Nonresponse in Federal Demographic Surveys: 1981-1991

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■ Introduction

The Subcommittee on Nonresponse of the Federal Committee on Statistical Methodology (FCSM) was asked to examine the current state of unit nonresponse in Federal surveys, with specific emphasis on assessing temporal trends in response rates during 1981-1991. This paper focuses on findings only for selected demographic surveys.

Concerns about response rates and/or types of nonresponse generally stem from the knowledge of the implications nonresponse has both for data collection and data analysis; and, the knowledge that effective survey designs should incorporate methods to both: (1) minimize the rate of nonresponse while controlling for data collection costs and (2) employ procedures to compensate/adjust for nonresponse once all practical efforts to minimize nonresponse rates during data collection have been exhausted.

Objectives

The main purpose of the study was to assess temporal response rate trends in Federal surveys from 1981-1991 and to explore factors that could be contributing to the change (if any). While assessing the data, we grappled with many of the same issues enumerated and discussed in the Council of American Survey Research Organizations (CASRO) report (1982). Because the data collected by the Subcommittee suggested that there was no or very little change in response rates over time, we needed to examine three basic questions:

❑ What old relevant response rates issues have been resolved?

❑ What old relevant response rates issues are still unchanged? and

❑ What new response rates issues are raised in Federally-funded demographic surveys?

Data Analysis

Twenty-six Federally-sponsored demographic surveys were selected for the study. These surveys were not selected by probability methods, because no machine-readable listing of Federal surveys with sufficient auxiliary information was available. These surveys, however, differed on a number of key survey design parameters. Included were Federal surveys conducted either on an ongoing or on an intermittent basis, either by Federal agencies themselves or under contract. Staff of agencies sponsoring the surveys were asked to complete a questionnaire for this study that was designed and pre-tested by the Subcommittee; this questionnaire was designed to elicit information on nonresponse during 1981-1991, as well as on a variety of survey design features known to possibly affect nonresponse. In addition, the Subcommittee sought information on post survey adjustment strategies for unit nonresponse.

The Subcommittee itself incurred no unit nonresponse in its data collection activities, but incurred some level of item nonresponse. As part of the analysis, issues of measurement, documentation and dissemination of nonresponse kept surfacing. Item missing data on the questionnaire that the Subcommittee fielded were not serious and indicated the kind of data that were not easily reported:

❑ number of hours that interviewers are given to secure response from the sampling unit;

❑ existence of "partial replacement of the sample" in successive time periods;

❑ accommodation for proxy respondents who cannot or do not respond;

❑   number of refusals; and

❑   weighted response rates.

Although limited, data analysis involved examining old issues and trying to get a sense of the temporal trends in nonresponse for the past decade. Specifically:

❑   examining measurement issues of non-response as they compare to those enumerated by the CASRO report;

❑   examining temporal trends; and

❑   identifying survey design features that affect unit nonresponse.

Study Limitations

Although it is of interest to assess the individual as well as the compounded effects of survey undercoverage, item nonresponse, and unit nonresponse in this paper, the focus is only on unit nonresponse. Both increased resources and use of imputation techniques may have played a role in maintaining the response rate over time. It would have been helpful to know on a survey-by-survey basis whether the definition of a complete case has changed over time. No data collection was attempted for any variable related to data collection costs; the anecdotal information pointed to the fact that it was not easy to obtain cost or surrogate cost information for the data collection component in a form that could be related to survey nonresponse rates.

Given the purposive design of the study sample, its small sample size, and the wide variety of survey design differences that characterize these surveys, analysis of these questionnaires should be considered exploratory and treated with caution.

It should be recognized that the demographic survey samples are typically not selected from highly skewed populations, where nonresponse from even a single eligible unit can have a large adverse effect on data quality. In economic and institutional sur-

veys, however, survey data from a few cases can dominate survey estimates.

Measurement Issues of Nonresponse

The 1982 CASRO report indicated that although "response rate" designates the ratio of the number of completed interviews divided by the number of eligible units in the sample, its determination depends upon the sample design of the particular survey that is employed. Results from the Subcommittee data collection effort indicate, as it should, the same result. Rates can be calculated in a multitude of ways, each providing different information, all designed to measure the success of the survey but all dependent on the design. The issue is not in the complexity of computing a ratio, but in the expectation that a response rate is one number and that its interpretation is independent of sample design, thus allowing for comparison across surveys. This is not case. For example, in a longitudinal survey with the several rounds of data collection, there are several types of response rates which might be of interest:

❑   response rates for each round of data collection which is the ratio of the number responding to the number of eligible for each round of data collection; and

❑   response rates for the survey over all rounds of data collection. The same definition holds for both the first and the second response rate, but the computation for the second is slightly more complex than for the first. This implies that when asked to report a response rate for that type of survey, there should be a set of "ratios" that are reported and not a single number.

