# A CATI FEASIBILITY STUDY FOR A MONTHLY ESTABLISHMENT SURVEY

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## INTRODUCTION

In May 1985, the Bureau of Labor Statistics began a feasibility study for Computer Assisted Telephone Interviewing (CATI) in its Current Employment Statistics (CES) survey. The CES survey is a federal-state cooperative survey which collects monthly data on employment, hours, and earnings from a sample panel of 250,000 non-agricultural establishments. The survey collects 5 data items:

- total employment
- total women workers
- total production (nonsupervisory) workers
- total hours for production (nonsupervisory) workers
- total earnings for production (nonsupervisory) workers

The data are collected almost exclusively by mail using a "shuttle" form. Each month the shuttle form is mailed to the respondent one week prior to the reference period. The respondent enters the data for the current month and then mails the form back to the State Employment Security Agency. The agency records the information on a data base, performs basic edits to ensure consistency, and follows up on edit failures and nonrespondents. The form is then remailed to the employer the following month.

From these data, a large number of employment, hours and earnings series with considerable industry detail on a national, state and area basis are prepared and published each month. The employment data include series on all employees, women workers, and production or nonsupervisory workers. Data on production or nonsupervisory workers include average hourly earnings, average weekly hours, and average weekly overtime hours. For many series, seasonally adjusted data are also published.

Initial national estimates (called "first closing" estimates) are published by BLS in a press release the first Friday of each month, approximately 15 days following the end of the survey reference week. Currently, the response rate by first closing is less than 50 percent. State and local area estimates are developed and published separately by the State agencies.

The CATI Collection Methodology Project was designed to determine the effectiveness of CATI for the Current Employment Statistics Program. The objectives of the program were to determine:

- the ability to convert current CES reporters to CATI, and factors affecting the conversion response rates,
- the attrition rates and the factors affecting the response of sample members over time under CATI collection,
- the timeliness of responses under CATI for meeting first closing,
- the number of contacts per respondent to obtain a completed report,
- the length of telephone calls needed to obtain a completed report,
- the cost per report to obtain data by telephone,
- the effectiveness of on-line CATI editing for identifying data errors and preserving ongoing quality,
- the amount and type of training required, and
- the hardware/software performance.

In addition, a response analysis survey was conducted for all selected units to measure and control the quality of data obtained from the respondents.

## DESIGN OF STUDY

**Scope** - The target population consisted of active business establishments in the CES survey in Florida and Maine. Excluded from this study (as well as the CES survey) are agricultural business establishments, some small nonprofit organizations, and businesses with no paid employees. Also, this study excluded most multi-unit reporters, interstate construction units, and large establishments which report under special arrangements with the BLS.

**Sample** - Probability samples of 381 and 213 units were selected in Florida and Maine, respectively. The sampled population was first stratified into 5 industry strata: (1) Mining, Construction and Manufacturing, (2) Services (3) Trade (4) Schools and (5) Government. Each industry stratum was further stratified by 3 employment size classes: 0-19 employees, 20-99 employees, and 100+ employees. Each of the 5 industry strata required a different survey instrument. Separate estimates addres-

sing all of the study objectives were desired for each survey instrument. Therefore, the sample was allocated equally among each of the 5 industry strata. Within each industry stratum Neyman allocation was used, based on employment. A systematic sample of establishments was selected within each industry/employment size stratum.

**Design of CATI Research** - Research contracts to conduct the CATI Collection Methodology Project were initiated with both the Florida and Maine Employment Security Agencies. After exploring various avenues for CATI during the summer of 1984, it was decided to contract with the Computer Assisted Survey Methods Staff (CSM) at the University of California at Berkeley in September 1984. This selection was based in part on the relative ease of programming in the system and the fact that the system operated on Personal Computers (PC).

