Integration of Multiple Data Sources to Inform a Responsive Design

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Introduction

How can data from administrative and commercial records be integrated to help improve survey data quality?

Two National Academies reports in 2017 focused on using multiple data sources for federal statistics

1. National Academies of Sciences, Engineering, and Medicine. 2017. *Innovations in Federal Statistics: Combining Data Sources While Protecting Privacy*. Washington, DC: The National Academies Press. https://doi.org/10.17226/24652.
2. National Academies of Sciences, Engineering, and Medicine. 2017. *Federal Statistics, Multiple Data Sources, and Privacy Protection: Next Steps*. Washington, DC: The National Academies Press. https://doi.org/10.17226/24893.

Introduction (cont.)

- Once researchers have identified supplemental data sources, and determined how to link the data with sample members and their survey data, the next question is how to use the extensive set of data productively
- Response unit can be defined using all sources
- Multiple sources can be used to inform decision making during data collection

Options for Defining a Unit Respondent

1. Sample member completing the survey interview under some rule for determining what constitutes ‘complete’

   Data collected from other sources may then be used to fill in any missing values prior to imputation

2. Sample member with sufficient data from any source to be judged complete

   Impute to compensate for missing interview data

Concerns With Defining a Respondent Without an Interview

Fails to address any bias among the interview nonrespondents

Ignores the potential bias that may be due to missing data from other data sources

Ethical and privacy issues because an interview nonrespondent may not know that his/her data are being obtained from administrative sources and has not explicitly given consent to do this

2015-16 National Postsecondary Student Aid Study (NPSAS:16)

Overview

Conducted by the National Center for Education Statistics (NCES)

Collects data on how students and their families pay for postsecondary education

Two-stage sample selection process

- 2,000 institutions
- 122,000 students
- Students sampled on a flow basis over several months

NPSAS:16 – Data Sources

1. Interview
2. Student records from institutions
3. Central Processing System (CPS)
4. National Student Loan Data System (NSLDS)
5. National Student Clearinghouse (NSC)
6. College Board (SAT)
7. ACT
8. Veterans Benefits Administration (VBA)

NPSAS:16 - Respondents

INTERVIEW

- Completed full or abbreviated interview
- Response rate - 66%

STUDY

- Use data from any source
- Data for 3 critical variables
- Data for at least 8 of 15 additional variables
- Response rate – 93%

NPSAS:16 - Imputation

- Impute interview for study members with no interview
- A lot of imputed data
- Conduct item-level nonresponse bias analysis
- No multiple imputation for analysis files

NPSAS:16 – Responsive Design

- Institution and student response rates are primary indicators of data collection success
- Study member nonresponse bias less of a concern with a 93% response rate
- Implemented a two-pronged approach to consider variance reduction

Prongs

Prong 1: Abbreviated Interview

Collecting data needed to be a study member

Prong 2: Abbreviated Interview

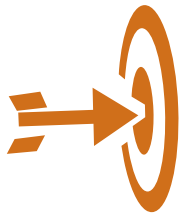
Collecting data to improve data quality for study members who were interview nonrespondents

Prong 1 – Abbreviated Interview

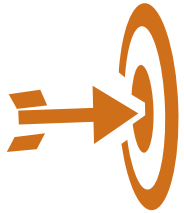
Motivation – collect some interview data for sample members who were ‘close’ to being study members

Abbreviated interview contained only items needed to qualify as a study member

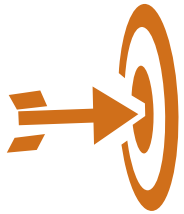
Prong 1 – Case Targeting



Tracked accumulation of variables, from each source, needed for study membership



Interview nonrespondents with at least 6 of the 11 variables needed for study membership were offered abbreviated interview