Thus, although the conceptual idea is to compute a simple ratio as the response rate, the actual calculation should vary with the sample design. A comparable problem would arise if we had to compute sampling variance without expecting that the computation should vary when using different sampling designs.

It is useful to restate the pair of definitions made in the CASRO report:

"Response rate: is a summary measure and should designate the ratio of the number of interviews to the number of eligible units in the sample.

Completion rate: is to be considered as a collective term that is used to designate how well a task has been accomplished. In general, completion rates are used to measure how well the various components involved in the sample survey are accomplished."

Other useful measures are used that can be confused with the notion of a response rate. The CASRO report in 1982 listed eight such measures and all are still used in demographic surveys. These measures are of tremendous help to monitoring data collection operations, getting feedback from the field of the progress, addressing reactions and difficulty encountered by interviewers. Because these measures are useful, one should continue to collect them; in some instances, they approximate a response rate, but they should not be viewed as substitutes for response rates.

Data collected by the Subcommittee indicated that counts of cases by response/nonresponse categories and the distinction between eligible/ineligible units existed. Twenty five of the 26 Federal surveys provided extensive information on:

- ❑ sample size
- ❑ number of ineligible cases
- ❑ number interviewed cases
- ❑ number of nonresponse cases
- ❑ characteristics of the sample design.

The remaining survey provided insufficient information to compute the response rates, but did provide information on survey characteristics and did provide a response rate. Furthermore, a complete breakdown of refusals and other types of nonresponse was reported only for 14 of the 26 Federal surveys. This was somewhat surprising, since distinguishing between refusal rates and other reasons for non-interviews is very important. Refusals are less amenable to nonresponse conversion, may require special treatments, and are generally more costly to convert. In this arena there is a need to define and operationalize the concept of refusal (since respondents can refuse to participate in a survey without uttering the words "I refuse") and there is a need to monitor both the number of refusals and the cost of converting refusals. A question arises on whether it is cost-efficient in mean square error reduction to permit interviewers to make a large number of calls for a respondent contact or nonresponse conversion (see Groves, 1989).

There are several reasons why the count of cases by sources of nonresponse was missing. Not all traditional sources of nonresponse -- such as refusals or "not at home" -- are applicable for all demographic surveys. For example, for surveys that extract data from administrative records, there are no refusals; thus, this particular measure is inapplicable (there was only one such survey in the pool of demographic surveys). Other responses were missing because the data were not readily accessible for reporting, although they are monitored. Despite the fact that counts were reported by response/nonresponse categories, *there was still no uniformity in the way response rates were computed.*

One additional issue that arose is the interchangeable use of two statistical concepts -- "sampling units" and "analytical units." In element sampling, the ultimate sampling unit contains one element, while in cluster sampling the ultimate sampling unit may contain more than one element. After data processing, the "element" of interest is called an "analytical unit." Response rates are generally computed at the level of the sampling unit, which is not necessarily the analytical unit. For example (hypothetically), in a survey of schools the sampling unit is a school, while the analytical unit could be the school, the teachers within the school, or the student population within the school. While analyzing survey responses from teachers, the response rate of interest is the proportion of teachers that were eligible and responding and what may be reported is the proportion of schools that were eligible and responding. Moreover, irrespective of the "unit," data on rates by major survey characteristics were not easily reported.

Most demographic surveys in this study were not based on self-weighting designs. However, in most cases, the unweighted response rate -- and not the weighted response rate -- was provided. If all elements in the sample were equally likely to be selected (a self-weighting sample), the unweighted and the weighted response rates would be the same. Therefore, in this case, the unweighted response rates can provide both the required measure of sample representativeness and the measure of success by field operations in securing a response. If, however, the elements of the population that are being selected are disproportionally sampled, the unweighted response rate provides one overall measure of the quality of the field operations, although the weighted response rates provide a measure of the representativeness of the population. These weighted response rates in a sample survey are essential to ascertain the representativeness of survey data and to assess the effect of nonresponse on estimates of interest. Most demographic surveys provided a response rate, but it was not always weighted. We, thus, have no evidence of the comparability of the response rates for broad arrays of Federal surveys. We believe, however, that for most demographic surveys the unweighted response rate approximates the weighted response rate. The amount of the difference depends on the variability of the probability of selection for the survey and whether nonresponse propensity is related to the probability of selection.

Response rates reported for these surveys were computed either during data collection (about 52 percent) or during data processing (about 48 percent). Some surveys reported response rates, while others provided completion rates or the proportion of the sample that was interviewed usually for the ultimate sampling units [1].

