

Methods: Mind the Gap

Webinar Series

Improving the Efficiency of Prevention Research Using Responsive and Adaptive Survey Design Techniques



Presented by:

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PRACTICAL TRAINING IN

RESPONSIVE SURVEY DESIGN



UNIVERSITY OF MICHIGAN
INSTITUTE FOR SOCIAL RESEARCH

Improving the Efficiency of Prevention Research Using Responsive and Adaptive Survey Design Techniques

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<https://rsdprogram.si.isr.umich.edu/>

Overview

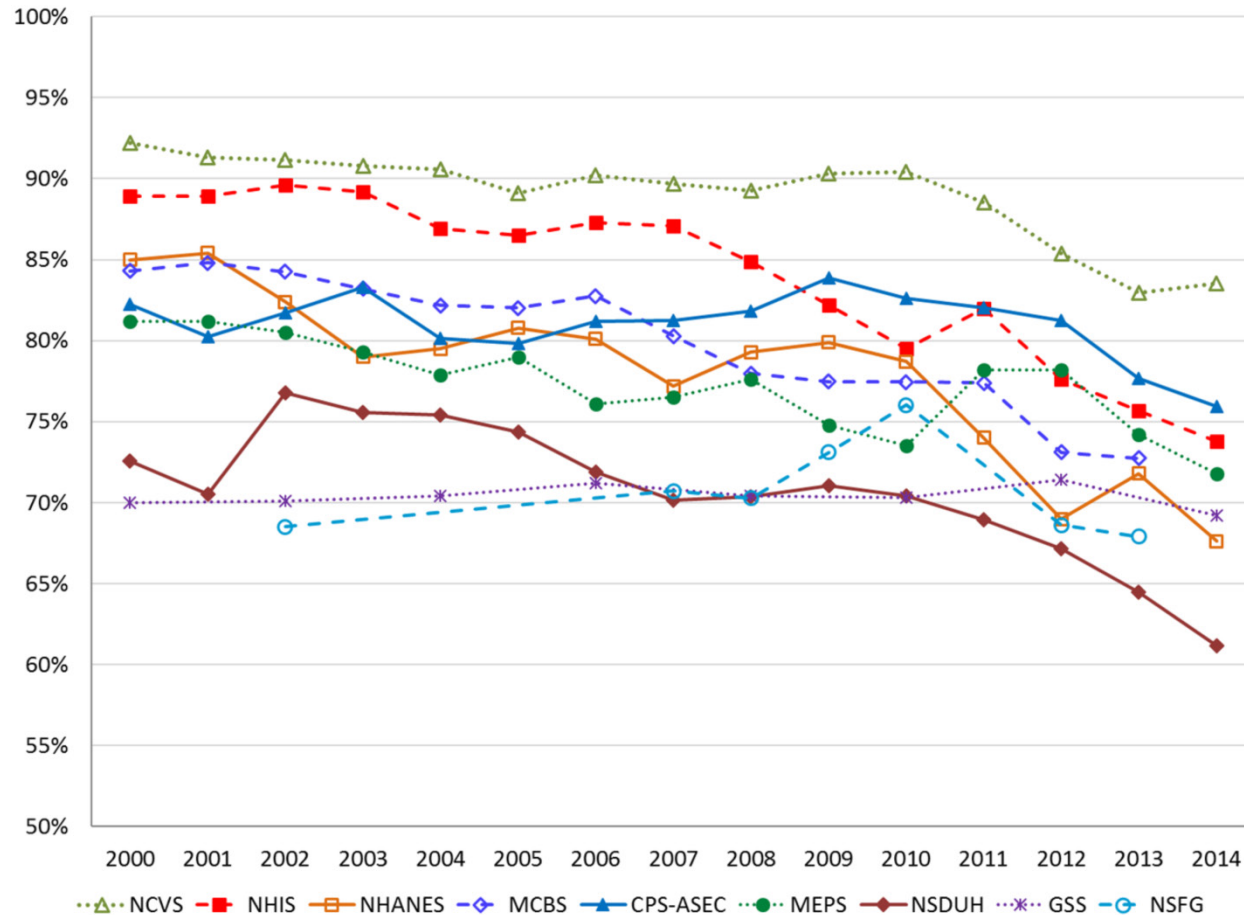
- An introduction to **Responsive Survey Design**, and how it can improve efficiency in longitudinal prevention research
- **Basic concepts** of RSD, and key terminology
- **Steps** and **Tools** for Implementing RSD in practice
- **Examples** focusing on the implementation of RSD in longitudinal prevention studies

WHY RSD?