Two 2 ½ day training sessions were provided to the State personnel in April, 1985, and hardware/software were acquired and installed. A shakedown period of 4-6 months (May-October) was anticipated for the project in order to: have state staff fully knowledgable on the hardware and software for the CATI system, eliminate most system bugs, incorporate most state-requested changes, develop most of the report listing functions, and validate performance data (i.e., number of contacts, time per contact, etc.) from the system. An independent validation of the performance data was set up by using data derived directly from the detailed reports provided by the telephone company for Maine's direct telephone line.

**Data Collection** - The collection of the CES CATI data in Florida and Maine began in May of 1985 when each state collected data for a portion of the sample of current CES reporters selected for CATI. Collection of government and education units was delayed until July to ease the workload on State staff and to allow more time to develop the instrument for these industries. The National Office retained 39 units from Maine and 38 units from Florida samples to use in testing. Twenty of the 39 Maine units were returned to Maine in June and the remainder in July. Thirty three units from Florida were kept for further testing. Some units (3 in Maine and 15 in Florida) were not collected in May due to a delay in receiving their April mail shuttle forms. Beginning in July, all sample units were initiated into CATI.

**Data Quality** - Each establishment selected in the sample received a telephone Response Analysis Survey (RAS) interview. The interviews were conducted after several months of CATI collection. The purpose of the RAS was to identify instances where reported employment, earnings, and hours differed from the BLS definition. In instances where a reported data differed from the BLS definition, respondents were asked to make adjustments to their data. Also included in the study was a small reinterview program conducted using Computer Assisted Personal Interviewing (CAPI) with lap-held micro computers. The objectives of the reinterview were to determine if the telephone RAS produced similar results to those conducted by personal visit and to use this information to improve the telephone interviewing process.

**Online Editing Features** - The CES CATI instrument included online range, internal consistency and longitudinal edits for all of the basic data items. Range checks determined if ratios of collected data items, such as average hourly earnings, were reasonable. Internal consistency edits determined if impossible situations occurred, such as the number of women workers exceeding total employment. Longitudinal edits compared the reported data to the previous month data.

## RESULTS OF STUDY

The CES CATI instrument is programmed to produce an audit trail for each unit by collecting the following management information:

- response disposition code
- scheduled call date
- date data was collected
- the number of calls necessary to complete an interview
- the length of time spent in direct telephone contact with each unit, and
- the length of time spent on the CATI system for each unit.

**Response** - In Maine of the 160 units in the sample only one unit refused to participate in CATI during initiation (May, June, July) with 3 more refusing to participate in CATI since initiation (August 1985 thru May 1986). The response rate is 97% after 13 months of data collection under CATI.

In Florida of the 306 (323 less the 17 units collected by the National Office) units in the sample, there were 20 units which refused to participate in CATI during initiation with 11 more units refusing to participate in CATI since initiation. The resultant response rate in Florida is 90% after 13 months of data collection under CATI.

**Scheduled vs. Actual Call Dates** - One of the advantages of CATI over the current mail/shuttle system is that there is a greater potential to control the time of data collection. The CES sur-

vey produces three estimates for each month -- two preliminary and a final estimate. However, the first closing estimate is of great importance, since it is one of the earliest economic measures available. To be included in the first closing estimate, data must be received in the State agency approximately 10 working days following the end of the reference period.

Under the current mail/shuttle environment, first closing estimates are based on data from approximately 45% of the sample. An earlier study of employee records, part of the 1983-1984 All Employee Payroll Project (AEPP), indicated that as many as 90% of the sample actually had the data available by the first closing date.

CATI results for the two states confirm the estimates developed earlier in the AEPP study. On average, 95% of the units were scheduled before first closing and 92% were actually collected. Chart 1 displays these data by month starting in November 1985. The results from the previously conducted AEPP study are provided in the first column.

Because the survey collects data each month it was possible to schedule the call to collect next month's data at the end of each CATI session. This insured that the contact date was convenient for the respondent and that the data would be available.

Percents of units scheduled and called are above the average when the first closing dates are later than normal (e.g., November and May) and below average when the first closing dates are earlier than normal (e.g., December and April). December results appear to be atypical and reflect collection and processing delays caused by Christmas and New Year holidays.