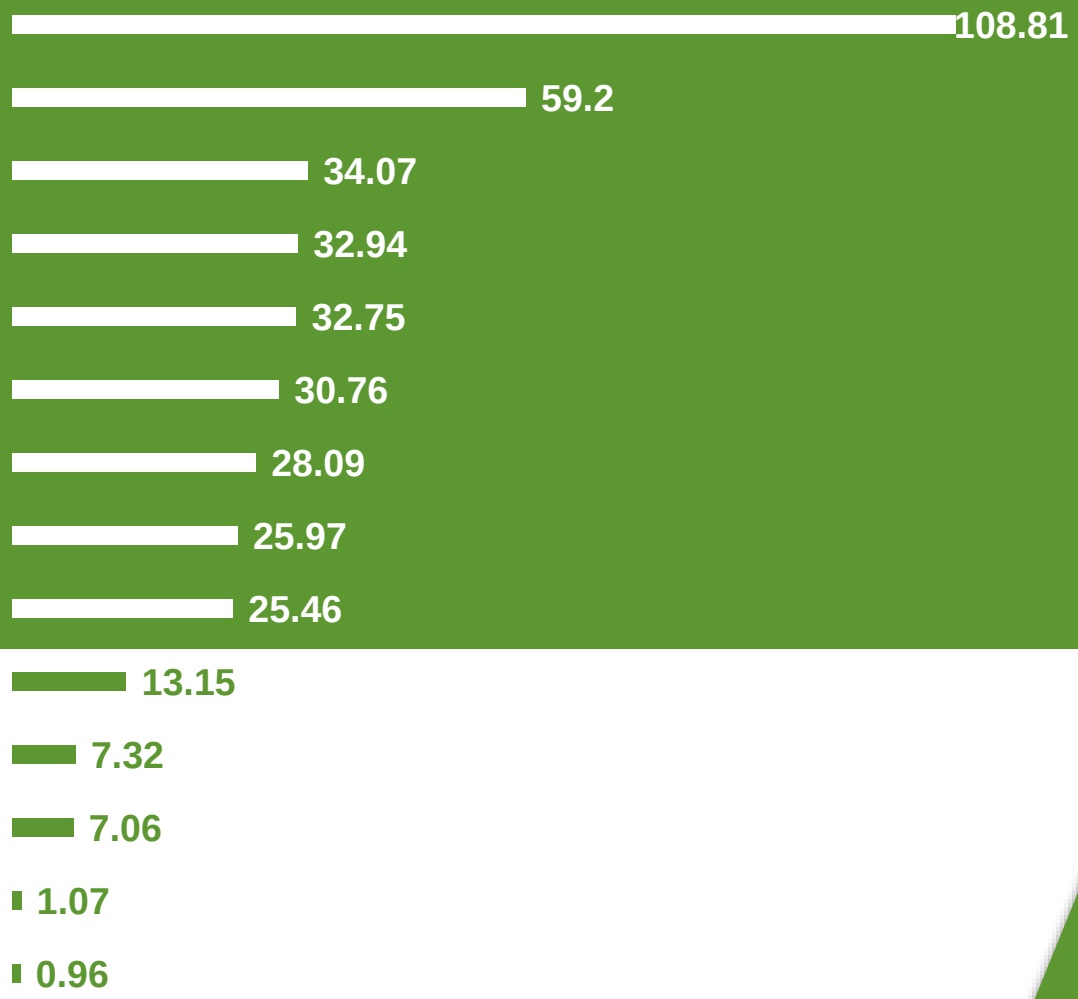
Cases were identified at 4 points in time, based on when they began data collection

Prong 2 – Abbreviated Interview

- Motivation – collect some interview data for study members who were likely to have high imputation variance
- Created a superset of interview-only variables based on analytic importance
- Performed multiple imputation on 14 variables available from previous NPSAS data

Prong 2 – Abbreviated Interview (cont.)

9 of 14 variables had mean RSEs greater than 25%



Prong 2 – Abbreviated Interview (cont.)

9 Other important variables new to NPSAS

9 + 9 =18

Variables included in abbreviated interview

Prong 2 – Multiple Imputation

On the fly during data collection

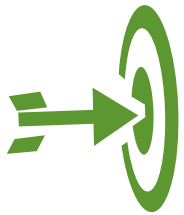
Using raw data

For study members who were interview nonrespondents

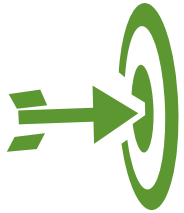
For 15 of 18 variables (3 had imputation issues for a subset of students)

To estimate the extent of variability present if sample member remained interview nonrespondent

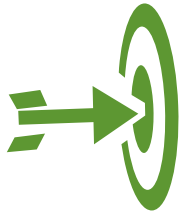
Prong 2 – Case Targeting



Sample members with high variation across 15 imputed items received abbreviated interview



Cases were identified at 3 points in time, based on when they began data collection



Prong 1 cases who completed abbreviated interview were asked to continue with prong 2 abbreviated questionnaire

Conclusions

- Results forthcoming, but promising
- Important to think through issues that will be raised as data from administrative and commercial sources are used more frequently with survey data
- Respondents do not have to be defined based solely on interview data
- Responsive design can focus on improving quality of data instead of, or in addition to, reducing nonresponse bias
- Best approach when using data from multiple sources will vary based on the study

Questions

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