Data Management and Analytic Use of Paradata: SIPP-EHC Audit Trails

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Overview

- Introduction to SIPP and EHC
  - Re-engineering of the SIPP
  - Event History Calendar (EHC)
- Making sense of SIPP-EHC audit trails
  - Parallel and sequential retrieval
- Analysis examples using SIPP-EHC audit trails
  - Item nonresponse
  - Answer changes
- More opportunities open up for analytic use of paradata

SIPP and EHC

Introduction to SIPP

- The Survey of Income and Program Participation (SIPP)
  - Nationally representative sample of U.S. households
  - Longitudinal data collection; first SIPP Panel began in 1983
  - Income dynamics; governmental program use; a wide range of information on demographic and socioeconomic contexts
  - One of the premier sources of data for planning, evaluating, and improving government programs
- Re-engineering of SIPP since 2006
  - To reduce costs and respondent burden while not sacrificing data quality and the unique value of SIPP to trace intra-year changes
  - Event History Calendar (EHC) recommended by CNSTAT Panel
  - SIPP-EHC field tests in 2010, 2011, 2012, and 2013 (EHC paper-and-pencil reinterview field test in 2008)

Event History Calendar (EHC)

- Autobiographical memory structure
  - Thematically and temporally structured within and across interrelated life events (Belli, 1998)
- Event History Calendar (EHC)
  - Encourages respondents to use their own life events as retrieval cues to remember other life events
  - Flexible, conversational interviewing method to collect accurate retrospective reports
  - May yield higher quality retrospective reports for certain types of events or more complicated retrieval tasks, when compared to conventional question-list interviewing (Belli & Callegaro, 2009)

Re-engineered SIPP

- EHC on SIPP data quality
  - SIPP-EHC and classic SIPP estimates not substantially different; with very few exceptions, agreement between survey and admin data is higher for SIPP-EHC (U.S. Census Bureau, 2013)
- Innovations in SIPP 2014 Panel
  - Annual data collection
  - Linkage of administrative records to the SIPP
  - Use of Event History Calendar (EHC) with dependent data
  - Integration of questions that used to be asked in add-on Topical Modules into regular annual interviews
  - Collection of various types of paradata (e.g., audit trails, CARI audio recordings and screenshots, contact history, neighborhood observation, FR Certification Test, FR debriefing)