Changing Research Environments and Uncertainty in Data Collection

- Increasing **nonresponse** in survey-like data collections and clinical studies
 - Attrition, refusal, non-compliance, etc.
- Increasing **costs** of data collection
- Multiple sources of **uncertainty**
 - Need for complex designs that extend beyond well-tested methods
 - Interactions among design features
 - Variability in data collection (e.g., field researchers, volunteer samples, etc.)

Decreasing Response

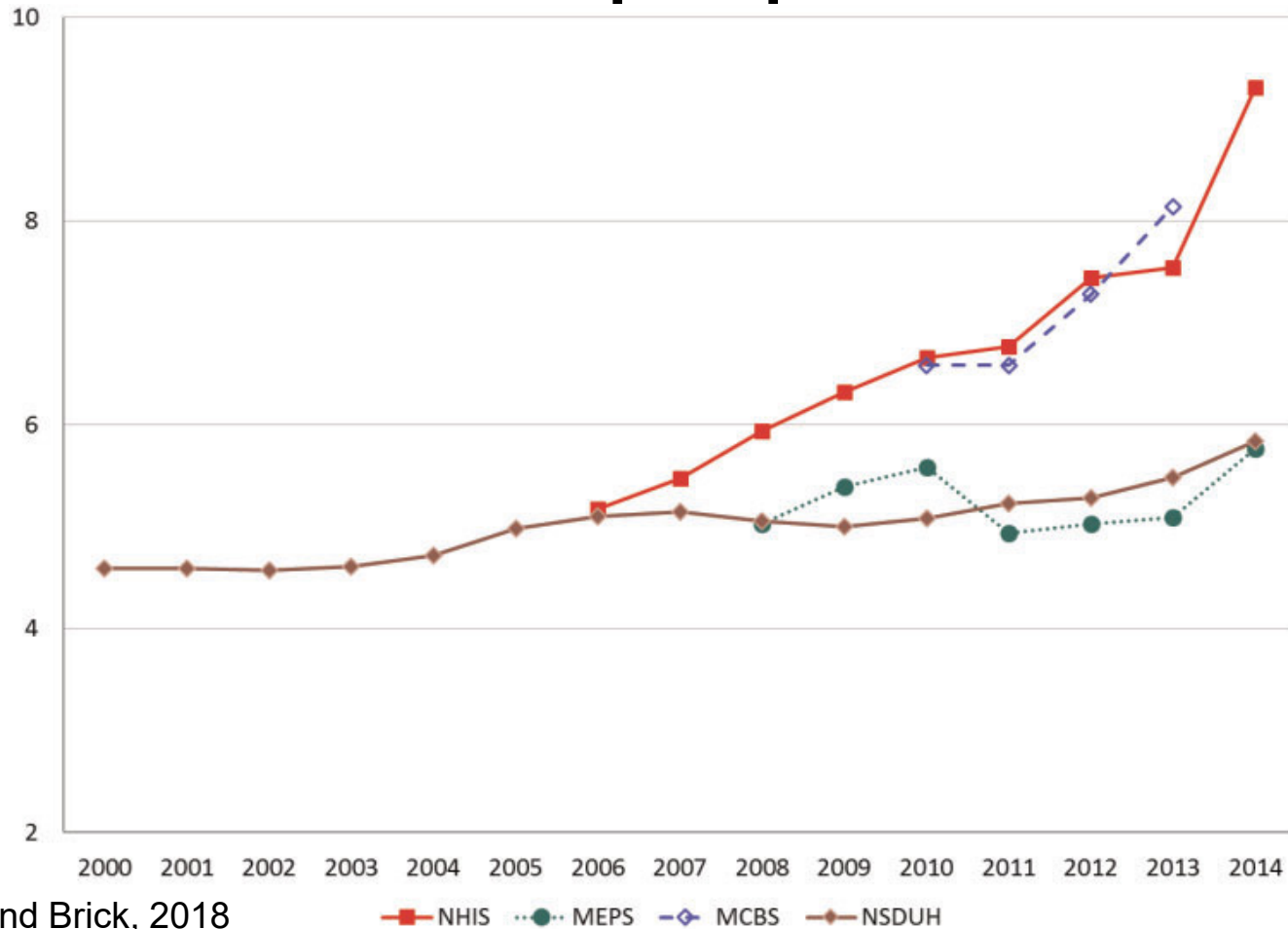


Williams and Brick, 2018

Increasing Costs of Data Collection

- Related to greater difficulty in gaining participation
 - More contact / follow-up attempts
 - More refusal conversion / tracking efforts
 - Curtin et al. (2000): declining response rates despite greater data collection effort
- Sampling and mode related factors, e.g.:
 - Higher nonresponse in web modes → need for more expensive follow-up procedures

Level of Effort: Contact Attempts per Interview



Williams and Brick, 2018

Why Does This Matter for Longitudinal Prevention Research?