Given the information reported, one can surmise that the general guidelines given in the CASRO report appeared sufficient in further stimulating the collection of nonresponse data, but were not sufficient in directing uniformity and comparability for computation of response rates. The data collected by the Subcommittee on Unit Nonresponse demonstrated that information concerning the sample design, field procedures, survey characteristics, and

methods for adjusting for nonresponse can be collected. The next step may be to prepare and disseminate guidelines for computing and reporting response rates that are sample design specific.

■ Data Analysis

## *Temporal Trends in Response/Nonresponse Over Time*

Analysis of response rate over time was restricted to those surveys with at least four points for survey data collection during 1981-1991. Only eight of the 26 demographic surveys included in the data collection met this criterion.

In this analysis we examine:

❏ the calculated response rate for these eight demographic surveys;

❏ the mean nonresponse rates for demographic surveys broken down by percent of refusals and percent of noncontact; and then

❏ focus on two specific ongoing surveys, the National Health Interview Survey (NHIS) and the Current Population Survey (CPS). All presented response rates are unweighted and calculated based on counts provided by the respondents.

Figure 1 displays the calculated response rates over time for the eight demographic surveys. Although no evidence was found to support a downward trend on survey response rates among Federal demographic surveys from 1981 to 1991, surveys that are less frequent exhibit larger fluctuations in their response rates than those that are conducted on a yearly basis. This fluctuation can be explained by separating the studies into two groups (see Figure 1). One group has response rates in the 95 percent range, while a second cluster lies about 10 to 15 percentage points lower. The studies in the 95 percent range consist of ongoing studies, often with panel components, conducted by the same interviewer corps. In addition, refusal rates for the less frequent surveys are almost twice those of the more frequent

FIGURE 1

Response Rates Over Time: Demographic Surveys
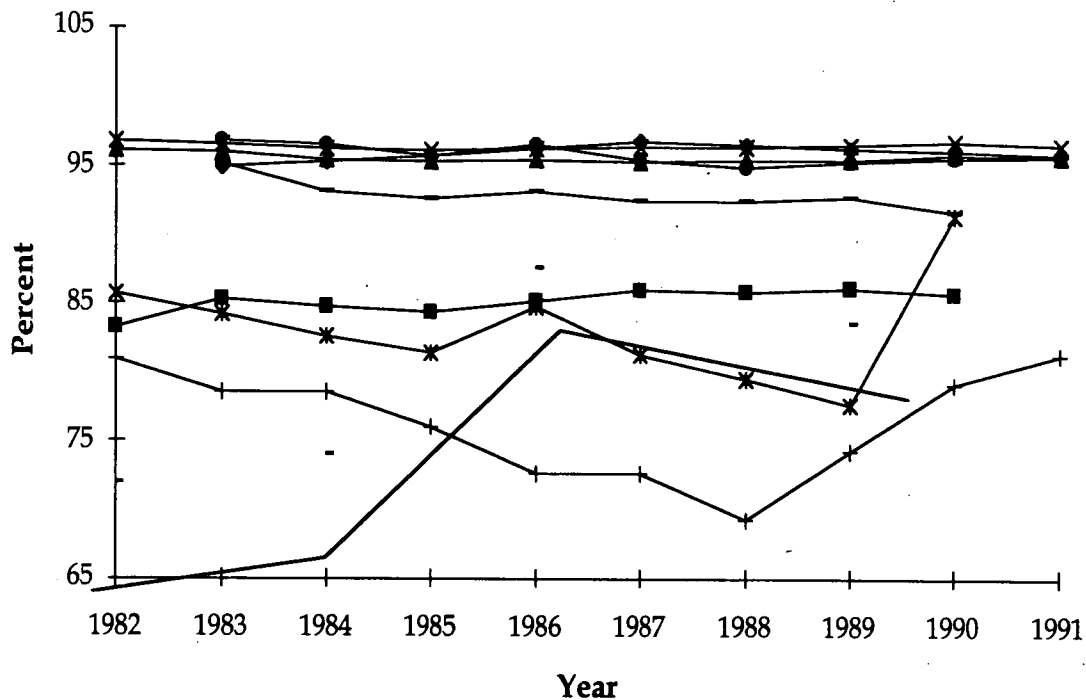
surveys. Neither group exhibited a strong consistent trend over time.

Figure 2 displays the mean nonresponse rates for demographic surveys (Kalsbeek et al., 1994). Furthermore it shows the respective breakdown by two types of nonresponse: refusals and noncontact. In 1983 and in 1987 there seems to be a downtrend in both overall nonresponse and noncontact rates, while the refusal rates seem to decline in 1986 and in 1989. The refusal rates seem to be more stable over time than the noncontact rates. One can speculate that although it is harder to gain cooperation from reluctant respondents, we can locate them and enlist their cooperation, while others are harder to contact.