Research Questions

1. Do paradata provide empirical evidence that EHC interviewing does exploit autobiographical memory structure?

2. Is the way in which respondents navigate their memory predictive of the quality for retrospective reports?

3. What might be future directions for analytic use of paradata?

Making Sense of SIPP-EHC Audit Trails

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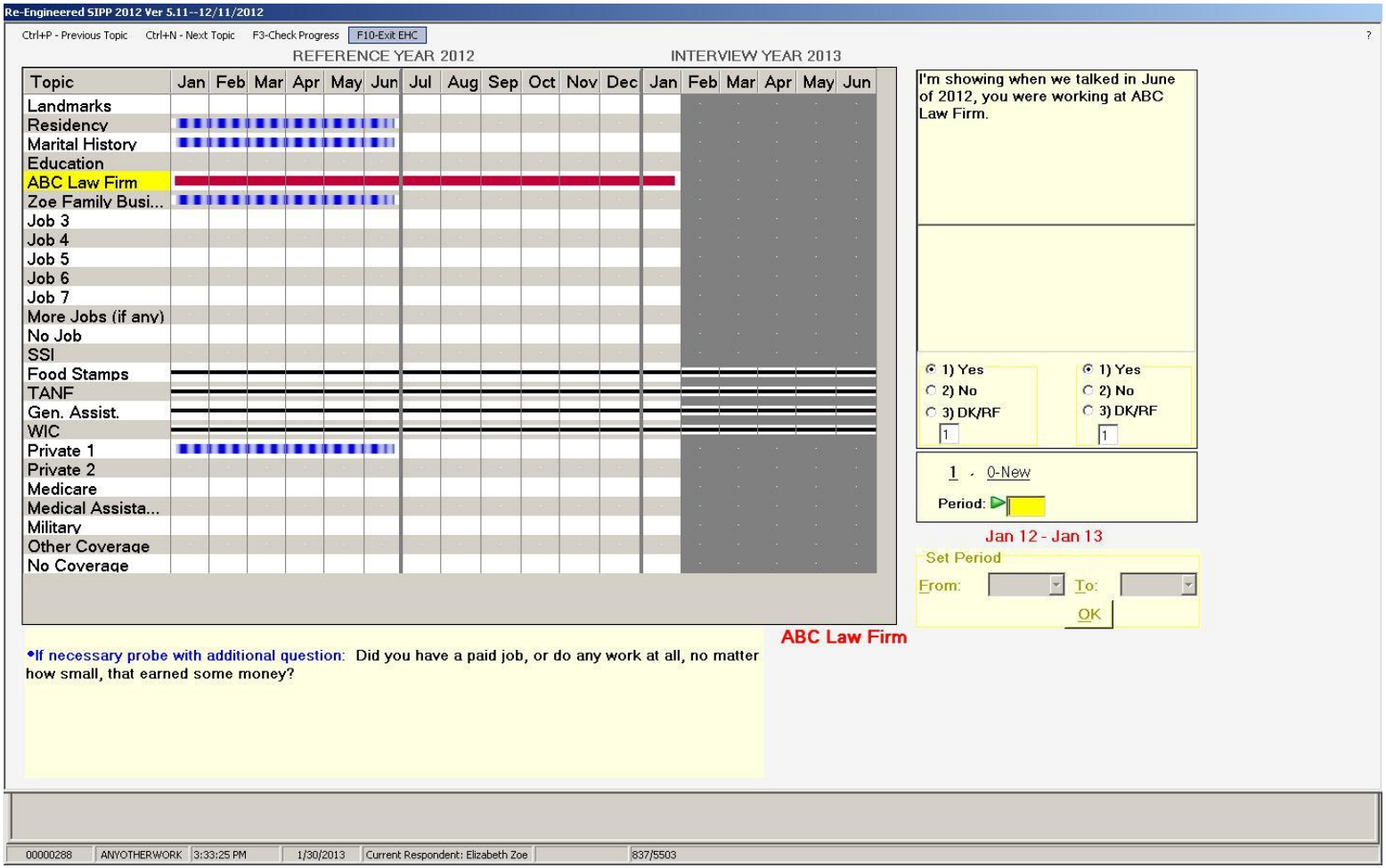
Contents of Reengineered SIPP

Front Sections	• Roster, demographics, and screeners
EHC Sections	• Topics involving the timing of events or changes in status • Residency, marital history, education, employment, programs, and health insurance
Post-EHC Sections	• Various topics, including assets, expenditures, health, child care, and well-being • Followed by Closing Sections

- Reengineered SIPP instrument programmed with Blaise and C#
- Two potential sources of paradata to examine EHC mechanisms
  - Audio recordings (not available from EHC Sections)
  - Audit trails

