Imputing Across Interviews: Balancing Time Savings with Data Quality

by

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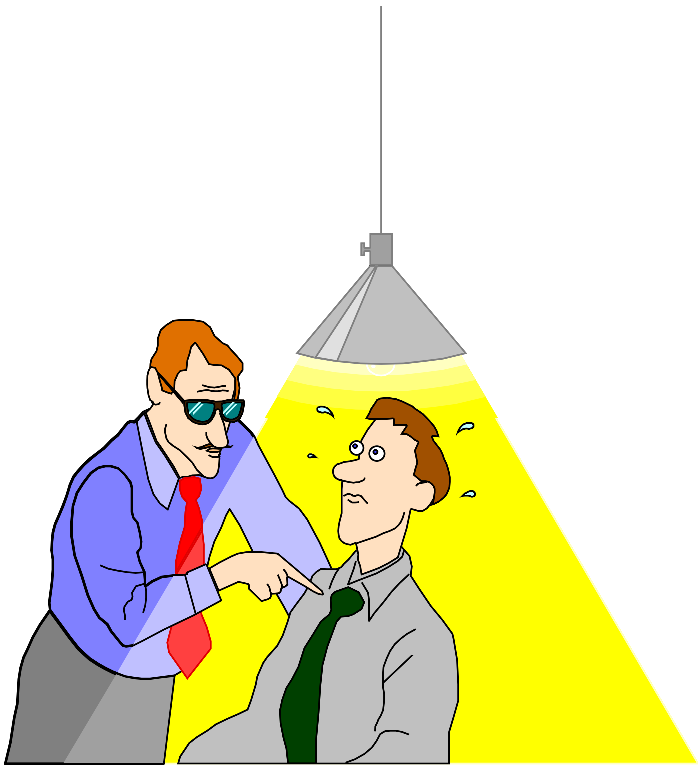
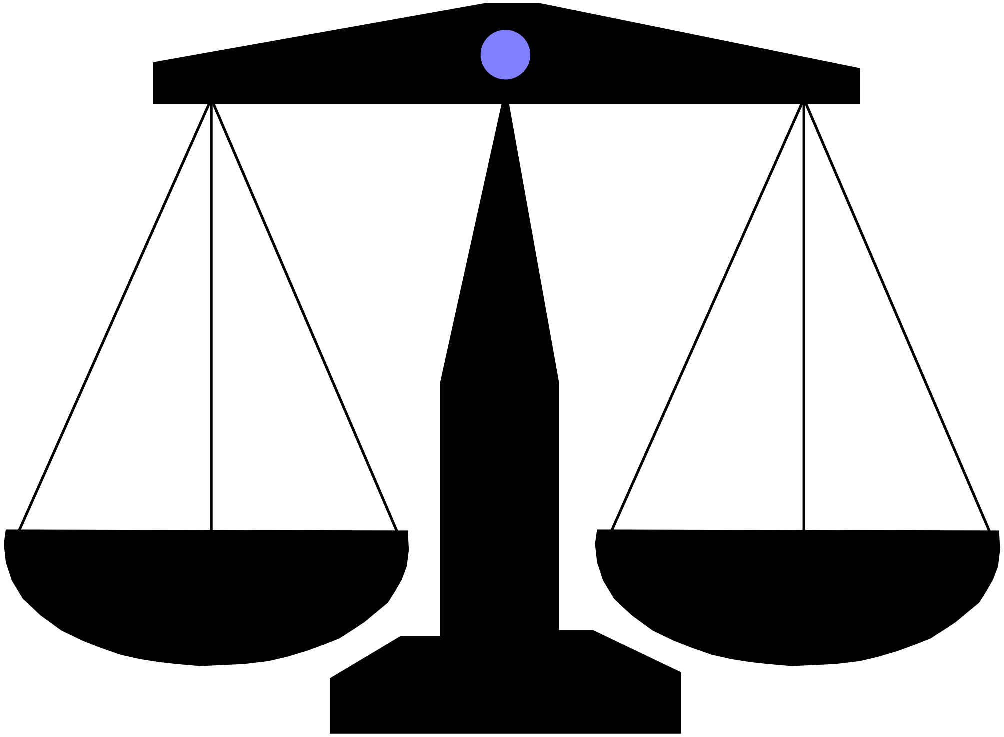
Reducing respondent burden is an important goal…



…In 2011, the average quarterly interview was one hour; 10 percent exceeded 100 minutes.

However, this must be balanced with maintaining high quality of data.



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In 2015, the Bounding Interview will discontinue.