**Number of Calls Required** - The CATI instrument monitored the number of calls made during the collection period and recorded reasons why data were not collected. As shown in Chart 2, over half of the respondents had the data available on the first call. An additional 30 percent reported data on the second call. By the third contact over 90 percent of the respondents had reported. The primary reasons for more than one phone call are; phone was busy, respondent was busy, or respondent has not yet prepared the report.

Maine tended to have somewhat higher response rates after each call than Florida. Most of this difference appears to be the result of fewer "no answer or busy signals" in Maine. Once this group is excluded, the average number of calls is virtually the same for both states--1.5 calls per unit.

**Length of Contact** - Chart 3 shows the average telephone interview time and time spent on each unit by month of collection for Maine and Florida. Interviewer variability and larger number of no answer or busy calls are likely explanations why the interview time is higher in Florida. The AEPP results for interview time are provided in column 1 of Chart 3.

Long distance charges were tabulated in Maine from telephone billing statements. The average long distance charge per firm stabilized to approximately $.50 per firm after initiation.

**Training** - The interviewer training consisted of two 2½ days sessions. In the first session the interviewers were taught how the PC's operated, basic CATI commands, and how to conduct CATI interviews. Also the interviewers were given a CATI operations manual. The manual provided general information about CATI, the CES survey, procedures for conducting CATI interviews, and managing survey operations. The interviewers in our study had no prior exposure to personal computers. Following this training, the interviewers had an opportunity to practice with the instrument for about a month. The interviewers then received 2½ days of additional training. The additional training focused on how to manage survey operations. We found that: (1) 5 days of training are sufficient for persons who had no prior exposure to computers, (2) mock interviews should be a major component of the training, (3) initial observation of an interviewer's interviewing techniques is important, and (4) interviewers felt very comfortable conducting interviews after the first month of collection.

**Hardware/Software Performance** - The overall performance of hardware and software were good. We experienced some problems with the disk drives, but they were easily replaced. Also, there were several instances, in an early stage of the study, where the operating system supporting the Berkeley software "crashed" and the software needed to be reloaded. We anticipated these problems and developed procedures for frequent backing up of data and hence no data were lost. A more automated back-up of data is recommended. Most problems were related to human errors such as forgetting a step during a sequence of commands. A full production system should streamline the management functions, both to reduce the overall time spent on these operations and the potential for system problems.

Over the course of the study numerous changes and enhancements were made to the system based on weekly feedback from the States. The Berkeley System proved to be sufficiently flexible to make changes without disturbing collection.

**Response Analysis Survey Results** - The Response Analysis Survey (RAS) profiled and provided a basis for controlling the major sources of response error affecting the survey estimates. A similar RAS survey (also part of the AEPP) was conducted by personal visit during 1983 and 1984. Results for the two surveys were similar, although a direct comparison is difficult. The earlier study included a different set of data items, although total employment and women worker employment were included in both surveys. The earlier RAS study was used as part of a personal visit initiation of new respondents to the CES survey, while the current RAS surveyed existing CES reporters who had been shifted to CATI.

Approximately 70% of all units surveyed needed to make an adjustment to at least one data item in order to be consistent with survey definitions. Respondents agreed to make approximately two-thirds of the total adjustments necessary in subsequent months. Fortunately, most of the adjustments which could not be made would have minimal impact on the reported data. The most common adjustments that needed to be made were:

- include vacation pay and hours in the proper pay period
- subtract nonregular bonuses from payroll
- add in employees who were on vacation for entire pay period
- subtract retroactive pay from payroll
- add in overtime pay to payroll
- add in commission pay to payroll

The results from this study as well as the previous study indicate that there needs to be specific instructions to the respondent on how to adjust their payroll data to survey definitions.

The length of time to conduct the Response Analysis Survey was approximately 12 minutes in Maine and 15 minutes in Florida, on average, and the average number of calls to collect the data was 1.2. Appointments were made during monthly CES collection for the Response Analysis Survey. Therefore, respondents were usually available when called.