- **Imbalances between treatment groups** introduced by differential attrition can:
 - Bias overall estimates of treatment effects
 - Bias estimates of long-term benefits due to treatment
 - Increase standard errors, reducing statistical power
 - Increase overall study costs
- We aim to introduce a principled methodology for addressing these problems **during data collection** → **Responsive Survey Design**

RSD: BASIC CONCEPTS

Responsive Survey Design

(Groves and Heeringa, 2006)

- (a) **Pre-identify a set of design features** potentially affecting costs and errors of survey estimates,
- (b) **Identify a set of indicators** of the cost and error properties of those features and monitor those indicators in initial phases of data collection,
- (c) **Alter the features of the survey** in subsequent phases based on cost–error trade-off decision rules drawing on the indicators, and
- (d) **Combine data** from the separate design phases into a single estimator.

Essential Concepts in Groves and Heeringa's Approach

- **Design phase**
- **Complementary** design features
- Use of **experiments** in early phases
- Notion of **phase capacity**
- Use of **paradata** in phase evaluation
- **Error-sensitive indicators**

Design Phase

- A related notion of **essential survey conditions** (*Hansen, Hurwitz, and Bershad, 1961*)
- A design *phase* includes a particular set of design features; this set is different across design phases
- Phases can be sequential, concurrent, or both (e.g., when assigned at the sample member level); phases considered within a wave

Design Phase: Example

- Phase 1: **Web survey**
 - Up to 3 email invitations
 - 15 minute instrument completed over the internet
- Phase 2: **Telephone**
 - Administered to remaining nonrespondents after phase 1
 - Up to 8 contact attempts
 - 15 minute instrument completed over the telephone

Complementary Design Features

- When combined, offer minimum error among a set of features
 - Elicit participation among those who do not participate for different reasons

Complementary Design Features: Example

- Phase 1: **Web Survey**
 - Younger persons and persons with internet access more likely to respond
- Phase 2: **Telephone Survey**
 - Older persons and persons without internet access more likely to respond
- Balance?

Use of Experiments in Initial Phases

- Which set of design features is optimal?
- Use part of the sample to select the preferred set of features, to implement for the rest, or in later phases for the same sample (incl. panel studies)
- Randomized experiments allow for data-based decisions *in the context of the specific study*

Phase Capacity

- “**Phase capacity** is the stable condition of an estimate in a specific design phase, i.e. a limiting value of an estimate that a particular set of design features produces.”
- When a phase hits capacity, there will be no benefit to additional effort!