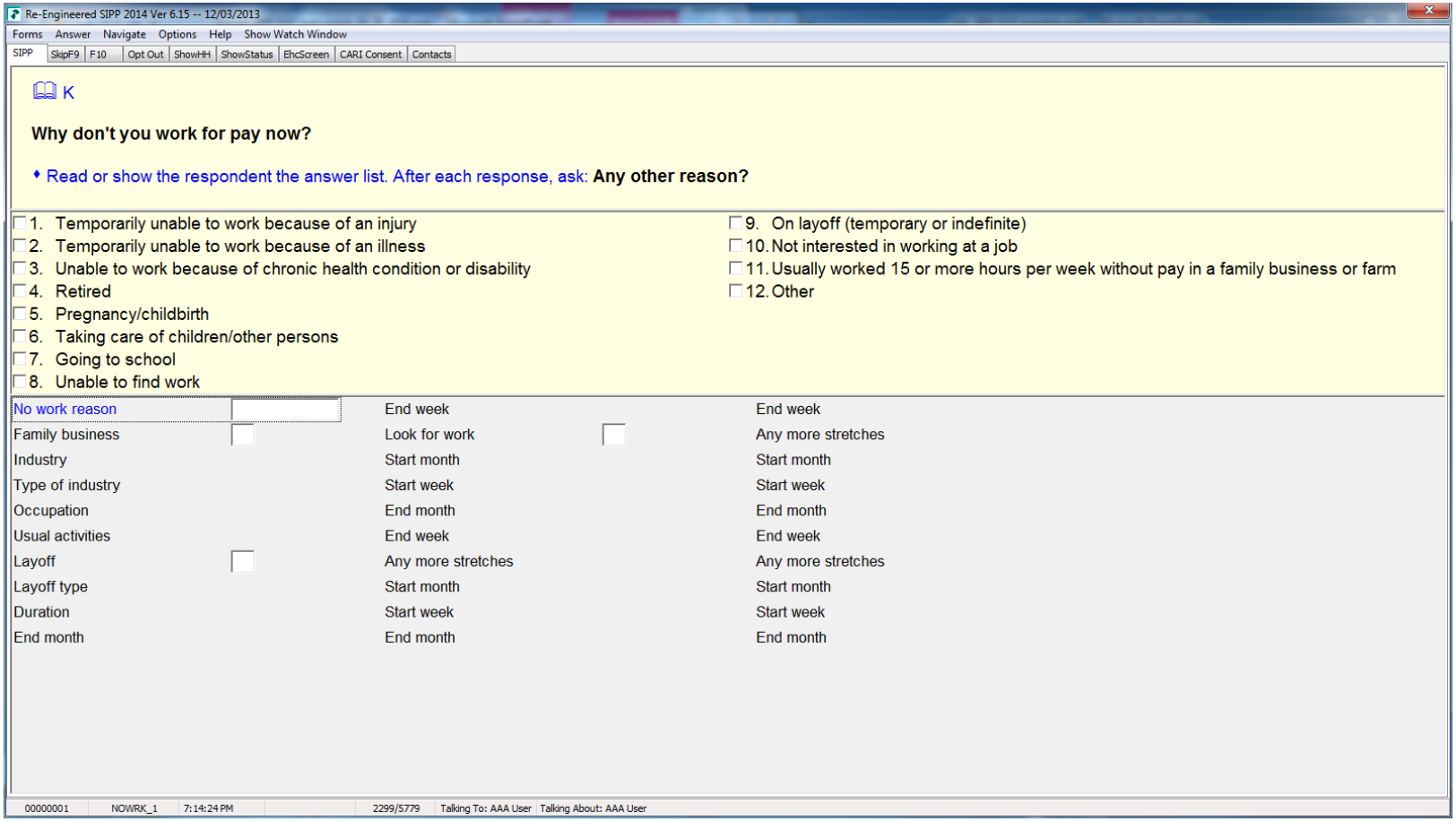
EHC Screen: 2013 SIPP-EHC Field Test

*Fake data, not from the survey



Supplemental Questions

*Fake data, not from the survey



SIPP EHC Audit Trails

*Fake data, not from the survey

Calendar

```
"4/20/2016 9:43:29 PM","EHC Action Performed: Topic Selected: 22  Medical Assistance"
"4/20/2016 9:43:42 PM","Leave Field: BCore_Middle.TEHC[1].BMedicaid_Screener","Cause:Leave Text Field","Status:Normal","Value:2"
"4/20/2016 9:43:43 PM","Leave Field: BCore_Middle.TEHC[1].BMedicaid_Screener","Cause:Leave RadioButton click","Status:Normal","Value:2"
"4/20/2016 9:43:43 PM","Leave Field: BCore_Middle.TEHC[1].BMedicaid_Screener","Cause:Leave Screener1 TxtBox","Status:Normal","Value:2"
"4/20/2016 9:43:45 PM","Leave Field: BCore_Middle.TEHC[1].BMedicaid_Screener2","Cause:Leave Text Field","Status:Normal","Value:1"
"4/20/2016 9:43:45 PM","EHC Action Performed: Radio button checked  Screener2"
"4/20/2016 9:43:45 PM","Leave Field: BCore_Middle.TEHC[1].BMedicaid_Screener2","Cause:Leave RadioButton click","Status:Normal","Value:1"
"4/20/2016 9:43:45 PM","Leave Field: BCore_Middle.TEHC[1].BMedicaid_Screener2","Cause:Leave Screener2 TextBox","Status:Normal","Value:1"
"4/20/2016 9:43:53 PM","EHC Action Performed: cmbFrom_SelectionChangeCommitted 12"
"4/20/2016 9:44:03 PM","EHC Action Performed: cmbTo_SelectionChangeCommitted 14"
"4/20/2016 9:44:05 PM","EHC Action Performed: Button Pressed  OK"
"4/20/2016 9:44:05 PM","Leave Field: BCore_Middle.BMedicaid[1].BMonth","Cause:Leave Combo Box","Status:Normal","Value:Dec 15"
"4/20/2016 9:44:05 PM","Leave Field: BCore_Middle.BMedicaid[1].EMonth","Cause:Leave Combo Box","Status:Normal","Value:Feb 16"