**Personal Visit Reinterview Survey** - A small (80 unit) subsample was selected for a personal visit (PV) reinterview. The goal of the reinterview was to determine the accuracy of the telephone CATI RAS versus a full Personal Visit RAS. In the PV, the respondent was asked the same questions as in the original telephone interview. The interview was conducted using a lap-held micro computer. The personal visit interview allowed interviewers to review the company's payroll summaries and provided more time for the interviewer to probe. For the most part, the same person performed both interviews. Following the interview, the computer produced a listing of required adjustments. This listing was compared with the adjustments obtained from the initial telephone interview, and differences were then resolved with the respondent. While there was reluctance on the part of respondents to participate in this additional interview, the refusal rate was less than 10%.

There were some differences detected during the personal interview program, however, most of the differences were minor or related to situations which might not arise each pay period. None of the differences would have appreciably changed the monthly report. Thus it appeared that the telephone RAS was performing similar to a full Personal Visit RAS.

In summary, the telephone RAS appears to be an effective tool for controlling respondent error in the CES survey. Most firms were willing and able to make adjustments to the data to make the figures more compatible with BLS definitions. The telephone interview yields essentially the same results as a face to face personal interview.

In conducting the personal visits, the GRID CASE 2 lap-held computer performed quite well. The respondents were not advised ahead of time that the interview would be conducted using a computer. In general, the novelty of the computer appeared to help start the interview on a positive note. The one refusal which occured on site did not appear related to the computer. The average length of the personal visit was about 25 minutes. Despite considerable travel and handling, no hardware problems with the computer were experienced. As many as four interviews were conducted in a day on a single battery. (A second backup battery and a plug in AC adapter were also carried at all times).

Two draw backs to the hardware were the difficulty in reading the screen under certain lighting conditions, and the capacity of the disk storage device. Both of these problems are being eliminated with the recent proliferation of new and improved lap-held computers.

## CONCLUSIONS

Reviewing the project objectives outlined in the introduction section and based on data obtained from the CATI Collection Methodology Project through May, 1986 the following conclu-

sions are offered:

- The vast majority (95%+) of current CES reporters can be converted to CATI. However, it is critical that detailed procedures be developed and adhered to in order to convert and retain nearly all current reporters. The only group of reporters which may be a problem are multi-reporters, most of which were out of scope of the project.
- Attrition rates after one year of CATI collection are 2% in Maine and 3% in Florida, compared to 12-15% with mail shuttle.
- In order to be used in the first closing estimates, data must be collected and processed within 2 weeks of the reference period. CATI can improve the timeliness of CES reports considerably. First closing response rates of about 90% can be expected under CATI, compared to 45% with mail shuttle.
- The average number of contacts to obtain the monthly data is about 1.8 including busy signals and no answers, and about 1.5 excluding busy signals and no answers.
- The total time per firm can likely be reduced to under 5 minutes with appropriate procedures, with the actual telephone interview time about 3 minutes per firm on average. The long distance charge after the initial month of CATI collection is approximately $.50 per firm.
- Major components of response error can be controlled by conducting CATI RAS interviews in order to identify deviations from survey definitions and establish exact reporting requirements. It appears that RAS information can be obtained by telephone for most CES survey reporters.
- The consistency and reasonableness of the reported data can be controlled by detailed online range, internal consistency and longitudinal editing, along with probing edit resolution questions.

The CATI Collection Methodology Project is still in progress in both states. A sample of CES reporters will be given the opportunity to report their data via touch tone phone beginning this fall. Each reporter will be in essence, developing, keypunching and verifying their own data.

**REFERENCES:**

Lillian H. Madow, "An Error Profile: Employment as Measured by the CES Program", ASA Proceedings of the Social Statistics Section, 1977, p. 33-34.

