAWN numbers he regarded them as "potential early warnings which must be heeded."¹⁷ Unfortunately, the release and announcement of these third quarter 1991 data occurred in May of 1992.

Furthermore, DAWN administrative agencies have never made the raw data generally available. Instead, written reports containing various cross-tabulations are distributed. Therefore, local patterns of use that are not apparent from these cross-tabulations may not come to light.

MONITOR DRUG ABUSE PATTERNS AND TRENDS

Another of DAWN's objectives is to "monitor drug abuse patterns and trends." The extent to which one believes DAWN meets this objective depends entirely on how one interprets the term "monitor."

Without a doubt DAWN provides information about patterns of abuse. For example, the steady increase in the average age of patients generating heroin mentions in the 1980s helped confirm the notion that initiation into heroin use was relatively low, and that most heroin was consumed by a stable, but aging cohort of users who had started using in the late 1960s and early 1970s. This information has been used in a variety of ways, e.g. by Kleiman and Caulkins (1992). Other

¹⁵Musto, 1987.

¹⁶Kleiman, 1992.

¹⁷Swan, 1992, p. 10.

applications, on the other hand, go beyond relatively cautious inferential arguments and seek to "analyze trends in emergency room admissions in metropolitan areas, along with medical examiner reports, in order to estimate the extent of drug abuse in this society".¹⁸ Such efforts are on shaky ground, at best.

The chief problem with the second application is that, as noted in Section 3, only a small and not necessarily representative fraction of drug users demand emergency treatment. This has two implications. First, absolute numbers of DAWN mentions need bear little relation to the number of users. Presumably the DAWN numbers are smaller, since demand for ER services is rare, even among drug abusers. But since repeated visits by the same individual are not identified as such, one can not even be certain that the number of DAWN mentions is a lower-bound on the number of users. Second, as illustrated in the previous section, trends in the number of DAWN mentions are not reliable indicators of trends in general patterns of use.

Some recognize this but still perceive of DAWN as an indicator of so-called heavy use. For example, Rhodes and MacDonald's analyses of trends in drug consumption "depend heavily on a presumed, relationship between the number of heavy drug users and the number of emergency room admissions for drug-related problems, as reported in the Drug Abuse Warning Network (DAWN)".¹⁹

For many reasons this is problematic. First, DAWN estimates the total number of drug abuse episodes leading to an ER visit, not just the incidence of those episodes among heavy users. ("Recreational use" was cited as the drug use motive for 15% of cocaine and 24% of amphetamine episodes in 1991.) Unless one tautologically defines heavy users as those whose use is damaging to the point that they need emergency care, this means there is a disjunction between what DAWN measures and what it is often interpreted as measuring.

Second, using DAWN numbers to estimate trends in the size of the using population implicitly assumes that the number of ER episodes generated per user is constant over time and location, which need not be

¹⁸Gerber and Hunter, 1991, abstract.

¹⁹Rhodes and McDonald, 1991, p. 11.

the case. Indeed, quarter-to-quarter variations in cocaine counts in individual metropolitan areas are often on the order of 20-30%. This far exceeds what one would expect from random noise, and it exceeds both in magnitude and in lack of serial correlation what one would expect from true changes in the size of the underlying population. This suggests that the number of episodes has greater variability than the number of users. Thus, the number of episodes per user must vary, and trends in episodes may not be representative of trends in the number of users.

Needless to say, if DAWN is at best an imperfect indicator of past trends in heavy use, it cannot be an ideal predictor of future trends in heavy use. The improbability of that role is accentuated by the observation that many DAWN episodes are motivated by drug dependence and/or the need for detoxification. This suggests that many episodes involve long-term users. Hence, changes in DAWN may be a lagging, not a leading, indicator of changes in heavy drug use.

Furthermore, there is no guarantee that current trends will continue into the future. For seven quarters of DAWN data (from 1989 and the first three quarters of 1990), in 20 of the 21 over-sampled sites there was a downward trend in cocaine episodes (Ebener and McCaffrey, 1992). Nevertheless the national number of cocaine episodes rose in the following year.

ASSESS HEALTH HAZARDS ASSOCIATED WITH DRUG ABUSE

Another of DAWN's stated objectives is to "assess health hazards associated with drug abuse." This objective, too, is very general and requires more precise definition before rendering judgment as to whether or not DAWN is suitable for the application.

Some people use DAWN numbers to comment on the absolute level of drug-related health hazards. For example, King observes that, "For 1990, this [DAWN ER] figure for cocaine/crack was 80,355 and for heroin/morphine 33,884. In short, the damage done by these two most-feared substances ... is in the same range as spills from bicycles and household accidents." This analysis is used to support the subsequent

comment that: "Sooner or later the nation is going to wake up and realize that its 'drug problem' ... is a nonproblem."²⁰

DAWN is clearly not appropriate for supporting such arguments. To begin with, as mentioned above, the need for emergency care reflects only a subset of health hazards; it does not, for instance, reflect chronic ill-health, such as malnutrition, to which drug abuse can contribute. Furthermore, not all emergency care is administered through DAWN-eligible facilities. For instance, emergency rooms at Veteran's Administration hospitals are excluded.

More importantly, DAWN grossly undercounts at least some kinds of ER episodes. All drug abuse episodes estimated by DAWN account for less than one half of one percent of emergency room visits nationwide. Among the 21 over-sampled sites, the average rate in 1990 was just eight-tenths of one percent. If DAWN captured all drug-related ER cases, these statistics could not be reconciled with reports of critical crowding and delay at ER rooms around the country, to which drug abuse related ER episodes are believed to contribute.²¹ Nor are statistics on the order of eight-tenths of one percent consistent with studies that find that in urban areas 20 - 40%, sometimes over 50%, of trauma patients test positive for illicit substances.²²

Even though DAWN is not capable of supporting estimates of the absolute cost of the health consequences associated with drug abuse, it might be a useful indicator of their relative magnitude, either between cities or over time. There is a great need for indicators of the relative severity of drug problems in different locations for purposes of allocating resources, e.g. SAMHSA block grants. If the number of recorded DAWN episodes in each metropolitan area were proportional to health costs in that area, then DAWN could be used in the allocation formulas. Unfortunately, there are at least five reasons why the ratio of drug-induced health costs to DAWN estimates of ER episodes may vary across the 21 over-sampled sites.

²⁰King, 1992, p. 10.

²¹Thorpe, 1990; Andrulis et al., 1991; Skolnick, 1992.

²²Soderstrom, 1988; Lindenbaum et al., 1989; Rivera et al., 1989; Sloan et al., 1989; Marzuk et al., 1990; Kirby et al., 1992; Brookoff et al., 1993.

First, reporting practices can vary across sites. San Diego reports that 30% of its cocaine episodes are the result of accidents, three times the national average. It is possible that drug users in San Diego are particularly accident-prone, but it seems more plausible that the difference is attributable to different reporting practices.

Second, drug-related demands for ER care are not homogeneous. They range from overdoses in suicide attempts, to auto accidents, to seeking detoxification, to the physical side-effects of repetitive injection drug use. The fractions of ER episodes associated with these events vary across sites; for example, in 1989 Minneapolis' fraction of episodes attributable to suicide attempts was twice the national average. Hence, the ratio of total health costs to ER episodes might also vary.

