SAMPLE EXPANSION PLANS FOR THE CURRENT POPULATION SURVEY

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1. Introduction

The Bureau of Labor Statistics and the Bureau of the Census are planning improvements to the Current Population Survey (CPS) in conjunction with the redesign of the CPS sample following the 1990 Decennial Census. The improvements include a new questionnaire, automation of the collection environment using computer assisted interviews, methods to reduce coverage error for minorities, increased longitudinal use of the CPS data, and an expansion of the CPS sample size (Plewes and Butz 1989). The CPS sample expansion will provide more reliable estimates for States and allow more comprehensive analysis of the components of unemployment and the socioeconomic composition of the labor force. Analysis of special situations affecting distinct groups of States based on industry or minority concentrations or geographic location will be possible with the more reliable estimates. Increasing the reliability of State data will also improve annual estimates of the labor force for rural areas and some metropolitan area estimates.

Plans call for a nearly doubling of the CPS sample size from 55,000 to 105,000 eligible households. The implementation of the CPS sample expansion is expected to be accomplished by extending the collection period to an additional week. Currently, most of the data collection occurs in the week following the reference week of the 12th of the month. The new sample would be an integrated sample designed to produce reliable State and national estimates. National estimates would be based on the portion of the sample collected during the week following the reference week. State estimates would be derived from the entire sample. Implementation of the redesign for the basic CPS sample will occur in 1994. The implementation of the larger sample is planned to begin in 1996, permitting time for further research into estimation and to address concerns with collection of data over a two-week period.

This paper describes some of the options considered for expanding the CPS sample and the reasons for selecting the two-phase approach. We discuss the major design issues in implementing the two-phase approach. We describe efforts to maximize the sample design efficiency despite the two years between implementing the basic sample design and implementing the expanded sample. We also describe efforts to minimize the effects on survey estimates. The effects may occur due to the phase in of the expanded sample and by data collection two weeks following the reference week, resulting in recall bias. We also discuss issues of inconsistency of State and national estimates caused by the use of an expanded sample for State estimates. The final section of the paper discusses other design considerations and provides an overview of sample design research now in progress.

2. Sample Expansion Options

The proposed CPS for the 1990's calls for the sample expansion to provide more reliable data for all 50 States and the District of Columbia. Collection of the data in one week, as is now done, is not operationally possible with the proposed increase in sample. Previous options for redesign involved large scale expansion in work load and, in some cases, more than a doubling of the cost of the survey. These proposals have been considered impractical from the viewpoint of collection and processing resources. Hence, other options are considered. The alternative we have selected retains the 1-week reference period now in use but spreads collection of the data over a 2-week period. We also considered several options involving pooling data from multiple reference weeks to obtain monthly estimates.

Proposals for spreading the CPS sample across the month date back at least to the early 1960's. They are discussed in the Gordon Committee report. The idea of such proposals is to pool data across weeks to produce "monthly" data, rather than "reference week" data. There are various ways to accomplish this. The primary options considered for producing "monthly" data by spreading the sample across the month are provided below.

ALL WEEKS--Each week of the year interviewing would occur using the preceding week as the reference week. Under one option, sets of four or five consecutive weeks represent the months. Alternatively, some type of moving average estimation scheme is possible for monthly estimates.

While providing the best "monthly" data, the all weeks option would likely delay publication of monthly estimates two (in some months, three) weeks beyond the current schedule. In addition, problems of overlap of reference periods into other months would occur more often than in the other options. The 4-(or 5-) week reference period of this option creates the greatest conceptual change from the current 1-week reference period. That change is likely to cause the greatest effect on seasonal factors. In addition, the publication timing and comparability with the payroll employment survey are affected. Also, the sample is spread further than is desirable. It provides fewer sample PSUs and less work load for field staff every week of the year.

