Addressing Nonresponse Using Responsive/Adaptive Survey Design
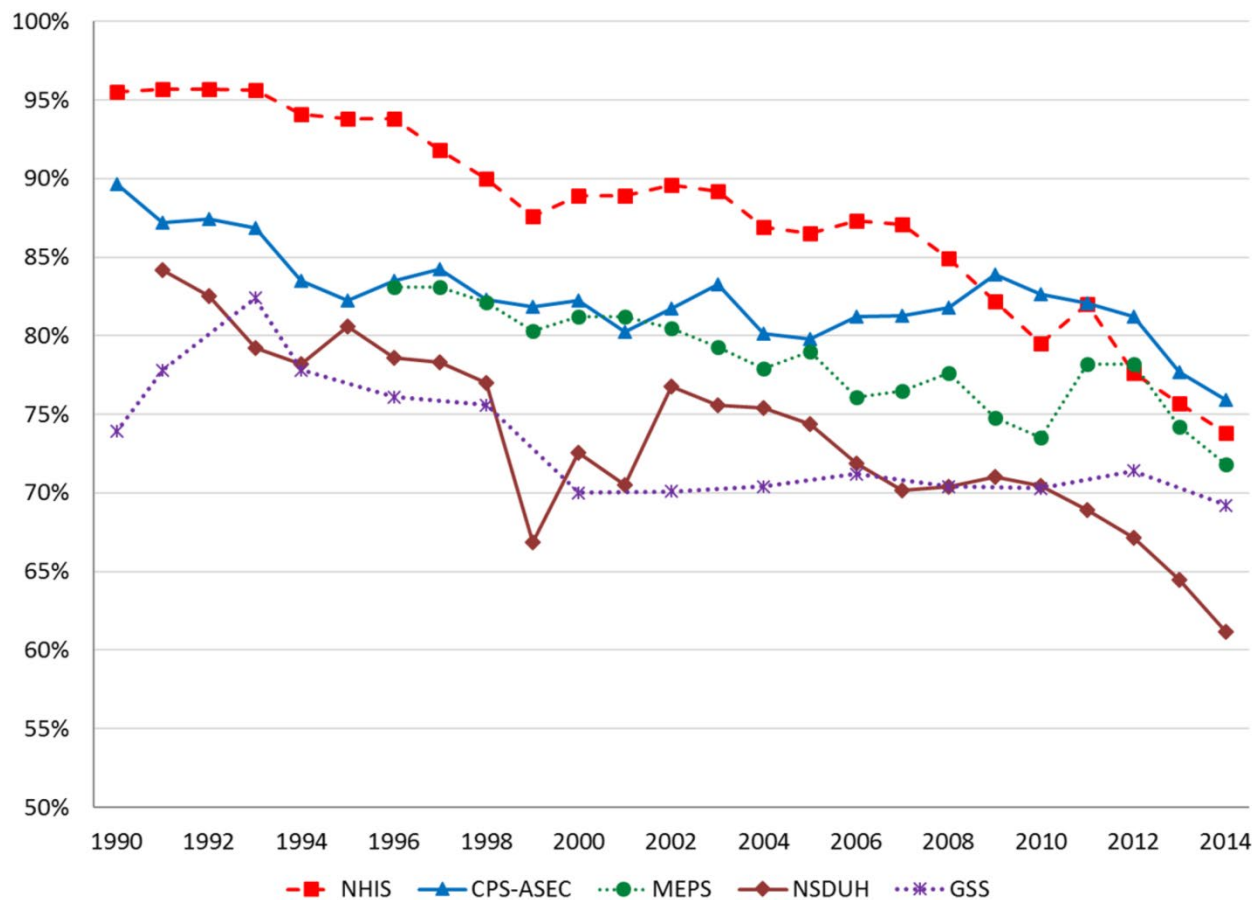
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Background

