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KEY WORDS: History, Methodological Studies, Validity

I. Introduction

The National Household Survey on Drug Abuse (NHSDA) is the primary source of statistical information on the use of illegal drugs by the United States population. Conducted periodically by the Federal Government since 1971, the purpose of the survey is to estimate the prevalence of illegal drug use in the United States, and to monitor trends in prevalence over time. Prevalence rates for various population subgroups and for various types of drugs (including alcohol and tobacco) are generated. These basic statistics are used by the Federal government in developing Federal policies and funding priorities related to substance abuse, and by researchers studying the epidemiology of substance abuse.

This paper provides a description of the methodology used in the NHSDA and how it has evolved over the past 20 years. A summary of the methodological research that has been done in conjunction with the NHSDA is given.

II. History of the NHSDA

The NHSDA traces its origin to a survey conducted by the National Commission on Marihuana and Drug Abuse (1970-72). The Commission required baseline data on the public's beliefs, attitudes, and use of marihuana, to assist its charge in developing recommendations for legislation and administrative actions to help impact the illicit drug problem. Through a private contractor, they conducted two surveys, in 1971 and 1972.

A concern for the sensitive nature of the survey content was paramount in all aspects of the design of the first National Survey. The sample was a National probability multistage cluster sample of the U.S. household population age 12 and older. To ensure reliable estimates of drug use, the sample was targeted towards younger people, oversampling persons age 12-34. The basic data collection method was to conduct in-person interviews with sample persons, but to incorporate procedures that would be likely to maximize respondents' cooperation rates and willingness to report honestly about their illicit drug use behavior. Promises of confidentiality and anonymity were given by the interviewer and a procedure utilizing self-administered answer sheets was used. With this procedure, the answers to questions on illicit drug use were recorded by the respondent and not reviewed by the interviewer. After these answer sheets were completed, they were placed in an envelope, which was sealed, and mailed back to the contractor. Respondents were invited to accompany the interviewer to the nearest mailbox to be sure the envelope was mailed. The selfadministered answer sheets were also designed to conceal responses from interviewers by avoiding the use of skip patterns which could allow non-drug users to skip questions on drug use that didn't pertain to them, thus identifying drug users as those who take longer to complete the answers. Interviewers also were instructed to conduct interviews in a private place, away from other household members.

The National Institute on Drug Abuse (NIDA) continued the survey in 1974 and subsequent years to satisfy the continuing need

for current data. The basic methodology of the first two Commission surveys has remained intact, because of the desire to maintain consistency for measuring trends in drug use prevalence and because of the lack of research that would suggest an improved methodology. However, there have been some changes over the years, particularly involving the sample design and questionnaire content.

With the use of self-administered answer sheets with no skip patterns, respondents will sometimes deny use of a drug during a certain time period on one question but later in the questionnaire report use of the drug in the same time period. Since there is no review of completed answer sheets by interviewers and no procedures for recontacting respondents, editing decisions to account for inconsistent responses must be made by survey staff. Prior to 1988, this editing was accomplished manually, by editors reviewing answer sheets and essentially forcing consistency by changing some answers, according to a set of guidelines. Since this made it difficult to document exactly how each respondent's data were edited, NIDA revised this procedure in 1988 by keying all the raw, unedited data and then implementing consistency checks with detailed machine editing software that was based on the same guidelines used in the manual edits done prior to 1988.

The most substantial changes in the NHSDA have been with the sample design, as seen in table 1. To comply with the Anti-drug Abuse Act of 1988, oversampling of selected metropolitan areas was initiated in 1990, and the national sample size was also substantially increased in 1991 to respond to the needs of the Office of National Drug Control Policy.

Starting in 1991 the target population was also modified to consist of the civilian noninstitutionalized population of the entire U.S., which had the effect of adding Alaska and Hawaii and noninstitutional group quarters (e.g., college dormitories, shelters, rooming houses) to the sample frame. A continuous data collection strategy, with quarterly sampling, was begun in 1992, which contrasts with all the previous surveys which were conducted at a certain time of year that varied in each survey.