"4/20/2016 9:44:05 PM","Leave Field: BCore_Middle.BMedicaid[1].PeriodNum","Cause:Leave Text Box","Status:Normal","Value:1"
"4/20/2016 9:44:06 PM","Leave EHC","Key:00000001"
```

```
"4/20/2016 9:43:28 PM","(KEY:)[ENTR]2[ENTR]1[ENTR][ENTR][DOWN][DOWN][ENTR][ENTR]"
"4/20/2016 9:44:09 PM","Leave Field:BCore_Middle.BMedicare[2].EndSpells.NOMORESPELLS","Cause:Next Field","Status:Normal","Value:1"
"4/20/2016 9:44:09 PM","Enter Field:BCore_Middle.BMedicaid[1].MDUNIT[1]","Status:Normal","Value:"
"4/20/2016 9:44:23 PM","(KEY:)5[ENTR]"
"4/20/2016 9:44:25 PM","Action:Store Field Data","Field:BCore_Middle.BMedicaid[1].MDUNIT[1]"
"4/20/2016 9:44:25 PM","Leave Field:BCore_Middle.BMedicaid[1].MDUNIT[1]","Cause:Next Field","Status:Normal","Value:5"
"4/20/2016 9:44:25 PM","Enter Field:BCore_Middle.BMedicaid[1].MDPLAN","Status:Normal","Value:"
"4/20/2016 9:44:29 PM","(KEY:)1[ENTR]"
"4/20/2016 9:44:29 PM","Action:Store Field Data","Field:BCore_Middle.BMedicaid[1].MDPLAN"
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"4/20/2016 9:44:30 PM","Enter Field:BCore_Middle.BMedicaid[1].MDEND[1]","Status:Normal","Value:"
"4/20/2016 9:44:36 PM","(KEY:)5[ENTR]"
"4/20/2016 9:44:36 PM","Action:Store Field Data","Field:BCore_Middle.BMedicaid[1].MDEND[1]"
"4/20/2016 9:44:36 PM","Leave Field:BCore_Middle.BMedicaid[1].MDEND[1]","Cause:Next Field","Status:Normal","Value:5"
"4/20/2016 9:44:37 PM","Enter Field:BCore_Middle.BMedicaid[1].EndSpells.ANYMORESPELLS","Status:Normal","Value:"
"4/20/2016 9:44:38 PM","(KEY:)2[ENTR]"
"4/20/2016 9:44:39 PM","Action:Store Field Data","Field:BCore_Middle.BMedicaid[1].EndSpells.ANYMORESPELLS"
"4/20/2016 9:44:39 PM","Enter EHC","Key:00000001"
```