Third, not all problems requiring care end up in an ER because of overcrowding, triage, and lack of availability and accessibility to health care facilities. The substantial variation in access to health care across sites suggests that this might be a nontrivial consideration. The number of inpatient beds per 10,000 residents in New Orleans is more than double that in Seattle. The total number of ER visits, not just drug-related visits, per 10,000 residents varies by almost as much and is positively correlated ($R^2 = 0.56$) with the number of inpatient beds per capita. It may be that metropolitan areas with a relative abundance of hospitals and ER rooms and/or a relative paucity of outpatient clinics and other health services have DAWN episode counts which overstate the magnitude of the health costs associated with drug abuse relative to other metropolitan areas.

Fourth, the composition of the metropolitan areas varies substantially. The metropolitan area surrounding a relatively isolated city like Denver may encompass more affluent, suburban neighborhoods than does the New York City metropolitan area (especially since Connecticut and New Jersey are excluded). Since drug abuse is more common in the central city, this can distort inter-city comparisons. DAWN reports the fraction of each metropolitan area that lives in the central city, but the central city includes only the city for which the metropolitan area is named. Hence DAWN's numbers for the central city

of the Los Angeles metropolitan area would exclude Compton and Inglewood, even though they might share more characteristics commonly associated with center cities than would neighborhoods within the city limits of a city, such as Phoenix, whose area is large relative to its population.

Finally there is the issue of precisely which numbers would be compared: the total episode estimate, the estimated number of episodes per capita, or the estimated number of drug related episodes per ER admission. Both the number of episodes per capita and the number of episodes per ER admission might be distorted by the variations in availability of health care noted above. One would expect the former to be inflated and the latter to be understated for cities which are relatively well-served by emergency rooms. On the other hand, one would certainly expect the number of episodes in a metropolitan area to be positively related to the area's population, and typically when one discusses problems one converts raw counts into a density measure, so the raw counts are not ideal for inter-city comparisons either.

The prospects for using DAWN to monitor trends in drug-related health hazards over time are marginally better. Comparing numbers of episodes across time is less vulnerable, though by no means invulnerable, to variations in reporting practices, availability of health care, and definitions of metropolitan areas than are comparisons between cities.

Time trends, however, can be distorted by changing patterns of polydrug use. To see this, imagine a city with an equal number of cocaine and heroin users, who previously consumed exclusively their drug of choice. Now suppose "speedballing" (mixing cocaine and heroin) became popular, and all the cocaine users cut their cocaine consumption in half but began using half a dose of heroin, and all the heroin users cut their heroin consumption in half but began using half a dose of cocaine. The city would still have the same number of users and the quantity of drugs consumed would not have changed. Presumably the health consequences would be similar. However, DAWN records every substance present for an episode, so episodes that previously would have simply been counted as a cocaine episode, will now also generate a

heroin mention, and vice versa. Hence, the DAWN episode count for both drugs would double even if users continued to demand emergency care at the same rate as before!

The actual DAWN numbers are consistent with this hypothetical example. Nationally, between 1989 and 1991 there was a 3 percent increase in the number of episodes involving both heroin and cocaine, even though both the total number of cocaine episodes and the total number of heroin episodes declined.

PROVIDE DATA FOR DRUG ABUSE POLICY AND PROGRAM PLANNING

The final objective NIDA/SAMHSA lists for DAWN is to "provide data for national, State, and local drug abuse policy and program planning." One could imagine DAWN being used to address a variety of policy purposes. For example, suppose a city with a well-defined cocaine market stepped up enforcement on that market and observed that cocaine mentions declined relative to methamphetamine and heroin mentions. The city might attribute the relative decline to cessation and/or displacement induced by the enforcement intervention.

It is not clear how often DAWN numbers are used for such relatively sophisticated purposes. It is perhaps more common to hear DAWN estimates, either the absolute numbers or their rate of increase, quoted as a preface to demands or promises, for additional resources to "do something" about "the drug problem."

When using DAWN numbers, the policy maker must distinguish between trends in data for individual sites and trends in the national estimates. Over a year or more trends across sites seem to move in the same direction. For example, between 1989 and the third quarter of 1990, the number of cocaine episodes fell in 20 of the 21 over-sampled sites. (Ebener and McCaffrey, 1992) Nevertheless, there can be substantial differences in quarter-to-quarter variations; the average correlation in the number of episodes between all pairs of sites for this same data was only 0.39.

Hence, the national trend is the average of many, often differing local trends, and local policy makers should not pay particular attention to the quarter-to-quarter variations in the national numbers

because they may not be paralleled at the local level. With the redesign, however, the 21 over-sampled sites can observe directly trends in estimates of the number of ER episodes in their own areas, at least as long as a careful eye is kept on which facilities are and are not responding.

DAWN is of less use to local policy makers outside those 21 sites. Not only should they not assume that national numbers scale down to their jurisdiction, but it is also not safe to draw inferences from trends in nearby sites. Patterns of drug consumption in neighboring areas are not always parallel; indeed, for the data mentioned above, the correlation between Baltimore and Washington is actually negative.

Perhaps the most prominent use of DAWN is as a "score card" for the success of US national drug policy. DAWN is the basis for one of the nine quantitative objectives that are explicitly laid out in the Office of National Drug Control Policy's 1989 Strategy. This application may be inappropriate for at least two reasons.

First, as discussed in Section 3, there is only a tenuous and somewhat ambiguous relationship between patterns of drug use and drug-related ER visits. Also, as was just discussed, ER visits are not a particularly good indicator of the health consequences of drug abuse. Thus, the scorecard measures little more than trends in drug-related ER usage, and there is no obvious reason for using DAWN estimates to monitor health consequences other than the absence of an adequate alternative.

Second, when DAWN is used as a scorecard, there is no counterfactual against which actual events can be compared. Exogenous changes having little to do with drug control policy per se can influence the number of ER episodes related to drug abuse. For example, a recession could deprive users of health insurance, forcing them to rely on emergency rooms for health care more often. Likewise, changes in the global supply of drugs, the causes of which are often beyond US control, can influence patterns of use.

No matter how much DAWN numbers increase, it is always possible they would have been still higher had the current drug policies not been implemented. Likewise no matter how much DAWN numbers fall, one can

never be sure they would not have fallen farther and faster under different policies. Since many factors other than official policies drive both consumption of illicit drugs and related health consequences, this lack of counterfactual data makes evaluating the success of drug control policy on the basis of DAWN numbers more political than scientific. Furthermore, even if DAWN gave perfect information about drug control policies' collective impact on "the drug problem," one still would not know how to apportion credit or blame between enforcement, treatment, prevention, and other policies.

It may be that DAWN can usefully inform the policy and program planning, but it is not obvious that the majority of past applications have been entirely appropriate.

SUMMARY

This discussion suggests that sweeping statements such as "the new DAWN provides reliable data" or "unresolved under-reporting problems leave the DAWN data flawed" are too simplistic. DAWN is capable of providing useful information, but, perhaps due to the paucity of other sources, it is also commonly applied in ways for which it was not designed and for which it is not particularly well-suited. Hence, it is important to understand DAWN's strengths and limitations in order to know how much credence to give various interpretations of the data.

5. POTENTIAL FOR ENHANCING UTILITY OF DAWN DATA

Earlier sections discussed key design features and how they limit the utility of DAWN data for a variety of the objectives and uses to which DAWN has been put in the past. In this section we suggest strategies that could enhance DAWN's utility or provide a greater understanding of the impact of its design features for applications to which DAWN has been used, especially its role in policy and program planning.