These recent expansions in the size and periodicity (and the resulting costs) of the NHSDA were the impetus for an expanded methodological research program to coincide with the survey. Although the survey methodology had been in place for nearly 20 years and seemed to be working well when decisions to expand the survey were made in 1988, there was a need to reevaluate the NHSDA methods in light of increasing concerns about validity, increasing costs, and the lack of a survey research literature that was directly applicable. NIDA had conducted some studies of the NHSDA methodology, but there was no substantial effort to evaluate and test new methods for the survey. Many issues were of interest and were still unresolved. Was it really necessary to continue the self-administered format in order to enhance respondents' willingness to admit drug use? How important is privacy in conducting interviews? Could less expensive data collection modes such as telephone surveys obtain data of the same quality as the NHSDA? Was nonresponse bias a serious problem in estimates from the NHSDA? Were the NHSDA procedures for dealing with inconsistent responses appropriate and were there ways to reduce these inconsistencies? How well did respondents really understand the complex definitions included in the survey questionnaire? Were there more efficient sample designs that could be used? With the increased interest in NHSDA data and the expansion of the sample, it became critical to provide answers to these questions and it was clear that the existing literature did not provide the answers. NIDA therefore funded a series of studies starting in 1989 which would address issues such as nonresponse bias, data collection mode, questionnaire design and sample design.

III. Summary of NHSDA Methodological Studies

A great deal of research has been conducted on the methods of collecting data on illicit drug use and other sensitive behaviors. Many studies have compared rates of reported behavior using different methodologies. In some cases certain methods were found to provide more valid data than other methods, while in other studies no differences were found (e.g., Smith, Federer, and Raghavarao, 1974; Sudman and Bradburn, 1974; Locander, Sudman, and Bradburn, 1976; Bradburn, Sudman, et al, 1979; Zdep, Rhodes, Schwarz, and Kilkenny, 1979; Zanes and Matsoukas, 1979; Malvin and Moskowitz, 1983; Mensch and Kandel, 1987; Needle, Jou, and Su, 1989). These studies and others focusing on the validity of self-reported drug use data have generally concluded that valid data can be obtained using a variety of data collection methods, although some methods have been found to be more effective than others (Single, Kandel, and Johnson, 1975; Smart, 1975; Amsel, Mandell, Matthias, Mason, and Hocherman, 1976; Smart and Jarvis, 1981; Rouse, Kozel, and Richards, 1985; Mieczowski, 1990).

While this research has been valuable to designers of drug abuse surveys, much of it is not entirely applicable to the NHSDA because of the particular methodologies studied and samples used. For example, much of the literature on validity of self-reported data is based on samples of heroin addicts or samples drawn from treatment or arrestee populations. Few studies specifically address the methodology used in the NHSDA (self-administered answer sheets administered in a cross-sectional survey of the general household population). The research that is most relevant to the NHSDA is the series of studies sponsored by NIDA in conjunction with the survey itself. A summary of this research is given below (Turner, Lessler, and Gfroerer, 1992):

A. Sample design issues study

This study is investigating new sample design options and stratification variables and evaluating their impact in terms of costs, data quality, and sampling error. Variables available from the 1990 Census files are being analyzed as possible stratification variables. Other predictors of illicit drug use are being evaluated as possible stratifiers at the sample person selection level. One new procedure that was developed was the addition of a question on cigarette use to the household screener to identify smokers prior to the selection of the sample person (smokers are more likely to be illicit drug users). Smokers will then be assigned higher selection probabilities so that more illicit drug users will be interviewed in the survey.

B. Cognitive studies

Evaluation of the NHSDA questionnaire was done in 1989, identifying a number of problems with specific questions and definitions used in the survey. An appraisal method which employed a scheme for coding survey items according to their cognitive characteristics was applied to the NHSDA questionnaire. This method identified items that may be difficult for respondents to accurately answer, because of vague or ambiguous terminology, unclear reference periods, and other reasons. Cognitive interview techniques (respondents "thinking aloud" as they answered NHSDA questions) found similar results. Two cognitive laboratory experiments were conducted to study several issues such as the use of well defined reference periods, the use of pill cards as memory aids, and enhanced explanation of definitions. Results indicated that anchoring of reference periods and enhanced definitions reduced the frequency of response errors, but the reduction was not statistically significant. The use of pill cards did not have an effect.

C. Analysis of inconsistent data

This study involved a detailed analysis of patterns of inconsistent and invalid responses to specific questionnaire items from 1988 raw data from the self-administered answer sheets. It identified questions that were often misinterpreted by respondents and types of respondents that had more difficulty. The results were similar to the results of cognitive evaluations in terms of the specific questions found to be problematic. Younger respondents (age 12-17) were found to be less likely to give inconsistent responses than older respondents.

