ANALYSIS OF SURVEY DATA ON DRUG EXPERIENCE BY MODE OF DATA COLLECTION

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1. Introduction

The increasing concern in recent years over the drug abuse problem in the United States has created a need for more data on the nature and extent of drug abuse. Policymakers demand timely, accurate data at the national, state, and local levels to guide them in directing programs and funding toward the goal of reducing drug abuse and to measure progress in these programs. At the national level, the primary source of data on the prevalence of illicit drug use has been and remains the National Household Survey on Drug Abuse (NHSDA), sponsored by the National Institute on Drug Abuse (NIDA). The NHSDA is a probability sample survey of the U.S. household population that employs personal visit interviews with all selected respondents. The high cost of conducting household surveys has raised interest in using telephone survey methodology to collect drug use prevalence data. In fact, several states have conducted drug use surveys by telephone and have compared their state results to national NHSDA data (Frank, 1985; Spence, Fredlund, and Kavinsky, 1989).

Some studies comparing data from telephone surveys to personal visit surveys have shown that comparable health-related data (Massey, Barker, and Moss, 1979) and sociodemographic data (Monsees and Massey, 1979) can be obtained from the two methods. Other studies have shown that sensitive data from telephone surveys are inferior to data collected from personal interviews (see Section 2). However, very little research has been done investigating how the quality of data collected from drug use surveys differ by the two methods.

In 1988, NIDA funded a telephone survey on drug abuse, through a cooperative agreement with the Food and Drug Administration (FDA) using a FDA Quick Response Survey (QRS) Contract. The QRS was conducted by Chilton Research Services at about the same time the 1988 NHSDA was in the field.

The purpose of this paper is to present an analysis of the QRS and NHSDA surveys in an attempt to evaluate the feasibility of using telephone survey methodology to collect data on illicit drug use.

2. Previous Research

Only a few studies have compared data collected by mode of interview on sensitive issues such as sexual activity and use of illicit drugs. Aquilino and LoSciuto (1989) conducted such a comparison on data collected in New Jersey and concluded that estimates of drug use among whites were similar regardless of collection mode. However, for blacks, telephone-based estimates of marijuana and alcohol were significantly lower than those based on face-to-face interviews. The authors note that mode differences among blacks were probably due to a willingness to provide socially desirable responses, even if they were incorrect. A study done on a sample of University of Kentucky students showed that personal visit interviews produced larger percentages of persons admitting using illicit drugs than those produced from telephone interviews (Johnson, Hougland, and Clayton, 1989). McQueen (1989) conducted a study of sexual behavior related to AIDS and concluded that Computer Assisted Telephone Interviewing (CATI) showed higher rates of sexual activity compared to rates based on face-to-face interviews.

A comparison of characteristics of present and former smokers by mode of interview in a 1979 Health Interview Survey revealed only small differences (Massey, Barker, and Moss, 1979). Hochstim's (1967) discussion of several public health studies indicated that women were more likely to discuss female medical problems or the consumption of alcoholic beverages when responding by mail or telephone rather than by personal visit interview. Groves and Kahn (1979) reported that respondents in a survey conducted by the University of Michigan were more willing to discuss issues such as income, racial attitudes, and size of income tax return when interviewed face-to-face than by telephone.

Overall, it appears that neither telephone nor personal visit interviewing is clearly better for soliciting all types of sensitive data. However, the limited amount of research addressing drug use data suggest that personal visit interviewing will provide higher estimates of persons involved in illicit drug use than telephone interviewing.

3. National Household Survey on Drug Abuse (NHSDA)

3.1 Sample Design

The NHSDA has been conducted by NIDA periodically since 1971. The 1988 NHSDA was conducted during the fall of 1988 and yielded 8,814 respondents age 12 and older selected from a stratified multistage area sample of 100 PSUs (defined as counties or metropolitan areas). The sample was designed to oversample people under age 35 as well as blacks and Hispanics. A total of 33,369 households were selected and screened in order to obtain a specified number of persons of a particular age group, race, and ethnicity in the sample. Solicitation letters were sent to these households in advance of screening. Depending on the age, race, and ethnicity composition of the household, either zero, one, or two persons were selected from each. The 1988 NHSDA achieved an interview response rate of 74 percent and a household screening response rate of 93 percent for an overall response rate of 69 percent.