- Responsive/Adaptive Survey Design (RSD/ASD) grows out of a particular context

- Key factors driving development of ASD:
  - Rising nonresponse
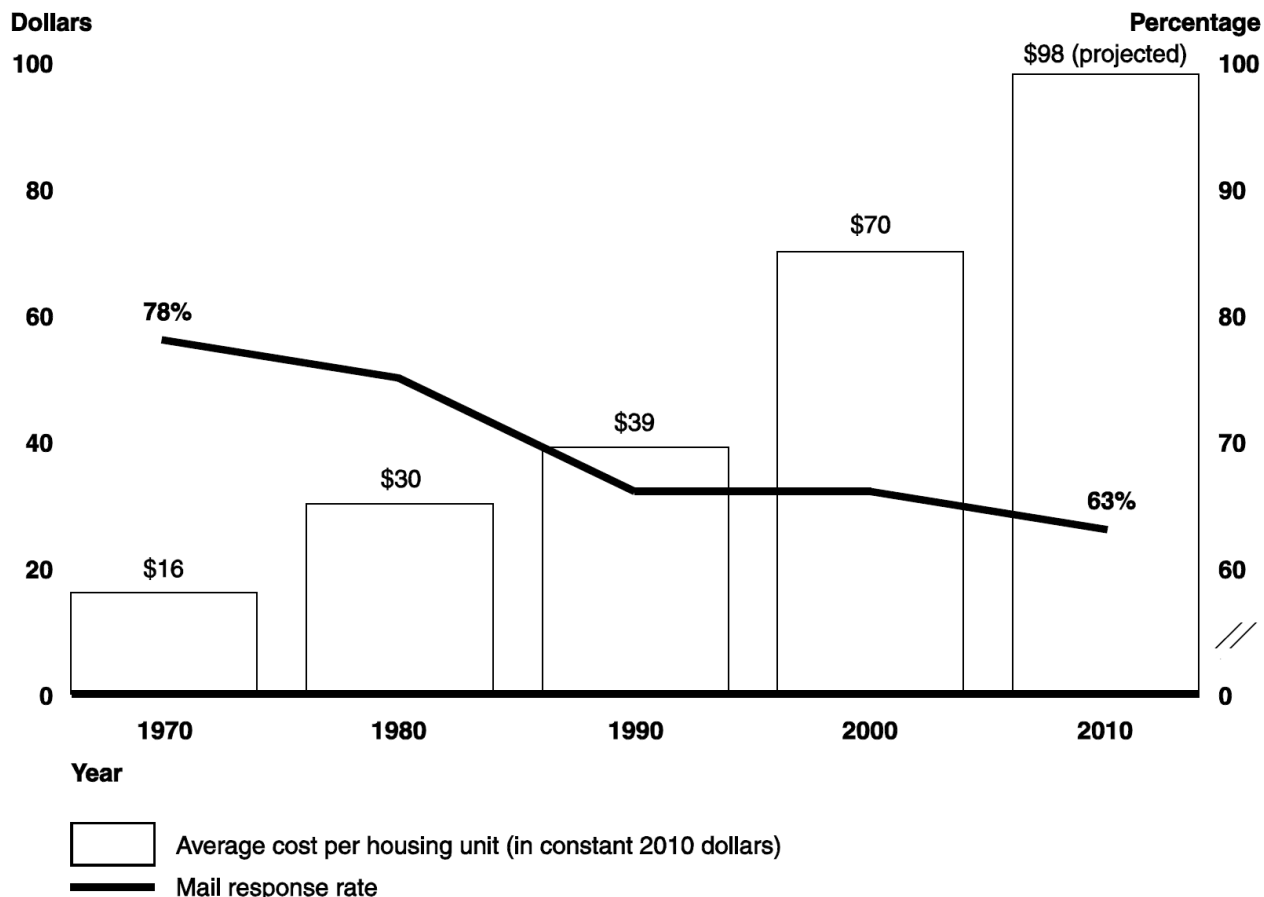 - Increasing costs / Shrinking budgets

Decreasing Response

Williams and Brick, 2017

Response Rates and Increasing Cost of Data Collection

Average Cost per Household for Completing the Census and Census Mail Response Rates

Source: GAO analysis of Census Bureau data.

Leverage-Saliency Theory

- *Groves, Singer, and Corning, 2000*
- Generalization of "tailoring the introduction" to survey design writ large
- Heuristic that guided new thinking

- Each person has specific **leverages**
  - Weights assigned to each feature
  - For some it's the topic, for others it's the incentive
- The survey makes these more or less **salient**

New Opportunities: Computerization

- **Computerization** leads to...
  - **Paradata** → data about the process of collecting survey data *(Couper, 1998)*
    - Paradata allows us to analyze the process
  - **Real-time monitoring** *(Kreuter, 2013)*
  - **Intervening** during the process
  - Implementation of **more complex designs**
    - CATI: Complex calling algorithms *(Greenberg and Stokes, 1990; Bollapragada and Nair, 2010)*

New Opportunities: Nonresponse Bias

- **Nonresponse bias analyses**
  - Who responds under different designs?
  - Experiments begin to analyze survey estimates as outcome
- **Tailoring the interaction** with the respondent *(Groves and Couper, 1996; Groves et al., 1997)*
  - Based on Leverage-Saliency Theory *(Groves, Singer and Corning, 2000)*
  - Each sampled person has different concerns
  - Interviewer should tailor their response to their concerns

Evidence of Heterogeneity in the Population

- Response rates vary greatly across modes
  - Some respond across all modes
  - Some only respond in particular modes

- Evidence beginning to build that subgroups respond to designs differently
  - For example, some experimental evidence that incentives can change who responds and estimates *(Singer and Ye, 2013)*

Can We Utilize this Heterogeneity?