- CONSEQUENCES:
  - Need to add bounding information to current 2nd interview
  - Current 2nd interview time will increase, which was already shown to be a concern
- QUESTION: Can expenditures collected in the (current) 2nd interview be successfully imputed from (current) 3rd, 4th, & 5th interviews to minimize response burden?

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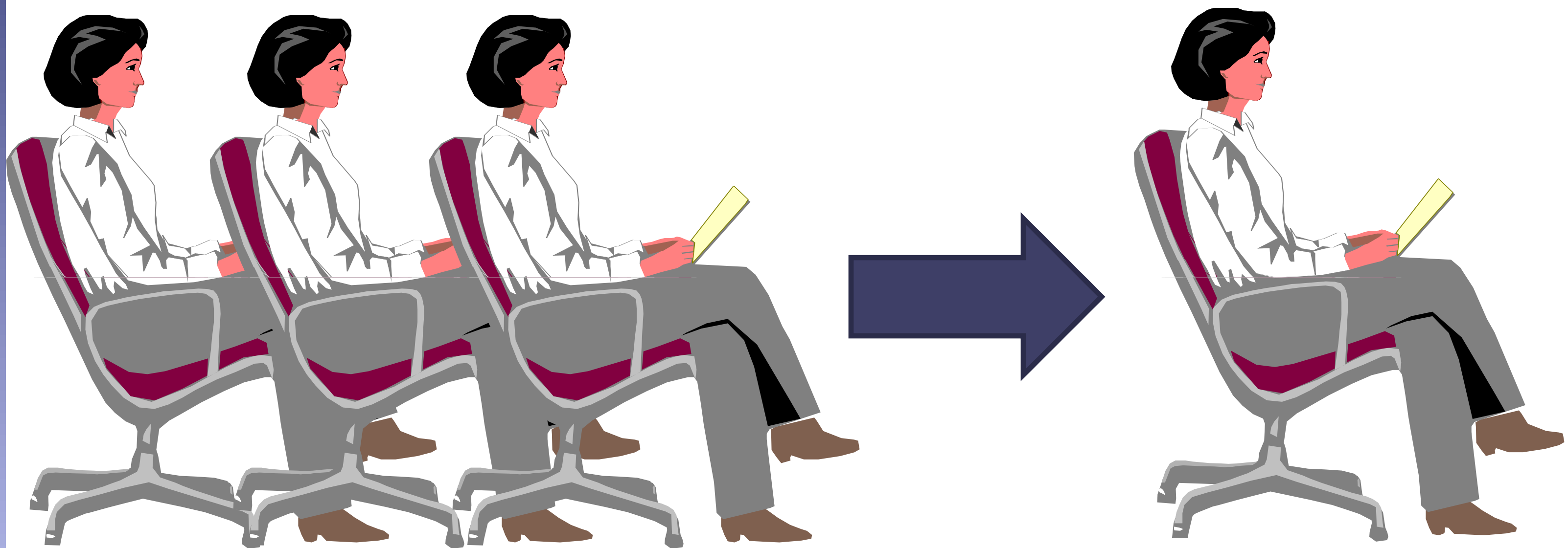
To achieve this, the CE program is investigating the feasibility of imputing results from later interviews to the current second interview.



3rd 4th 5th **2nd**

This presentations includes:

1. The conceptual framework currently being investigated
2. Problems encountered or anticipated
3. A request for comments

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At present, there are three basic categories of expenditure under consideration:

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1. Utilities (Electricity, Natural Gas, Fuel Oil/Other Fuel, Telephone, and Water)

2. Apparel

3. Those for which Interview respondents are asked are about "usual" weekly/monthly expenditures

1. Utilities

Reasons for considering:

- Section 4 is the most time consuming
- Expenditures are expected to occur each month, which makes processing easier (no need to decide in which month to place an expenditure; just allocate across the three)
- Expected to be highly correlated with explanatory variables already collected (housing size, types of appliances, region/State/PSU, urban/rural, city size)

2. Apparel

Reasons for considering:

- Burden reduction.
  - In 2011, 75 percent of consumer units interviewed reported expenditures for apparel and services (Section 9). In these cases:
    - Section 9 accounted on average for 6 percent of total interview time (almost 4 minutes), and increased with family size for consumer units up to 6 members.
    - 25 percent of reporters required more than 4½ minutes to complete the section; 10 percent required over 7½ minutes.
- Many items collected in both surveys are selected from the Diary for integrated publications.