THREE WEEKS--Distribute sample across the three weeks centered on the week of the 12th. This option would allow publication a week (or two weeks) earlier than under the 4-(or 5-) week proposal. By centering collection on the week of the 12th, the impact on the seasonal factors due to a reference week change is less than under the all weeks option. Comparability with the payroll survey is better than the all week option, but data can not be released at the same time. There would also be more sample PSUs than with the all week proposal, and there would be a larger sample with a reference week of the 12th.

Using three weeks does not provide full representation of the month, it goes a considerable way in that direction. It would entail some delay in publication relative to the current schedule. There would be some months where the first reference week contained one or two days from the previous month. However, from an operational viewpoint, this option seems optimal, as it would allow us to use the field and CATI staff on CPS for three weeks. It also allows the use of the fourth week of the month for other surveys, reinterview, training, and other necessary functions.

TWO WEEKS--This option is the closest to the two-phase option. Under this option, there are two reference weeks within the month. One is the week of the 12th. The week prior to the 12th can be the second reference week. We would maintain the current publication schedule, but the reference week would fall partially in the previous month in some cases. The impact on seasonal factors would likely be more than the 3- week option, but less than the all week option. A major advantage would be the ability to maintain the same publication schedule for CPS estimates and estimates from the payroll employment survey.

Alternatively, the week following the week of the 12th can be the second reference week. Reference periods are then wholly within the month, and provide data from the middle of the month. Among the alternatives, this proposal is the furthest away from the concept of providing data that are truly representative of the whole month. The advantage, as we discuss in the next section, is elimination of recall bias. However, the conceptual change to a two week reference period could be as disruptive to our data users as the recall bias problem.

All of the above options involve collecting data for more than one reference week. They will likely have some impact on the seasonal patterns and cause a discontinuity in the data series. The week of the 12th is standard for collecting economic data. Changing the CPS reference period would result in inconsistencies. Another primary concern is with the payroll employment survey which has the same reference period, and the same publication schedule. Comparisons are made between data from the CPS and data from the payroll employment series. Inclusion of a reference week beyond the week of the 12th for national estimates would extend the collection period. A delay in the publication date for the current monthly estimates is required. The extent of the delay depends on the option implemented. In general, a delay of one week occurs for each week of collection beyond the present collection period.

We considered three options, but the negatives associated with them led us to discard them in favor of the two-phase option. The primary concerns were: (1) the need to maintain historical consistency, (2) consistency with other series, and (3) publication timing.

3. Major Design Issues

In developing the design for the two-phase expansion of the CPS, four significant design issues have emerged. These are:

- The timing of the sample redesign and selection does not coincide with that for the expansion. Therefore, it is not possible to make both designs maximally efficient.
- With the delayed phase in of the expanded sample there are risks of discontinuities in the series due to both the redesign and with the introduction of the two-phase sample. We classify the issues under the general issue of phase in effects. If both the redesign and the expansion occur jointly, we risk only one discontinuity in the data series.
- Interviewing for a portion of the sample will take place two weeks after the reference week

rather than the usual one week later. Hence, respondents may have different recall patterns depending on the time of the interview. This may result in biases in the data and differential bias by State.

- Sample designated for the first week of interviewing is used to produce national estimates. The combined first and second week sample is used for State estimates. Therefore, it will be possible to produce two national estimates for the same time period. The State estimates from the full sample will not be consistent with the current official monthly national estimate developed from the first week only.

The issues are discussed in greater detail below.

4. The Timing Issue

The current plans are for the implementation of the redesigned CPS in 1994, and later for the implementation of the two-phase expansion, perhaps, in 1996. Since both do not occur at the same time, it is not possible to maximize the efficiency of both simultaneously.

The redesign of the sample in 1994 will involve the restratification of the primary sampling units (PSUs), the reselection of sample PSUs, and the selection of sample housing units within those PSU's from the 1990 Census frame. For maximum efficiency of the design the two-phase sample for 1996 should also involve the same steps. However, it is not cost effective to select new PSUs in 1994, hire interviewers for those PSUs and then two years later reselect the PSUs for the two-phase design. Doing this would result in deleting some of the new PSUs and adding additional PSUs. The hiring and training of interviewers for just a two year period would be very costly. If we are to keep all of the PSUs selected in 1994 in the 1996 design, then there must be some inefficiencies built into both designs. We do have a choice of when the inefficiencies will occur, but not whether they will occur. They can occur either during the 1994 - 1996 period, after the implementation of two phase design, or they can be spread over the entire period. Current plans are to maximize the efficiency of the redesign sample, which starts in 1994. That results in some inefficiencies after implementation of the two-phase design.