D. Study of telephone surveys of illicit drug use

A study evaluating the feasibility of collecting drug use data by telephone was completed by NIDA in 1990, based on data collected in 1988. An analysis of NHSDA data found that persons living in nontelephone households have higher rates of drug use than persons living in households with telephones. A comparison of data from NHSDA households with telephones with data from an independent national RDD telephone survey using similar questions found significantly lower reported rates of drug use via the telephone method in all demographic groups. For example, prevalence rates for past year marijuana use from this study were 5.2 percent in the telephone survey and 8.0 percent in the NHSDA. The RDD method also produced lower rates of lifetime marijuana use (25.8 percent vs. 34.4 percent), past year cocaine use (1.4 percent vs. 3.1 percent), and lifetime cocaine use (7.9 percent vs. 11.3 percent).

E. Methodological field test

A field test of 3,326 respondents was conducted to test several new methods of collecting drug use data. A 2 by 2 factorial design was employed testing the effects of interviewer-administered (with skip patterns) vs. selfadministered and a newly designed questionnaire vs. the current questionnaire. The newly designed questionnaire was developed using the results of the cognitive studies and the analyses of item nonresponse and inconsistent data. It included enhanced definitions, reordering of questions to improve flow, and improved anchoring of time periods referred to in the questionnaire. Results of the field test showed that lower rates of drug use were reported using the interviewer-administered method, particularly for more recent use. Differences were small for alcohol use, somewhat larger for marijuana use, and even larger for cocaine use, suggesting an effect of the sensitivity of the drug in question. The differences in reported use between interviewer and selfadministered modes were greater for youths than for adults. The lack of privacy during an interview also had a negative effect on the reporting of drug use, particularly for youths. The new questionnaire generally did not have a significant impact on reported prevalence rates, but did result in improved data quality as indicated by lower rates of inconsistent responses to drug use questions. The field test also provided evidence that respondents are, in general, capable of responding to a self-administered form that includes skip patterns (although the effect of skip patterns on the reporting of drug use could not be determined).

F. Skip pattern experiment

Throughout its history, the NHSDA has generally avoided the use of skip patterns because of the fear that respondents will realize that their use or nonuse of a drug will be revealed to interviewers (and others present during the interview) based on the length of time needed to complete answer sheets, diminishing confidentiality. Also, drug users may deny their use if they realize that a "never used" response will allow them to avoid answering a series of questions, thus saving time. However, substantial benefits in terms of reduced respondent burden and expanded questionnaire content would occur with the introduction of skip patterns into the NHSDA questionnaire. During the first three months of 1992, NIDA conducted an experiment to test a new questionnaire that incorporated skip patterns into the drug use answer sheets. A nationally representative sample of 974 interviews was employed, and prevalence rates for the experimental sample and the main NHSDA sample were compared. Preliminary results show that prevalence rates for marijuana and cocaine were lower using the skip pattern questionnaire.

G. Analysis of nonresponse patterns

A detailed analysis of the patterns of nonresponse in the 1988 NHSDA was completed in 1991, to gain a better understanding of the characteristics of nonrespondents and the potential nonresponse bias that may exist in NHSDA estimates. This included the analysis of screening nonresponse, interview nonresponse, and item nonresponse. For the 1988 NHSDA, screening nonresponse was not a serious problem (overall rate was 6.4%) and any residual screening nonresponse bias in existing estimates after adjustment was thought to be minimal. Interview nonresponse, which was higher in 1988 (it was 25.7%) than in other NHSDAs (it was 16.5% in 1985, 18.0% in 1990, and 15.8% in 1991), was found to increase with age. Nonresponse was higher in the Northeast and West regions and in metropolitan areas. Differences by race/ethnicity and gender were small. Nonresponse was also higher in PSUs that had high rates of drug use. This analysis provided descriptive data on the characteristics of nonrespondents, and did not evaluate the effectiveness of NHSDA nonresponse adjustment procedures in reducing bias. However, it is likely that the existing nonresponse adjustment procedures correct for some of the biases that could be caused by these variations in response rates. Item nonresponse rates were found to vary in the different NHSDA questions from 0% to 8.3%. Item nonresponse was found to be associated with the applicability of the question to the respondent (i.e., respondents who did not use drugs often left questions about patterns of drug use blank) and the placement of the question (questions on the back page of an answer sheet were often left blank). Overall, 49% of NHSDA respondents had at least one missing data item. Item nonresponse rates were higher among males, blacks, and older adults. (Witt, Pantula, Folsom, and Cox, 1991).

