

MAJOR DESIGN CHANGES IN THE NATIONAL HOUSEHOLD SURVEY ON DRUG ABUSE

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Background. The National Household Survey on Drug Abuse (NHSDA) is the federal government's primary source of information on the magnitude of substance use and abuse in the household population of the United States. Conducted since 1971, the survey collects data by administering questionnaires to a representative sample of persons aged 12 and older at their place of residence. Since 1992, the survey has been administered by the Substance Abuse and Mental Health Services Administration (SAMHSA). Data from the survey are used by policymakers and researchers to measure the prevalence and correlates of licit and illicit drug use, to identify and monitor trends in substance use, and to analyze differences by population subgroups. This paper describes the current design of the NHSDA, and the methodological research that has been done to improve it. Two major design changes that will be implemented in 1999 are discussed. These are (1) the conversion of the survey to computer-assisted interviewing (CAI) and (2) the expansion of the survey to provide state-level estimation.

NHSDA data collection methods. The basic methodology has remained unchanged since the survey began. In-person interviews are conducted, with some questions interviewer-administered and the more sensitive questions self-administered. The basic strategy of targeting the sample toward younger people, who are more likely than older adults to be using illicit drugs, has also continued throughout the survey's history.

Questions in the interviewer-administered sections are mostly demographic in nature. The self-administered questions (SAQ) are given to the respondent on "answer sheets", which he/she reads and fills out without assistance from the interviewer, unless requested. The answer sheet methodology is used to encourage honest reporting of sensitive information by allowing respondents to report these behaviors in privacy. After its completion, each answer sheet is placed in an envelope, and at the end of the entire interview the envelope is sealed and mailed to the contractor's data processing site. Thus, there is no field editing of the respondent-completed answer sheets, and respondents are not recontacted to resolve inconsistencies. No respondent names are collected, and anonymity as well as

confidentiality is promised.

Beginning in 1994, the NHSDA instrument was divided into "core" and "supplemental" components. Questions designated as "core" are included in the first half of the interview and comprise the critical data items in the NHSDA. "Core" data are collected on certain basic demographic characteristics and on the use of 12 substances: tobacco, alcohol, marijuana, cocaine, "crack" cocaine, heroin, hallucinogens, inhalants; and non-medical use of analgesics, tranquilizers, stimulants, and sedatives. Question wording, order and format are maintained from year to year in these core sections to facilitate analysis of trend data. To maximize the respondent's privacy and to minimize respondent confusion, no skip patterns are used in most of the self-administered core sections. Respondents must answer every question regardless of whether or not they have used a particular drug. Appropriate answer categories are included in each question for respondents who have never used the drug and for those who did not use the drug during the time period of interest. Questions designated as "supplemental" appear in the second half of the interview. These items may be revised, re-ordered, or even replaced with different items from year to year. Skip patterns are used in these self-administered supplemental sections, although not at the level that could be used if an interviewer (or a computer) was administering the questions.

The household interview takes about one hour to complete. Data are collected on the recency, frequency and initiation of use of drugs (core), opinions about drugs, problems associated with drug use, and drug abuse treatment experience (supplemental). Also collected are data on demographic characteristics, employment, education, income, health status, health insurance, utilization of various health services, and access to health care. In 1994-97, questions for estimating the prevalence of various mental and emotional problems were included in the survey. In some years, other agencies co-sponsor the NHSDA to support the collection of information on special topics. In 1994, the Department of Agriculture funded a supplemental rural sample, and the Department of Labor funded a module of questions on workplace issues related to substance abuse. The 1996 NHSDA included supplemental questions on driving behaviors in conjunction with substance use (funded by the National Highway Traffic Safety Administration) and on sexual and drug use behaviors associated with HIV/AIDS risk

(funded by the Centers for Disease Control and Prevention). In 1997 and 1998, questions about various risk and protective factors associated with youth drug use were included. In developing special topic modules, the NHSDA has made extensive use of cognitive laboratory testing and small scale field tests.

Sample design. Between 1971 and 1990, the NHSDA sample was restricted to the household population in the 48 contiguous states. The sample was a stratified, multistage, area probability sample of the U.S. household population aged 12 and older. In each household, zero, one or two persons were selected for interview. In 1991, the NHSDA sample was redesigned so that study results could be used to make inferences about the entire civilian, noninstitutionalized population aged 12 and older. In order to do this, Alaska and Hawaii were added to the sample frame, as were civilians living on military bases and individuals living in noninstitutional group quarters, such as homeless shelters, college dormitories, and boarding houses. Persons excluded from the sample are the homeless who never use shelters, active military personnel, and residents of institutional group quarters, such as jails and hospitals.