3.2 Questionnaire Design

The NHSDA questionnaire has remained comparable over time, and includes questions on the use of various licit and illicit drugs as well as a question on the number of non-business phone numbers in the household, allowing for a comparative analysis of sensitive and demographic data by presence of telephone. The interviewing procedure includes a combination of open interview and self-administered answer sheet techniques (for sensitive drug use questions) to maximize confidentiality and response validity. After the household screening process is completed and a respondent is selected, the interview is conducted according to the following protocol:

- Introduction
- Questions
  - Cigarettes,
  - Alcohol,
  - Prescription-type drugs,
  - Marijuana/Hashish,
  - Inhalants,
  - Cocaine/Crack,
  - Hallucinogens,
  - Heroin,
  - Drug Experience, Drug problems,
  - Opinions about drug use,

Health, and demographics.
- Interviewer observation
- End of interview

3.3 Estimation Procedures

Data used to produce prevalence estimates from the NHSDA are based on extensive logical editing and logical imputation to check and correct for inconsistencies in reporting. A statistical imputation procedure (hot deck) was done to adjust for item nonresponse. Survey weights consisted of the inverse of selection probabilities, nonresponse adjustments, and adjustments to reflect population totals for age, sex, and race/ethnicity groups (NIDA, 1989). These population totals were obtained from the Current Population Survey and are census-based estimates of the U.S. household population as of November 1, 1988. The geographic scope of the NHSDA survey is the continental U.S.; however, the population totals represented the continental U.S. as well as Alaska and Hawaii.

Prevalence estimates or percentages for characteristic j in domain d were calculated using the ratio estimator:

$$P^N_{jd} = (\sum_i W^N_{ijd} / \sum_i \sum_j W^N_{ijd}) \times 100,$$

where W^N_{ijd} is the NHSDA survey weight for respondent i with characteristic j in domain d.

Variance estimates were calculated based on a Taylor series linearization of P^N_{jd}. SESUDAAN, a SAS procedure (Shah, 1981) was used to generate all estimates and variances from the NHSDA data.

4. Quick Response Survey (QRS)

4.1 Sample Design

The QRS was conducted in November and December 1988 and obtained interviews from 1,965 adults age 18 and older (Chilton Research Services, 1989). The sample was drawn using a random digit dialing (RDD) technique, providing a representative sample of all telephone households in the continental U.S. In order to obtain a sufficient number of black respondents in the sample, a subsample of households from zip codes containing a large percentage of blacks (>50%) was selected. The individual with the most recent birthday was selected for interview from each household. The interview was conducted without advance notification to the household (no names and addresses were known) and the overall response rate was 66 percent.

4.2 Questionnaire Design

The QRS questionnaire was a subset of the NHSDA collection instrument, which was reformatted and programmed into a CATI system. In order to complete the interview as quickly as possible while obtaining the necessary information about drug use, the following protocol was used:

- Introduction
- Identification of respondent
- Questions
  Marijuana/Hashish,
  Cocaine/Crack, and
  Demographics.
- End of interview
- Interviewer observation

One difference between the QRS and NHSDA protocol worth noting is that the NHSDA illicit drug use questions are preceded by questions on use of legal drugs such as cigarettes, alcohol, and prescription-type drugs.

4.3 Estimation Procedures

Prevalence estimates from the QRS were based on weights that incorporated the inverse of selection probabilities and an adjustment to 1988 U.S. household population estimates taken from the Current Population Survey to balance the data by age, race/ethnicity, and sex. These population counts include persons in both telephone and nontelephone households in the continental U.S., Alaska, and Hawaii. No nonresponse adjustment was incorporated into the survey weights. Prevalence estimates were determined using the same estimation procedure as given in Section 3.3; however, the variance estimates were calculated as follows:

For characteristic j in domain d,

$$V(P^Q_{jd}) = DEFF(P^Q_{jd})(100 - P^Q_{jd})/n_d,$$

where P^Q_{jd} = Prevalence estimate, n_d = number of respondents in domain d, and DEFF = the design effect. In the QRS study the design effect is equal to 1.192 and reflects the oversampling of blacks and the selection of one respondent in each sampled household.