Although response rates over time do not seem to change, especially for on-going surveys, the Subcommittee had no way to assess either the cost or the effort involved in maintaining the response rate level. [i]

Temporal Trends for Nonresponse: The CPS and the NHIS

Two major surveys collected data and reported response and nonresponse rates for the last decade (1981-1991): The National Health Interview Survey (NHIS), sponsored by the National Center for Health Statistics, and the Current Population Survey (CPS), sponsored by the Bureau of Labor Statistics. Temporal trends are depicted for the NHIS and the CPS in Figures 3 and 5, respectively. Moreover, for the NHIS we were able to obtain information on the average number of call-backs for both completed interviews and refusals (Figure 4).

Over this last decade response rates for both the NHIS or the CPS have not changed dramatically. For the NHIS the line depicting the refusal rate almost parallels the plot for the nonresponse rate. The refusal rates constitute between 61 to 68 percent of the overall total nonresponse. For the CPS the pattern is

FIGURE 2
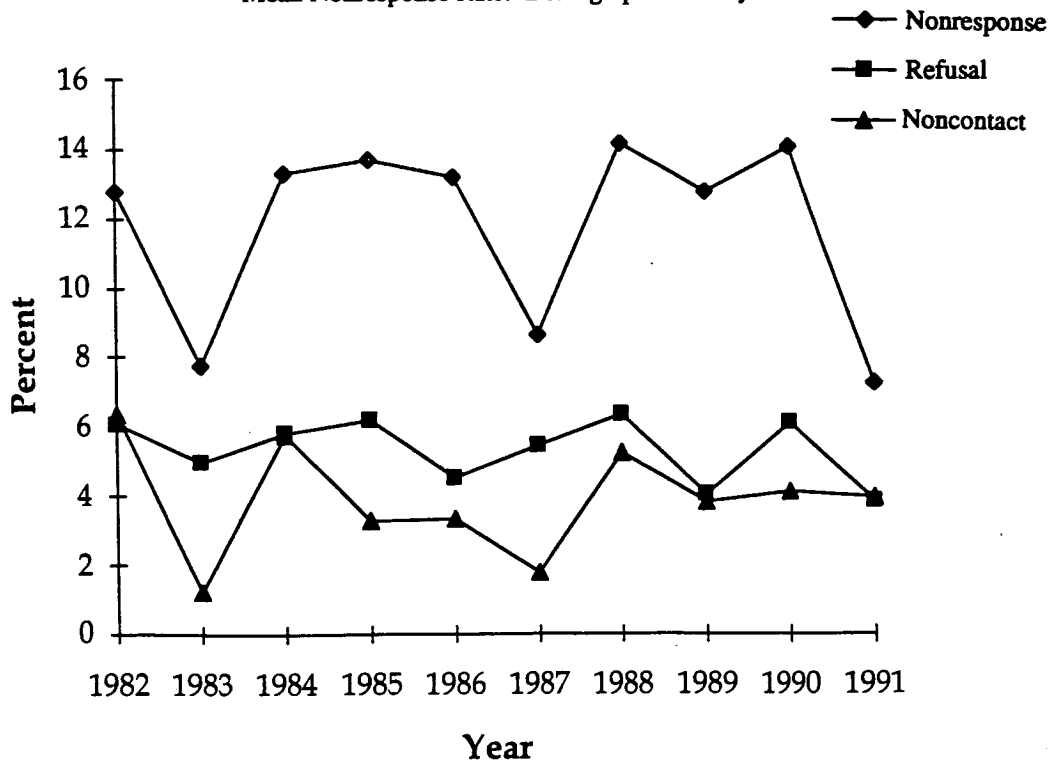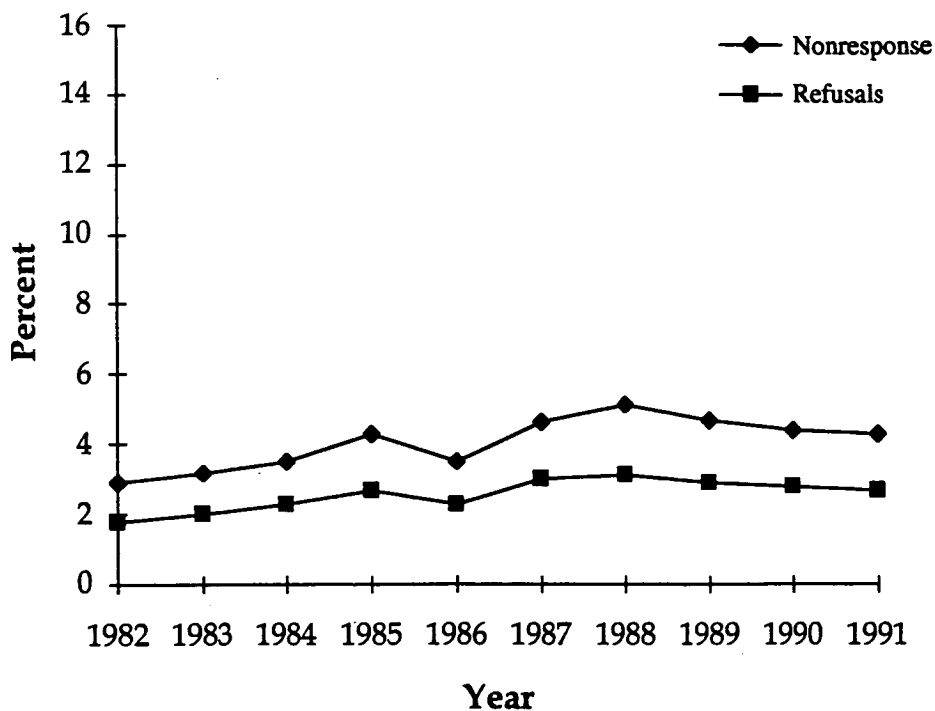Mean Nonresponse Rate: Demographic Surveys

