

# **Issues Related to Achieving Target Response Rates for Economic Surveys at the U.S. Census Bureau**

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This paper discusses issues related to achieving target response rates for economic programs conducted by the U.S. Census Bureau. The first section covers efforts to meet Performance Assessment Rating Tool (PART) response rate targets. The second section covers issues in conducting nonresponse bias analysis for programs that do not achieve response rates prescribed by the Office of Management and Budget (OMB).

## Efforts to Meet PART Response Rate Targets

Various programs of the Economic Directorate are being assessed according to the Performance Assessment Rating Tool. One of our measures is the collection (unit response) rate. With the exception of the *2002 Census of Governments*, targets have been met.

The target for the 2002 Economic Census was 84% and for 2007 is 86%. Targets for other programs are shown in the table below.

FY	Annual Surveys	
	ARTS, AWTS <sup>1/</sup>	SAS, ASM, APES <sup>1/</sup>
2004	75%	75%
2005	77%	77%
2006	77%	77%
2007	77.5%	77%
2008	78%	77%
2009	78.5%	77%
2010	79%	77%

<sup>1/</sup> ARTS-Annual Retail Trade Survey  
 AWTS-Annual Wholesale Survey  
 SAS- Service Annual Survey  
 ASM-Annual Survey of Manufactures  
 APES- Annual Payroll and Employment Survey

For many of these programs we have struggled to achieve the rates. The good news is that the struggles have led us to examine and change some of our follow-up strategies. These changes have led to dramatic improvements in the collection rates for some surveys. For others, it has made it somewhat easier to achieve the targets. The bad news is that some of the improvement efforts have added significantly to the cost of conducting the surveys.

The Service Annual Survey will serve as an example.

The Service Annual Survey (SAS) provides data that help to measure America's current economic performance. SAS is mandatory under title 13 and provides estimates of annual revenue and other measures for most traditional service industries. It is the only source of annual revenue estimates for the service industries.

Coverage includes businesses that primarily provide services to individuals, businesses, and governments (NAICS 484: Truck Transportation, 492: Couriers and Messengers, 493: Warehousing and Storage, 51: Information, 5231: Securities and Commodity Contracts Intermediation Brokerage, 52392: Portfolio Management, 52393: Investment Advice, 532: Rental and Leasing, 54: Professional, Scientific and Technical Services, 56: Administrative and Support and Waste Management and Remediation Services, 62: Healthcare and Social Assistance, 71: Arts, Entertainment and Recreation, 81: Other Services (except Public Administration)). Current coverage accounts for nearly 30% of economic activity in the U.S.

Using a sample of about 70,000 service firms, SAS collects revenue; expenses; e-commerce sales; and, for some industries, exports, inventories, class of customer, and revenue for detail product lines based on the North American Product Classification System (NAPCS).

Survey reports are usually released no later than 12 months after the end of the survey year. Summary data are provided at the sector, sub-sector, and industry group level for the reference year and prior years. In addition, for some kinds of business, we provide data by federal income-tax status (taxable and tax-exempt).

Federal Government users include the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Centers for Medicare and Medicaid Services, and the Federal Communications Commission. Other users include the Coalition of Service Industries, various trade and professional organizations, private businesses, and the media.

The SAS unit response rate target was set at 77% for FY 2005 and will remain at that level through FY 2010. Rates were held steady throughout the period because SAS was introducing a new sample in FY 2006 and plans call for increased industry coverage and expanded collection of expense data.

FY 2006 Efforts- The target of 77% was met for FY 2006, but required one extra mail follow-up, two extra weeks of telephone follow-up, additional clerical staff, additional research for missing phone numbers, and a significant amount of overtime for the professional staff. These additional efforts added approximately \$155,000 to the original budget.

Follow-up was originally scheduled for completion the end of July. Because the unit response rate stood at 64.2% in early August 2006, a decision was made to extend the follow-up period. The target was finally achieved on Dec. 27, 2006 just before the PART report out date. This was accomplished by going after any case that would respond, regardless of size or impact on the final estimates. The additional efforts spent on driving in response cut into the time that analysts would have normally devoted to resolving edit failures and status changes, and conducting macro review and analysis of the data. The plan had been to release publications on a flow basis beginning in November 2006. However, to achieve the unit response rates and ensure that some amount of analysis was performed, all data were released in January 2007. It should be noted that a new sample

had been introduced during this time period and that SAS collects many detailed data items.