5. Description of Methods Used to Analyze NHSDA and QRS Estimates

5.1 Analysis of NHSDA Estimates

Using the 1988 NHSDA data, comparisons of telephone and nontelephone households were made to assess the bias due to the exclusion of nontelephone households from RDD surveys of drug use. The comparisons were based on a sample of 5018 and 655 persons age 18+ living in telephone and nontelephone households respectively. Data on the presence of a telephone were not available for 46 persons.

Standard z-tests were used to determine statistically significant differences between estimates from households with phone and households without. Cramer's measure of association for RxC contingency tables ($0 \le \phi \le 1$) was used to provide an indication of the relationship between telephone coverage and selected demographic characteristics (Marascuilo and McSweeney).

5.2 Comparison of QRS and NHSDA Estimates

5.2.1 Preparation of NHSDA Data

Before an analysis of data from the two surveys was performed, it was necessary to recalculate the NHSDA estimates to account for differences in editing and weighting in the two surveys. The NHSDA does not use skip patterns in the administration of the drug use questions, and inconsistencies in responses are resolved during machine editing. The QRS employed CATI with skip patterns that resulted in some drug use questions not being asked of all respondents. For this study, the NHSDA data were reedited to be consistent with the QRS skip patterns.

The NHSDA data were also reweighted based on population counts used in the QRS. This was done because (1) only a subset of the NHSDA sample was used (5018 out of 8814 respondents) and (2) any differences in estimates due to adjustments to different population counts would be eliminated.

5.2.2 Analysis of QRS and NHSDA Estimates

Differences in drug use prevalence attributable to mode of data collection were tested by comparing QRS estimates to estimates from the NHSDA age 18+ sample living in households with a telephone. Also assuming that the reedited and reweighted NHSDA estimates were true values, an estimate of bias for characteristic j in domain d was calculated as

$$B^Q_{jd} = P^Q_{jd} - P^N_{jd}, \text{ where } P^Q_{jd} \text{ and } P^N_{jd} \text{ are the respective}$$

measures of prevalence from the QRS and NHSDA.

If the QRS data are used to estimate drug use, it is important to be able to know the amount of distortion present in the estimation of confidence intervals due to this bias. The ratio of bias to the standard error of the QRS estimate was used to measure this distortion. This ratio is written as

$$BSE = B^o_{jd}/se(P^o_{jd}), \text{ where } se = \text{standard error.}$$

Hanson, Hurwitz, and Madow (1953) showed that if the absolute bias $|P^o_{jd} - P^N_{jd}|$ is of primary concern, and not the direction of the bias, then confidence intervals will not be seriously distorted if $-1<BSE<1$. For example, if BSE=1 and the QRS estimates are normally distributed, the proportion of estimates (from repeated sampling) that differ from the true value by more than twice the root mean-square error is 0.034 (as compared to 0.046 when BSE=0).

6. Results

6.1 Comparison of NHSDA Telephone and Nontelephone Households

Previous research has shown significant differences in the characteristics of persons living in households with no telephone, compared to persons living in telephone households. Telephone ownership is less likely in the South, in rural areas, among blacks, youth, divorced or separated people, the unemployed, and people with low incomes and educational attainment (Frank, 1985; Aquilino and LoSciuto, 1989; and Thornberry and Massey, 1978, 1989). Persons living alone or in large households (5 or more persons) are also less likely to own a telephone. The 1988 NHSDA sample is consistent with all of these patterns. Based on values of Cramer's measure of association, work status appears to be the most significant correlate of telephone coverage ($\phi=.18$) followed by educational attainment (.15), race/ethnicity (.14), age (.14), marital status (.14), and personal income (.13).