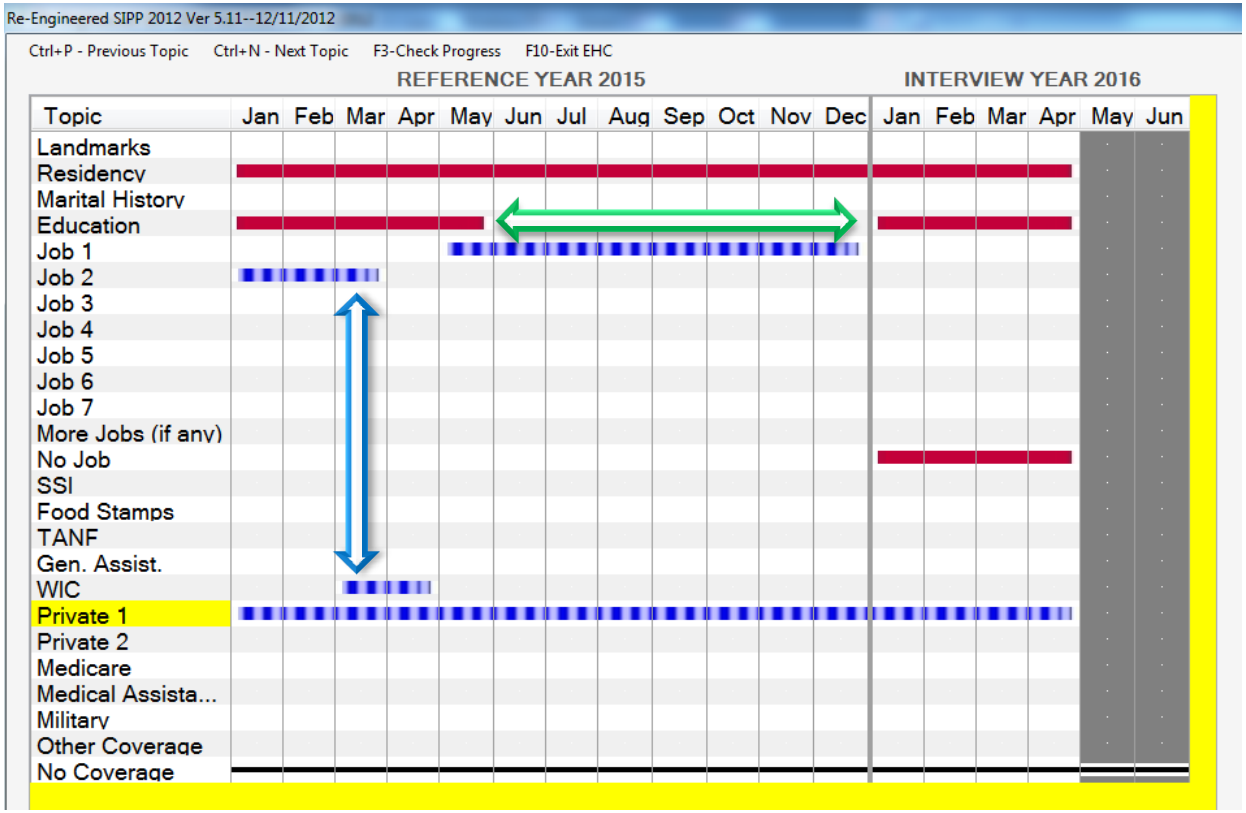
Supplemental Questions

What We Did

- Protect confidentiality
  - Under NCRN, we sent our research team members to Census HQ and had them sanitize SIPP-EHC audit trails
    - Confidential answers into “TEXT” or “888888”
  - Obtained sanitized audit trails for EHC Sections (i.e., without Front Sections and Post-EHC Sections)
- Replicated audit trails line by line to understand the structure
- Parse audit trails in accordance with EHC theory
  - Created structured data sets out of audit trails
  - Sequential retrieval
    - Chronological retrieval of events within the same themes
  - Parallel retrieval
    - Retrieval of contemporaneous events across themes
    - Flexible question flow of EHC allows and encourages parallel retrieval
    - May be indicative of high quality of data as well as optimizing (Belli, 1998; Belli & Callegaro, 2009; Krosnick, 1991)

Parallel and Sequential Retrieval

*Fake data, not from the survey



Sequential retrieval
if chronological retrieval of events within the same theme

Parallel retrieval
if retrieval of contemporaneous events across themes

- Audit trails keep track of both *spell months* and *question flows* of reporting spells (e.g., question sequence, jumping forward or backward)

Analysis Examples
Using SIPP-EHC Audit Trails

Data

- Sample size
  - 4,332 sanitized audit trails from 2013 SIPP-EHC field test
    - 2,216 households; 5,323 persons
  - Analytic sample includes 2,175 households; 4,363 persons
    - Include persons who have at least 3 final spells
    - Exclude outliers at above the highest 99th percentiles on outcome
- Outcomes
  - Item nonresponse rates
  - Answer changes
- Key predictors
  - Retrieval patterns (i.e., sequential and parallel retrieval)
  - Number of spells, number of items asked, and interaction terms

Research Questions

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2. Is the way in which respondents navigate their memory predictive of the quality for retrospective reports?

3. What might be future directions for analytic use of paradata?

Evidence of Parallel Retrieval in EHC

- Retrieval patterns

Variable	N	Mean	S.D.	Min	Max
# sequential retrieval per person	4,363	0.368	0.641	0	6
If any sequential retrieval per person	4,363	0.299	0.458	0	1
# parallel retrieval per person	4,363	**0.299**	0.718	0	10
If any parallel retrieval per person	4,363	**0.201**	0.401	0	1
# final spells per person	4,363	5.088	1.951	3	23

  - Did find some indication of parallel retrieval, although small
  - Next step to examine the effects of parallel retrieval on data quality