IMPROVE TIMELINESS

DAWN's utility for policy and program planning, especially at the local level and as a "warning" system, would be strengthened if the data could be acquired, processed and disseminated in a more timely manner. For warning to have benefits it must be received in time to take corrective action.

But DAWN has long suffered from the delays between collection and dissemination of its reports. Improved technology used in various health and other surveillance systems (for example, the Fatal Accident Reporting Systems (FARS); Poison Control Centers could greatly reduce the time (and possibly the costs) of data processing. For example, direct data entry from ER records, could replace the processes involved in filling out forms, sending them, checking them and then performing batch data entry and data retrieval. Direct data entry software systems encode many checking and editing functions for data quality control that DAWN lacks in the field.

INCREASE ACCESS

A major weakness of the current DAWN system is the lack of dissemination of the data sets for secondary analysis. NIDA provides extensive cross-tabulations, but they are not, nor could they be, exhaustive. Different users have different needs. For example, some users might wish to track DAWN mentions exclusive of suicides. Unless NIDA makes DAWN tapes available there is no way to do this. But in the past, NIDA was not generally willing to make data available to

researchers who have sought them. Repeated requests for use of DAWN have been denied by NIDA. This policy should be changed and DAWN should be treated like other HHS data systems that are routinely archived for public use. Appropriate documentation and assistance with the use of the data should be available and grant programs to promote use of the data should be established.

Permitting access would require more than a policy decision by the DAWN administrator to do so. Certain DAWN design features would need to be addressed in order to produce the data in a timely manner. For example, the sample design includes a process for replacing quarterly weights with final weights that can only be completed after a full year of data have been collected. This feature would delay dissemination, unless interim files were also produced.

EXTEND ANALYSIS

Most applications rely exclusively on the aggregate number of DAWN mentions, and typically only for a few of the better-known drugs. DAWN, however, also collects data on attributes such as the demographics of patients (plus the ZIP code of their residence), mode of drug administration, reason for visiting the ER, disposition of the episode and drug use motive. The issues described in Section 3, which impact the utility of aggregate DAWN counts, also affect inferences based on these more detailed data, but sometimes comparative statements are still possible. It is difficult to believe that the dearth of applications of these detailed data is completely and adequately explained by their limitations. Indeed, if it were, then it may be that DAWN should stop collecting these data. Rather we suspect that lack of access to and familiarity with DAWN's data explain the scant attention these data have received. Several illustrations of their potential application are suggested below.

Demographics of Users

If DAWN's biases are consistent over time, trends in demographic information might well be meaningful. For example, suppose one believed that over two successive years there was no change in the relative likelihood that male and female users would present to an ER and be

detected by DAWN. Then, if one saw the fraction of DAWN episodes accounted for by women increase substantially, one might tentatively infer that the fraction of problem users who were female was increasing; one might even consider tailoring a larger fraction of treatment slots to the needs of female addicts. Similar comments apply across drugs. Indeed, DAWN data were one of the early signs that crack users were more likely to be female than were users of powder cocaine or heroin.

Mode of Administration

AIDS education and prevention programs have been introduced among IVDUS in several major cities. Evidence of their impact might be sought using DAWN data on mode of administration for heroin, cocaine and amphetamines. For example patterns of declining injection and increasing insufflation or smoking among dependent cocaine user episodes in targeted cities might suggest a positive impact of outreach efforts.

As another example of the utility of mode of administration, increases in the fraction of heroin-only episodes associated with smoking combined with decreasing average ages could signal renewed initiation into heroin use, perhaps spurred by higher purities which make smoking heroin feasible. Retrospectively, one might be able to date the arrival of crack in an area by observing when the mode of administration shifted from insufflation to smoking. (Note, however, that currently DAWN only records one mode of administration per episode, even though up to four substances can be recorded in one episode.

Motivation for Use

DAWN also records the motive for use of the drug (only one motive per episode) including dependence, suicide, recreational and other psychic effects. As long as there was no reason to think that there had been changes for different motives in the relative probabilities of needing emergency care and of being detected by DAWN, changes in the distribution of motives might suggest changing patterns of drug use. For example, suppose one noticed that the fraction of ER admits who are dependent increased relative to the fraction taking drugs for recreational purposes. Then, one might consider this to be circumstantial evidence that initiation was declining (perhaps

suggesting that resources should be shifted from prevention to treatment).

Reasons for ER Contact

Examining changes in reason for ER visit may also suggest shifts in needs for services. For example, if cases seeking detox show significant increases, it might suggest an increasing demand for treatment services. Health impacts of enforcement efforts might also be observed, if, for example, withdrawal episodes increase after major seizures. Increases in unexpected reactions and overdoses may signal increases in initiation, or of increased purity of the drug consumed.

Identifying Local Target Areas

The ZIP code data can be used, in conjunction with information on DAWN hospital catchment areas, to map locations within metropolitan areas that produce the greatest concentration of ER patients. This information could be useful when locating treatment programs, planning street outreach routes, carrying out enforcement and conducting research.

As noted above, none of these detailed data are immune from the many potential pitfalls discussed in Section 3. Nevertheless, some relative comparisons using detailed data may be less vulnerable to these pitfalls and provide more information about changing patterns of use than counts alone. If resource allocations decisions are to be based on DAWN as they have in the past (HHS News, 1992), combining information from more detailed analyses of these data with what is observed from changes in episode counts could provide a more solid empirical base for deciding on sites, amounts and targets for resources.

Address Methodological Problems

In addition to furthering our knowledge of drug abuse patterns and trends and their variation among metropolitan areas, exploring DAWN variables that have been rarely used could help address a number of methodological problems.

Most analyses will be limited by the design and implementation problems described in Section 3. But such problems can differ and have

different impacts for analysis depending on the characteristics of episodes. For example, undercounting may be a bigger problem for recreational than for dependent users. Additional DAWN data can be used to disaggregate the population of episodes into more homogeneous categories. For example young, recreational users with unexpected reactions to hallucinogens can be identified as a category separate from older, dependent users with chronic effects of intravenous drug use. Methodological problems and their impacts can then be investigated and perhaps compensated for separately for discreet groups.

Using additional data could also be helpful in interpreting some of the short term changes in number of episodes that have received much attention in the past few years. Short term increases or decreases across all substances, users, motivations and sites at the same time may suggest an artifactual explanation rather than a change in use patterns, because of the diversity of drugs, sites, users, and motives captured by DAWN. For example, rarely do major seizures involve more than one or at most two major substances. Different kinds of users should be expected to respond differently to reduced drug supply. If a drug became less available, recreational users might reduce their use and the ER visits decline, but dependent users without their drug supply might be expected to increase their visits due to withdrawal and lack of drugs for self-medication. While national publicity about the dangers of drugs might result in less recreational use across sites in the same time period, dependent use is unlikely to be so affected in the short-term.

Finally, further analyses of additional data might identify items that should be dropped from recording, such as source of the substance. Other modifications like coding mode of administration and motive for use for each substance recorded could enhance the utility of these data.

COMPARE AND CONTRAST DAWN WITH OTHER INDICATORS

To this point we have focused exclusively on DAWN as a single indicator. Another way to strengthen its utility is to use it in combination with other indicators to help interpret trends and patterns. Credibility could be enhanced, despite its limitations, if DAWN reasonably compared with other measures, even if they too were limited.