Some of these populations with lower probabilities of having telephones have been shown to have either lower or higher rates of drug use. For example, rates of past year illicit drug use in the 1988 NHSDA were highest for the 18-25 year old age group, and were higher for unemployed than for employed people. On the other hand, the South and rural areas have lower rates of use than other areas of the country.

Based on the NHSDA interviewers assessment of respondent cooperation, it appears that respondents in nontelephone households are less cooperative than respondents in telephone households. This may suggest that persons without a phone are more likely to provide incorrect responses. This can also be seen when examining the large difference between the distribution of the level of understanding of the interview by presence of telephone. The percentage of persons living in nontelephone households who fully understood the interview is about 20 percent lower than those with a telephone (Table 1).

Table 3 compares drug use prevalence for NHSDA telephone and nontelephone adult (age 18+) household members. The rates of use are consistently higher for nontelephone households, and differences for total lifetime and past year marijuana and cocaine use were statistically significant, with the largest differences usually occurring among whites and males.

Based on the NHSDA sample, about 93.5 percent of the adult household population have telephones. Thornberry and Massey (1989) reported that estimates of the telephone household population based on data from the Health Interview Survey is about 93 percent as of 1986, and has not changed considerably since the early 1980s. Given this high percentage, it is not surprising that the prevalence rates for NHSDA telephone households are not very different from rates for the total sample.

6.2 Comparison of QRS and NHSDA Telephone Households

In general, the QRS estimates were found to be significantly lower for past year and lifetime use of marijuana and cocaine, compared with NHSDA estimates (Table 3). Compared with estimates from the full NHSDA sample of persons age 18+ (including nontelephone households) that employ standard NHSDA editing and weighting, QRS estimates are even more divergent. The full NHSDA sample estimates (shown in column labled "All") show that 10.4 and 4.3 percent of adults have used marijuana and cocaine respectively in the past year, compared to 5.2 and 1.4 percent from QRS. Lifetime use of marijuana and cocaine was 34.9 and 11.5 from the full NHSDA sample while the QRS estimates were 25.8 and 7.9 respectively.

Estimates of BSE for total lifetime and past year marijuana and cocaine use in Table 3 were over five times the prescribed limit of ±1, an indication that confidence intervals will be seriously misleading. Blacks and persons over age 35 exhibited the smallest BSE values, all within or relatively close to this limit for all drug characteristics except lifetime marijuana use. Also, most of the differences for these two groups were not statistically significant from zero.

To evaluate the extent to which the differences seen in Table 3 could be attributable to sample characteristics between the two surveys, weighted distributions of the samples by various demographic variables were compared (Table 2). It should be reiterated that the estimates for both QRS and NHSDA shown are adjusted to the same age, race, and sex distribution; thus, differences for these groups by mode of interview are all equal to zero. Here, there appears to be a reasonable amount of similarity among the marital and work status distributions from the two surveys. This is an indication that the QRS survey provided good sample coverage of these characteristics. Also, the BSE estimates are all less than 1.0 in absolute value for the work status distribution. However, the QRS sample appears to be biased toward better educated, higher income populations (data not shown). This sample bias is probably the result of higher nonresponse among low income and less educated persons in the QRS compared with the NHSDA; but, it could also be caused by reporting differences for the education and income questions on the two surveys. In other words, respondents may tend to report higher income and education in a telephone interview than in a personal interview (Monsees and Massey, 1979; Groves, 1989).

7. Summary and Recommendations for Further Work

7.1 Summary

National estimates of illicit drug use from a telephone survey (QRS) and a personal visit survey (NHSDA) were compared. Overall, the results show that estimates of illegal drug use from the QRS are significantly biased downward - a bias large enough to seriously distort confidence interval estimates. There were considerable differences in sample and drug use characteristics by phone status in the NHSDA data alone; however, because about 93% of the household population have phones, estimates from NHSDA telephone households were similar to estimates from the total sample.