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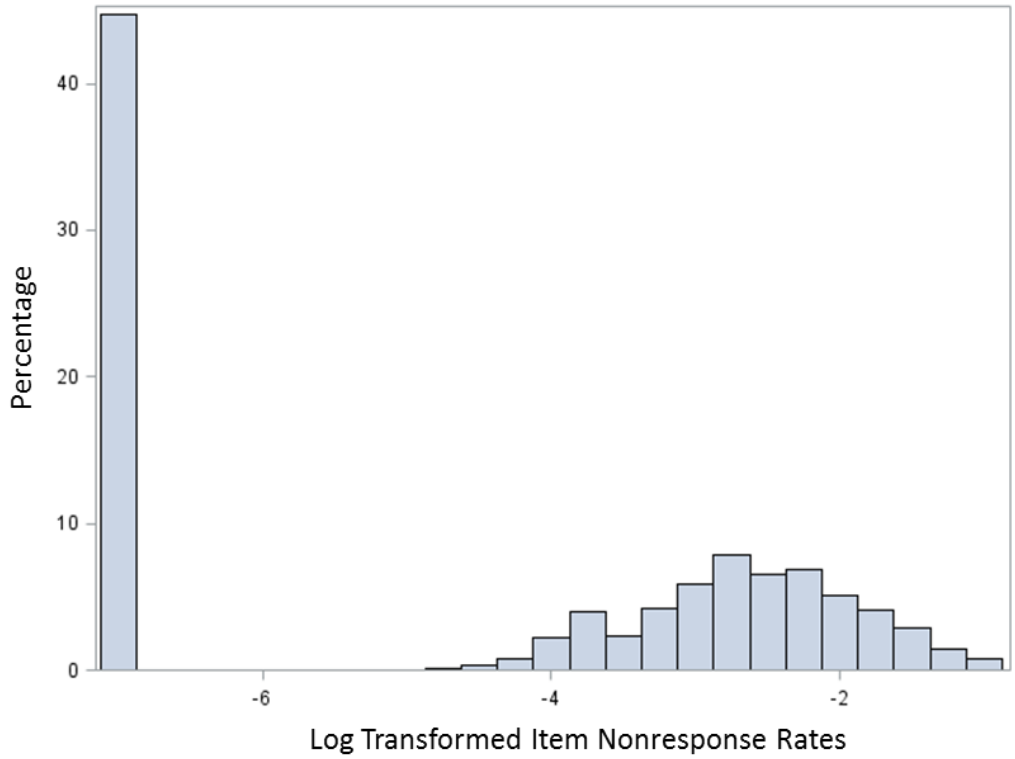
Item Nonresponse Rates

- Assumption: ↓ Item nonresponse → ↑ Data quality



44.7% of persons have zero item nonresponse

Multilevel Two-Part (Model if not 0 and if not how much)

