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Using responsive and adaptive survey design to control data quality and costs

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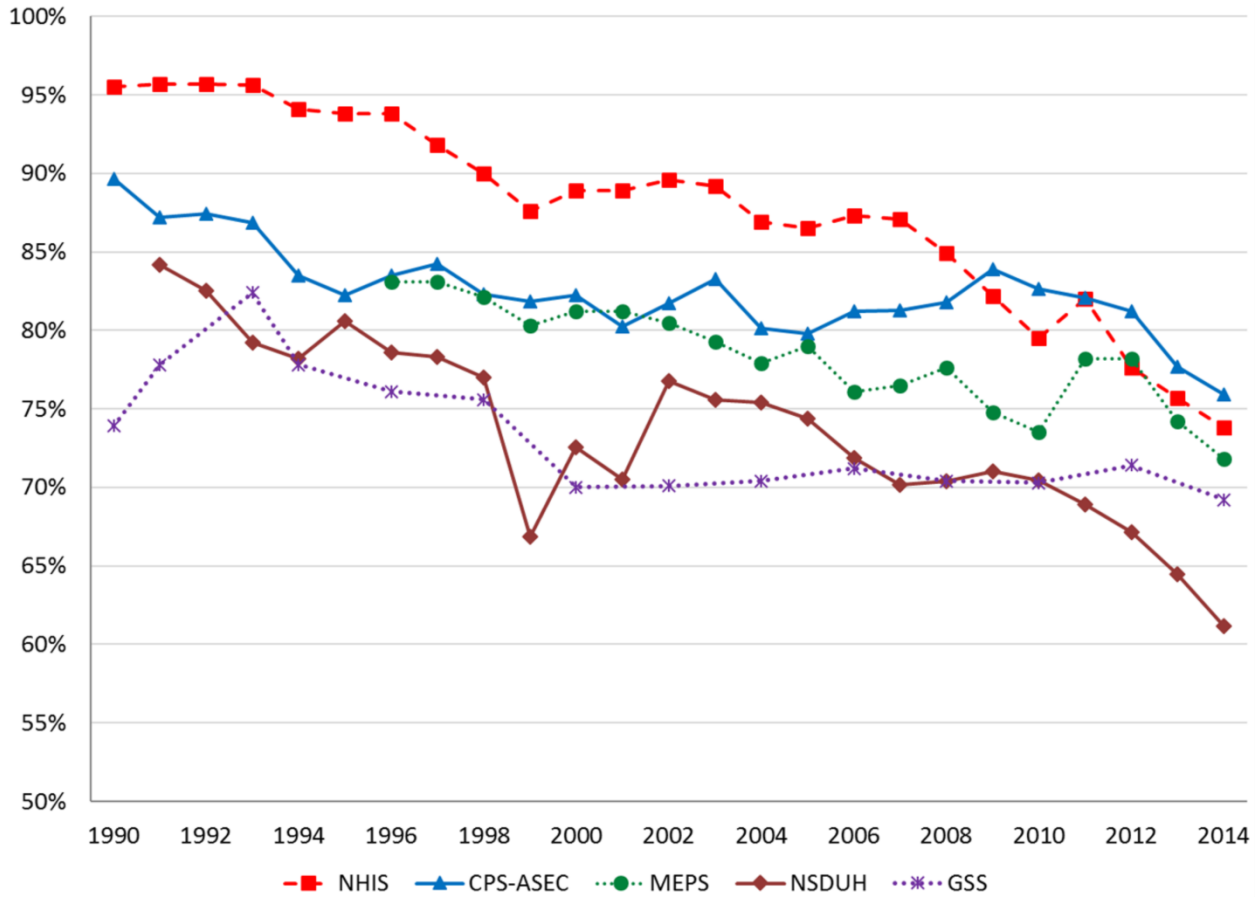
Overview

- Changing context of surveys
- Heterogeneity
- Responsive and adaptive survey design
  - Definition
  - Examples
- Logistics
- Way forward

