Selecting and Monitoring the Workload for the 2010 Coverage Followup Operation

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Abstract

The 2010 Coverage Followup (CFU) operation was designed to make sure everyone was counted once, only once, and in the right place in the census. The CFU was a computer-assisted telephone interview in which we re-contacted households if there was an indication that the initial household count was not right, either because someone was missing from the roster or because someone was counted erroneously. Research this decade indicated that these followup interviews could be conducted with approximately 19 million households. Based on budget and time constraints, the workload was prioritized and the CFU operation contacted just under 7.4 million households as part of the 2010 Census. Calls were made from 11 call centers spread across the U.S. with a centralized dialer that could route cases to any available interviewer at any call center. Each center had its own management structure with the overall program monitored and coordinated centrally.

This paper discusses how we determined which households had potential coverage error, the prioritization of the workload for this operation, and how a workload selected on a flow basis was managed and monitored. It also discusses how the program was implemented, the challenges associated with developing and managing a one-time survey of this size, and lessons that were learned.

Key Words: 2010 Census, within household coverage, workload management

1. Background

1.1 2000 Census

The 2010 Census Coverage Followup operation was a within-household coverage improvement operation, designed to ensure that everyone was counted once, only once, and in the right place in the census. A similar operation was conducted during the 2000 Census, called the Coverage Edit Followup operation. During this operation in 2000, phone calls were made to households who had completed a census form which indicated that additional clarification was needed. Large households (those with more than six people) were called to collect data for the additional household members because the original form did not have sufficient space on the original form to capture this information. Additionally, households with a discrepancy between the reported population count and the number of people on the form with demographic information were called to clarify the household count.

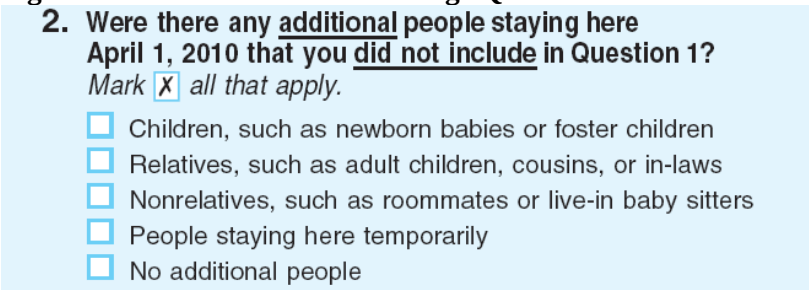
[1] Disclaimer: Any views expressed are those of the author and not necessarily those of the U.S. Census Bureau.

1.2 Mid-Decade Research

Between the 2000 Census and the 2010 Census research was conducted on additional ways to identify households with potential within-household coverage issues. This research included the use of an undercount coverage question on the initial census form, the inclusion of an overcount coverage question on the initial census form, the use of administrative records to flag households with someone potentially missing, and the use of computer matching to identify people counted in more than one place.

The undercount coverage question was asked once at the household-level, immediately after the population count question. Categories were used to help cue respondents to identify someone who may have been omitted in the population count. See Figure 1 for the 2010 question wording that was ultimately developed as a result of the mid-decade research.

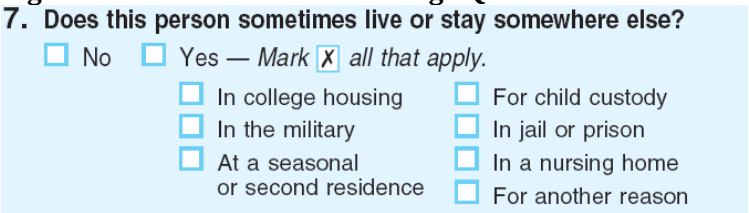
Figure 1: 2010 Undercount Coverage Question



Source: 2010 Census Mailback Questionnaire

The overcount coverage question was asked at the person level. Categories, again, were used to help cue respondents to identify a situation that may have caused the person to be counted elsewhere. See Figure 2 for the 2010 question wording that was also ultimately developed as a result of the mid-decade research.

Figure 2: 2010 Overcount Coverage Question



Source: 2010 Census Mailback Questionnaire

The Census Bureau also researched the use of administrative records by matching them using a computer algorithm to people enumerated in the census. If at least one person in a housing unit matched between the census and the administrative record but at least one person was included in the administrative record but not in the census, the census return was identified as potentially missing someone. Because the focus was on improving within-household coverage issues, ensuring that at least one person matched eliminated followup on whole-household movers. A probability of a household having a missed person was determined by the algorithm and a cut-off threshhold was set to determine

which of the identified households would be included in the Coverage Followup operation.

Finally, all census returns were computer matched against all other census returns to identify duplicated people. Characteristics such as first name, last name, date of birth, and phone number were used to identify the duplicated people. The geographical distance between the matches was also taken into consideration when researching how best to resolve the duplication. Some duplicated people are believed to be caused by housing unit issues, such as a housing unit being listed twice on the census address list and then receiving and completing two census forms. Other duplicated people are believed to be caused by living situations, such as attending college or having a vacation home. In these situations the person lives some amount of time at two different addresses and therefore may be counted at both places. Living situation cases were determined to be best resolved through the Coverage Followup operation.