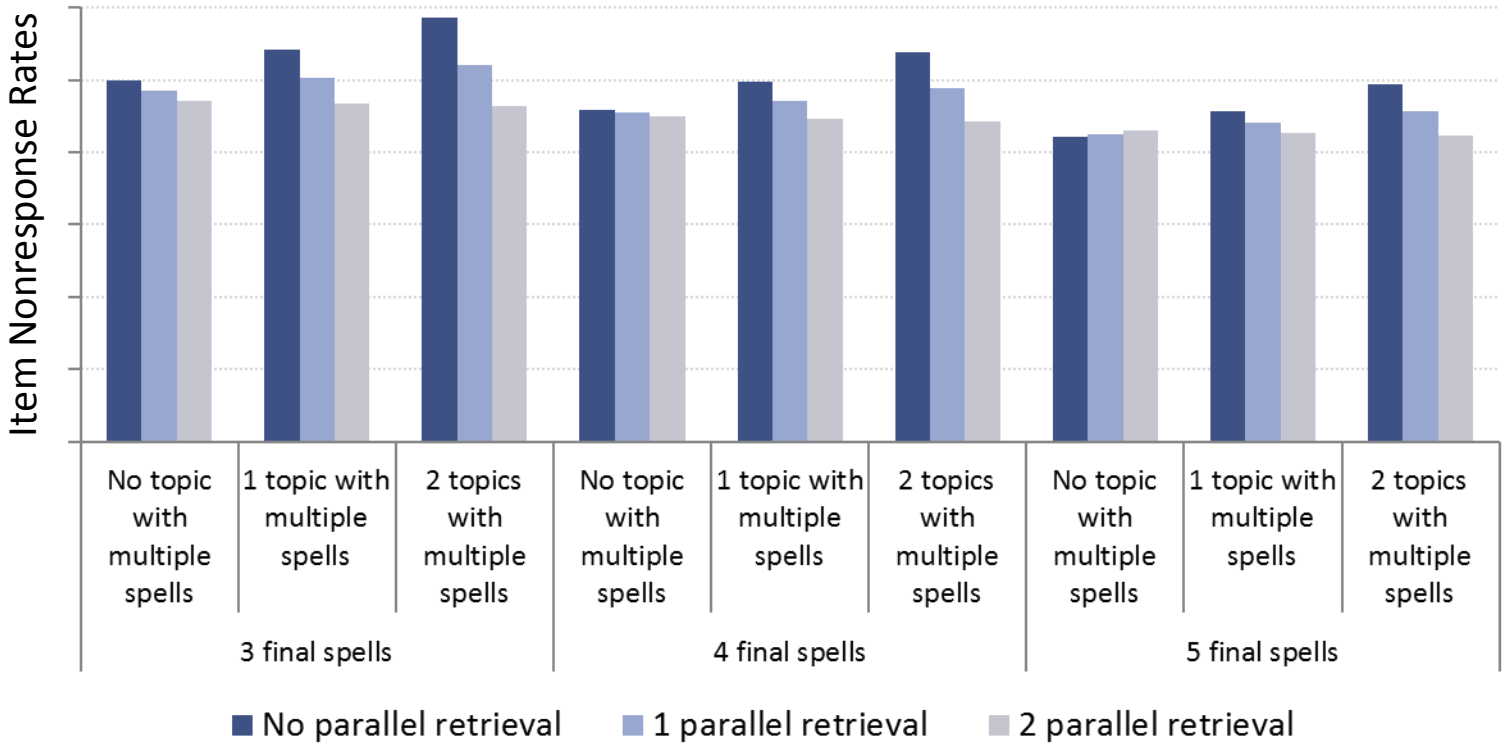
Item Nonresponse Rates: Two-Part Model

Item Nonresponse Rates	If NR		How much NR	
	Coeff.	S.E.	Coeff.	S.E.
Fixed Effects				
# sequential retrieval	-0.369**	0.089	0.002	0.035
# parallel retrieval	0.216*	0.089	-0.030	0.031
# spells (centered at 3)	0.310**	0.029	-0.086**	0.011
# topics with multiple spells	-0.349**	0.092	0.080*	0.037
Interactions				
(# parallel)*(# spells centered at 3)	0.012	0.030	0.020*	0.008
(# parallel)*(# topics with multiple spells)	-0.052	0.076	-0.044*	0.021
Random Effects				
Residual variance			0.427**	0.023

** $p < 0.01$; * $p < 0.05$.

- All opposite signs for main effects in the two-part model indicating that zero item NR and nonzero item NR may involve very different processes in EHCs

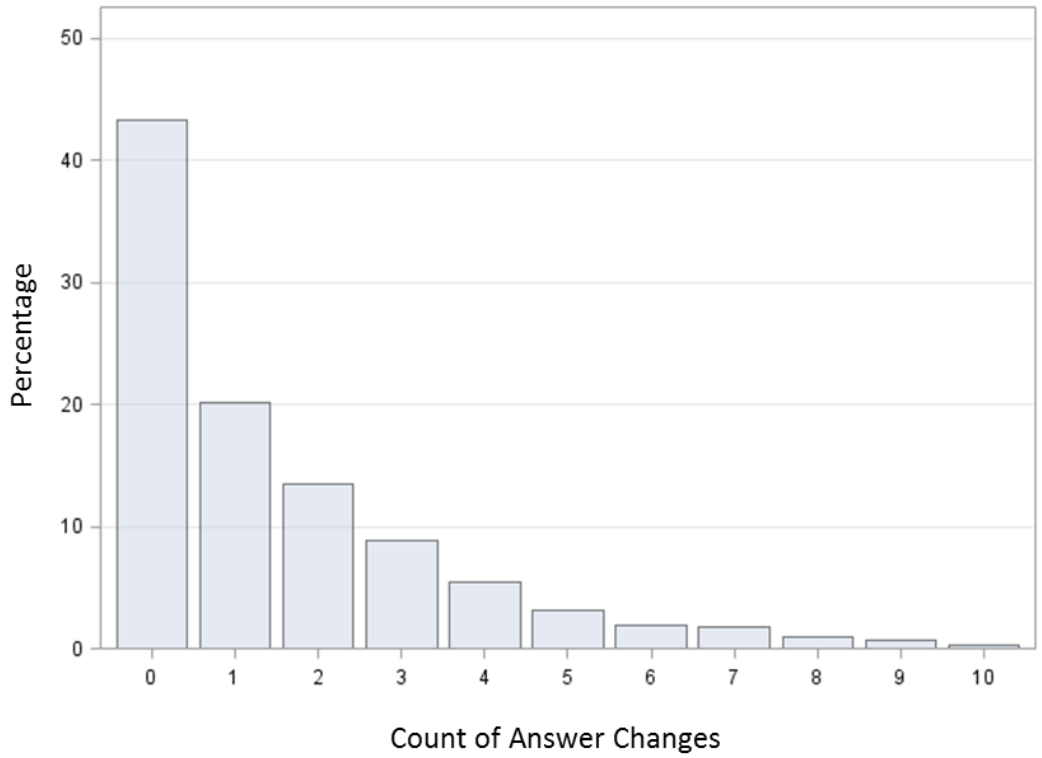
Predicted Item NR Rates (If not 0 how much?)