The effect of leading into sensitive questions on use of illicit drugs by first asking about legal drugs cannot be ignored. QRS respondents may have been more willing to admit their illegal drug use if they had been eased into these sensitive questions with less sensitive questions such as cigarettes, alcohol, and prescription-type drugs, as is done on the NHSDA. This could also have the negative effect of reduced response rates due to the length of the interview; however, while this contextual issue needs further study, it is unlikely that this difference could have accounted

for the substantial differences in reported drug use in the two surveys.

7.2 Recommendations for Further Work

Alternative sampling, data collection, and estimation strategies that can significantly reduce coverage, nonresponse, and response error must be used if telephone is to be the primary means of collecting national data on drug use.

Estimation strategies should be evaluated such as Thornberry and Massey's (1978) research which examined several correlates of telephone coverage and survey items in the 1976 National Health Interview Survey (HIS). They found that the HIS estimates improved when telephone data were post-stratified on income, census region, race, and age. In a 1980 national RDD telephone survey on smoking and health characteristics of the household population, Massey and Botman (1989) examined several poststratification estimators and found that coverage and nonresponse error was reduced by forming poststrata on age, sex, race, educational attainment, and census region.

Included in the investigation of alternative sampling and data collection procedures should be the use of RDD samples that are supplemented with nontelephone households from which data will be collected in person. In Hochstim's (1967) study, one of the samples selected involved the use of personal visits to screen the household and obtain a telephone number. A subsample of households was then selected and data were collected in person from nontelephone households and by telephone from the rest.

Response error may be reduced by attempting to conduct personal interviews from selected demographic groups or in geographic areas with a higher likelihood of drug use, regardless of phone status. To obtain a better understanding of differences between telephone and face-to-face drug surveys, a study that tests for mode effect while controlling for response rate, sample characteristics, and the context and administration of questions should be investigated.

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| Characteristic | All | Persons living in household with | | Difference |
		Phone	No Phone	
Age(.14) 1/				
18-25	16.7%	15.8%	29.6%	13.8% *
26-34	21.6	20.8	33.9	13.1 *
35+	61.7	63.5	36.4	-27.1 *
Sex(.03)				
Male	47.5	47.2	52.4	5.2 *
Female	52.5	52.8	47.6	- 5.2 *
Race/Ethnicity(.14) 2/				
White	79.9	81.4	58.7	-22.7 *
Black	10.7	10.0	21.6	11.6 *
Hispanic	7.2	6.6	15.1	8.5 *
Work status(.18)				
Full-time empl.	53.6	54.1	45.9	-8.2 *
Part-time empl.	11.2	11.5	7.5	-4.0 *
Unemployed	4.2	3.2	17.9	14.7 *
Not in labor force	31.0	31.2	28.7	-2.5
Cooperation of respondent(.06)				
Cooperative	98.2	98.4	95.8	-2.6 *
Very cooperative	90.1	90.5	85.5	-5.0 *
Fairly cooperative	8.1	7.9	10.4	2.5
Not cooperative	1.8	1.6	4.2	2.6 *
Understanding of interview(.12)				
(Amount of difficulty)				
None	84.8	85.9	68.9	-17.0 *
A little	8.5	7.9	18.0	10.1 *
A fair amount	3.6	3.4	6.4	3.0 *
A lot	3.0	2.8	6.7	3.9 *

* Difference between the no phone and phone estimates is statistically significant at α =.05.

1/ Numbers in parenthesis are Cramer's measure of association between presence of phone and the
sample characteristics.

2/ Distribution excludes race/ethnicity="other".

Table 2 Comparison of Distribution of Adult Sample Characteristics
by Mode of Interview (Weighted)

Characteristic	QRS	NHSDA 1/	z-value	BSE
Marital status				
Married	60.8%	63.9%	-1.82	-2.8
Widowed	6.3	7.0	-0.93	-1.2
Divorced/separated	10.3	9.5	0.90	1.1
Never married	22.7	19.6	2.33 *	3.0
Work status 2/				
Full-time empl.	55.0	54.6	0.24	0.3
Part-time empl.	11.6	11.5	0.11	0.1
Unemployed	3.5	3.4	0.18	0.2
Not in labor force	30.4	30.5	-0.07	-0.1
Cooperation of respondent				
Cooperative	97.6	98.4	-1.90	-2.1
Very	84.7	90.4	-5.43 *	-6.4
Fairly	13.0	8.0	5.08 *	6.0
Uncooperative	2.4	1.6	1.90	2.1

* Difference between the QRS and NHSDA estimates is statistically significant at α =.05.