Challenge: Decreasing Response

- US trends
- Similar experience in Europe
  - *de Leeuw, et al., 2018*

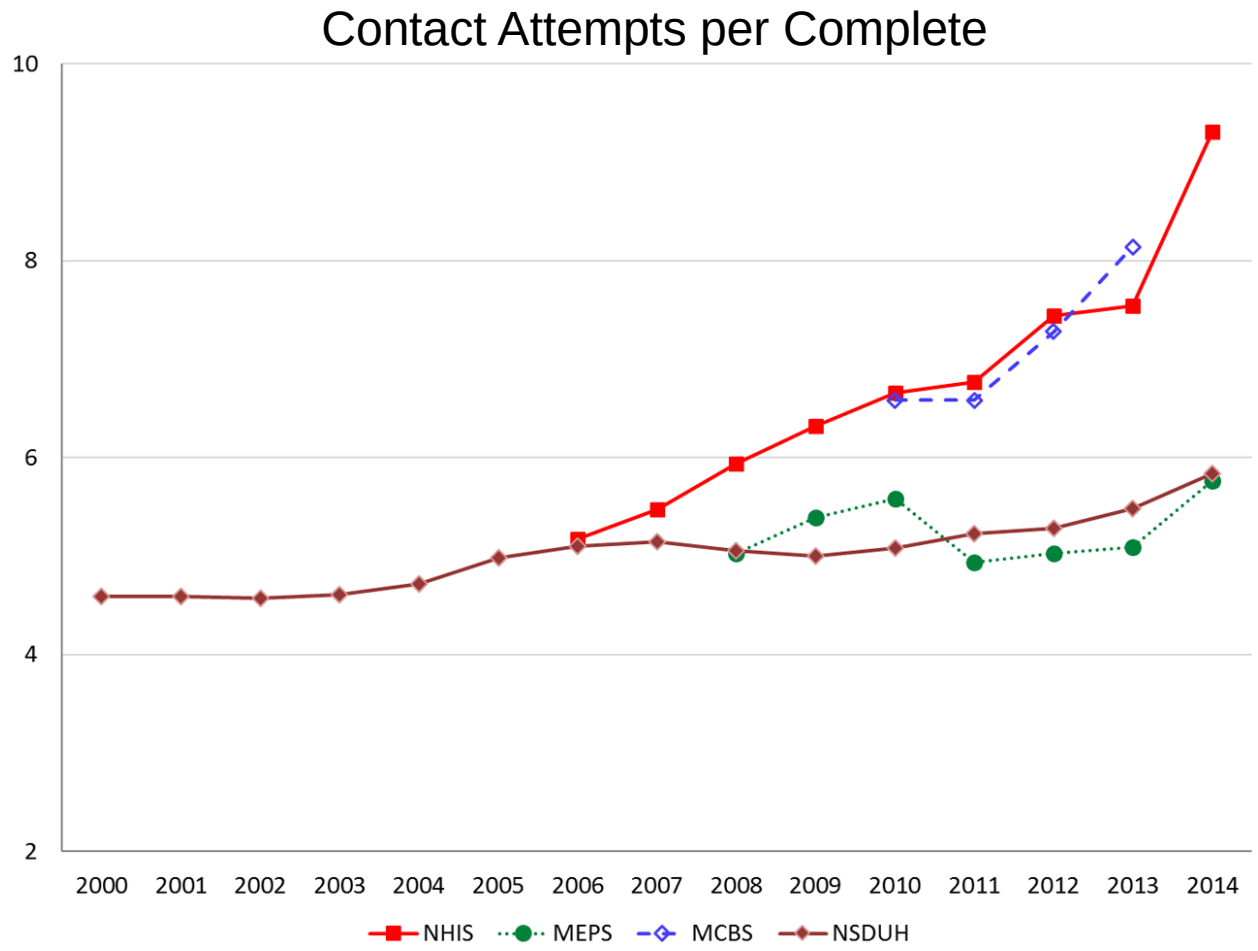


Williams and Brick, 2017

Challenge:

Costs increasing for face-to-face surveys

- Over time, more effort required to achieve the same or worse results
- Costs go up



Williams and Brick, 2017

Opportunities

- **Computerization**
  - Allows us to **monitor field progress** in almost real-time
  - **Interventions** also possible
  - **More complex designs** possible
- **Nonresponse bias** vs nonresponse rates
  - What is the impact of design on estimates, not just response rates?

