

# RESPONSE IN FEDERAL ESTABLISHMENT SURVEYS

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## ABSTRACT

The Interagency Group on Establishment Nonresponse (IGEN) was formed to examine issues of unit nonresponse in establishment surveys conducted by Federal statistical agencies. IGEN's formation, purposes and plans are the subject of a companion paper presented at ICES-II. Among other activities to facilitate its work, IGEN collects information from member agencies on their respective survey response rates and their research into unit nonresponse in establishment surveys. This paper summarizes the information collected to date. We present trends in response rates for selected surveys and provide examples of how agencies calculate and present response rates. We also discuss various definitions of respondents and survey eligible units which are used to derive the numbers included in response rate calculations.

The intention of this paper is to bring together information about unit response from across a wide spectrum of Federal agencies and establishment surveys. We hope that this will facilitate previously unavailable comparisons across surveys and establishment populations as well as promote the exchange of research ideas (both to IGEN members and others) as the IGEN member agencies work to increase response rates in establishment surveys.

**Key Words:** Response rates, unit response, trends, rate calculations

## 1. INTRODUCTION

Response rates are a measure of quality for survey operations and the resulting statistics. In this paper we present a collection of unit response rates produced for Federally sponsored establishment surveys in which data are collected from or about establishments where an establishment is deemed to be an economic unit that conducts business or performs a service or industrial operation. Our focus is on situations in which the target establishment provides no survey response (unit nonresponse) as opposed to situations in which the establishment cooperates overall but omits particular data items (item nonresponse).

## 2. REVIEW OF PRIOR WORK

In our prior paper (IGEN 1998) we noted that selected Federal establishment surveys usually compute response rates according to one or both of two general formulas. The most basic is the unweighted response rate, which can be formulated as:

$$\text{Unweighted Response Rate} = \frac{\text{Number of responding eligible reporting units}}{\text{Number of eligible reporting units in survey}} \quad (1)$$

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<sup>1</sup> The opinions expressed here are those of the authors and do not necessarily represent those of their agencies. The paper is based on the work of IGEN members who currently are: Stephanie H. Brown, U.S. Bureau of the Census (BOC); Jay Casselberry, Energy Information Administration (EIA); Sylvia Fisher, Bureau of Labor Statistics (BLS); David M. Friedman, BLS; Steven Kaufman, National Center for Education Statistics; Douglas G. Kleweno, National Agricultural Statistics Service (NASS); Ruey-Pyng Lu, EIA; Donald M. Luery, BOC; Jeanie C. Mah, BLS; Chris Manning, BLS; Antoinette Martin, EIA; Chester H. Ponikowski, BLS; Carl Ramirez, U.S. General Accounting Office; Robert Sabatelli, BLS; Iris Shimizu, National Center for Health Statistics; David Slack, BLS; Jaki Stanley McCarthy, NASS; Albert Tou, BLS; Clyde Tucker, BLS; Diane K. Willimack, BOC.

The other is a weighted response rate which takes into consideration the relative importance assigned to reporting units. This rate can be formulated as:

$$\text{Weighted response rate} = \frac{\text{Total weighted quantity for responding reporting units}}{\text{Total estimated quantity for all eligible reporting units}} \quad \text{Q}$$

The unweighted response rate is used to indicate the proportion of eligible units which cooperate in the survey, while the weighted rate is generally used to indicate the proportion of some estimated population total which is contributed by respondents. In establishment surveys, a small number of large establishments may account for a major proportion of the population total. In these cases, the weighted response rate is probably a better indicator of the quality of the estimates.

While equations (1) and (2) are frequently the formulas used to calculate response rates, it was observed in the IGEN (1998) that definitions for the numerator and denominator components of the response rates varied by more than just the units sampled or targeted in the respective surveys. For example, some rates are calculated with only eligible units, while the rates for other surveys include all units at which data collection was attempted. In addition to the variations in the definitions of components for response rates, it was noted that other rates may also be calculated by using equations (1) and (2) and replacing numbers of respondents with numbers of units that were refusals, out-of-scopes, and so forth in the rate numerators.

Because of the variety of response rates and the definitions used for the rate components by Federal agencies, IGEN proposed taking an inventory of those response rates for Federal establishment surveys. The inventory could also be used to indicate which rates are comparable across surveys. This paper presents the preliminary inventory.