NIDA reported in 1992 that DAWN was being used in conjunction with other surveillance mechanisms like the Community Epidemiology Working Group (CEWG); ethnography networks; narcotics squads in police departments; and recent treatment admissions.²³ However, we are unaware of any publication of findings from this integrated surveillance system.

At times it may also be profitable to combine DAWN with data from quite different sources to examine different kinds of drug policy questions. For example, Hyatt and Rhodes (1992) observed that DAWN trends are negatively related to trends in drug prices. Such an analysis could be extended to estimate elasticities and cross-elasticities of DAWN mentions with respect to price changes.

ALTERNATIVE INDICATORS

Some of the original objectives for DAWN may now be better met by using alternative indicators, and relying on research that has developed since DAWN was originally designed. Clinical research on illicit substance abuse is much more advanced and biological effects and health consequences better understood than they were in the 1970s.²⁴ With this understanding, some of the limitations of DAWN procedures for identifying drug related health consequences, have become evident. For example, not all drug-related health consequences are immediate and easily recognized in emergency medicine.²⁵ Many drug users seek care in alternative settings.²⁶ Some users are likely to make repeated use of ERs (e.g. AIDS patients; suicide attempts).²⁷ Demands on emergency rooms have also changed since DAWN was developed. Increasing delays in providing services, ambulance diversion programs, triage to refer incoming patients and other practices that have emerged may make it increasingly difficult for DAWN to meet the objectives for which it was designed.²⁸

²³Swan, 1992.

²⁴Stein, 1990; Rutenber, 1991.

²⁵Dunlop and Steedman, 1985; Lindenbaum, et al., 1989.

²⁶Rader and Brewer, 1992; Weinstein, 1986; Weisner, 1993.

²⁷Reynolds, 1986.

²⁸Andrulis, et al., 1991; Ling, 1992; Will, 1990.

Warning of New Entities and Substances of Abuse

While DAWN was designed as a "warning" system, data access problems and time consuming data processing procedures limit its utility for this purpose. The National Network of Poison Control Centers might be one option. Poison control centers participate in a fully automated national index, available on-line in many large emergency departments. Analysts could use this national database to identify new substances and locations of new substances. It also obtains input from a much wider network of health care providers, e.g. out-patient clinics, than DAWN and includes reports from settings other than healthcare. Other options might include increased use of local reporting services that acquire and analyze street samples, like the Up Front Drug Information Service in Miami, Florida, and increasing law enforcement undercover purchases of street drugs.²⁹ These systems capture drugs that are available, but not causing acute medical consequences.

Over the years DAWN has identified hundreds of drug names in its index, but few new substances have emerged. At one time NIDA built an Emergence Index for detecting new substances. In describing its operation, Retka reported that when using the national database in the period 1973- 1976 he found "very few truly new problems drugs appearing on the drug scene."³⁰ Today there are probably even fewer. But, as he pointed out, at the local level there may be new arrivals of drugs known in other areas. We have no further research findings based on the NIDA Emergence Index.

While new combinations of drugs and polydrug use may be expected to emerge from time to time, the current configuration of DAWN is unlikely to identify them quickly enough for local intervention. Furthermore, without local access to the data it isn't possible to discern such substances, which in fact, may be more easily identified through the work of the Community Epidemiology Working Groups.

The objective of finding new substance of abuse dictates certain constraints for the NIDA design, for example, capturing every ER drug related episode. Given the recent development and possible superiority

²⁹Ruttenber, 1991.

³⁰Retka, 1979.

of other options (at the local, state, and national level) it might make sense to consider eliminating this objective from DAWN and modifying the design to better support other objectives that DAWN alone might be available to serve.

Assess Health Hazards Associated with Drug Abuse

When DAWN was established, relatively little was known about drug users, especially heavy users. That has changed dramatically. A great deal of research, for example, studies of IDUs and chronic crack users as part of the National AIDS Demonstration Research Project, have provided a wealth of information on the health hazards associated with drug abuse that are far richer than what DAWN can provide. Such efforts, however, do not provide the regular monitoring that DAWN does.

In its present configuration, DAWN is unable to address the health hazards of greatest concern such as HIV seroprevalence among drug users and drug abuse among pregnant women. In fact, the changing nature of health hazards may be influencing trends in DAWN at different points in time, but they cannot be identified by DAWN. Diagnosis information is not included in the DAWN record. Also, DAWN cannot identify chronic use of the ER by particularly unhealthy drug users, e.g. IDUs with AIDS, though their presence may be contributing significantly to ER episode counts in DAWN sites where the rate of AIDS among IDUS is high. NIDA has fielded a separate survey to determine prevalence of use among pregnant women, some of whom might be expected to present with pre-natal problems to ERs, but would not be coded as DAWN episodes under current definitions.

The National Health Interview Survey, the National Maternal and Infant Health Survey,, the National Ambulatory Medical Care Survey and the National Hospital Discharge Survey all provide information that could be useful in describing health consequences associated with substance abuse. In fact, the Hospital Discharge Survey should be capturing the DAWN episodes that are admitted as inpatients. To the best of the authors' knowledge, the two systems have never been used in combination to compare the characteristics of ER versus inpatient drug abusers. Medicaid databases and other health care utilization databases

also contribute to the assessment of health hazards among drug users and unlike DAWN link cost information to utilization data.

DAWN data on health consequences could be greatly enhanced if they could be linked with the hospital's cost, diagnosis, and automated medical treatment records for DAWN patients. Systems that link the separate hospital systems together without additional data entry have proven their efficiency and improved clinical and research utility.³¹

CONDUCT METHODOLOGICAL RESEARCH TO ADDRESS DAWN PROBLEMS

Some of the limitations to using DAWN can be corrected. Others can be studied and possibly compensated for in applications of DAWN. Still others have little chance of being resolved. The remainder of this section focuses on research that might be undertaken to improve our understanding of the relationship between DAWN episodes and underlying drug use and to address the problem of undercounts of drug related episodes.

Investigating the relationship between drug use and ER episodes

Since there is so little information about hard-core drug use to guide policy and program planning, determining the potential of DAWN to serve as such an indicator deserves attention. If researchers and policy makers better understood this relationship they might decide that it is valid to use DAWN as a surrogate indicator of trends in underlying use or know positively that DAWN is invalid for such inferences. For example, if conclusive evidence were available that emergency room utilization rates depend on the substance abused, comparisons between cocaine and heroin episode numbers would be avoided. Some research exists for example on health problems and health care utilization behavior among heavy drug users, that could be utilized to help enhance understanding of this relationship. Additional studies would also be required.

First, information is needed on the frequency of health consequences associated with use among different types of users. (Since policy interest focuses on hard-core users and we suspect their

³¹Rodewald, et al., 1992.

utilization is greatest we use this group of users as an example). Some indication is available from studies of IDUs and crack users conducted as part of the National AIDS Demonstration Research Project. Other public health studies have provided similar information from in and out of treatment samples of drug users.³² The National Household Survey on Drug Abuse asks users it surveys about their utilization of emergency medical services. The latter source provides information predominantly on casual drug users.

Second, information is needed on health care utilization by heavy drug users, given health consequences. For what consequences, do they seek medical care? Where do they go for care? Do they have alternatives to ERs? How often do they use ERs? Again, health surveys can provide some of this information. Follow-up studies with a sample of DAWN patients or their medical records would yield other needed information.