FIGURE 3
National Health Interview Survey:
Nonresponse and Refusals Rates

similar. The refusal rates, in this case, constitute between 57 to 64 percent of total nonresponse. However, if one examines the CPS temporal trend from 1955 to 1990, there is an increase in the refusal rate (Kotejin et al., 1994).

This basically indicates that contrary to the sense that response rate are declining, response rates are not significantly changing. A couple explanations can be offered:

❑ response rates are stable but they are costing more to maintain;

❑ extensive use of imputation techniques can allow for a less restrictive definition of a responding unit.

Although the stability of the response rate for the NHIS is consistent over the years, the average number of call attempts for interviewed cases has increased (Figure 4). On average, 4.1 calls were required to complete an interview in 1982, compared to 4.7 calls in 1991. The increase is more pronounced when dealing with refusal rates. There were on average 2.7 calls for handling refusals in 1982, compared with 3.2 calls in 1991. Thus, the average number of calls provides some evidence that increased efforts were required to maintain these response rates in the field. Moreover, it is an example of where, for an on-going survey, it is feasible to collect data that can help with the assessment of the level of effort.

Survey Design Features Affecting Response Rates

In addition to examining response rate trends over time, the Subcommittee examined how response rates for Federally-sponsored demographic surveys may vary across different design features. These survey characteristics included: frequency and length of the survey, definitions of the sampling unit, data collection agent, mode of data collection, and number of supplements. Although the questionnaire asked about the use of incentives, the number of Federal demographic surveys that offered incentives to raise response rates was too small for this analysis.