1/ Estimates are based on reedited and reweighted data from persons age 18+ living in telephone
households.

2/ Multiple responses were allowed in the QRS.

Drug Use and Demographic Group	NHSDA households with			QRS	NHSDA [1]/		BSE
	All	Phone	No Phone				
Lifetime marijuana use							
Total (18+)	34.9%	33.6%	54.8% *	25.8%	34.4%	x	-8.0
18-25	56.4	55.3	63.1	34.2	55.1	x	-6.2
26-34	62.1	61.3	68.6 *	49.2	61.4	x	-4.6
35+	19.6	19.1	35.3 *	14.9	19.1	x	-3.9
White	35.2	33.8	63.2 *	28.0	34.8	x	-5.4
Black	36.4	34.9	48.3 *	26.4	35.1	x	-2.8
Hispanic	29.7	29.1	33.9	9.6	30.0	x	-6.4
Male	39.3	37.8	60.5 *	30.1	38.6	x	-5.2
Female	31.0	29.9	48.6 *	21.9	30.6	x	-6.1
Past year marijuana use							
Total (18+)	10.4	9.4	24.9 *	5.2	8.0	x	-5.1
18-25	27.9	27.0	34.3	13.3	22.9	x	-4.0
26-34	17.6	16.1	31.4 *	8.4	13.2	x	-3.2
35+	3.2	2.9	11.3	1.4	2.0		-1.7
White	10.0	9.3	25.7 *	5.4	7.9	x	-4.0
Black	11.0	9.3	22.7 *	6.7	7.2		-0.3
Hispanic	10.4	9.1	19.2 *	2.3	7.3	x	-3.1
Male	13.6	12.5	29.6 *	7.5	10.7	x	-3.4
Female	7.5	6.7	19.8 *	3.1	5.5	x	-4.0
Lifetime cocaine use							
Total (18+)	11.5	11.0	19.2 *	7.9	11.3	x	-5.1
18-25	19.7	19.5	22.5	11.0	18.7	x	-3.5
26-34	26.5	26.1	30.4	19.0	26.2	x	-3.4
35+	4.0	3.9	6.0	3.1	3.9		-1.5
White	11.5	11.1	21.1 *	8.6	11.4	x	-3.6
Black	10.5	9.9	14.7	7.4	9.8		-1.3
Hispanic	12.0	11.2	17.5	3.2	11.4	x	-4.3
Male	14.3	13.6	22.8 *	9.2	14.1	x	-4.8
Female	9.0	8.6	15.1 *	6.7	8.7		-2.3
Past year cocaine use							
Total (18+)	4.3	4.0	8.7 *	1.4	3.1	x	-5.9
18-25	12.1	11.9	13.7	3.1	9.2	x	-4.9
26-34	8.0	7.5	12.2 *	2.8	5.8	x	-3.3
35+	0.9	0.8	1.4	0.5	0.5		0.0
White	4.0	3.9	7.9 *	1.2	3.1	x	-6.3
Black	4.8	4.6	7.1	2.8	3.3		-0.4
Hispanic	6.0	4.9	13.4 *	1.7	3.3		-1.1
Male	5.9	5.4	12.0 *	1.5	4.3	x	-6.5
Female	2.8	2.7	5.1 *	1.4	2.1		-1.7

* Difference between the no phone and phone estimates is statistically significant at α=.05.

x Difference between the QRS and NHSDA estimates is statistically significant at α=.05.

[1]/ Estimates are based on reedited and reweighted data from persons age 18+ living in telephone households.