Recognition of Heterogeneity

- Survey design used to be *"one-size-fits-all"*
- Recent research looks at **variation** within samples
  - Tailoring the introduction
    - *Groves and Couper, 1996*
  - Leverage-Saliency theory
    - *Groves, Singer, and Corning, 2000*
    - Each sampled person has specific leverages
    - Survey makes these salient
  - Nonresponse bias analysis
    - *Groves, 2006*
    - Focus on impact on estimates
    - Naturally leads to examination of subgroups who respond under different designs

Recognition of Heterogeneity

- Language barriers to self-administered modes
  - *Ahlmark, et al., 2015*
- Incentives have differential impact
  - *Groves, et al., 2004; Singer and Ye, 2013*
- Differences in response to web surveys by age
  - *Calinescu, et al., 2013; Börkan, 2010*

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
- Two different approaches based on this distinction:
  - Adaptive Survey Design *(Schouten, Peytchev, and Wagner, 2017)*
  - Responsive Survey Design *(Groves and Heeringa, 2006)*

Responsive Survey Design

- *Groves and Heeringa (2006)*
- Arises from **uncertainty**
  - We do not know much about the sample ahead of time
- Differences within the sample are revealed across **phases**
  - Each phase constitutes a set of unique design features
- The goal is to design **complementary** phases
  - Biases of each phase "cancel" each other out

Example: Responsive Survey Design

Characteristic	Phase 1 $40	Phase 2 $80
Female	*n=1,896*	*n=68*
College degree or more	34	51**
Ever had an abortion	6	1**
Never had a live birth	41	60**
Ever had sex with a female	13	4**
Income $75,000+	17	25
Living in a multi-unit structure	38	24**
Male	*n=1,432*	*n=70*
Hispanic	20	37**
College degree or more	28	36
Never fathered a birth	57	64
Ever had sex with a male	7	1**
Income $75,000+	25	42**
Living in a multi-unit structure	37	26*

- National Survey of Family Growth (NSFG)
- Phase 1: US Mail prenotification, $40 post-paid token of appreciation for main interview, interviewers have large workloads
- Phase 2: Priority Mail sent, $40 pre-paid and $40 post-paid token of appreciation, small workloads

NSFG 2006-2010
Lepkowski, et al., 2013
*p<=0.10
**p<=0.05

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

Example: Adaptive Survey Design

- Dutch Labor Force Survey
  - *Schouten, et al., 2017*
- Create 9 strata using 5 most relevant auxiliary variables:

Registered Unemployed	Young Household Member and Employed
65+ Households without employment	Non-Western and Employed
Young Household Members without Employment	Western and Employed
Non-Western without Employment	Large Households
Western without Employment	

Example: Adaptive Survey Design

	Stratum								
	1	2	3	4	5	6	7	8	9
W	23.2%	23.6%	15.5%	10.8%	27.9%	27.7%	17.5%	36.7%	22.4%
TS	12.2%	31.4%	8.5%	4.7%	19.7%	13.3%	7.2%	18.1%	21.2%
TE	20.8%	41.3%	15.2%	8.6%	31.1%	23.8%	14.3%	33.3%	37.5%
F	43.5%	53.5%	42.2%	34.1%	45.1%	45.3%	35.9%	46.7%	54.6%
FE	52.4%	58.3%	51.0%	41.2%	51.2%	54.9%	46.0%	56.8%	61.4%
W→TS	28.3%	41.0%	20.2%	13.9%	36.3%	34.0%	20.8%	44.5%	23.1%
W→TE	32.8%	48.4%	23.8%	17.5%	42.1%	41.1%	25.8%	52.1%	24.4%
W→FS	46.3%	57.7%	38.6%	32.7%	50.0%	51.0%	39.3%	58.9%	50.0%
W→FE	49.8%	58.3%	43.4%	36.6%	52.6%	54.7%	44.3%	62.0%	54.2%

Example: Adaptive Survey Design

- From these estimates, it is possible to use optimization techniques to assign strategies to the strata
  - Maximize some **quality measure**
  - Subject to other **quality constraints** (response rate, balance indicator, or other – more on this in next section)
  - Subject to **cost constraint**
    - Need cost estimates for each strategy, ideally for each strategy/stratum combination

Logistics

- ASD and RSD presuppose **technical** and **administrative** structure to implement
- Current systems not built for ASD/RSD
- May need to start with existing systems, build designs that can be accommodated
  - Then add features to survey design and improve systems
- Management: Start with training
  - Start slow and grow

Way Forward

- Identify risks
- Identify available resources
- Prepare a plan
  - ASD: Subgroups, matched to designs
  - RSD: Complementary design phases
- Implement
- Document, learn, extend…

Thank you!

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