H. Nonrespondent followup study

A sample of nonrespondents to the 1990 NHSDA in the Washington, D.C. metro area was contacted at the end of the survey and interviews were again attempted, using an abbreviated questionnaire and a payment of ten dollars as added incentive. The study was only able to convert 38% of the survey nonrespondents. According to interviewers' assessments of the reasons initial nonrespondents participated in the followup, the \$10 payment played a significant role, particularly for children. The shorter questionnaire was a factor in converting some cases, but the most frequent reason for conversion was simply that the person had never been available for the interview until that time. A comparison of NHSDA respondents to followup respondents showed little difference in demographic characteristics. Although rates of cocaine use were higher in the followup sample than in the NHSDA (18.1% vs. 12.8% lifetime use), differences were not statistically significant and revised prevalence estimates for the Washington metropolitan area based on the addition of the followup cases to the original NHSDA sample were similar to the original NHSDA estimates.

I. Census match study

As part of a comprehensive study of several major surveys that were in the field at the same time as the Decennial Census, a sample of nonrespondents to the 1990 NHSDA was matched with Census data from the same households. Of the 5,030 households in the study, 95% were successfully matched. Using the Census data, the characteristics of responding and nonresponding households will be compared to determine factors associated with nonresponse. Using data from questionnaires completed by interviewers, an analysis of the effects of interviewer demographic characteristics, attitudes, and behaviors on nonresponse will be conducted. An overall model of NHSDA nonresponse based on household and interviewer characteristics will be developed.

J. NHSDA validity study

In 1986 NIDA conducted a limited validation study on the NHSDA. In an attempt to measure underreporting of drug use among heavy users, a sample of clients recently discharged from drug treatment facilities was selected and included in a household survey, using the NHSDA questionnaire and methodology. The interviews were conducted double-blind, with neither interviewers nor respondents aware of the source of the sample. Data reported on the survey questionnaire were later matched with data from the respondents' treatment records. The results of this study are shown on table 2. Of the clients who were classified as past year marijuana users based on their treatment data, 86 percent admitted marijuana use during the household interview. Of lifetime marijuana users, 96 percent reported their use in the household interview. Reporting rates were lower for cocaine users, and even lower for heroin users. The pattern suggests that underreporting increases as more recent and more socially deviant behaviors are asked about. Since this study included only people who had recently been in treatment, these results cannot be generalized to infer overall underreporting rates in the general population. However, another finding from this study was the low reporting of drug treatment experience among this sample of known treatment clients. Only 38 percent of respondents reported being in drug treatment

during the past year, even though all interviews were conducted less than a year from respondents' date of discharge from a treatment program. This underreporting was consistent across all age, sex, and race groups (Harrell, Kapsak, Cisin, and Wirtz, 1986).

K. Analysis of the effect of privacy on reporting of drug use

In 1985 NIDA published the results of a study based on data collected by NHSDA interviewers regarding the level of privacy during the conduct of each interview. Estimates of the effect of privacy were developed using regression models which predicted the likelihood of reporting drug use under conditions of complete privacy and no privacy. This study found that reporting of drug use by youths is more likely under conditions of complete privacy, even when using self-administered answer sheets. The effect is small on NHSDA prevalence estimation because most (about 60%) interviews are conducted in complete privacy, but this varies by population group. In particular, Hispanic youths are less likely to be interviewed in private. Surveys of youth drug use that are not conducted under conditions of privacy may be subject to substantial underreporting bias (Gfroerer, 1985).

L. Comparisons with other data sources

Because of the difficulties involved in obtaining criterion measures of drug use for validation purposes, NHSDA data are often compared with data from other surveys which use different methodologies to gain insight into the validity and consistency of rates and trends. Along with the NHSDA, Monitoring the Future (MTF), conducted by the University of Michigan under a grant from NIDA, is one of the primary sources of drug abuse prevalence data. This is a nationally representative survey of schools, conducted annually since 1975, which samples high school seniors every year. In 1991 eighth and tenth graders were included. Data are collected in classrooms (Johnston, O'Malley, and Bachman, 1991). Trends in prevalence have been consistent in the NHSDA and MTF since 1975, but until 1991 when the NHSDA sample was expanded. NHSDA sample sizes of high school seniors were too small to make accurate comparisons of rates of drug use. Using data on school status reported by NHSDA respondents, comparisons of rates for eighth, tenth, and twelfth graders were made for 1991 (table 3). For twelfth graders, estimates were similar for the two surveys, and for tenth graders rates were also similar, but slightly lower in the household setting. For eighth graders, rates were significantly lower in the NHSDA. Table 3 also shows that high school dropouts, not covered by MTF, have much higher rates of drug use than students. This illustrates a limitation (the apparent underreporting by young teenagers in the household setting) and a strength (the representativeness of the sample, which includes important populations such as dropouts) of the NHSDA methodology.