Since 1992, the NHSDA has been conducted continuously (January-December each year), using quarterly samples. The continuous data collection strategy eliminates seasonal bias. Sample size has varied between approximately 18,000 and 28,000 persons per year. Approximately four times more households are screened than the number of households where one or more persons are selected for interview. Between 1992 and 1997, the screening response rates have averaged about 94%, interview response rates have varied between 78% and 84%, with overall (person) response rates ranging between 73% and 81%.

Beginning in 1997, in order to better measure household effects on substance abuse, the sample design was modified to produce representative samples of pairs of household residents. In previous NHSDAs, selection probabilities were assigned to individual household members, and within household dyads were sampled ad hoc, depending on the particular within household sampling algorithm used. Thus, analyses of household effects and of correlations between household members (e.g., parent and child substance use) were limited and were not representative of the possible pairs in the nation. Starting with the 1997 NHSDA, the selection of these dyads is controlled, with known selection probabilities, and with analytic pair weights calculated for use in special analyses. Giving all pairs a probability of selection has a very small effect on the precision of other estimates.

The annual sample size has varied over the years as special sub-populations or geographic areas were

oversampled. Emerging issues such as successful ballot initiatives in November 1996 to legalize medical use of marijuana and other drugs in California and Arizona led to expansions of the sample in these states beginning in April of 1997.

History of NHSDA methodological research. Considerable research has been conducted over the years to continually improve the quality of data collected in the NHSDA. This research has focused on content, sample design, questioning strategies, editing methods, and estimation procedures. Methodological improvements have included an extensive review of the methodology by an NHSDA Advisory Committee in 1984 and a subsequent revision of the questioning methods for the 1985 survey (Turner, et. al., 1992), a small-scale double-blind validation study in 1986, in which a sample of people from drug treatment facilities were interviewed using the NHSDA methodology (Harrison and Hughes, 1997), the adoption of machine editing in 1988 to provide detailed documentation of editing and improve the consistency of edits; increases in sample sizes and improvements in the sampling methodology; a series of methodology studies that included a cognitive appraisal of the 1988 instrument, a study of missing and inconsistent data and nonresponse in the 1988 survey, a series of laboratory studies examining questioning techniques, a nonresponse follow-up study, an experimental field test of alternative questionnaires conducted in 1990 (Turner, et. al., 1992); a Census match study, which examined correlates of household screening nonresponse and person level nonresponse (Harrison and Hughes, 1997); evaluation of the feasibility of using a telephone survey to collect drug use data (Gfroerer and Hughes, 1992); a 1992 experiment examining use of answer sheets with skip patterns (Harrison and Hughes, 1997); and pretests of revised questionnaires in 1992 and 1993 in preparation for the adoption of revised questioning and editing strategies in 1994 (SAMHSA, 1996).

In 1990, SAMHSA contracted with RTI to conduct a large experimental field test designed to evaluate alternative questionnaire wording and mode of administration on the reporting of drug use in the NHSDA. One of the strongest and most consistent results to come from this field test was that self-administered questionnaires produced more reports of illicit drug use than when the same data were collected in an interviewer-administered data collection mode. As noted by Turner, et. al., "The relative advantage of SAQ's (self-administered questionnaires) in encouraging more complete reporting of drug use appears to be a direct function of the sensitivity of the behavior being reported." (1992, p. 303) In addition, Turner and his colleagues found that lack of privacy during an interview

had a negative effect on the reporting of drug use. These results convinced SAMHSA of the importance of maintaining the “answer sheet” component of the NHSDA even though it might hinder the ability to ask complex question series requiring elaborate skip patterns.

In addition to the methodology studies that have been conducted in the context of the NHSDA, the NHSDA measurement methodology has been evaluated by comparing its results with those from other surveys. A recent article by Gfroerer, Wright, and Kopstein (1997) compared the NHSDA to the Monitoring the Future Survey (MTF), a school-based survey that produces estimates on drug use by adolescents for many of the same substances as the NHSDA. Although the two surveys show similar trends, rates of drug use are higher in MTF. While many methodological differences were noted between the two surveys, the authors hypothesized that the higher rates of use observed in MTF may be due to greater under-reporting in the household setting used in the NHSDA. Other studies have examined the impact of mode of interview and privacy of the interview setting on reporting of drug use. Gfroerer and Hughes (Turner, et. al., 1992) compared estimates from the NHSDA to those from an RDD survey, and Aquilino (1993) compared three modes of interviewing for a group of respondents who were randomly assigned to complete either: a telephone interview, in-person interview, or a self-administered questionnaire during an in-person interview. Using data from the same experiment, Aquilino (Harrison and Hughes, 1997) examined the effect of the presence of third parties on the reporting of illicit drug use. The results from the majority of these studies have supported the use of the basic methodology of the NHSDA, i.e., household interviews, self-administered questionnaires, and a private setting all contributed to improved reporting.