A similar situation exists in the selection of the within PSU sample. The sample size within a State for the basic redesign will not match that required of the two-phase design. This is a particular problem in that the two-phase design uses the two week interviewing period. In the eleven largest States, it is not necessary to add sample for the two-phase design. However, after the implementation of the two-phase design, it will be more efficient to interview some cases in these eleven States during the second week. The originally redesigned sample will be interviewed in only one week and form the basis for determining interviewer work loads and PSU sizes. Spreading that work over a two week period in 1996 will result in inefficient interviewer work loads.

The problems described here are a direct result of the decision to separate the two-phase expansion from the redesign. The designs will maximize the efficiency of the system given that split. However, the designs will not be as efficient as would have been possible if it had not been necessary for cost and design reasons to implement the two phase later than the redesign.

5. Phase In Effects

A carefully controlled phase in of the redesigned CPS occurs after each decennial census to minimize effects on the data. We use a statistical procedure to maximize overlap between successive designs to minimize the number of new PSUs and new interviewers needed for the new design.

The introduction of the two-phase design in 1996 contains several features that are different from a normal redesign. Many features increase the risk of affecting the data. There are, however, ways to exert more control of the phase in than is possible with a normal redesign.

As with a redesign, the two-phase expansion will result in new PSUs and new interviewers. The number of new PSU will be greater than that experienced with the regular redesign because of the major expansion of the survey. We expect to reduce the number of new interviewers by designing and selecting the samples for the basic redesign and the sample expansion jointly.

During the phase in of the expansion, there will be some shifts in the interview week. For example during the 1994 to 1996 period the interviews will occur during the current one week period. Some interviews will be shifted to the second week with the phase in of the two-phase sample. There will be concurrent changes in the estimation methodology. Such changes do not normally occur during a sample redesign. We will carefully control these changes in much the same manner as we control the phase in of a redesigned sample.

There is one significant advantage that we have in the phase in of the two-phase sample that does not exist in the regular redesign. During the redesign, we use the sample data in estimation as soon as we introduce the sample into the field.

The only exception is dummy work loads assigned to new interviewers for training. With the two phase expansion, it is not necessary to introduce all the sample into the estimation process concurrent with the introduction of sample into the field. This can be done because the expansion improves the reliability of the estimates. Therefore, it is not necessary to incorporate the improvement into the official estimates as soon as interviewing begins in the field, permitting a greater opportunity to control the phase in, train the interviewers and reduce potential data effects.

6. Delayed Recall

Before a final decision is made on implementing the two-phase approach, we will assess the impact of an interpolated week on response error. Also, we will evaluate potential modifications to the questionnaire in order to minimize any impact.

Work by Perkins and Staff (1969 and 1970) measured the recall bias on estimates of labor force status by comparing current responses for previous months with previous month's actual responses for the same respondent. This work showed that recall bias may be serious for some variables. However, recall bias with one month delay is likely to be much larger than for a one week delay. Work by Bushery and Woltman (1979) showed that for highly correlated month-to month variables, such as labor force status, an extended recall technique was not effective in reducing mean squared error. This study shows the need to explore alternative techniques to reduce recall bias. There will be two parts to the delayed recall project. The first phase will involve laboratory investigations. The second phase will involve a field test. We expect the questionnaire to be essentially the same as the new CPS questionnaire proposed for implementation in January 1994. It may contain modifications which would minimize effects of delayed recall.