FIGURE 4
National Health Interview Survey:
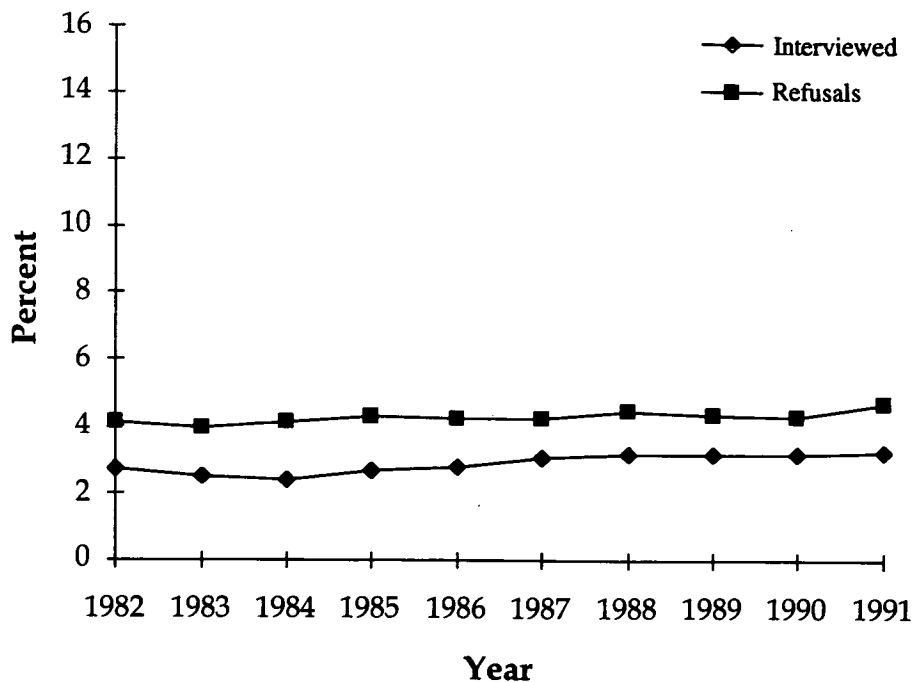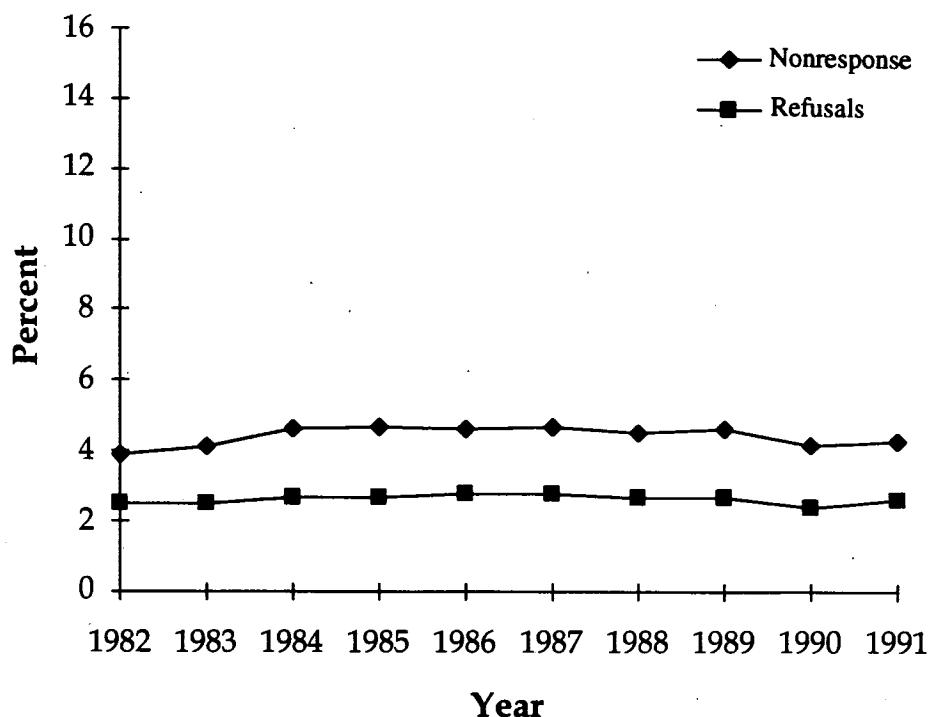Average Number of Calls per Household

FIGURE 5
Current Population Survey: Nonresponse and Refusal Rates

Frequency of the Survey

Demographic surveys clustered into two major groups:

❑ those surveys that were conducted at least four times during the period of 1981 through 1991; and

❑ those surveys that were conducted less than four times during the same period.

When analyzing the response rates over time one can see two distinct bands (see Figure 1). The response rates for all surveys over all years ranged between 67 and 96 percent. Although the differential between the first two sets of surveys was about 4 percent, no statistical difference was detected between response rates for the more frequent and the less frequent surveys. The main differences detected were in refusal rates. Refusal rates for the less frequent surveys were almost twice those reported by more frequent surveys.

One of the working hypotheses was that less frequent surveys may use a more complex and time consuming core questionnaire or deal with difficult topics. As part of this study, we collected information on the amount of time it takes to complete the core questionnaire. A cross tabulation of the frequency of the survey and the length of time it takes to complete the core questionnaire reveals that this is not the case. For thirty-three percent of the less frequent surveys it takes more than one hour to administer the core questionnaire, compared to 27 percent for the more frequent surveys. This might indicate that the length of the core questionnaire is dictated more by the analysis objectives, rather than by the frequency of the survey. A second possible hypotheses is that most on-going surveys have lower refusal rates, because they employ more experienced interviewers, who may also have worked on the survey and have experience in obtaining the required cooperation. Moreover, for the less frequent surveys, there is a learning curve not only for interviewers, but all involved in the survey, on how best to field the survey; ongoing surveys, on the other hand,

can build on lessons learned and experienced gained during previous rounds.

Length of Interview

This is the one design factor that was consistently inversely related to response rate -- the longer the interview, the higher was the nonresponse rate. Although the result is not surprising, it reinforces the notion that once at the door, the quality and the length of the instrument will play a major role in obtaining a response.