Converting the NHSDA to CAI. In spite of the evidence supporting the value of the basic methodology used in the NHSDA, SAMHSA recognizes that improvements can be made. While it is clear that privacy is essential and the self-administered method is preferred, it is difficult to design written questionnaires with a level of literacy appropriate for children as young as 12 years old and older persons with varying reading abilities. Audio computer-assisted self-interviewing (ACASI) is a methodology that may balance the need for privacy, the need for reducing response burden (including possibly complex skip patterns), and improved data quality through edit checks during the interview. The ACASI methodology allows the respondent to listen to questions through a headset and/or to read the questions on the computer screen. Respondents also key their own answers into the computer. Under ACASI, the self-administered format found to increase reporting of

sensitive behaviors in the NHSDA can be maintained and greater privacy can be assured for the respondent even in interview settings that might not otherwise be considered sufficiently private. Programming the questionnaire also allows for more complex skip logic in a format where the routing is less visible to the respondent. Thus, it may be less obvious to a respondent how answering a question in a particular way will influence the number and type of additional questions asked. Research showing the feasibility of ACASI and its potential for improving the reporting of sensitive behaviors has been pivotal in SAMHSA’s decision to actually develop and test a computer-assisted interview for use in the NHSDA (Turner, et. al., 1996, Duffer, et. al., 1996). Most recently, Turner (1998) obtained greatly increased estimates of injection drug use and other HIV-risk behaviors using ACASI compared to a paper SAQ.

SAMHSA has carefully considered the shift to computer-assisted interviewing, requiring extensive testing and proof of the feasibility of the new technology for the NHSDA. The testing protocol completed has included a small (n=400) initial field test in the fourth quarter of 1996 (1996 CAI Feasibility Experiment), small-scale cognitive laboratory testing, and a second, larger (n=1982) field test in the fourth quarter of 1997 (1997 CAI Field Experiment). The final pretest will be conducted August 1-31, 1998. Descriptions of the 1996 CAI Feasibility Experiment, subsequent laboratory testing, and the August pretest are given below. The 1997 CAI Field Experiment will be discussed in other papers.

1996 CAI Feasibility Experiment. The 1996 CAI Feasibility Experiment was designed to assess the operational feasibility of using an electronic version of the NHSDA, the impact on perceptions of privacy, the length of the interview, the effect of computer-assisted interviewing, particularly the ACASI component, on the interviewing environment, and the quality of data provided. This study compared two versions of the CAI to the 1996 paper and pencil interview (PAPI) in 20 purposively selected PSU’s. One CAI version, called the “Skip” version, incorporated skip patterns in all sections, including the SAQ, and the other version, called the “Mirror-image”, was as similar as possible to the PAPI SAQ, with no skips in the core self-administered sections. Only the self-administered sections from PAPI were administered via ACASI, with the remaining questions interviewer-administered (CAPI). Consistency checks were not included in the ACASI portion of either questionnaire version, but were added to the CAPI portions. A short set of interviewer observation questions were included at the end of each questionnaire. All programming was completed using the Blaise 2.5 software.

Overall, the 1996 CAI Feasibility Experiment demonstrated that a CAI approach to collection of NHSDA data is workable and is likely to have several positive benefits to the survey. The main findings were:

- Respondents will complete an extended (>30 minutes) ACASI interview.
- CAPI reduces the time it takes for interviewers to complete the personal interview component.
- The Skip version was about 10 minutes shorter than the Mirror-image version.
- About 14% of all ACASI respondents asked the interviewer to explain a question and about 25% asked about how to use the computer during the interview. Respondents were less likely to ask for help when using the Skip version.
- About 50% of respondents had never used a computer prior to the interview, and only 3% complained about the difficulty of doing so.
- There were large differences in the degree to which the interviewer could glean the respondents' answers to the self-administered sections under the two ACASI versions relative to the paper SAQ version, based on a question asked of interviewers following each interview: "How often did the respondent let you know his/her answers?" About twice as many interviewers answered "none of the time" for the ACASI versions as for the paper SAQ. This indicates that the ACASI administration is more private even though the privacy of the overall setting was similar.
- ACASI appears to increase reporting of past year and past month marijuana and cocaine use.
- Very few respondents gave a pattern of response that indicated that they were either unwilling or unable to complete the response task once they had begun.