### 3. DATA COLLECTED FOR THE STUDY

The IGEN members, representing eight Federal agencies, were asked for the following information on eleven characteristics of the establishment surveys routinely sponsored or conducted by their respective agencies:

1. Survey name
2. Sponsoring agency
3. Agency conducting the survey
4. Target population
5. Data collected
6. Basic description of sample design (including sample unit definitions)
7. Basic description of survey administration design (Examples of information include: Panel survey, multistage or hierarchical units for data collection, administrative data collected from a government unit, data collection methods, whether participation was mandatory or voluntary.)
8. Frequency of data collection
9. Response rates typically calculated. For rate reported,
  - a. Definition of units in the numerator
  - b. Definition of units in the denominator
  - c. Are unweighted rates calculated?
  - d. Are weighted rates calculated?
  - e. Definition of weights used in weighted rates (if applicable)
  - f. Latest value of rate and year.
10. Which rates are released to the public?
11. Measures typically used internally and why.

Data were collected on these characteristics for 49 surveys and aggregated in a summary table; the table is available upon request. These 49 surveys were ones for which it was practical for IGEN members to collect data within their respective agencies. While these surveys are probably typical of those sponsored by the agencies, they do not comprise a probability sample of Federal establishment surveys.

#### 4. RATES FOUND IN OBSERVED SURVEYS

To facilitate analysis of the rates produced for the different establishment surveys, some standardized terminology and notation were developed to categorize the survey case outcomes that agencies commonly used in rates across the surveys included in our study. Some inspiration for this standardization was derived from AAPOR's Standard Definitions (1998) in which AAPOR defined survey unit dispositions that are frequently used in response rate calculations for population-based surveys. After examining the rates calculated for the establishment surveys in our study, we devised the following definitions and notation for major factors which are used in the rates calculated for those surveys.

- S = Successfully completed survey-eligible units (unit satisfied criteria required for respondent status)
- D = Nonrespondents with some data received
- R = Refusal (survey-eligible units for which a responsible authority was contacted and that authority deliberately declined participation in the survey)
- O = Other or Pending (attempted survey-eligible units with no data received but not refusals or other final disposition).
- n = Attempted units among those which are included in the survey at the start of data collection (excludes units not attempted).
- NAT = Original survey units at which data collection has not yet been attempted.
- OOB = Units that are deemed out-of-business (includes units that cannot be located).
- OOS = Confirmed out-of-scope units.
- DUP = Confirmed duplicates of units already included in the survey.
- UAA = Post office returns because of "undeliverable as addressed."
- E = Attempted original survey units that were not deemed to be ineligible  
= n - OOB - OOS - DUP.
- NU = New eligible units identified after data collection for the survey has started
- $w_i$  = Weight for i-th sampled unit applied in weighted response rates
- $t_i$  = Size for i-th sampled unit used in weighted response rates.

Using the above notation and definitions, rates were calculated for the observed surveys. The Table summarizes the results for response rates by survey type (census, cross-sectional sample survey, longitudinal sample). In the following comments, rate numbers refer to numbers assigned to rates in the Table. Among the observed surveys:

- Response rates are calculated for all but one survey.
- Of those computing response rates, all compute unweighted rates (rates 1-7), and about a third compute weighted rates (rates 8-10).
- All surveys generally restrict their response rate calculations to units at which data collection was attempted.
- All of the weighted rates (rates 8-10) and the most frequently used unweighted rates (rates 1-2) exclude units that were confirmed to be ineligible for the survey during data collection. Those rates indicate the proportion of the population (or population size) that is represented by respondents.
- For surveys which do include known ineligible units in their response rates (rates 3-7):
  - All but one include all units where contact was attempted during data collection. The exception excludes Post Office returns from its response rate calculations (rate 4).
  - All but one include confirmed out-of-business (OOB) units in their numerators. Most of these numerators also include other classes of ineligible units such as out-of-scope units (rates 4 and 6), duplicates of units already included in the survey (rate 6), and so forth. In one mail survey, the numerator also includes units for which forms were returned twice by the Post Office because of "undeliverable as addressed" (rate 5).
  - When the numerator includes all units for which the final disposition is anything other than "pending" or "refusal," these are "receipt rates" or "return rates."
- A number (7) of the response rates include survey-eligible units (NU) which are identified after the start of data collection (rates 1, 5, and 6).

Besides response rates, a number of the surveys in our study routinely calculate other rates for a variety of purposes. These rates are described in the Appendix, where rates are organized by use made of those rates. Agencies use these other rates to (1) monitor survey progress, (2) assess collection operations, (3) examine factors that reduce sample size, (4) measure proportion of estimates based on imputation, (5) measure relationships between the sample and the sampling frame and between respondents and the frame, and (6) measure percent of reporting units with useable data. Except for the rates produced by the Standard Economic Processing System (StEPS) for the Census Bureau's economic surveys and "collection" rates also produced for some Census Bureau surveys, the other rates are unique to the surveys reporting them.