FY 2007 Efforts- The target of 77% was met on September 27, 2007. To meet the target, most of the additional steps used in FY 2006 to drive up response were planned for FY 2007. The only exception was that there was no need to conduct extensive research for telephone numbers. In addition, the survey was mailed four weeks earlier. About \$90,000 was added to the FY 2007 budget for these efforts. This was the 2<sup>nd</sup> year of the sample, meaning analysts were able to work referrals sooner and there was opportunity to reconcile annual and quarterly survey findings. With response targets realized sooner, professional staff overtime was reduced and they were able to devote adequate time to clean-up and data analysis activities.

FY 2008 Efforts- The target will remain at 77%. Several additional expense questions will be added to the SAS for FY 2008. There is concern that the additional questions will require even more efforts to meet this target.

Some issues that surfaced as a result of our attempts to achieve collection rate goals:

1. Do higher unit response rates translate into improved data quality?
2. By spending extra funds we were able to achieve the unit response rate targets. Could the funds have been used in other ways (such as for data analysis) that would have translated into better quality data?
3. Much time and effort was devoted to driving up response. For SAS, this meant paying more attention to even the smallest businesses that have very little effect on the final estimates. Is this the best use of time and resources?
4. Did we add bias and thereby degrade the quality of the estimates with our push to meet the unit response rate targets?
5. For economic surveys are there other alternatives to the unit response rate, such as the response rate based on weighted characteristics of interest, for PART measures? In FY 2006 for the 2005 SAS, the unit response rate was 73.6% and the weighted revenue response rate was 84.4% on October 11, 2006. Had the response rate based on weighted revenue been used, we would have achieved targets much earlier with much less cost. For the 2006 SAS, the unit response rate was 77.4% and the weighted revenue response rate was 85.4% on October 11, 2007.
6. If a nonresponse bias study showed the absence of significant bias, would that be an acceptable alternative to achieving PART response rate targets? Even though the unit response rate of 77% was achieved for the 2005 SAS, it is still in need of a nonresponse bias study according to the "Office of Management and Budget (OMB) Standards and Guidelines for Statistical Surveys."

### **Issues in Conducting Nonresponse Bias Analysis for Programs not Achieving OMB Prescribed Response Rates**

The OMB standards state that surveys having a unit response rate less than 80 percent should be studied to evaluate the potential for nonresponse bias. We have identified the need to conduct such studies for several of our surveys and have taken steps to begin

addressing this requirement. As a first step we conducted a nonresponse bias analysis for the Quarterly Services Survey (QSS), which is closely related to the Services Annual Survey (SAS).

The QSS is an economic indicator that provides national estimates of quarterly revenue for employer firms located in the United States and classified in select service industries. The sample includes firms classified in NAICS 51: Information, 54: Professional, scientific, and technical services, 56: Administrative and support and waste management and remediation services, and 622 and 623: Hospitals and Nursing and residential care facilities.

Each quarter, the QSS collects data from a probability sample of approximately 6,000 employer firms selected from the larger SAS sample. The QSS sample is updated on a quarterly basis to account for new service businesses, deaths, and other changes to the survey universe.

Data for nonresponding firms are imputed based on data for similar-sized firms classified in the same kind of business. Quarterly revenue estimates are obtained by summing weighted data (either reported or imputed), where the weight for a particular unit is the reciprocal of its probability of selection. The quarterly revenue estimates are adjusted using SAS results.

A nonresponse analysis was conducted for the 2004 and 2005 Quarterly Services Survey (QSS) estimates. The analysis had two main purposes - to examine the survey itself and to serve as an example for other Census Bureau Economic programs.

We used several techniques from the Goves/Brick nonresponse bias course. These included performing comparisons to other estimates, looking at nonresponse bias for estimates based on variables available from the sampling frame, comparing response rates on subgroups, analyzing estimates by level of effort, and altering the weighting adjustments. These allowed us to examine conditions that might lead to nonresponse bias, namely substantial nonresponse, data not missing at random, and nonresponse treatment methods based on response information only. Results of the analysis show some evidence of nonresponse bias.