1.3 Operational Overview

The management of the 2010 Coverage Followup (CFU) operation was contracted out as part of the Decennial Response Integration System contract. Calls were made from eleven call centers spread across the U.S. with a centralized dialer that could route cases to any available interviewer at any call center. Each call center had its own management structure with the overall program monitored and coordinated centrally. The CFU operation started April 11, 2010 and concluded on August 14, 2010.

2. Determining Who to Call

2.1 Coverage Followup Workload Estimates

Overall, we estimated that if we followed-up on all of the types of cases that were researched, including those cases included in the 2000 Census, we could call just over 19 million housing units. Table 1 shows the estimated 2010 Coverage Followup workload for each case type. These estimates were based on mid-decade research, and as such are subject to error.

Table 1. 2010 CFU Workload Estimate

Case Type	Workload Estimate
Large Households	1,200,000
Count Discrepancies	2,212,586
Undercount Question Total	3,277,622
Undercount Question - Children	546,613
Undercount Question - Relatives	1,132,819
Undercount Question - Nonrelatives	191,616
Undercount Question – Temporary	1,005,394
Undercount Question – Other	2,061
Undercount Question - Multiple categories marked	399,119
Overcount Question Total	9,192,918
Overcount Question – College	1,076,971
Overcount Question – Military	280,685
Overcount Question – Seasonal	2,624,929
Overcount Question – Custody	1,473,417
Overcount Question – Jail	105,476
Overcount - Nursing Home	80,205
Overcount Question - Yes Only	493,471
Overcount Question – Other	2,125,771
Overcount Question - Multiple People in different categories	647,493
Overcount Question - More than one reason for a person	284,500
Administrative Records	27,097
CFU Duplicates Total	3,123,941
CFU Duplicates - Within County	1,741,386
CFU Duplicates - Within State	791,539
CFU Duplicates - Within the U.S.	591,016
Total	**19,034,164**

Source: Poehler, 2010.

These estimates were generating by taking into account the estimated number of housing units in the 2010 Census, the assumed mailback response rate, and selection rates from mid-decade CFU tests. The estimates were subject to several assumptions and limitations related to the reliability of the estimates and the validity of drawing conclusions about mid-decade geographical tests to the national level. Despite these limitations, these estimates represented the best known information about the different case types at the start of the operation.

2.2 Followup Capacity Determination

The size of the 2010 Coverage Followup operation was constrained by budget as well as available infrastructure in existing call centers and network capacity. Several modeling exercises were conducted to determine capacity. First, the call center staff modeled the expected productivity of interviewers. This model accounted for completed cases per paid

interviewer hour, average handle time of a case, staff schedule adherence, and quality monitoring, among other variables. Infrastructure was also evaluated by looking at how many call centers and staff were available to potentially handle the operation. There was an initial concern that with call center operations increasingly moving overseas, which cannot be used for the census, that there may be some constraints on capacity. Network capacity was evaluated for the volume of data flow.

This analysis led to the conclusion that we believed we could follow up with approximately eight million households within the given budget and time constraints. In contrast, the Census 2000 followup operation included just over 2.5 million households.

2.3 Prioritization of Cases

In order to prioritize the cases for inclusion in the CFU operation, two rules were used to guide a decision. The first rule was to maximize the number of corrections that could be made. A "cost per roster change" statistic was used to rank the case types. A roster change is the sum of the number of people added to the initial household roster plus the number of people deleted from the initial household roster. The results of mid-decade testing provided estimates for the number of roster changes. The cost per roster change was calculated as follows:

$$\frac{Cost\ per\ Case * Number\ of\ Cases}{Number\ of\ Roster\ Changes}$$

The second rule stipulated that once we started to interview cases of a specific type, the entire workload of that same case type had to be attempted in the followup operation. For example, if we decided to call the Overcount Question – College cases, there had to be enough capacity and time to attempt all of the cases that fell in that category.

2.4 Cases included in the 2010 Census Coverage Followup

Based on the cost-per-roster-change statistic, the following cases were ultimately determined to be included in the CFU operation:

- Large Households,
- Count Discrepancies,
- Undercount Coverage Question cases where Relatives or Temporary was marked,
- Overcount Coverage Question cases where College, Military, Jail/Prison, or Nursing Home was marked or there were multiple reasons within a household marked, and
- Administrative Records cases (above an established probability).

We also sampled the other cases for evaluation purposes.

3. Capacity Management

3.1 Capacity Management Challenges

Because the CFU workload was selected as returns were received, there was no way to know the exact workload at the start of the CFU operation. As the forms were received,

they were evaluated to determine if they met one of the criteria for followup. For example, if a mail return was received and it indicated that there were thirteen people who lived there, it would have been flagged for followup as a large household case. This selection process occurred roughly every week from mid-March through July 2010. During mid-decade tests, it was determined that the selection rates for mailback forms were much higher than for Nonresponse Followup (NRFU) forms. This is likely because NRFU interviewers were trained how to use the NRFU form, were able to handle large households through the use of continuation forms, and were able to answer respondent questions and resolve who to count in the household while at the door. Because the selection rates were different for these two types of returns, the CFU operation size was also heavily dependent on the mailback response rate in the census. Case selection rates also varied by week and by type of case and estimates were based on mid-decade tests.