- Define important subgroups

- Vary the strategies across subgroups

- Optimize for cost and quality

- Example:

  - Web survey for those highly likely to respond

  - Face-to-face survey for those unlikely to respond with important differences

Context Matters

- What do we know about the sample before we begin?

- More observed characteristics means more information for forming subgroups

- Fewer observed characteristics… may need to learn about subgroups over time

Responsive and Adaptive Survey Design

- **Responsive survey design** involves using incoming data from the field to implement planned changes in data collection

- **Adaptive survey design** involves using existing data to create different data collection designs across subgroups

- Both are responses to the challenges and opportunities
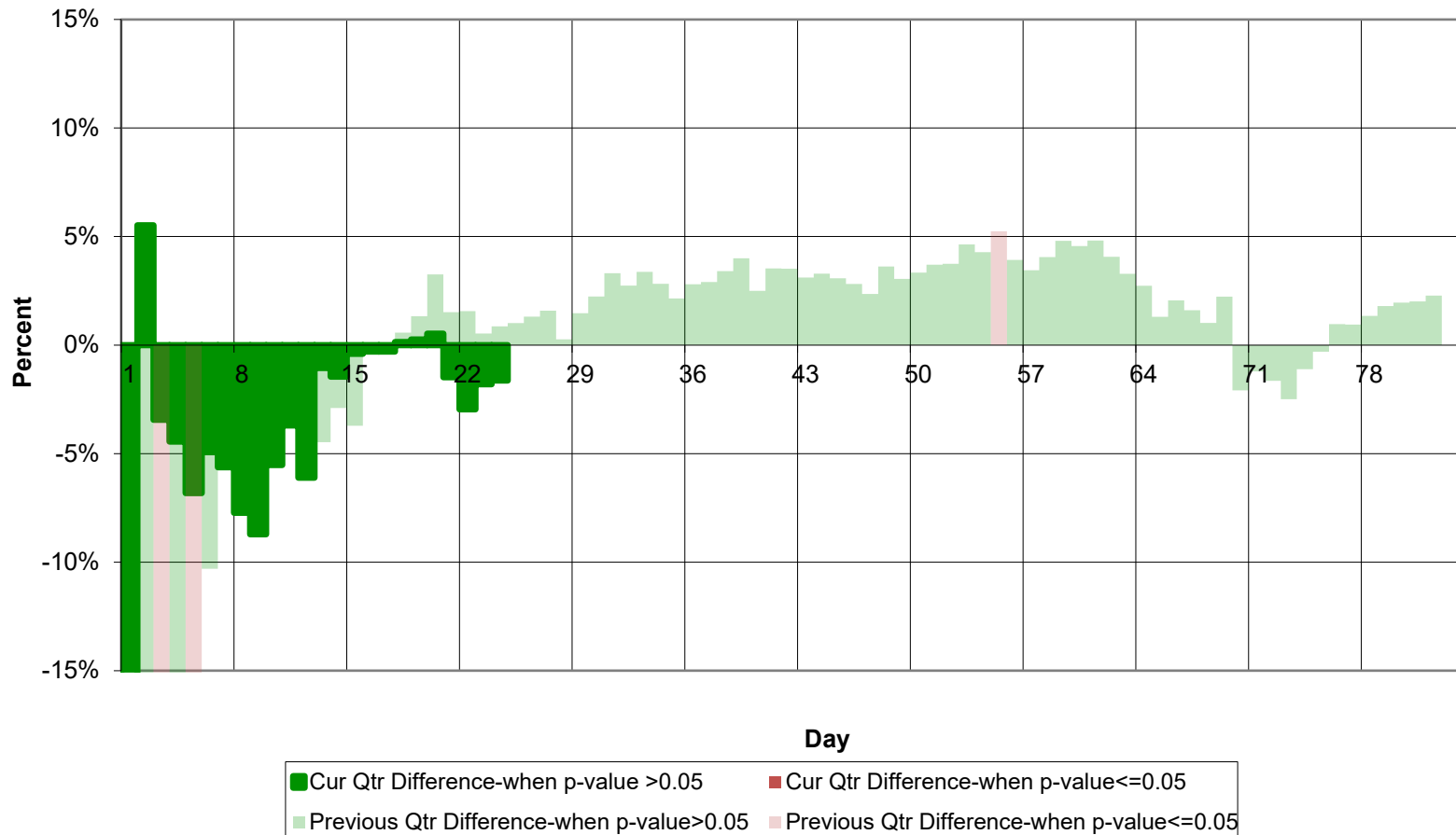
- Evolve in different contexts