Laboratory testing. Following the CAI Feasibility Experiment, in the spring of 1997 several rounds of cognitive testing were conducted in Research Triangle Institute's Laboratory for Survey Methods and Measurement in order to further develop the methodology to be used in the 1997 Field Experiment. Fifty respondents were recruited from the Raleigh/Durham/Chapel Hill area. Each respondent was paid \$35 for up to two hours of his or her time. Only adults were recruited for this testing because there was not sufficient time to obtain parental permission for interviewing youth. Three topics were explored in this lab testing:

- the voice used in the ACASI portion of the interview,
- a new method for asking the question: "On how many days in the past 12 months did you use

(substance)" and

- a method for resolving inconsistent responses during the interview.

Lab respondents were presented with four pairs of voices (male and female in each pair) and asked to indicate which pair of voices they preferred. Respondents then listened to each voice separately and rated each on several voice characteristics. Respondents were able to reliably choose preferred voices. The original plan was to use both a female and a male voice for the ACASI interview in 1997 CAI Field Experiment as another experimental version, but there was not time to program the interview in two voices. The male voice from the pair of preferred voices was selected, and the ACASI interview programmed in his voice.

The current 12-month frequency of use question, which is asked for all substances except tobacco, is difficult to answer because it demands recall over a long time period, and because the response categories combine total number of days with a periodicity estimate, which confuses respondents who have "episodic" use patterns. The response categories are as follows:

more than 300 days (every day or almost every day)
at least 201 but not more than 300 days (5-6 days a week)
at least 101 but not more than 200 days (3-4 days a week)
at least 51 but not more than 100 days (1-2 days a week)
at least 25 but not more than 50 days (3-4 days a month)
at least 12 but not more than 24 days (1-2 days a month)
at least 201 but not more than 300 days (less than one day a month)
at least 3 but not more than 5 days in the past 12 months
at least 1 but not more than 2 days in the past 12 months

For example, a respondent who only drinks alcohol every day for a two-week vacation period each year would be expected to choose the category which includes 14 days, but is confused by the parenthetical which defines this as "1 to 2 days a month".

Laboratory testing demonstrated that the major problem with this item is the inherent periodicity contained in the categories. To alleviate this problem, we developed a revised series of questions, which allows the respondent to select the unit for reporting days of use. Respondents can choose to report the number of days per week, days per month, or the total number of days they used during the past 12 months. The follow up question that verifies the total number of days is based on the respondent's choice of units. This procedure worked well in the lab, and was incorporated into the 1997 Field Experiment.

The inconsistency resolution procedures tested in the lab and the resulting procedures implemented in 1997 CAI Field Experiment are described in another paper (Caspar, et. al., 1998).

Electronic screener. In addition to examining the use of CAI instruments for collecting data from respondents, we are examining the use of an electronic screener for the NHSDA. We are currently testing and evaluating the use of a pen-based, hand-held computer for conducting the NHSDA's dwelling unit screening process. Currently interviewers are asked to manage a difficult paper-and-pencil interaction while conducting a mini-interview on the housing unit composition and then execute the complex respondent selection algorithm which makes use of complex paper forms. These paper forms are difficult to manage, prone to error, expensive to process, and limiting in terms of the sample selection algorithms that can be implemented.

After reviewing available hardware and software options, we selected the Newton 2000 (upgraded in 1998 to the 2100) as the hardware platform, and developed a prototype for implementing the core screening and sample selection functions. This prototype was tested in 1997 CAI Field Experiment. The Newton-based screening system worked very successfully. The units are reliable, interviewers are able to manage the system quite well, and data from screening results are consistent and complete. Interviewers are very positive about the process and believe it enhances their professionalism and the acceptance of the study by respondents. We have recently added a series of related functions, including a complete case management system, the ability to add dwelling units on the go, group quarters screening, and data transmission. These features and others are being tested in the August pretest, with the goal of implementing electronic screening in the 1999 NHSDA. In March of this year, Apple announced the decision to end production of the Newton. Because we believe that the Newton platform is superior to similar computers still in production, we negotiated an agreement with Apple to produce 1600 Newton 2100 units in a special production run delivered in August, 1998.