Sampling Units

The major difference in these demographic surveys is the definition of the ultimate sampling unit on the sampling frame and the respondent rule used to collect the data. Five surveys sampled the "household" and interviewed one or all persons in the "households." Seventeen surveys sampled and interviewed persons. The remaining three surveys consisted of physician and school surveys. On average, the response rates are higher for household surveys (90 percent), followed by surveys of persons (82 percent), and, finally, other surveys (82 percent). Refusal rates were comparable for the first two groups of surveys -- persons and household -- and slightly lower for the other surveys.

Data Collection Agent

We distinguished among surveys whose data collection was conducted by Federal agencies, academic and contract organizations working for the Federal agencies. The average response rate for surveys conducted by Federal agencies is at 88 percent, for contract organizations the average is at 79 percent, while for academic organizations it is at 76 percent. This differential might be due to many confounding factors, such as the frequency and the difficulty of the survey or the resources available to the different organizations for conducting these surveys.

Mode of Data Collection

Most demographic surveys collect their data using more than one mode of data collection. Eleven

of the 26 surveys use face-to-face interviews as the main mode of data collection, with additional contacts made by telephone, mail, or use of administrative records. Five of the surveys are conducted using only face-to-face interviews. One survey is conducted only by phone, and seven others have a combination of telephone, mail and extraction from administrative records. The remaining two, based only on administrative records, are the "other" group. It is clear from this distribution that most surveys try to establish some verbal communications with the respondents and use more than one mode of data collection to try to reduce the rate of nonresponse.

Number of Supplements

Number of supplements administered did not seem to affect the response rate; they did, however, affect the refusal rates. The existence of supplements was indicated by a higher refusal rate. It should be noted, though, that there were problems in defining what should be counted as a supplement and no measure on the length of the supplement was available.

Post-survey Adjustment for Unit Nonresponse

Respondents were asked about the use of a number of post-survey adjustment techniques, which are used to reduce the effect of nonresponse bias. Eleven of the demographic surveys used poststratification, 22 used ratio adjustments (weighting up), nine used raking, five used regression and one used an imputation technique. The common factor present in all demographic surveys is that these Federal agencies use one or more forms of post-survey adjustments. This can be considered one area where changes are being made and, analytically, each of the agencies is trying to tackle the challenge of minimizing or adjusting for potential nonresponse bias.

Use of post-survey adjustments may also be a contributor to the tolerated level of response rates. Since there is methodology that can be used to handle issues of item and unit nonresponse, we do not know whether the classification of unit nonresponse has changed on a survey-by-survey basis. Thus, a new issue that has not been discussed in previous reports involves the classification of when a case should be

considered a response. Computation of response rates may be tangled with the issue of imputation for item nonresponse. In this area it is the hope of the analysts to use all reported data. Currently, a subjective judgment guides the computation of response rate in the presence of item nonresponse. All responsible survey organizations should identify imputed values for variables on survey data files.

Practice in Documenting Response Rate Components

All 26 demographic surveys maintained some information about response/nonresponse components. Fifty-nine percent of the demographic surveys tracked five or more different components simultaneously. The one component most frequently documented was "refusals" (14 of the responding surveys). Other frequently recorded components were "temporarily absent" (10 surveys), "not at home" (10 surveys), "ineligible" (8 surveys), and "language barriers" (7 surveys). In addition to the listing of the type of nonresponse components that are monitored, we specifically asked for the number of cases for each category of response disposition. This information was hard to obtain, but was generally available for the same number of years as the overall response rates. Unfortunately, there was some variation over years in what components were recorded.

A request for response rates by main demographic characteristics was either not tracked or harder to obtain, since it required intensive computer manipulation of the databases.

■ Conclusions

Despite the study's focus on nonresponse rates, major difficulties arose in getting consistent information on response rates. Computed rates, identified as "response rates," have different names and different definitions, depending on the survey and depending on the time in which they are collected (e.g., during data collection or during report writ-

ing). In that sense, the measurement issues outlined in the CASRO report have not changed.

Reporting practices and documenting response rate components varied widely across surveys. Demographic surveys maintained information about response/nonresponse components, but not in an easily accessible database and, in most instances, using definitions and concepts that were tailored for their specific needs.

Temporal trends do not seem to indicate a decline in response rates, although for some of the demographic surveys the noncontact rates fluctuate. Refusals seem to be stable -- there is a core of persons or institutions that refuse to participate.

Post-survey adjustments used to reduce the effect of nonresponse were post-stratification, ratio adjustment, raking, regression modelling of the propensity to respond, and imputation. Some of the approaches were traditional, while others were at the cutting edge of best practice.

