National Center for Education Statistics Adaptive Design Overview

FCSM Conference December 16, 2014
Introduction

• Conceptualization of adaptive design
• Short summary of NCES longitudinal studies testing adaptive design approaches
• Review of recent experiments of adaptive design options for the studies
Introduction

• Adaptive design is a relatively new concept
• “Alteration of sampling and collection approaches during the course of a data collection using real time process and survey data to improve survey cost efficiency and to achieve more precise and less biased estimates.”
Introduction

• Largely driven by declining response rates, costs for improving them, and concern about related data precision and biases

• Adaptive design experiments are numerous in the field

• Primarily focused on boosting overall response rates or cost reduction
Introduction

• Presentation highlights research NCES is doing with longitudinal studies that:
  – Focuses on improving response rates
  – Simultaneously considers bias reduction
  – Can reasonably be assumed to be adaptive to various nonresponse avoidance or conversion strategies
Studies

• Information presented here is drawn from work on NCES longitudinal studies

• Beginning Postsecondary Student Study (BPS)
  – First follow-up fielded this year

• High School Longitudinal Study of 2009 (HSLS:09)
  – 2013 update
Studies

- BPS 12/14 follows students who participated in the National Postsecondary Student Aid Study (NPSAS) in 2011-12
  - NPSAS collects considerable information about students in postsecondary education
  - BPS sample drawn from freshmen in NPSAS
  - Approximately 37,000 students selected for BPS
Studies

• HSLS:09 follows representative sample of 9th graders sampled in the Fall of 2009
• 2013 Update gathered information when most of the sample was transitioning into postsecondary education or work
  – Over 23,000 students participating in HSLS:09
BPS 2014 Example – Use of Field Test

• Adaptive design process began with the field test for the 2014 BPS

• Field test results and NPSAS information used to model response propensities

• Identified 5 groups from lowest (under 40 percent) to highest (over 90 percent) likelihood of response without intervention
Phase 1 – BPS 2014

• Referred to as the calibration study
• Random subsample of 10 percent of the full 37,000 case national sample
• Grouped cases into 5 response propensity groups based on characteristics identified during the field test
• Fielded 7 weeks prior to main sample
Phase 1 – BPS 2014

• Assigned random subsamples of each response group to cash incentive groups defined by $5 increments from $0-50

• Purpose was to identify optimal initial incentive amount for undergraduate students

• Incentives are promised incentives for completing interviews
Calibration Study Response Rates

Response rate by incentive group through 6 weeks of data collection

Weighted Response Rate

Incentive
Phase 2: Full Sample Collection Starts

- Offered $30 the main national BPS sample
  - Response rate was highest for groups 1&2 at $45, but based on small number of responding cases
  - For groups 3 – 5, response rate nominally highest at $45, but not significantly different from amounts of $30 and above
Phase 2

• Phase 2 encompassed the first four weeks of collection with the full sample
• Data available to identify nonrespondents who would contribute most to bias
  – Bias estimated using a set of variables from earlier stage BPS collection – NPSAS and frame information
  – New intervention approach tested with calibration sample
Phase 2

- Crossed information about estimated contribution to bias with response propensity estimate
- Importance score was assigned to nonresponding cases based on bias contribution and response propensity
  - Higher bias and response propensity resulted in higher scores
Conceptual Framework

- Higher bias – lower response
- Lower bias – lower response
- Higher bias – higher response
- Lower bias – higher response
Select 500 cases with the highest importance score

Plot of Bias Likelihood by Response Propensity Score

Bias likelihood by response propensity

Response propensity score

Bias likelihood score

- Targeted cases
- No treatment: Cases below bias likelihood threshold
- No treatment: Cases beyond propensity thresholds
Phase 3 Experiment

• Data from phase 2 used to identify 500 cases with highest importance scores
• 3 treatments were tested
  – $0 additional incentive offer
  – $25 additional incentive offer
  – $45 additional incentive offer
Phase 3: Response Rates for 500
Targeting Study Results

• After a month of data collection during phase 3, analysis indicated
  – $25 not significantly higher than $0
  – $45 significantly higher than $25 and $0
  – $45 led to reduction in bias in the largest number of estimates
Phase 4: Main Sample

- At time of intervention, response rate for main sample about 36%
- Targeted 30% of nonrespondent cases with $45 additional incentive - About 6,420 cases
- Same importance model as used in Calibration Study to select targeted cases
- Monitored response rates and bias in real time
- Data collection just ended so no results just yet
  - Planning a presentation at FEDCasic this spring
High School Longitudinal Study: 2009 – Fall 2013 Update

• Similar adaptive design approach pursued in the HSLS:09 2013 Update study
  – HSLS:09 suggests the results will be promising

• HSLS:09 approach did not control for response propensity, but used the same approach to predicting bias
HSLS:09

- Interventions began after the first 2 phases of the collection
  - Phase 1: self-directed web instrument
  - Phase 2: phone interview followup
- Phases 3-6 involved different monetary incentive interventions
- Last intervention was a reduced-length instrument
HSL:09 – Phase overview

1. 3-week self-administered web period
2. 5-week computer-assisted telephone interview
3. $5 prepay for targeted cases
4. $15 offer for targeted cases
5. $25 offer for targeted cases
6. Expand cases for $5 prepay and/or $25 offer
7. Short survey for remaining cases (last 3 weeks)
HSLS:09 – Percent of cases who took Algebra 1 by respondent group and phase

- Targeted cases
- Other nonrespondents
- Responding cases
- All cases

### Phase 3
- Targeted cases: 68%
- Other nonrespondents: 50%
- Responding cases: 57%
- All cases: 57%

### Phase 4
- Targeted cases: 68%
- Other nonrespondents: 54%
- Responding cases: 52%
- All cases: 57%

### Phase 5
- Targeted cases: 68%
- Other nonrespondents: 56%
- Responding cases: 53%
- All cases: 57%
Interpretation

• The green bar represents the percentage who took algebra 1 as reported in 2009 (study year 1)
• The blue bar represents the percentage who took algebra 1 as reported in 2013
• As adaptive phases progress, the respondent algebra 1 rate more closely approximates known 2009 rate
Considerations

- Flexibility is critical – work closely with OMB to ensure public is able to understand plans
- Approaches here focused on studies with extensive a-priori information for sample
- If possible, study intervention options with subsamples then use for full sample
Followup

• For additional information about the specific studies discussed here, please contact
  – Sarah Crissey (BPS) – sarah.crissey@ed.gov
  – Elise Christopher (HSLS:09) – elise.christopher@ed.gov
  – Chris Chapman (plans for NCES sample surveys) – chris.chapman@ed.gov

• Studies discussed here were done in close cooperation with experts at RTI International
Questions?