**Nonresponse:** The Office of Management and Budget (OMB) guidelines say that surveys having a unit response rate less than 80 percent should be studied to evaluate the potential for nonresponse bias. The unit response rate for QSS is less than 80 percent at the survey level. Given the skewed distribution, a response rate based on the weighted characteristic of interest seems to be a more appropriate response measure for QSS. The average weighted quarterly revenue response rates exceed 80% at the total survey level and for two of the four sectors covered by QSS.

**Data Not Missing at Random:** Certainty and noncertainty units for QSS do not respond at the same rate. The average weighted quarterly revenue response rates exceed 80% for certainty units in all four sectors. However, the average weighted revenue response rates

for all but one of the four sectors are below 80%. Survey follow-up efforts focus on larger units, thereby increasing their response rate. Larger units may understand the mutual benefits of responding and may have staff dedicated to responding to government inquiries.

**Nonresponse treatment methods based on response information only:** Current quarter revenue for a given nonrespondent are imputed as the product of the nonrespondent's prior quarter revenue and the ratio of current-to-prior quarter revenue for all respondents in the same industry. Use of administrative data to compare respondent-based statistics to non-respondent-based statistics indicated that for two of the four sectors, imputation methods may be biasing estimates for nonrespondents. Estimates of the relative bias computed using Census-equivalent revenue showed that biases may be substantial. It should be noted that the Census-equivalent revenue are also estimates.

**Other Findings:** A sensitivity analysis on the level of nonrespondent estimates, shows the potential for large differences between the published estimates and the true parameter.

Differences exist between QSS and the Services Annual Survey (SAS) calendar year estimates. However, differences are reconciled by benchmarking the QSS estimates to the SAS estimates. The benchmarking methodology ensures that the calendar year revenue estimates from QSS are equal to the SAS revenue estimates and causes minimal differences in the quarterly change estimates originally published for QSS.

Some issues that surfaced as a result of these studies:

1. How much analysis is enough? As indicated earlier, several techniques were used to examine the potential bias in the QSS and more could have been done. This seems to be more than one would be expected to do.
2. What if different techniques had given conflicting results?
3. For economic surveys, is it acceptable to conduct nonresponse analysis using a response rate based on the weighted characteristic of interest? The OMB standards prescribe a nonresponse bias analysis based on the unit response rates.
4. How much potential bias is enough to decide that data should not be published?
5. If measures are taken to adjust for bias, is a nonresponse analysis needed? For QSS our level estimates are benchmarked to the latest available Service Annual Survey estimates, which in turn have been benchmarked to the latest Economic Census results.
6. How often should nonresponse analysis be conducted? Conducting these studies is time consuming.

One final issue - As efforts are made to improve response and minimize bias, what are some effective follow-up strategies for skewed populations that avoid introducing bias into the estimates?

## Questions for the Discussion

1. Do higher unit response rates necessarily translate into improved data quality? By spending extra funds for SAS we were able to achieve the unit response rate targets. For SAS to meet its targets and its release dates, data review time had to be shortened. Analysts also had to devote more attention to obtaining response from even the smallest businesses that have very little effect on the final estimates.
2. For economic surveys are there other alternatives to the unit response rate, such as the response rate based on weighted characteristics of interest, for PART measures and for determining when to conduct a nonresponse analysis? For the 2005 SAS, the unit response rate was 73.6% and the weighted revenue response rate was 84.4% on October 11, 2006. Had the response rate been based on weighted revenue, we would have achieved targets much earlier with much less cost.
3. If a nonresponse bias study showed the absence of significant bias, would that be an acceptable alternative to achieving response rate targets?
4. How much potential bias is enough to decide that data should not be published?
5. If measures have been taken to adjust for bias, is a nonresponse analysis needed? For example, the QSS estimates are benchmarked to the latest available SAS estimates, which in turn have been benchmarked to the latest Economic Census results.
6. How often should nonresponse analysis be conducted?