- ↑ Spells → ↓ NR rates; ↑ Parallel retrieval → ↓ NR rates
- Parallel retrieval moderates the effects of more complicated life event histories

Count of Answer Changes

- Assumption: ↑ Answer changes → ↑ Data quality



Count data
Overdispersion

Multilevel Negative Binomial

Answer Changes: Negative Binomial

Answer Changes	Negative Binomial	
	Coeff.	S.E.
Fixed Effects		
If any sequential retrieval	-0.404**	0.077
If any parallel retrieval	0.133**	0.468
# items asked (centered at the grand mean)	0.030**	0.001
# topics with multiple spells	-0.050	0.035
Interactions		
(If any parallel retrieval)*(# items asked centered)	-0.009**	0.001
(If any parallel retrieval)*(# topics with multiple spells)	0.113*	0.057
Random Effects		
Residual variance	0.097**	0.029

** $p < 0.01$; * $p < 0.05$.

- Strong effects of sequential retrieval on answer changes
- Parallel retrieval moderates the effects of more complicated event history

Some Thoughts on Data Quality Indicators

- Data quality indicators are *proxy* measures of data quality
  - More answer changes may indicate that the respondent was not satisficing, which is one of the reasons why many people consider answer changes as a proxy measure of data quality
  - Answer changes may also indicate respondents' (or often interviewers') difficulties in completing the tasks.
- EHC and data quality indicators
  - Not sure *whether the same assumptions on data quality indicators will hold for EHC interviews*
  - If retrieval patterns in EHC do help more accurate reports of retrospective events, the number of answer changes may have to decrease…
- Analysis should be grounded on both theory and empirical evidence
  - We need *record check studies* using benchmark data to test such assumptions on data quality indicators

Summary

- Key findings
  - Parallel retrieval moderates the effects of complicated life event history (i.e., more spells within and across topics) on item nonresponse rates
    - Different underlying processes between item NR and zero item NR in EHCs
    - In the presence of item nonresponse, respondents with more complicated event histories are more likely to benefit from parallel retrieval, which might be a unique advantage of EHCs
  - Parallel retrieval seems to be associated with respondents' optimizing efforts, indicated by the increase in answer changes
- Results are limited for generalization
  - Sample not representative of the nation; lack of control variables
  - Future research to examine whether the same assumptions on data quality indicators in conventional question-list methods hold for EHCs
- RDC project to access unsanitized data beginning in Summer

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Paradata Open Up New Opportunities!

Further Directions

- Paradata analysis may contribute to…
  - Survey design, adaptive implementation plans, questionnaire design, interviewer training, data processing as well as survey management
  - Evaluating, predicting, and improving data quality
    - Data quality assessment
    - Nonresponse adjustments
    - Missing data imputations
- Some suggested examples of paradata use
  - Audio recordings
    - Behavior coding to examine the interviewer-respondent interactions as well as how respondents actually behaved
  - Geographical information
    - Often available for both respondents and nonrespondents
    - Nonresponse rates persistently higher in certain areas
    - Misreporting might be spatially clustered (e.g., underreporting of income, overreporting of voting)

THANK YOU!

Questions/Comments/Suggestions?

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