Plans for 1999 implementation

Tobacco module. SAMHSA originally planned to convert the NHSDA to CAI beginning with a split sample design in the Year 2000 and full implementation in 2001. However, this schedule has been considerably accelerated to meet emerging data collection priorities of the Department of Health and Human Services. There has been great concern in this administration and Congress about tobacco use among teens. Most recently, the McCain bill would have levied surcharges on the tobacco companies which produce the brands usually used by teens, unless prevalence rates of use of those products decreased by a certain percentage each year over the next 10 years.

While this legislation was being drafted during the past year, the Department of Health and Human

Services convened work groups to consider how best to track teen tobacco use; i.e., whether to implement a new national survey or to simply add questions to an existing one. Initially the main purpose would have been to determine which tobacco companies would sustain surcharges. While the proposed legislation has not yet passed, both the Secretary of Health and Human Services and the President have been very clear in their commitment to collect these data. By early June of this year, the Departmental work group decided that the NHSDA, with its greatly expanded sample size, its focus on substance use and on youth, and its potential to produce State estimates, was the logical vehicle for collecting these data. We were asked to replace our current tobacco module with an expanded set of questions including the usual brand of each product used. In the light of recent research demonstrating the benefits of ACASI, the work group decided that the tobacco module must be conducted via ACASI.

After considering the complications in the field and in data processing which would have been introduced by implementing only one short ACASI module while retaining PAPI for the remainder of an hour-long interview, we decided to implement CAI for the entire survey a year ahead of schedule. Following this decision, intensive efforts by RTI and SAMHSA staff have resulted in a fully functioning CAI system for NHSDA screening, case management, interviewing and data transmission.

August pretest. A final round of testing all CAI procedures and instruments which will be implemented in January of 1999 is now underway. This pretest consists of a field test and concurrent cognitive laboratory interviews. The field test will be conducted in 76 segments, including 836 total addresses, designed to produce interviews with 75 adolescents (12-17 years old) and 75 adults (18+ years old). Laboratory interviews will be conducted with about 50 adolescents and 50 adults. Major features of the field test include:

(1) electronic screening and case management using the Newton 2100 palmtop computer, and (2) the NHSDA questionnaire programmed in Blaise 3.0 for Windows, including the new tobacco module and changes in all "core" substance use sections, as follows:

- new method for asking *12-month frequency of use* question;
- asking *month of first use* for respondents whose age at first use is current age or one year younger than current age, for better data on incidence;
- updated "pill cards" and questions on non-medical use of prescription drugs;
- additional questions to estimate *withdrawal symptoms* related to use of specific drugs; and

- inconsistency resolution for certain inconsistent responses.

Supplemental PAPI Sample in 1999. In order to provide the capability to adjust prior estimates to maintain comparability for long-term trend analyses, we will include in the 1999 NHSDA a supplemental PAPI sample of 20,000. This sample size is large enough to measure differences in drug use prevalence estimates caused by the change in instrumentation. Current plans are to repeat the 1998 PAPI in 1999.

Expansion of NHSDA for state estimation. Beginning with the 1999 survey, the sample size will be increased to approximately 70,000, to provide substance use prevalence estimates at the state level. The expanded NHSDA will help SAMHSA identify states with comparatively high rates of substance abuse so that technical assistance and other resources can be targeted more efficiently.

The sample design in 1999 will ensure that each of the eight states with the largest populations will have a sample designed to yield 3,600-4,630 completed interviews per year in each state. The remaining 42 states plus the District of Columbia will each have a sample designed to yield 900-1,030 completed interviews each year, for a total sample of about 70,000. Approximately one third of the sample will be allocated to each of three age groups (12-17, 18-25, 26+). To achieve this age allocation, approximately 280,000 households will be screened. With this state-based sample design, the first stage of sampling will be at the segment level, with about 7200 segments selected. Thus, there will be no initial stage of county-based PSU selection as is done in most national household surveys. This design will produce annual sample-based national estimates and sample-based estimates for the eight largest states. Small area estimation (SAQ) modeling techniques will be used to develop annual prevalence measures for the 42 smaller states and D.C. The approach used for these models will be a Survey-Weighted Empirical Bays approach that estimates the parameters in a mixed model. The modeling combines the direct survey data from each state in a regression model that employs a variety of local indicators with model-based results from the rest of the nation. The methodology will be an improved version of the methodology used previously by SAMHSA for 1991-93 state estimates. Direct estimates for the smaller states will also be made periodically by combining several years of data.

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