A proposal for laboratory work exists. One major limitation is in verifying the information provided by respondents. We will use a self-validation procedure in order to compare the amount of error produced in one week and two week recall. Such a technique can yield hours worked data that deviate very little from information obtained from employer records (Edwards, Levine, & Cohany 1989).

The self-validation interview involves asking detailed questions. The purpose is to reinstate the various events and context of the reference week in the minds of the respondents. Subjects are cued with plausible event categories that may help the respondent recall the current information. For example, when asked for hours worked during the reference week, the subject is told there was a holiday on Monday of that week. Ample time and encouragement to make repeated attempts to retrieve the proper information is given. Further verification of responses is obtained by soliciting proxy reports for each respondent and conducting a reconciliation interview for the self and proxy reports.

The responses given in the CPS interview are compared to the self-validated, proxy-reconciled information. This comparison helps determine the amount of error for respondents interviewed one and two weeks after the reference week. As a result of the initial study, we will determine the potential changes to the questionnaire. With small laboratory samples, precise quantification of response error due to the one week delay in the interview is not feasible.

The field test for delayed recall is scheduled for May 1994 through August 1995. The test will use random digit dialing with interviewing for a control group beginning early during the week after the reference week and interviewing for a test group to start on the second Sunday following the end of the reference week. We recognize limitations of the random digit dialing (RDD) design and the possible effect on the test results. We, therefore, plan to supplement the RDD portion of the sample with a sample of persons without telephones identified from external sources, for instance, the unemployment insurance rolls.

The objective of the field test is to obtain estimates of the effect of recall bias on key characteristics. Direct measures of errors are always difficult to get. Hence, the study will include reinterviews and debriefings of the respondents to obtain indirect measures of recall error. The final decision to proceed with implementation of the expanded sample using the two-phase approach will be based on comparison of recall error to other sources of error in the CPS. If the error due to delayed recall is large relative to the other error, then the expanded sample will not be implemented with a two-phase approach. The alternative now under consideration is implementation of the two-week option described earlier in section 2. This option entails a conceptional change from current practice due to the different reference weeks. The conceptional change will effect the CPS estimates. The effect will be large only when the labor force composition is changing rapidly.

7. Multiple Estimates Issues. In a system that uses one week of interviews for the national esti-

mates and two weeks of interviews for the State estimates, there are multiple opportunities to produces estimates for various characteristics. These estimates need not all be consistent.

The current plans are to designate a national sample for interviewing during the first week. This sample is for production of the official national labor force estimates. During the second week, additional interviewing will occur. Sample from both weeks of interviewing form the basis of the official State estimates.

Such a design permits us to produce national estimates based on the sample designated for the first week and then one week later revise the estimates based on the full sample. The estimates based on the full sample would have a slightly lower variance due to the increased sample size. However, the variance gains would be small and likely not very important for aggregate level national estimates. The bias in the national estimates would likely be larger for the full sample as a result of any delayed recall bias.

An additional problem with revised estimates exists in the context of month-to-month change estimates. With the use of revised estimates, month-to-month change estimates are the difference between preliminary estimate for the current month and revised estimates for the previous month. To the extent that the bias levels are different in the two estimates, the change estimates are also biased. Thus, in the interest of protecting the integrity of the official labor force estimates, we do not plan to issue revised national estimates.

This decision means that the State estimates produced from the full sample will be inconsistent with the official national estimate. From a statistical perspective it is not clear that the most efficient estimator of a total is the sum of the estimates for each component. However, this may be a problem for some data users.

8. Other Design Considerations

The purpose of this section is to provide a brief overview of some of the research on detailed design considerations for the implementation of the two-phase design in 1996. These considerations fall into two broad areas. The first area includes research related to the time delay between the implementation of the redesign and the implementation of the two-phase design. This area includes issues of stratification, PSU, selection, and sample overlap. The second area includes work on the optimum allocation of the sample between the two weeks of interviewing for the two-phase design.