Responsive Survey Design

- *Groves and Heeringa, 2006*
- Uncertainty prevails
  - Limited knowledge about sampled units
- Uncertainty reduced over time
- Design in phases
  - Early phases use experiments…
  - Then inexpensive protocols…
  - Then more expensive protocols
- Phases are complementary

NSFG: Subgroup Response Rates

Difference of Percent Respondents or Nonrespondents Known to Have Kids Between
Respondents and NonRespondents
(from screener data)

NSFG: Prioritize Cases in Low-Responding Groups
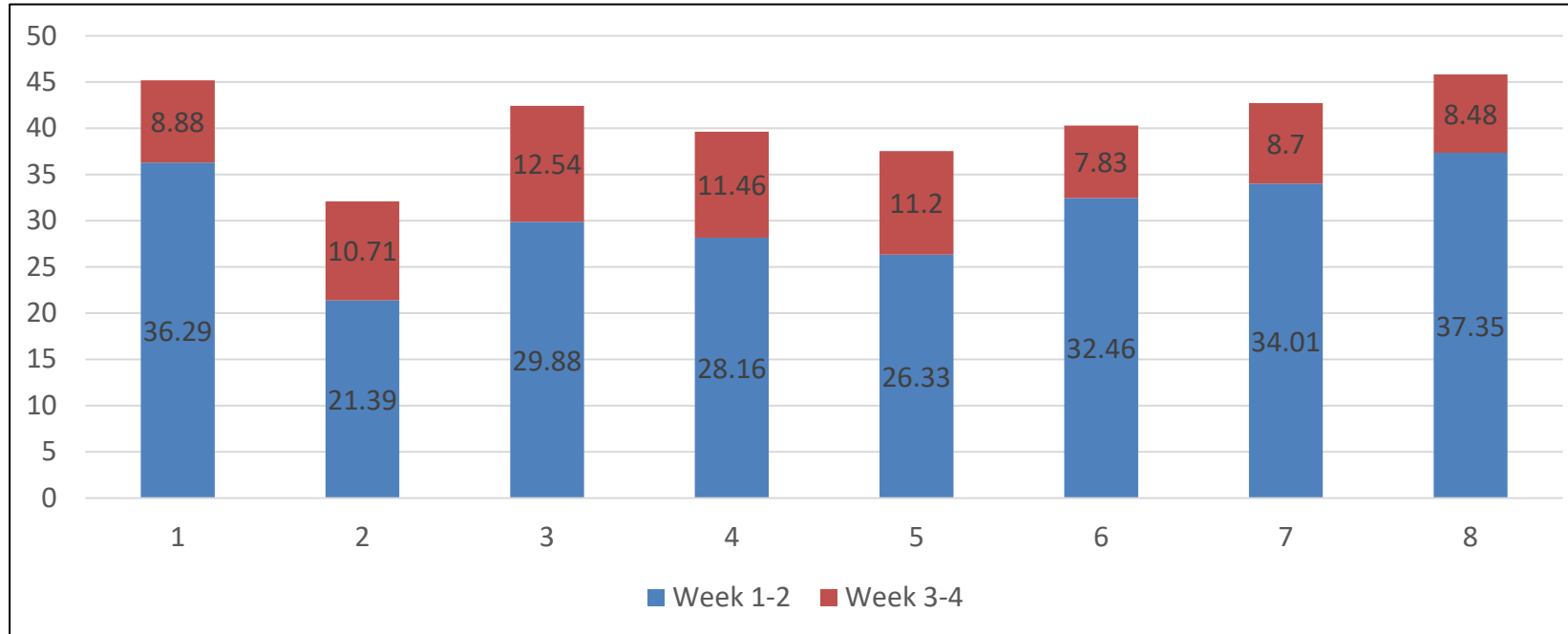
Adaptive Survey Design

- More information available about the sample

- Possible to identify subgroups in the sample before data collection

- Prior experimentation with design alternatives

- Use targeted designs for each subgroup

- Optimize for cost and quality

Labour Force Survey ONS UK: Create Strata

Strata	Urbanicity	Deprivation	Age group
1	Urban	Less deprived	45+
2	Urban	More deprived	16-44
3	Urban	Less deprived	16-44
4	Urban	More deprived	45+
5	Non-urban	More deprived	16-44
6	Non-urban	More deprived	45+
7	Non-urban	Less deprived	16-44
8	Non-urban	Less deprived	45+

From Tortoriello (2023). The Transformed Labour Force Survey: Improving the Representativeness and Quality of Data through an Adaptive Survey Design. Paper presented at the ESRA Conference 2023.