IV. Discussion

Recent methodological studies sponsored by NIDA have clearly demonstrated that nonsampling error and bias can be significant in drug abuse surveys and that the conditions under which interviews take place can affect the resulting estimates. Results of these studies have led to improvements in the design of the NHSDA and in our understanding of the biases present in NHSDA data. Some of these improvements were implemented in the 1991 and 1992 NHSDAs, and a completely restructured questionnaire is being developed.

While the research shows that the procedures used in the NHSDA since its inception (i.e., the use of self-administered

answer sheets) should be maintained, there are still some areas that need further research. For example, selfadministration can be difficult or impossible when surveying persons with poor reading skills. In many of these cases, interviewers must administer the questionnaire. Also, the lack of skip patterns is burdensome for respondents and awkward for interviewers. Further methodological development, including experimentation with audio-CASI technology, will be useful in addressing these problems. There is also a critical need for a well designed study of the validity of self-reported drug use in the household population. New technologies for obtaining criterion measures of drug use, such as hair testing, may provide the means for conducting such a study (Mieczkowski, Barzelay, Gropper, and Wish, 1991).

Additional NHSDA methodological research that is planned includes further analyses of nonresponse patterns and the characteristics of nonrespondents in the NHSDA, and development of improved nonresponse adjustments. Estimates from the 1991 National Health Interview Survey drug use supplement, which used similar methods to the NHSDA but included the collection of identifying information and the use of Census Bureau interviewers, will be compared to NHSDA data. Comparisons will be made with the 1991 National Comorbidity Study, which included questions on drug use taken from the NHSDA.

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Table 1. Chronology of Sample Sizes and Oversampled Populations in the National Household Survey on Drug Abuse

-	Groups Oversampled		
3,186 3,291 4,023 3,576 4,594 7,224 5,624 8,038 8,814 9,259 32,594 28,000 (Est.) 28,000 (Est.)	Rural Areas Hispanics Non-Hisp.Blacks Hispanics Non-Hisp. Blacks D.C. Metro Areas 6 Metro Areas Hispanics Non-Hisp. Blacks 6 Metro Areas Hispanics Non-Hisp. Blacks 6 Metro Areas Hispanics Non-Hisp. Blacks 6 Metro Areas Hispanics Non-Hisp. Blacks 6 Metro Areas Hispanics Non-Hisp. Blacks		
	3,291 4,023 3,576 4,594 7,224 5,624 8,038 8,814 9,259 32,594 28,000 (Est.)		

¹In all years, selection probabilities were also designed to oversample younger populations, generally ages 12-34. A particularly large oversampling of 12-17 year olds occurred in 1988.

Table 2. Self-Reported Drug Use in a Sample of Known Drug Users by Drug Type and Time Period, 1986

Drug Type and Time Period	Number Admitted to Treatment for Abuse	Number Reporting Use in Houseehold Interview	Percent Reporting Use in Household
	n	n	%
Marijuana Ever use Past year use	49 28	47 24	96 86
Cocaine Ever use Past year use	25 13	21 9	84 69
Hallucinogens Ever use Past year use	20 6	14 2	70 33
Heroin Ever use Past year use	28 17	19 10	68 9

¹Treatment records indicate use of the drug type during the indicated time period.

Drug Use Measure	Eighth Graders		Tenth Graders		Twelfth Graders		Dropouts (Age 16-18) NHSDA
	MTF	<u>NHSDA</u>	MTF	<u>NHSDA</u>	MTF	<u>NHSDA</u>	
	%	%	%	%	%	%	%
Marijuana							
Lifetime	10.2	+ 5.8	23.4	+ 18.8	36.7	31.9	60.7
Past Year	6.2	4.4	16.5	14.5	23.9	23.7	43.7
Past Month	3.2	+1.3	8.7	6.0	13.8	11.6	21.0
Cocaine							
Lifetime	2.3	1.3	4.1	3.1	7.8	8.6	20.0
Past Year	1.1	0.6	2.2	2.1	3.5	4.7	15.3
Past Month	0.5	0.2	0.7	0.8	1.4	1.3	2.3
Hallucinogens							
Lifetime	3.2	+1.1	6.1	5.6	9.6	9.3	16.8
Past Year	1.9	+0.7	4.0	3.0	5.8	6.0	11.2
Past Month	0.8	0.3	1.6	0.9	2.2	1.5	4.0

Table. 3 Comparison of Illicit Drug Use Prevalence Rates from Surveys Done In Classrooms (MTF) and Households (NHSDA) in 1991

Note: MTF = Monitoring the Future. Eighth, tenth and twelfth graders and dropouts in the NHSDA were classified based on responses to questions about years of education and current enrollment.

⁺ Difference between MTF and NHSDA estimates for the grade is significant at .05 level.