Reducing Undercounts

As discussed in Section 3, several problems result in significant DAWN undercounts of drug-related episodes, including the difficulty that ER personnel can have in identifying whether or not drugs are related to an ER visit, the difficulty of determining this relationship (even when identified by ER personnel) from records available to DAWN coders, and the differences in procedures used across DAWN facilities.

While the first problem of identification by ER personnel is difficult to solve, it may be possible to change DAWN procedures to achieve greater standardization in procedure and increase the likelihood that drug related episodes get captured by DAWN. For example, entire hospital records could be reviewed for ER cases rather than only the ER record. This would also provide more information to DAWN coders for those cases admitted as inpatients (about half of all DAWN episodes).³³ Another standardizing procedures would be to select cases to screen from hospitals' computerized patient diagnosis database and screen full

³²Iguchi, et al., 1992; Vlahov, et al., 1991; Dinwiddie, et al., 1992.

³³NIDA, 1991.

records for those diagnoses most likely to involve drug use (e.g. all ICD-9-CM E codes related to drug overdose; all trauma cases) looking for evidence of drug relatedness in the full record. DAWN currently uses such a process for screening ER logs in some hospitals. Cases with certain presenting symptoms (e.g. trauma) as shown on the ER log are selected for screening for drug involvement.

As an alternative, depending on the objectives for the system, it might be modified to rely exclusively on existing toxicology reports. One can easily identify new biases that might be introduced with this approach, but this and other approaches could be examined for their potential to both limit undercounts and produce greater standardization and validity and reliability.

Much greater standardization and comprehensiveness, with accompanying greater cost, could be achieved by performing toxicology screens on all ER patients, or all trauma patients, or other high risk sub-groups. The American Medical Association is on record as recommending screening of all trauma cases for the presence of drugs and alcohol. To reduce costs, this procedure might be carried out only several times per year instead of year round. Protocols for tox screening exist already in some hospitals.

Any of the above suggestions involve different tradeoffs for different DAWN applications that would need to be investigated. Perhaps as a starting point several small studies using different methods could be conducted just to calibrate the DAWN undercount and identify the biases that result. This information alone could be useful in adjusting for the problem in other analyses.

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APPENDIX G

**THE ROLE OF REPORTING SYSTEMS IN SUBSTANCE
ABUSE PROBLEM MONITORING**

INTRODUCTION

Substance abuse researchers have often characterized substance abuse as a chronic disease with various medical complications arising from different patterns of use.¹ While national policy in the past several years has been characterized as a "war on drugs" with elimination of use as the goal, recently national policy statements have articulated another view. ONDCP Director Lee Brown, in his testimony about this administration's interim drug strategy, stated that the strategy "recognizes that drug dependence is a chronic, relapsing disorder, and that users stand little chance of recovery without the benefit of treatment."² Local policymakers too have pointed out their view of the "public health epidemic" that alcohol and other drug addiction problems present.³ The health care reform debate will also draw attention to the health complications, treatment needs and disease aspects of serious substance abuse problems in the community.

While we know a great deal about the prevalence of alcohol and drug use in the general population, much less is known about the sub-population that is currently of increasing public concern - those whose use appears to be chronic and to result in dependence and severe consequences that require intervention. It is only when the consequences and interventions occur that this group becomes evident, because otherwise it is largely concealed among the far greater population of non-users and infrequent users captured by the present surveys.

A number of drug-related consequences such as DUI arrests, treatment admissions and emergency room episodes are monitored by indicator systems. But these systems typically provide little more information than counts of the event being monitored. Often it isn't possible even to know how many individuals are responsible for the events captured. Because different indicators are not linked, it is

¹Stein, et al., 1993.

²Hon. Lee P. Brown, Statement before the House Committee on Appropriations, November 16, 1993.

³Clark, Sorensen and Morin, 1993.

impossible to piece together whether interventions occur as a result of consequences and whether further consequences are minimized as a result of interventions. For example, we know from DAWN that so many drug-related emergency room episodes (conforming with DAWN case selection criteria and procedures) occur in a given jurisdiction in a given year. We don't know how many more occur that involve alcohol only and we don't know how many similar episodes occur in other health care settings, although there are known high rates of medical care utilization by substance abusers which are of serious concern to health policy planners.⁴ We don't know what medical treatment drug patients in emergency rooms received; the cost of the treatment; whether and at what rate they are referred to and access substance abuse treatment; and who among them incur further medical consequences, or die in the future due to their drug problems.

Yet different administrative and services information systems capture different pieces of all of this information. Hospitals and public health clinics maintain medical history, clinical, laboratory and billing information on patients. Substance abuse providers maintain records on admissions (and some have linked records on services received and discharges). Public health officers have records on AIDS and other infectious disease patients as well as causes of death. Mental health providers have separate information systems about their treatment clients, many of whom are dually diagnosed with alcoholism and/or drug addiction.⁵ In addition, the law enforcement system keeps records on individuals that contain arrests, convictions, and sentences received for drug and other offenses. Welfare, employment and other social services agencies maintain data systems about their own clientele, among whom drug and alcohol problems are far greater than in the general population.⁶

The kind of information currently collected, but not linked or merged across separate systems, is the kind of information that if integrated could support the development of more effective policies to

⁴Stein, et al., 1993; Rader, et al., 1992.

⁵Weisner and Schmidt, 1993.

⁶Weisner and Schmidt, 1993.

address the "epidemic" consequences and the "chronic, relapsing" condition that substance abusers present. While it is important to have some sense of the size of the sub-population of interest, it is also important to have better information about how consequences distribute across the population, where the population is concentrated, the history or career of substance abuse, the kinds and frequency of consequences that occur over time and the experience of users before and after contact with interventions such as medical care, substance abuse treatment and arrest. If linkages within and across existing information systems could be created, far more comprehensive data would be available about the sub-population of problem substance abusers, revealed through contact with various service agencies, than is available from cross-sectional surveys and individual reporting systems.

Public health epidemiologists have a long tradition of supplementing population survey data with data from reporting systems designed specifically for surveillance of certain diseases and at-risk populations. Using these systems they are able to monitor trends, project resource needs, map improved interventions, track treatment histories, and evaluate existing approaches. Efforts to link data from multiple sources have been undertaken within some of these systems.

In this paper we describe the different kinds of public health surveillance systems that are used in the U.S. and adaptations of these approaches that have been used here and abroad for surveillance of substance abuse. We identify common problems facing various systems and the solutions that have been attempted to address them.

It is our conclusion that further development of some of these approaches, relying heavily on advanced computer and information technology to link and integrate data from existing systems, might be a viable option for improving data on the heavy user population, currently targeted by policy makers and about whom present data are the weakest for supporting policy and program planning. As researchers and service providers demonstrate the complicated set of interrelated problems that substance abusers present and current White House policy draws attention to the integration of substance abuse policy with health care policy and criminal justice policy in general, the feasibility of linking

information across sectors to better inform substance abuse policy as well as health care and justice policy seems particularly worthy of consideration. ONDCP, which is charged with coordination of substance abuse policy across the federal agencies that intervene with substance abusers, is uniquely positioned to lead such an effort.