One key issue that needs to be addressed in future studies is the cost (not necessarily in dollars) that it takes to maintain these response rates. Variables pertaining to call-back rules, expectation on nonresponse rates, mean square error, as well as cost-per-case could shed light on reasons for higher or lower response rates.

Other issues that have yet to be addressed are the impact of the use of computed-assisted personal interviews (CAPI) on both unit nonresponse and item nonresponse. Early results from various users of a CAPI indicate a lower rate of item missing data; as far as unit nonresponse, it is not clear if the use of CAPI has an impact; it certainly poses a challenge for the interviewer who needs to record the nonresponse in a machine that has not been opened. Thus, with new technologies being used for data collection, the nonresponse methodological issues are likely to be different.

■ Recommendations for Demographic Surveys

The recommendations of the Panel on Incomplete Data are still valid, and, judging from the information that was collected, many have not been implemented. We highlight a few.

Recommendation No. 4 of the Panel on Incomplete Data (Madow et al., 1983) was to:

> *"compute nonresponse rates during as well as after data collection, for important domains, and for important items."*

This recommendation has been partially implemented. Federal agencies compute rates, but those are not necessarily response rates and, for the most part, they are not broken down by domains. Moreover, for Federal demographic surveys, these numbers are not part of an information system that is easily accessible.

One can speculate about the reasons for having multiple definitions of rates and for not having a system that tracks response rates for a survey both at a given point and over time. First, the recommendation, although clearly stated, did not elaborate on how this should be done, and, unlike the CASRO report, the Subcommittee did not advocate uniformity in definition.

A second reason for having only partial implementation of the Panel's recommendation has to do with resources, costs, and benefits associated with such a monitoring system. Researchers are interested in the data that have been collected and not the data that have not been collected. Thus, one has to stress the importance of maintaining a system that will provide the necessary information on nonresponse rates for those who do want to do analysis and be assured of the quality of their analysis.

A third reason is quite simple. If the interviewers encountered unit nonresponse, then the domain to which the unit belongs is unknown. We would need to devise a mechanism to capture some data on nonrespondents.

This study recommends that the Panel's recommendation be supplemented with guidelines for computation of response rates which will be design-specific and will provide the necessary information for computing and tracking response rates over time. Also, since controlling for nonresponse starts during the design and the data collection phase, these guidelines should be extended to rates other than nonresponse, which will be helpful in monitoring and reducing nonresponse when it is encountered.

In order to compute domain-specific rates, the effort needs to be extended beyond use of available data and adopt a strategy for estimating nonresponse rates. For example, one can incorporate as part of the design a subsample of nonresponse which will be subjected to additional data collection efforts.

> *Survey staff should monitor response rate components over time in conjunction with routine documentation of costs and design changes.*

Although response rates are only one of many measures of data quality, they are useful tools to monitor changes in the quality of survey statistics. For example, for repeated surveys, graphs of times series of response rate components juxtaposed with costs for each wave and indicators of design changes introduced in that wave can be valuable management tools.

Ideally, nonresponse components should be presented for all major analytic subgroups. This, then, provides the consumer of statistical reports with consistent information about nonresponse properties of the statistics.

> *A centralized database of response rates and survey design features should be constructed to help explore the influences on magnitudes of response rate components.*

The Subcommittee's work was focused on a small number of surveys, but required hundreds of hours of work of its members and survey staffs -- all to assemble and centralize information that is of critical importance in assessing the ability to dissemi-

nate information. Further, by including key design features of the surveys in the database, observational studies of correlates of response rates can be made. This would assist managers and survey designers in assessing the marginal effect of survey design features.

The Subcommittee notes that the current international effort at compiling this information is compatible with this recommendation. If the international effort at creation of such databases is successful, the U.S. will have comparative data cross-nationally. The Federal statistical system should address the practical implications and the need of monitoring response rates over all surveys.

Full sample data sets should be given in public-use data files.

Recommendation No. 12 of the Panel on Incomplete Data is to:

"Make sure the database contains data records of nonresponding as well as responding units."

The Subcommittee found that this was the exception, not the rule, in Federally-funded surveys. Most Federally-funded surveys, when releasing public-use data sets, include only the respondent data file. Releasing a complete data set with the selection weights, allows the analysts to construct alternative post-survey adjustments for the nonresponse. Some surveys, however, have only limited information on nonrespondents. That information could be only an address that cannot be released because it will violate the privacy of nonrespondents; in such cases, there is very little useful information for designing alternative nonresponse adjustments.

■ Footnote

[1] A response rate is the ratio of the number of responding units to the number of eligible units; a completion rate is the ratio of number completed to number fielded; and the proportion of number interviewed is the ratio of those interviewed to those fielded.

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