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3. Respondents asked about “usual” weekly/monthly expenditures

- Food at home
- Food away from home (except on trips)
- Alcoholic beverages at home
- Alcoholic beverages away from home (except on trips)

Reasons for considering (GLOBALS):

- In 2011, Section 20 is the second most time-consuming expenditure section
- All food and alcohol items are published from Diary
  - This indicates that quality of collected data is higher in Diary Survey than in Interview Survey.
  - Imputing data for food at home from Diary was investigated, but dropped due to poor quality of imputed results. However, matching from other interviews may produce higher quality estimates.
  - Food expenditures from the Interview Survey are required for supplemental poverty measures, and therefore information must be collected where possible.

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Procedural Concerns and Clarifications:

- "Back Imputation"—that is, using reports from a specific consumer unit's 3rd, 4th, and 5th interviews to impute that consumer unit's 2nd interview is not feasible as it:
  - Causes delays in production (process cannot start until subsequent interviews have been completed;
  - Is still subject to nonresponse. (What happens if the unit participates in the 2nd, but no subsequent, interview?)
- For these reasons, regression using data from ALL consumer units participating in 3rd, 4th, and 5th interviews will be performed. Collection periods will be matched for source data. For example: 3rd, 4th, and 5th interviews from January of a given year will be used to impute 2nd interview values collected in January of that same year.

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The "Yes/No" question will still be asked.

- That is, respondents will be asked whether or not the consumer unit incurred each expenditure, but not how much was spent if the answer is yes.
- This eliminates the need for a two-stage estimation procedure where the first stage predicts whether or not a purchase took place.
- As a result, the estimation process is much easier, and less prone to error, since the first stage is reported, not estimated.

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As noted, expenditures shall be estimated by regression analysis.

- **Hot decking has been considered but rejected.**
  - Currently, hot decking is used when respondents report that an expenditure occurred, but not the amount. The team investigated the possibility of adopting this approach for the larger project.
  - However, the limitations of hot decking are well-documented (e.g., ability to use few predictor variables; effects on variance).
  - The limitations are less problematic for filling in nonresponse blanks, especially when item nonresponse rates are low. But in this case, all expenditures would be imputed.
  - The inability to properly preserve correlations among expenditures and independent variables would be detrimental to microdata users.
- **This means regression will be used.**

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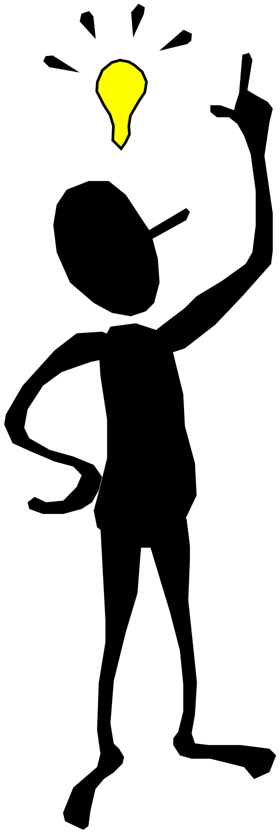
The first item considered is electricity.



Status:

- Regressions in progress
- Models are:
  - The most complicated so far. They include:
    - Standard demographics (age, family size, income)
    - Special variables such as—
      - Number/type of appliances in household, where known
      - Detailed geographic data as described earlier
      - Type of housing (detached, townhome, highrise, dormitory, mobile home, etc.)
  - Currently run separately for homeowners and renters, but may require further breakdown (e.g., housing tenure by region).

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Next up:

Apparel

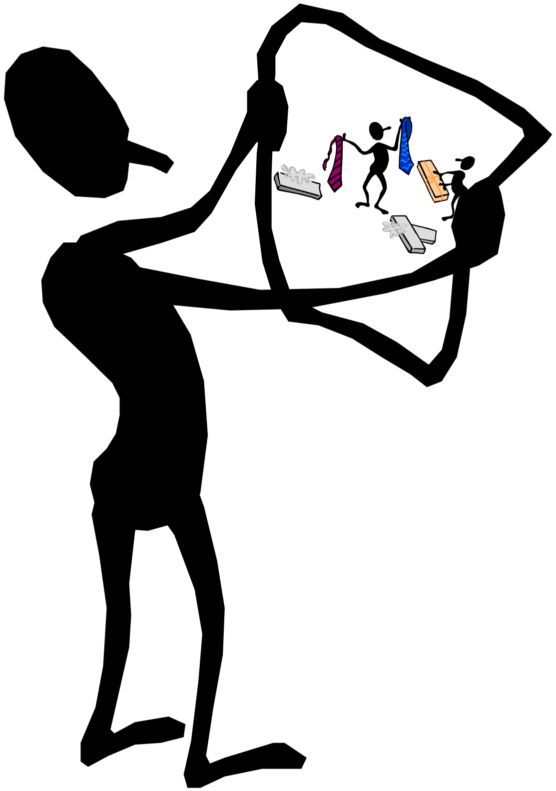
Apparel status

- So far, models require only standard characteristics variables
- However, may need separate models for different family types, etc.