Additionally, while it was determined that the capacity for CFU was eight million cases, there was flexibility in that number as well. If any of the assumptions used in modeling interviewer productivity were different, then the capacity of the call center could either be higher or lower.

3.2 Contingency Planning and Management

Acknowledging there was risk in the ultimate number of cases that could be included in the 2010 CFU operation, a contingency plan was put in place. If the operation was more productive that expected or selection rates were lower than predicted, three additional case types were to be made available for interviewing. These case types were Undercount Coverage Question cases with Children marked, Undercount Coverage Question cases with Nonrelatives marked, and Overcount Coverage Question cases where an individual marked multiple categories.

In general, the approach to managing the workload challenges was to hold lower priority case types until there was a clear idea if the workload and productivity projections were accurate. This meant that case types were gradually released over the course of the operation. At the beginning of operations, we started with the first two case types being called (Count Discrepancies and Large Households) and as the weeks progressed we released additional case types. We also conducted weekly re-forecasting based on the actual productivity measures from the call centers and the case selection rates. Once we confirmed the estimates or saw a new trend develop, the model was re-projected as necessary.

As a result of our ongoing observations we recommended changes to the operation to manage the work. Changes that were considered and executed at various times during the operation included releasing additional case types, expanding or reducing labor hours, and modifying dialer priorities and rules, such as giving new cases a higher priority. Interviewer behaviour was also monitored and coached, including time on the phone in comparison to idle time, schedule adherence, and average time spent on a case.

4. Results and Conclusions

4.1 Final Workload

We had projected that the workload could have been 15 percent higher than the 8 million cases included in the baseline, if we had included the contingency cases. However, the actual workload was eight percent below the plan at 7.37 million cases, including the contingency cases. For roughly the first two months of the operation, it appeared that the selection rates were matching the estimates from the mid-decade tests and that the workload was on target. Further investigation showed, however, that data capture of the paper returns was proceeding faster than anticipated, masking a low selection rate. So, we made the decision to include all three contingency case types. We discussed sending additional case types during the operation, but this was ultimately deemed too risky to implement. Instead, we increased the sample size for the evaluation cases to maximize what could be learned through the operation.

4.2 Productivity

While the call centers stayed on target in many ways, there were several pressures on productivity. There was higher than expected attrition among call center staff. This may have been a result of the call center staff having much more experience working inbound and hotline-type of operations rather than a primarily outbound operation. To combat this higher attrition rate, the call centers implemented an aggressive new hire initiative and staff retention incentive plans. Another pressure on productivity was an 80 percent higher demand for Spanish-language support than predicted. A rapid expansion of the Spanish-speaking interviewers was implemented in July to accommodate the demand.

We also monitored the completed cases per labor hour rate throughout the operation. A completed case was defined as one in which a successful interview was conducted (all essential questions were answered by the respondent). In reviewing the completed cases per labor hour rates as the operation was progressing, at first productivity rates looked very good, even higher than expected. In the middle of the operation we forecasted that we could handle many more cases than originally thought. However, it turned out that this high rate was due to a continuous stream of new cases, since case selection was on a flow basis. As the cases aged the completion rate plummeted. Thus, not sending additional case types to CFU was ultimately a good decision.

4.3 Lessons Learned

There were several lessons that were learned over the course of the operation. First, it is difficult to manage cases on a flow basis. We need to continue to improve our monitoring of this type of selection and account for more variables and influence on the case selection. We also noticed that the release of case types over time resulted in unique interviewing situations that the interviewers were not always prepared for. For example, when we started dialing the undercount coverage question cases, interviewers increasingly encountered respondents who wanted to add someone to the household roster. While operationally this was expected, we did sometimes need to provide refresher training to interviewers to prepare them better.

Another lesson learned related to the use of a progressive dialer. The progressive dialer required that an interviewer was available to take the call in order to dial the case, whereas, the call center industry is much more used to a predictive dialer which tries to anticipate when people will be home relative to the amount of interviewers available. The use of a progressive dialer was an attempt to avoid dead-air - which would allow

respondents to hang up - and ensured that if we made a call there would always be someone available to handle it. However, this approach required a gross amount of overstaffing which may have reduced productivity rates. The Census Bureau will have to consider these pros and cons for future operations and then test the options.

4.4 Successes

Despite the challenges that we faced, the program was successful. The capacity management plan allowed for open lines of communication between the call center staff, contract managers, and the Census Bureau. The release of new case types over time was a good plan for mitigating the risk of an unknown workload size and operational changes were implemented in a way to maximize the operations success. We were successfully able to attempt to fix the coverage in the 2010 Census of over seven million households and thus maximize the number of corrections that could be made. Ultimately, the operation was concluded with a 66 percent completion rate of those attempted.

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