9. Overview of the Sample Designs

The CPS design involves two distinct stages of sampling. First, we cluster geographically the counties in the United States into primary sampling units (PSUs). These PSUs are generally MSAs in the urban areas and usually contain from one to three counties in rural areas. Because the CPS is a State-based design, PSUs do not cross State boundaries. The largest metropolitan areas are always in sample. The remaining areas of the country are grouped into strata within States based on economic variables. Within each stratum, we select one PSU with probability proportionate to size. The second stage of sampling is a systematic selection of a sample of clusters of roughly four housing units within each PSU.

The expansion of the CPS to provide reliable monthly State estimates will require the addition of a State-based supplemental sample. Many States require additional sample to achieve the required reliability. The eleven largest States require no additional sample, since the required reliability will remain the same for these States.

The full two-phase design will be very similar to the current CPS design. The major differences are the increased sample and the spread of the interviewing over the two week period. The stratification will be State-based. The within PSU sample will still be a systematic sample of clusters of four housing units. The national design will be embedded in the two-phase sample. It may or may not use a State-based stratification. The within PSU sample will also be a systematic sample of clusters of four housing units. Research is under way on the means for coordinating the two designs and optimizing the sample allocation between the two designs. There are no plans to change the 4-8-4 rotation system for the CPS sample as a part of the sample expansion.

10. Stratification and PSU Selection Considerations

It will be necessary to develop three separate designs for the two Phase CPS system.

Design 1. The first design is the redesign sample for use from 1994 to 1996. This design will produce National labor force estimates, monthly State estimates for the eleven largest States, and annual State estimates for the remaining 39 States and the District of Columbia.

Design 2. The second design is a national design utilizing the first week of interviewing. This design is a subset of the two-phase design. It will produce national estimates at the current levels of reliability.

It will not produce State level estimates.

Design 3. The third design is the total two-phase design. This design will produce the State level estimates. It will also have the capacity for producing national estimates, but will not be used for that purpose.

We expect that minimum costs and minimization of potential data effects are best achieved by retaining the sample selected for the redesign in 1994 for the two-phase design. There is considerable inefficiency in selecting PSUs and sample units for the redesigned CPS in 1994 and then not using those PSUs and sample in the two-phase design. Thus, we prefer that the redesigned sample in 1994 be a subset of the two phase sample in 1996. Additionally, we want efficient designs for both the redesigned sample from 1994 to 1996 and the two-phase sample introduced after 1996. As we mentioned in the previous section, meeting all criterion simultaneously is not possible. Research is underway to maximize the efficiency of the system. We are studying methods of jointly selecting PSUs for all of the designs. The methods would use controlled selection and guarantee that no PSUs from the redesign be dropped when the two-phase design is implemented. Other design and PSU selection methodologies are also under consideration.

11. Optimum Allocation of the Sample to Week of Interview

A number of efficiency considerations will determine the allocation of the sample to week of interview. Spreading the interviews across the two weeks requires fewer interviewers for the survey. The main impetus for the two-phase design is the expectation that it will help in the hiring of qualified interviewers. From this perspective the best strategy is to spread the sample evenly across the two weeks in all PSUs. Unfortunately the design constraints will not permit this. We cannot assign, for example, half the sample in California to each week. The national reliability requirements would not be met with the data from the first week of interviewing. The research on optimum allocation is addressing these issues.

12. Summary

The expansion of the CPS sample is necessary to continue to meet the needs of our data users into the 21st century. Survey design improvements introduced into the CPS over the years and plans for further improvements in the 1990's continue to reduce nonsampling error in the CPS estimates. Reduction in sampling error is necessary to take advantage of the survey design improvements and provide our users with the ability to assess the labor force changes across States.

The two-phase approach, described in this paper, promotes a solution to implementing the larger sample size. However, there continue to be concerns with this method, especially the effect of delayed recall for State estimates, and the need to explain and control the multiple estimates for the same characteristics using the full and partial samples. Plans are to evaluate the recall problem before a final decision is made on implementation of the two-phase approach. If the problem is serious relative to other sources of error, then one of the alternative approaches, described in the paper, will be selected for implementing the sample expansion.

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