Richard J. Rosen and John B. Farrell, "Collection of New Data Types in the Current Employment Statistics Program", ASA Proceedings of the Business and Economic Statistics Section, 1986.

Stuart Scott, "Availability of Employee Hours Data", ASA Proceedings of the Survey Research Methods Section, 1983, p. 461-465.

Carol M. Utter and Richard J. Rosen, "Employment Records and Recordkeeping Practices of the BLS790 Sample Respondents", ASA Proceedings of the Business and Economic Statistics Section, 1983.

George S. Werking and Alan R. Tupek, "Controlling Response Error in the Current Employment Statistics Survey", ASA Proceedings of the Survey Research Methods Section, 1984, p. 658-663.

Chart 1. **Percent of Units With 1st Scheduled Call and Data Collected Before the First Closing Date for Florida and Maine Combined**

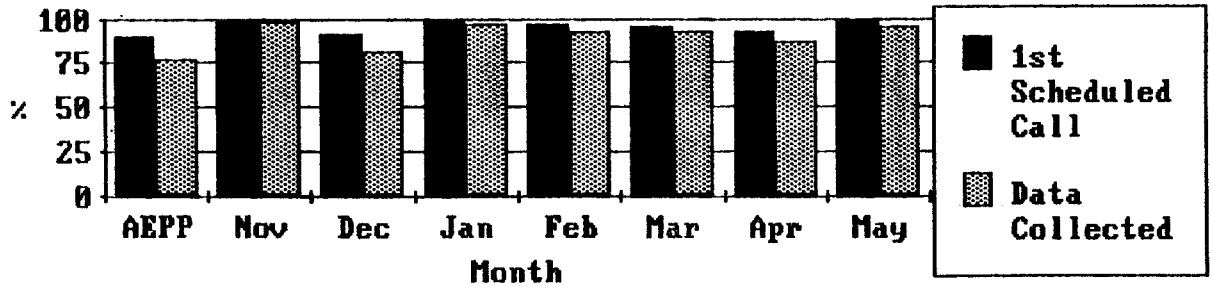


Chart 2. **Percent of Completed Interviews After 1, 2, and 3 Calls**

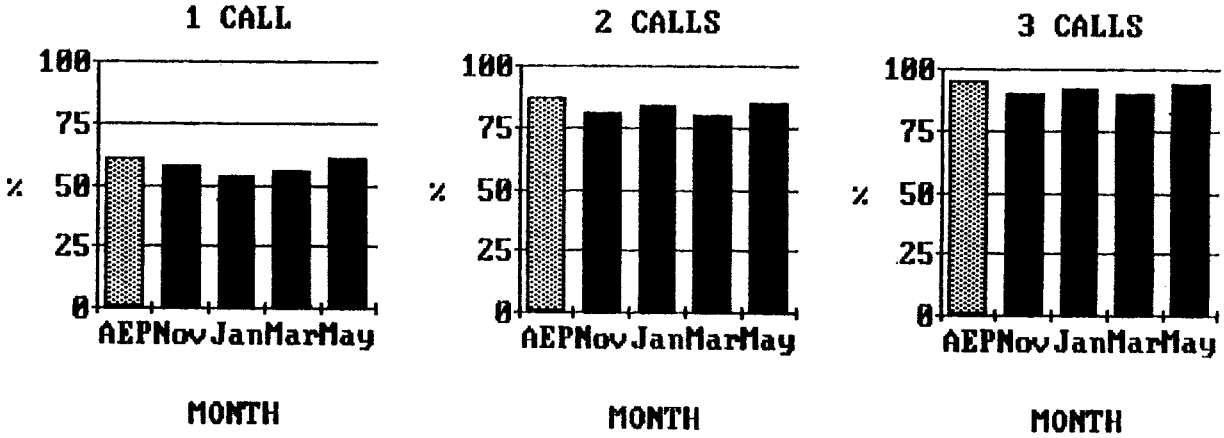


Chart 3.

**Average Telephone Interview Time by Month of Collection for Florida and Maine**