PUBLIC HEALTH & SUBSTANCE ABUSE REPORTING SYSTEMS

Definition

Public health reporting systems are information systems that utilize systematic reporting procedures, whereby eligible events or individuals are identified at a number of capture points and standardized data on these events/individuals are submitted to a central body for further processing and dissemination. Some include identifiers for individuals so that multiple episodes or events involving the same individual can be linked. These systems may be used to define the incidence, prevalence and specific characteristics of particular populations at risk. They can also continuously measure the trends and consequences of particular types of exposures, identify high risk populations and even assess the successes or failures of treatment and prevention efforts. Reporting systems vary considerably in terms of their costs, their complexity and the types of issues they can realistically address.

Reporting systems are superior for monitoring trends and signaling early changes, as opposed to annual surveys, because they are continuously "sampling" the community. They are particularly good for use in the early detection and response to new drug, to the serious effects of new patterns of use and for the identification of drugs in a new population of users. Certain types of reporting systems -- case reports and surveillance systems -- also allow for determining the impact of change in the demand for treatment and the sequence and direction of contact with agencies.

The primary limitation of reporting systems is that any given one captures only a portion of the population of interest. For example, a trauma registry run by the local trauma center captures only those who present for treatment at a trauma center. When a broader based

surveillance mechanism is used, for example a trauma registry that is maintained by all hospitals and emergency medical services, it will have much greater coverage of the population of interest. Other problems of reporting systems are discussed in a subsequent section.

Types of Systems

Event Reporting Systems. An event reporting system counts the number of times a particular event occurs during a given time period. This system does not reflect the number of individuals in contact with the reporting agencies, because that person may be treated more than once for the same problem. The only "event" that is an exception to this rule is death. Such systems may be quite advantageous to operate for a number of reasons. They are the simplest of all systems to operate, which means that training, maintenance and costs are kept to a minimum. Confidentiality is also generally not an issue, because the system is not concerned with the individual, but rather, the event. In the case of drugs, these systems are quite successful in alerting medical personal of new adverse reactions, new routes of administration, and new substances in use, or in combination of use. Examples of event reporting systems include the Uniform Crime Reporting System, the National Poison Control Index and DAWN.

However event reporting systems are still the least flexible of the three. Because they are not tracking individuals, they can not determine how many individuals are involved in a given set of events. For example, ten events may either be the report of ten separate individuals reporting one event each, or it may be the report of one individual who has experience the event, such as a drug overdose, ten times (WHO). Because the system doesn't identify anew or old group of users, it also is difficult to target prevention/intervention efforts. In addition, because the event report does not contain a system for follow-up, determining the success or failure of the particular response to the event, such as treatment is not possible. Finally, it is difficult to evaluate the reliability or validity of the data in the system because it cannot be compared with other information about the

individual. Such systems, therefore, are the least amenable to conducting scientific research.

Case Reporting Systems. Case reporting systems are used to report the number of individuals experiencing a particular event for a particular time. The event may be a particular disease, such as AIDS; a particular exposure, such as lead; or a specific treatment, such as residential substance abuse treatment for a chronic drug abuser. Because this type of system allows for the identification of specific individuals, it may be used to get an accurate estimate of how serious a particular problem is, the geographic location of the individuals and the spread of the problem over time and space. Various characteristics of the cases may be evaluated in order to identify those populations at risk. This is especially true for describing the spread of infectious diseases (described below under the Center for Disease Control's System for Reportable Diseases). In such cases, authorities are only temporarily interested in the identity of the individual with the infectious disease, in order to trace possible contacts to limit the spread of disease. However once the outbreak is over, the personal identification of the case ceases to be important. Thus, there is no need to maintain a permanent register of those who had the disease.

These systems have a number of advantages over the event reporting systems previously described. First, they can describe characteristics about an individual. Therefore, the characteristics of cases using a particular drug can be evaluated in a way to pinpoint the high risk group for that particular drug. Second, these systems can evaluate outcomes when they are limited to one set of events, or one type of institution, such as treatment. And third, because these systems are more complete, it is not only easier to interpret the meaning of the data, but the reliability and validity are more easily verified as well.

The major disadvantage of such systems is that they cannot be used to evaluate outcomes over time or in different sectors. In the case of drug treatment for example, one cannot determine the status of the user on the anniversary date of his/her release. Such systems are not as efficient or easy to run as event reporting systems but as noted above they have expanded utility. An example of case reporting systems used

in the drug area is the former CODAP, or Client Oriented Data Acquisition Process.

CODAP was a case reporting system administered by NIDA that operated between 1972 and 1982. This system was designed to follow drug cases through the federally funded drug abuse treatment and rehabilitation network. Approximately 2,000 clinics and 40,000 admissions and discharges per month were included in the system (WHO). Four basic forms -- an admission report, a client flow summary, a client progress report and a discharge report -- were used for data collection throughout the client's stay. The admission and discharge reports were linked by using a client identifier code, a client number assigned by the clinic, the date of admission to the clinic, and the client's sex and date of birth. In order to protect client confidentiality, only the individual clinic maintained the files which enable the cross linkage of the client name and client identifier code. Because of these strict confidentiality procedures, it was impossible to link the CODAP records to other treatment providers' databases. An incentive built into this federally mandated system to ensure accurate reporting was that states did not receive funding unless there was a match between admission and discharge records. Analysis of these data showed an 80% agreement between these records within treatment institutions for one treatment episode.⁷ As previously described, the major disadvantage of this system was the fact that clients could not be traced once they had been discharged. Therefore, it was impossible to evaluate such questions as the success of the treatment on the one year follow-up date, whether the client was also brought into the criminal justice system, or whether the client died due to drug related causes after being released. In addition, the system only included federally funded centers, which meant that certain geographic regions were highly underrepresented.

The Client Data System (CDS), is a new federal reporting system designed to obtain client level data on treatment from the providers. This system, which was instituted in 1989, requires that a minimum of thirty four data elements, known as the Minimum Data Set (MDS), be sent

⁷Personal communication with SAMHSA staff.

to the federal government for every treatment admission. At this point the MDS only requires enrollment data from the states, which includes some demographic information about the client, the date the client was enrolled, the types of services received and the substances abused. Other states, such as Oregon have collected more extensive data than required, such as specific information on arrests, the source of household income and DUI information. Certain states, such as California are standardize their client identifier systems, so that cases can be tracked if they are ever readmitted for treatment within the same state (however the Client Data System does not currently require this level of complexity).

Child Abuse Reporting System: As in the CDC reportable disease system, there is a legal mandate in some states that child abuse must be reported to the state - either to Child Protective Services, or in some cases, directly to the police. Such reports must be called into the agency the same day that the professional encounters a suspected case. In some states a written report is also required within 24 hours. Unlike the case of disease reporting, the diagnosis of "child abuse" is much more difficult to substantiate. Additionally, a wider range of professionals are responsible for detecting the abuse, as compared to the role of physicians in disease detection. These professionals vary profoundly in their attitudes about reporting and this results in a differential reporting bias between professions. For example, psychiatrists, as a group, tend to report child abuse at a much lower level because there is the sense that this requirement breeches the confidentiality of their patients.⁸ Overall, there is approximately a 30%-50% compliance rate for reporting. There are also some similarities between the child abuse reporting system and other public health and drug abuse reporting systems. As in the other examples, the protection of confidentiality is crucial in child abuse reporting and confidentiality is strictly protected under the legislative mandate. And similar to the case of drug use, there are many institutions where a

⁸Zellman, 1992.

case may be identified, such as the criminal justice system, schools or hospitals, yet these organizations seldom interact with each other.