## **5. TRENDS IN RESPONSE RATES**

We also compared response rate trends for surveys which have been conducted at least three times over the 13-year period 1987-99. To permit the greatest number of comparisons, unweighted rates were reported for all 12 surveys for which rates were available. (See Figure 1)

Only limited interpretations can be drawn from these comparisons. As noted in the prior section, the definitions for response rates vary across surveys. There are also differences in the surveys' target populations and survey administration which can affect response levels. For example, a longitudinal sample panel would likely suffer greater attrition, and therefore experience more downward trends in response rates over time, than would a mixed or more frequently rotated panel sample.

The conventional wisdom among survey professionals that nonresponse rates are increasing appears to hold from these data. Of the surveys included, some exhibited monotonically decreasing trends in response rates over the period, while others had generally decreasing trends. On the other hand, a couple of surveys appeared to have increasing response rates most of the period and some appeared to have stable or mixed rate patterns.

Some surveys benefitted from increased effort in terms of recontacts and incentives that were targeted to improve response rates, making it difficult to detect change in establishment survey response. For example, the National Hospital Discharge Survey started purchasing medical records from abstracting services to which sampled hospitals subscribed to reduce response burden beginning in 1985; the result was increased response rates for several years afterward. In contrast, the Commercial Building Energy Consumption Surveys (CBECS1 and CBECS2) reported an increase in the number of call backs and total interview hours expended per completed interview for the four surveys conducted from 1989 through 1995 and still experienced a net decrease in overall response rates during that time.

## **6. SUMMARY**

The purpose of this paper is to examine issues of unit nonresponse rates in Federal establishment surveys. We have documented the response rates for a number of those surveys. Thus, we have a better understanding of the definitions and components of establishment survey response rates used by various agencies. In conclusion, while examination of various response rates is important for the assessment of different surveys' data quality, clearly other factors should also be considered to assess the overall quality of sample survey estimates.

## **REFERENCES**

- American Association for Public Opinion Research (1998) *Standard Definitions: Final Dispositions for Case Codes and Outcome Rates for RDD Telephone Surveys and In-Person Household Surveys*. Ann Arbor, Michigan: AAPOR.
- Interagency Group on Establishment Survey Nonresponse (1998) *Establishment Nonresponse: Revisiting the Issues and Looking to the Future*, Statistical Policy Working Paper 28, Washington, D.C.: Office of Management and Budget, pp. 181-227.

**Fig. 1: Unweighted Response Rates of Selected Federal Establishment Surveys**

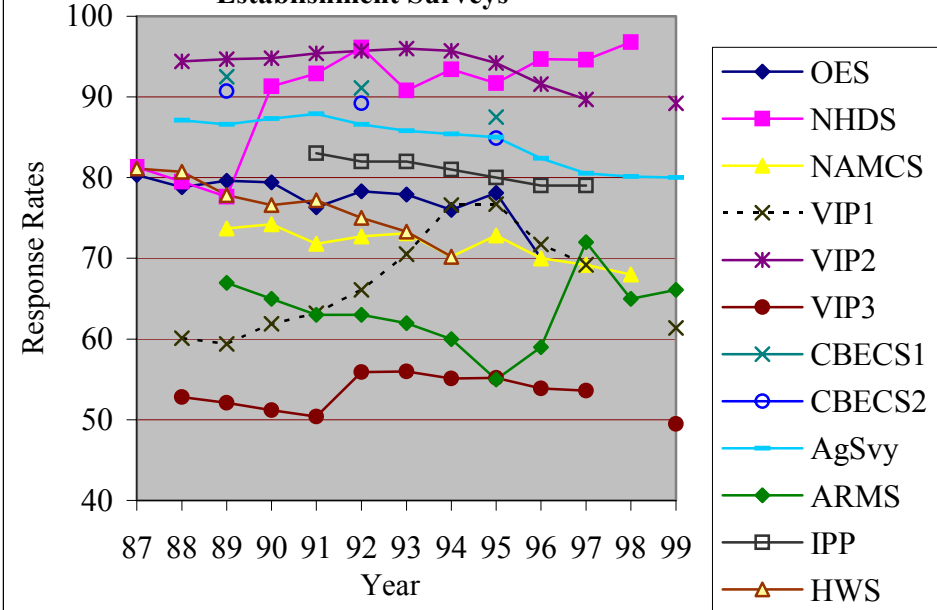


Figure 1 surveys and sponsors are: OES = Occupational Employment Statistics Survey / BLS ; NHDS = National Hospital Discharge Survey / NCHS; NAMCS = National Ambulatory Medical Care Survey / NCHS ; VIP1-3 = Construction Value Put-In-Place Surveys ("Nonresidential," "State and Local," and "Two plus") / Census; CBECS1-2 = Commercial Building Energy Consumption Survey / EIA; AgSvy = Agricultural Survey / NASS; ARMS = Agricultural Resource Management Study / NASS; IPP = International Price Program / BLS; HWS = Hours at Work Survey / BLS.