And finally:

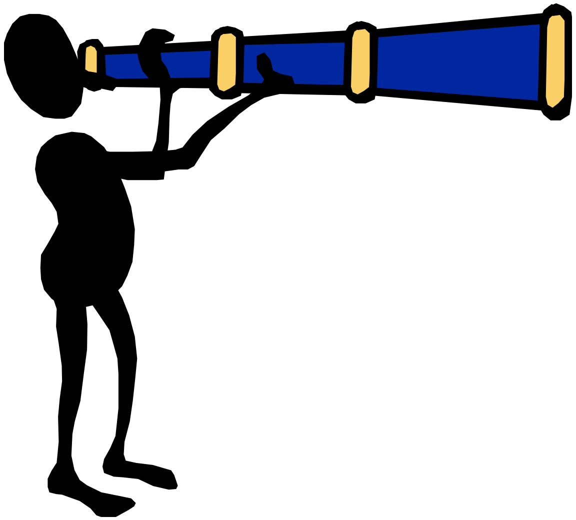
Food and Alcoholic Beverages

Globals status



Models have not yet been constructed, but they are expected to be similar to apparel.

Looking ahead:



General questions

- Quality assessment: Will the imputed values fall within acceptable ranges when subjected to testing?
- Are there qualitative differences in current 3rd, 4th, and 5th interviews (e.g., means or variance) at least when compared to current 2nd interviews for which the models need to account?
- What are the unintended consequences of replacing reported with imputed data?
  - Can/will covariate relationships be preserved (e.g., food at home with apparel)
  - If not, what are the implications for the supplemental poverty measures, and other important uses of the data?

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Technical Questions

- Should single or multiple imputation be used?
- If multiple imputation is used, what is the proper way to use income, which is itself multiply imputed?
  - Use average imputed income for each consumer unit the same way as a non-imputed variable would be used, generating five imputations of the Interview expenditure variable
  - Obtain a regression estimate using the five imputed income values; shock; repeat four times. In this way, 25 regressions yield 5 imputed expenditure values per consumer unit.

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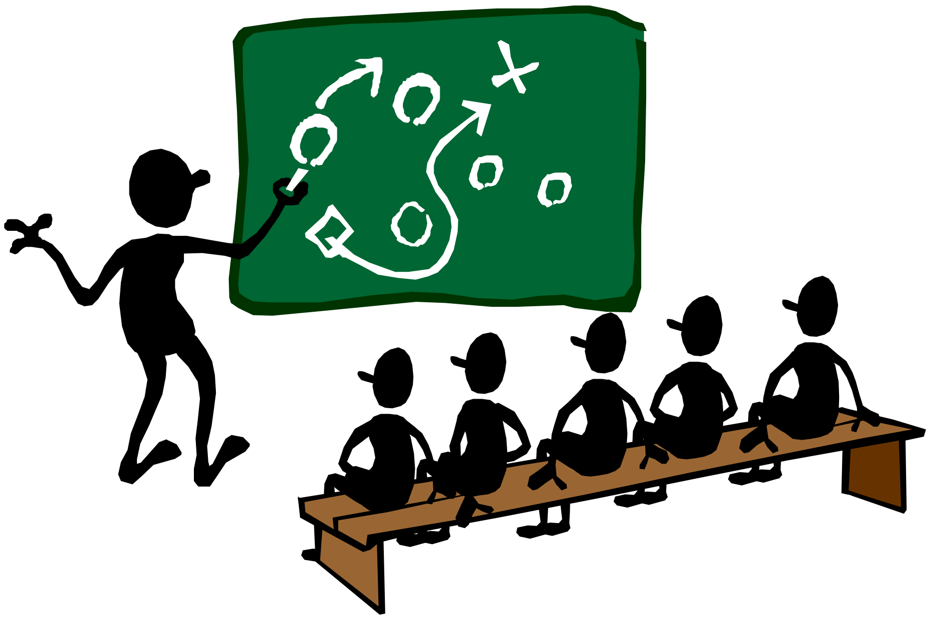
Next Steps:

- Continue refining models and assessing quality of results
- Receive and incorporate comments and suggestions from experts like you(!)
- Prepare an interim report on feasibility (October 2013)

If you have any suggestions, comments, or questions of your own…



…The team looks forward to hearing from you.

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