Case Surveillance Registers. Case registers are used in situations when surveillance of the individual is the direct goal. This type of reporting system allows for linking events that occur in different settings for the same case. For example, case registers can be used to determine the impact of treatment and enforcement on subsequent drug use for particular individuals or populations. Therefore, case surveillance has the greatest flexibility and analytic capability of all three reporting systems. They can analyze in terms of events, cases or individuals. However given the complexity of surveillance registers, there are particular issues that require special attention. Specifically, maintaining confidentiality of the cases is essential for the register to operate effectively. The record linkages are also the most complicated of the three systems and they require a more specialized staff to operate and greater resources to maintain. Thus, the costs associated with a case register are likely to be much higher than those for the other systems previously described. Some examples of drug registers and the registers most commonly affiliated with the public health field -- disease registers and exposure registers -- are described below.

There are only a few examples of drug registers that have been developed in the U.S.. Many of these registers have targeted either specific drugs, such as narcotics, or specific segments of the population, such as psychiatric patients, or patients in treatment. These registers have primarily functioned in Europe, for example in England and the Netherlands, and in Asia, e.g. in Malaysia and in Australia.

There have only been a very few examples of registers that have incorporated a broader spectrum of case identification into their system. Two such examples include the Hong Kong Central Registry of Drug Abuse and the New York City Narcotics Registry. There are reportedly a number of reasons that contributed to the successful

implementation of the Central Registry of Drug Abuse in Hong Kong.⁹ First, the Registry was able to enlist the cooperation of many of the key agencies and institutions in which drug abusers come in contact. This broad reporting base includes treatment services, correctional institutions, hospitals and social welfare agencies. Second, the Registry is legally protected under the Dangerous Drug Ordinance. This legislation was specifically amended in 1981 to ensure that the registry and its reporting agencies are protected so that the confidentiality of the drug users is never jeopardized. These factors, in combination with the fact that Hong Kong is a very heavily concentrated and homogeneous population, "...permits extrapolation of the addict population as a whole with greater validity and reliability than may perhaps be the case in other countries."¹⁰

The New York City Narcotics Register was established in 1964 and was operational through the 1970's. While it was not limited to narcotics, fewer than 5% of all cases reported using drugs other than heroin (based on reports received through 1974).¹¹ This registry contained reports from a variety of sources, including treatment, police, corrections, parole and probations departments. While there was clearly underreporting of long term daily users in this system (as confirmed by evaluating how many overdose deaths were known to the register), it still provided a great deal of useful information and was a tool that could be used to evaluate the success of treatment. For example, by studying the discharge data for patients in the New York City Methadone Maintenance Treatment Program, it was found that during the first six months after a patient was discharged, almost half were reported at least once from one of the intake agencies. This proportion increased to almost 70% after 3 years had passed.¹² The registry also maintained strict procedures to ensure the confidentiality of the clients. This was just one of the many challenges faced in maintaining a registries. The other difficulties faced in conducting drug

⁹Wat, 1985.

¹⁰Wat, 1985.

¹¹Newman, 1976-77.

¹²Newman, 1976-77.

surveillance is further described in Section IV of this report. The New York City Narcotics Registry was finally discontinued due to the cuts in federal funding that supported it.

When the CODAP system was stopped in the early 1980's, the State of California decided to continue their data collection effort. Between 1982 and 1991, California instituted the CALDADS, or California Drug Abuse Data System, to continue collecting data on drug treatment utilization. During this period, they developed a statewide client identifier system. This unique identifier incorporated the first two letters of the person's name, their sex and date of birth. In 1991, CALDADS was renamed CADDS, or California Alcohol Drug Data System, which now includes the minimum data requirements under the Client Data System. The unique client identifier, in combination with the standardized information on drug use means that California has the capability of using the CADDS system as a registry for all patients who use state and federally funded treatment facilities. Therefore, it is now possible, for example, to track whether a person treated for abuse in early 1991 has been brought back for treatment in 1993.

Disease registers share a number of commonalties which have lead to their success. Probably the most critical point is that there is a specific disease that has been identified and may be verified at some level. Such verification may include pathology analysis, blood tests, radiology reports. In addition, cases can be targeted, based on the known risk factors for the disease. For example, individuals at risk for melanoma share a common set of risks, such as fair skin, or severe burns in childhood. These risk factors are different than those for breast cancer. Therefore, the combination of many factors, such as age, race, sex, and genetic history all assist in the identification of high risk populations for the disease.

A related issue is that in most cases, reporting of disease is mandatory. Because disease registries are instituted by legislative mandate, there is generally a mechanism in place with checks and balances to ensure that the system will run effectively. For example, CDC or state health agencies will issue protocols to assist physicians in conducting their differential diagnoses. Therefore, should a patient

present a case with a number of risk factors for the specific disease, the physician will be required to do the recommended follow-up testing for the disease and report it to the appropriate agencies, should the results be positive.

Disease registries share the common goal of protecting the patient's confidentiality. Since these registries are housed within Public Health agencies, their confidentiality is automatically protected and the data may only be used to assist the patient, or for scientific research and may not be subpoenaed in a court of law. Examples of disease registers include: Cancer, tuberculosis, and birth defects.

Exposure Registers - Exposure registers have been implemented when a particular source has been identified, such as lead from paint chips, or Agent Orange in Vietnam. These registers have also been directed at particular high risk populations, such as individuals living near toxic waste sites, or occupations, such as asbestos workers, coal miners or pesticide applicators. The point of this type of register is to track individuals over time in order to understand who of the exposed population is at risk for developing disease.

These registers may or may not share some of the features of the disease registers. For example, there may be specific ways to evaluate exposure, such as analysis for blood lead levels, or it may not be feasible, as in the case of Agent Orange. It is also more difficult to identify, because the physician is in the position of looking for diseases, not exposures. Therefore, unless the physician has been notified that a particular population is at high risk for exposure, they may remain unidentified. Again, confidentiality is maintained if the registry is maintained within the purview of the health department, however there are other agencies, such as the Department of Labor, or individual corporations, which may also be involved.

History and Management

National disease surveillance activities have been undertaken by the CDC since 1946, when a mechanism for monitoring communicable diseases was first developed. Expansion has resulted in the addition of new areas of infectious diseases, for example, AIDS. Other surveillance

activities at CDC include programs in "human reproduction, injuries, environmental health, chronic disease, risk reduction and occupational safety and health."¹³ Recently CDC surveillance policy development and implementation resulted in the statement of the following goals for CDC surveillance activities: "a) conducting epidemiologic surveillance of all health events considered to be of high priority, b) evaluating regularly all CDC surveillance activities, c) developing and evaluating improved methods for the collection, analysis, and dissemination of surveillance data, and d) maintaining and improving the expertise of CDC staff and constituents in the development, implementation and evaluation of systems of public health surveillance."¹⁴

Alcohol surveillance is included in the risk reduction program, but drug abuse is not, and no program, including the chronic disease area, targets substance abuse specifically. However it is clear that this agency has the necessary expertise, and infrastructure and past experience in developing new surveillance activities that would be necessary to improve surveillance of substance abuse problems in the public health domain. Among its support activities, CDC has published case definitions for use at the local and state level in reporting to the CDC National Notifiable Diseases Surveillance System.¹⁵ These definitions were developed in conjunction with the Council of State and Territorial Epidemiologists to try to obtain greater uniformity in reporting. The CDC has also produced guidelines for evaluating surveillance systems at the state and local level.¹⁶ The evaluation guidelines list a number of attributes of surveillance systems and indicate that because systems vary considerably, the importance of individual attributes also varies. Finally, *Morbidity and Mortality Weekly Report* is the well known vehicle for broad dissemination of CDC surveillance data and analysis. In addition to its publications through

¹³Centers for Disease Control, *Morbidity and Mortality Weekly Reports*, March, 1992.