**Table 1: Number of selected Federal establishment surveys with response rates by survey type and rate calculation method**

Formula <sup>1</sup>	Total Surveys included	Survey type		
		Census	Cross-sectional <sup>2</sup> samples	Longitudinal <sup>3</sup> Samples
Included Surveys	48 <sup>4</sup>	15	24	9
Unweighted rates				
1 S/(E+NU)	5	5		
2 S/E	36	8	20	8
3 S/n	1			1
4 S+OOB+OOS n-UAA	1	1		
5 S+OOB+UAA n+NU	1	1		
6 S+OOB+OOS+DU P n+NU	2		2	
7 S+OOB n	2		2	
Weighted rates				
8 $\frac{\sum_S t_i}{\sum_E t_i}$	2	2		
9 $\frac{\sum w_i t_i}{\sum_E w_i t_i}$	11		11	
10 $\frac{\sum w_i}{\sum_E w_i}$	1		1	

<sup>1</sup> Definitions for units included in rates (S, E, NU, and so forth) are contained in Section 4.

<sup>2</sup> “Cross sectional” surveys collect data only once from a sample before the sample is retired.

<sup>3</sup> “Longitudinal” surveys collect data multiple times from the same sample.

<sup>4</sup> Total differs from sum of surveys because some surveys have both weighted and unweighted rates.

## Appendix. Selected rates calculated by some Federal establishment surveys: 1999-2000

### Rates to assess success of data collection operations

S/n or S(m)/n

Collection rates in cross-sectional surveys (where m denotes different categories of respondents, such as mode of data collection used, industry sector, region, etc.)

(S+D)/n Reporting rate

S/(E-R) Collection rate in a longitudinal survey (This is percent of enrollees who respond where R denotes refusals during enrollment wave for survey.)

### Rates used for examining factors that reduce sample size

S/(n+NAT) and S/(n-O) Cooperative rates

R/(n+NAT) and R/(n-O) Refusal rates

OOS/(n+NAT) and OOS/(n-O) Out-of-scope rates

OOB/(n+NAT) and OOB/(n-O) Out-of-business rates

O/(n+NAT) Pending rates.

The preceding rates either include all survey units, including those not attempted (n+NAT), or they are limited to attempted units for which the final dispositions have been determined (n-O).

### Rates used to monitor progress

(S+D+OOB+OOS)/n

Receipt or check-in (These rates may also be used as overall response rates. They are similar to the receipt rates discussed earlier)

1 - (Check-in rate) Delinquent rate (the proportion of units for which no response has yet been received)

O/n Extension rate (Proportion of units without a response and for which the extension date is after today)

(S+D)/E Received rate

EDIT/E Edited rate

The preceding rates are routinely calculated by a processing system called StEPS, which is being phased in for economic surveys conducted by the U.S. Census Bureau. The following rates are used by a longitudinal survey to monitor survey progress.

AR/n Address refinement (Proportion of units for which collection or confirmation of contact information is completed - this is prior to contacting the units.)

1 - (O+NAT) / (n+NAT) Completion rate

R/E Refusal rate

Note that the R in these rates denotes refusals during the enrollment wave for the longitudinal survey.

### Rate for measuring initiation success in longitudinal survey

$$\frac{\sum_S (QP_i / QA_i) w_i t_i}{\sum_{E+NU+NAT} w_i t_i}$$

Where QP/QA is response rate for sample within establishment.

### Rates to measure proportion of population estimate represented by imputed data (Imputation rates)

$$1 - \frac{\sum_S w_i t_i}{\sum_{n-OOB} w_i t_i} \quad \text{and} \quad \frac{\sum_S (w_i' - w_i) y_i}{\sum_S w_i}$$

where  $w'$  is the nonresponse-adjusted weight and  $y$  is the value of interest.

**Rates to measure relation between sample, respondents, and sampling frame**

$$\frac{\sum_S \frac{Q_i^R}{4} t_i w_i}{\sum_N t_i}$$

Percent of frame total represented by useable responses ( $Q^R$  denotes number of quarters with useable data in a quarterly survey.)

$$\sum_S t_i w_i \div \sum_N t_i$$

Percent of frame total represented by weighted usable data units.

$$\sum_n t_i \div \sum_N t_i$$

Percent of frame selected to the sample

$$\sum_S t_i \div \sum_N t_i$$

Percent of frame that is in sample establishments with useable data.

$$\sum_S cfs_i \div \sum_S t_i$$

To see how estimates for useable sample compare to corresponding frame total.

**Rates for other uses**

$$S/(S+D)$$

Percent of responders with usable data.