"Knock to Nudge" Intervention

From Tortoriello (2023). The Transformed Labour Force Survey: Improving the Representativeness and Quality of Data through an Adaptive Survey Design. Paper presented at the ESRA Conference 2023.

Open Questions: Precision

- Rules and inputs are not well-specified
  - E.g. "target groups with lower response rates"

- How can the rules be specified?
  - Optimization using an objective function

- How can we improve the inputs to these rules?
  - Need data with high correlations with survey variables *(Zhang, 2022)*

Open Questions: Precision

- **Inputs**
  - Wagner, J. and F. Hubbard (2014). "Producing Unbiased Estimates of Propensity Models During Data Collection." Journal of Survey Statistics and Methodology **2(3): 323-342.**
  - Wagner, J., B. T. West, M. R. Elliott and S. Coffey (2020). "Comparing the Ability of Regression Modeling and Bayesian Additive Regression Trees to Predict Costs in a Responsive Survey Design Context." Journal of Official Statistics **36(4): 907-931.**
  - Wagner, J. and F. Hubbard (2014). "Producing Unbiased Estimates of Propensity Models During Data Collection." Journal of Survey Statistics and Methodology **2(3): 323-342.**
  - Wagner, J., B. T. West, M. R. Elliott and S. Coffey (2020). "Comparing the Ability of Regression Modeling and Bayesian Additive Regression Trees to Predict Costs in a Responsive Survey Design Context." Journal of Official Statistics **36(4): 907-931.**
  - West, B. T., J. Wagner, S. Coffey and M. R. Elliott (2021). "Deriving Priors for Bayesian Prediction of Daily Response Propensity in Responsive Survey Design: Historical Data Analysis Versus Literature Review." Journal of Survey Statistics and Methodology.
  - Coffey, S., B. T. West, J. Wagner and M. R. Elliott (2020). "What Do You Think? Using Expert Opinion to Improve Predictions of Response Propensity under a Bayesian Framework." Methods, Data, Analyses **14(2): 159-194.**
  - Zhang, S. (2022). "Benefits of Adaptive Design under Suboptimal Scenarios: A Simulation Study." Journal of Survey Statistics and Methodology **10(4): 1048-1078**.

- **Rules**
  - Coffey, S. M. and M. R. Elliott (Early View). "Optimizing Data Collection Interventions to Balance Cost and Quality in a Sequential Multimode Survey." Journal of Survey Statistics and Methodology.
  - Wagner, J., X. Zhang, M. R. Elliott, B. T. West and S. M. Coffey (Early View). "An Experimental Evaluation of a Stopping Rule Aimed at Maximizing Cost-Quality Trade-Offs in Surveys." Journal of the Royal Statistical Society Series A: Statistics in Society.

Open Question: Identifying Design Strata

- What are the subgroups?

- Criteria

  - Amenable to similar design features

  - Changing response rates for this group can either:

    - Save money with minimal reductions in quality

    - Have improve quality of estimates (i.e. reduce bias)

- Schouten, B., A. Peytchev and J. Wagner (2017). Adaptive Survey Design, CRC Press.

- Lynn, P. (2016). "Targeted Appeals for Participation in Letters to Panel Survey Members." Public Opinion Quarterly **80(3): 771-782.**

Open Question: Impact beyond weighting?

- ## If we use variables in design and then use them again in weighting, is there any gain?

  - Does equalizing response rates across subgroups improve estimates compared to just weighting those subgroups to their size in the population? (i.e. Poststratification)

- Schouten, B., F. Cobben, P. Lundquist and J. Wagner (2016). "Does More Balanced Survey Response Imply Less Non-Response Bias?" Journal of the Royal Statistical Society: Series A (Statistics in Society) **179(3): 727-748.**

- Zhang, S. and J. Wagner "The Additional Effects of Adaptive Survey Design Beyond Post-Survey Adjustment: An Experimental Evaluation." Sociological Methods & Research

Summary

- Responsive and adaptive survey design provide a framework for deploying design features

  - Cost effective approaches for controlling bias

- Possible to deploy features selectively

  - Subgroups

  - Phases (late responders)

- Several areas of continuing research

Thanks!

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