¹⁴Centers for Disease Control, *Morbidity and Mortality Weekly Reports, Surveillance Summaries*, March, 1992.

¹⁵Centers for Disease Control, *Morbidity and Mortality Weekly Reports, Recommendations and Reports*, October, 19, 1990.

MMWR CDC has also convened numerous workshops and conferences for participants in its surveillance programs.

The CDC is best known for its maintenance of the National Notifiable Diseases Reporting System. This system is supported by national and state laws which mandate that medical personnel report all diagnoses of about 40 different infectious diseases. This system is a very simple, streamline vehicle for early identification of communicable diseases. Local practitioners are to report immediately to local health authorities, who forward weekly reports on to state and national health authorities. Little information is associated with these reports, which are used primarily for monitoring trends and outbreaks in these diseases.

An important consideration is the time it takes for a system to indicate that a specific disease is on the rise. The lag period between the time of diagnosis and notification to the state for the MMWR reportable diseases may vary, depending on the severity, or infectious nature of the disease. However generally, there is approximately a one to two week lag between the time of diagnosis to when the information is forwarded to the CDC by the individual state agency. This information is then generally ready for publication in the MMWR within the week. Because CDC does not receive any identifying information about the case, such as the person's name or hospital, follow-up surveillance on the case cannot be conducted.

Another surveillance program of interest for its relationship with substance abuse surveillance is the national trauma registry.¹⁷ This is a relatively new program. There is widespread development of trauma registries throughout the nation and a mechanism for reporting to the CDC at the national level, has been set up. This experience offers several important lessons to consider in establishing improved reporting of substance abuse problems. For example, the need for trauma registries was widely perceived in order to improve treatment for injury

¹⁶Centers for Disease Control, Morbidity and Mortality Weekly Reports, Supplement, May 6, 1988.

¹⁷Centers for Disease Control, Trauma Registry Workshop Report, 1988.

victims, to enhance injury treatment services delivery, and to inform injury prevention programs. Their development proliferated without any standards or core data elements being specified and agreed to in advance. The diffusions resulted in multiple case definitions, data content and coding conventions. Pooling at the national level was made difficult by the diversity among systems being developed. Subsequently a national workshop representing multiple disciplines was convened and developed standards for trauma registries. In spite of efforts at standardizations, it is anticipated that major differences will continue, if only because the availability of resources differs among participants. For example, in some jurisdictions, it may be possible only to record trauma patients who are placed in intensive care, rather than all hospitalized, or treated trauma victims.

Other organizations also sponsor public health surveillance activities. For example, the National Cancer Institute established the Surveillance, Epidemiology and End Results (SEER) Program in 1973 to both monitor incidence and track outcomes of cancer patients.¹⁸ This system relies on a series of decentralized registries rather than a single national reporting program because the size of the target population exceeds, the four to five million cases thought to be reasonable for management within a single national registry.¹⁹ As a system for monitoring the characteristics of a chronic disease many aspects of the NCI system are particularly applicable to monitoring the chronicity of substance abuse problems. Of particular interest is a history of the cancer registries which points out that population based surveys, the National Cancer Surveys, formerly used to monitor incidence of cancer in the U.S. population, were eventually replaced by the registries.²⁰ One of the major drawbacks to the surveys was the extensive time required to plan the survey and carry it out. In addition, the cross sectional survey was not able to provide the survival data that was of importance for cancer policy planning and clinical services.

¹⁸Pollack, 1982.

¹⁹Haenszel, 1975.

²⁰Greenberg, et al., 1982.

Cancer registries record the identity of patients so that treatment in different facilities, over time can be monitored. Thus primary provider, acute care, hospital, hospice and other services can be linked to an individual's record which also contains information on exposure, date of diagnosis, response to treatment, etc. Very explicit regulations safeguard the identities of individuals included in the registries. Using statistical estimation techniques, national incidence and prevalence rates are calculated from the network of cancer registries scattered throughout the U.S.

Outside the health field there are other public health surveillance mechanisms. For example, the National Highway Traffic Safety Administration maintains the Fatal Accident Reporting System (FARS) that reports on all motor vehicle-related fatalities. This system has been in operation since 1975. For years it has provided important information on the involvement of alcohol in these fatalities, but not of other drug involvement. The FARS has been cited as a model after which a new system for monitoring firearm fatalities might be patterned.²¹ A firearm fatality reporting system has been recommended to Congress by the CDC.

Not all surveillance systems are sponsored at the national level. For example, a single hospital in Philadelphia, mounted a surveillance program for syphilis in response to clinicians' perceptions of its epidemic proportions.²² This system was put in place in the emergency department of the hospital where all patients, rather than only those presenting with STD symptoms were screened for syphilis. Screening of individuals for certain illnesses and conditions is another common vehicle for surveillance, in addition to reporting of diagnoses and registration of individuals diagnosed. For example, factory workers have been screened for lead exposure as a means of developing a lead exposure registry.²³ In 1992, the House of Delegates of the American Medical Association (AMA) recommended that hospital emergency rooms implement procedures for testing all acute trauma cases for the presence

²¹Teret, et al., 1992.

²²Hibbs, et al., 1993.

²³Baser, 1992.

of drugs and alcohol. Such screening could be the basis for improved surveillance of health related drug problems, and would also improve information for injury surveillance. Injury surveillance is especially important to examine because the national trauma registry program already includes information about blood alcohol and drugs, if detected. With greater screening for drugs in emergency medical services, the information about drugs contained in the trauma registry would be more complete.

POTENTIAL OF NETWORKED REPORTING SYSTEMS

As described above a number of different approaches to surveillance of illness and injury have been demonstrated in public health epidemiology. Variations on these systems have been used in different times and places to monitor substance abuse problems. Yet the development of reporting systems specifically for monitoring substance abuse has been quite limited, especially in the U.S.

Nonetheless, it is clear that a myriad of information about problem drug users is currently captured in separate unlinked information systems within the agencies that have contact with problem drug users. These include law enforcement agencies' criminal history systems (rap sheets), welfare agencies roles, primary and mental health care patient records, selected registers and drug treatment client information systems. If a unique, common identifier could be established across sectors, it might be possible to link the case history, services and outcomes information contained in the separate systems.

There is some evidence that such systems could be established. In some small jurisdictions this approach is already used informally for needs assessment, by reviewing the records of various social services agencies and identifying substance abusers among their clientele. Duplicates across sectors are easily recognized. In larger jurisdictions there are examples of utilizing advanced computer technology to search different automated systems for records pertaining to substance abuse treatment clients and linking these records with treatment records. Such a task was successfully undertaken as part of a treatment outcomes study conducted in New Mexico. The potential of

integrated information systems is great, not only for the more comprehensive epidemiological information that they can produce but also for the potential enhancement of treatment and other services for substance abusers that could be provided if more information were available to service providers about other problems and services clients are receiving simultaneously.

Previous attempts to integrate data from different information systems for public health surveillance have met with serious problems due to lack of coordination, disinterest, and disincentives on the part of potential participants. Future efforts would require significant investigation of the feasibility and potential benefits of forging such links.

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