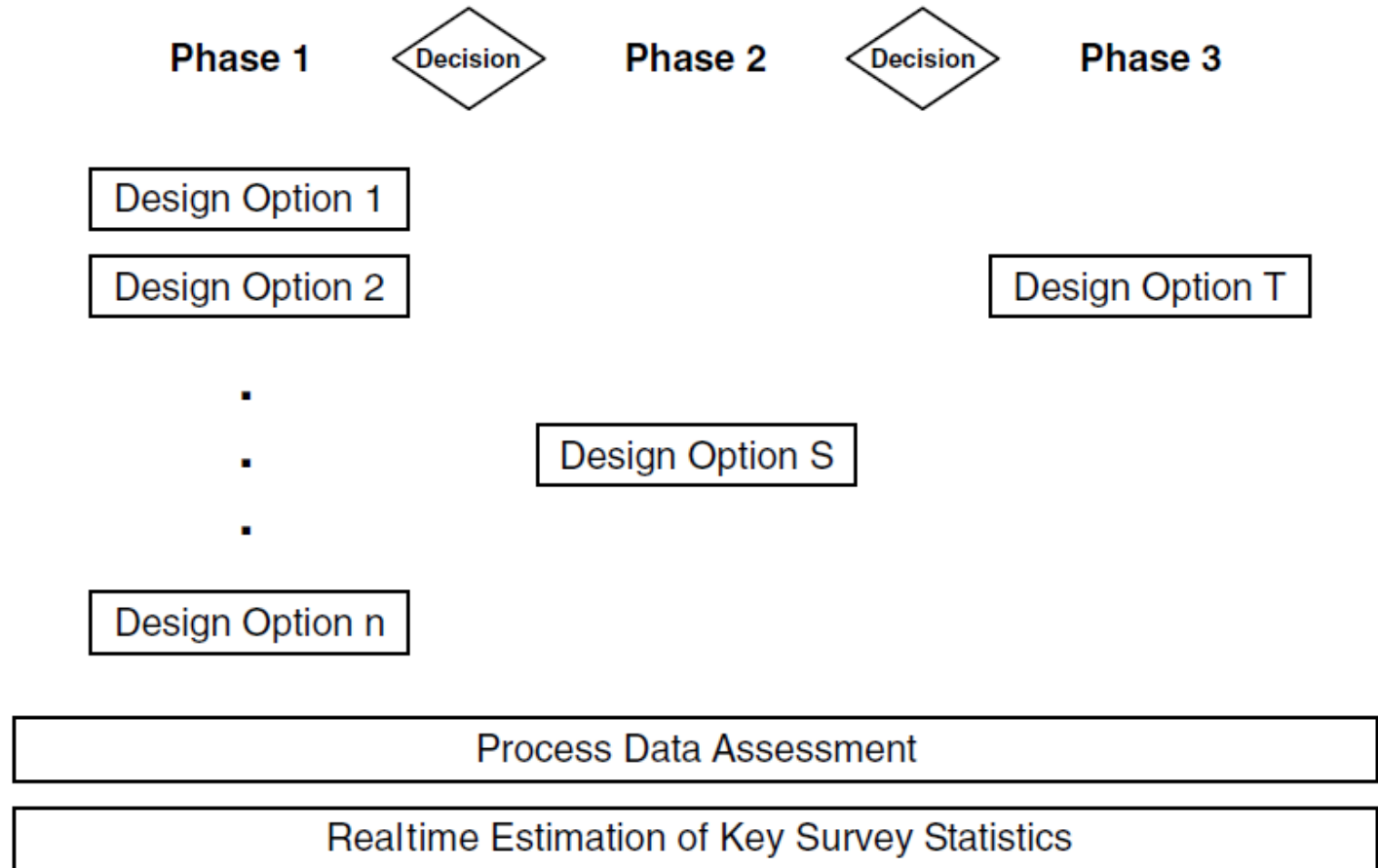
Use of Paradata

- **Paradata** are data about the data collection process
 - Example: Records of contact attempts
 - Example: Keystrokes from web/CATI/CAPI survey
- Can be used to form **indicators**
 - Example: Do estimates change when we make the 10 contact attempts compared to 8 attempts?

Error-Sensitive Indicators

- Example: R-Indicator (*Schouten, et al., 2009*)
 - $1 - 2S(\hat{p})$
 - How variable are response rates across subgroups?
 - Higher R-Indicator indicates less variability; characteristics of respondents similar to sample characteristics
 - Could be computed within treatment groups: have the desired effects of randomization held up over time?
 - Proxy for nonresponse bias
 - Empirical evidence (*Schouten, et al., 2016*)

Combining It All Together Into a Responsive Design



(Source:
Groves and
Heeringa,
2006)

RSD: STEPS AND TOOLS

Example Survey: The Relationship Dynamics and Social Life (RDSL) Panel Study

- Documents risk factors for unintended pregnancy in early adulthood (2/3 of pregnancies to U.S. women ages 18-21 are unintended)
- Measure the weekly dynamics of contraceptive use as young women enter and exit sexual relationships
- Minimize recall error to maximize accuracy of relationship context of contraceptive choices

Key RDSL Design Features

- Weekly interviews in a prospective panel
 - Minimize recall error
 - 30 months (130 weeks)
- Internet and Phone modes of data collection
 - Maximize privacy for sensitive topics
 - Example of a protocol change to try and gain participation from initial non-respondents in web
- Initial face-to-face interview
 - Achieve high response rates
- Single county design

0. Identify key objectives

- “Step 0” in a responsive design
- Example objectives:
 - Limit risk of nonresponse bias,
 - Largest sample size for a fixed budget,
 - Cost control... and so on.
- Make explicit prioritization of objectives

0. Key RSD Objectives for RDSL Panel Survey

- Top priority:
 - Minimize attrition from the panel
- Next priority:
 - Complete as many weekly interviews as possible (130 possible)

I. Identify Areas of Uncertainty

- Identify areas of uncertainty or risk
- Survey design often assumes known quantities
 - Response rate
 - Eligibility rate
 - Effort/costs
- Estimates actually have uncertainty
- *Which of these risks most threaten the quality of estimates, especially estimated treatment effects?*

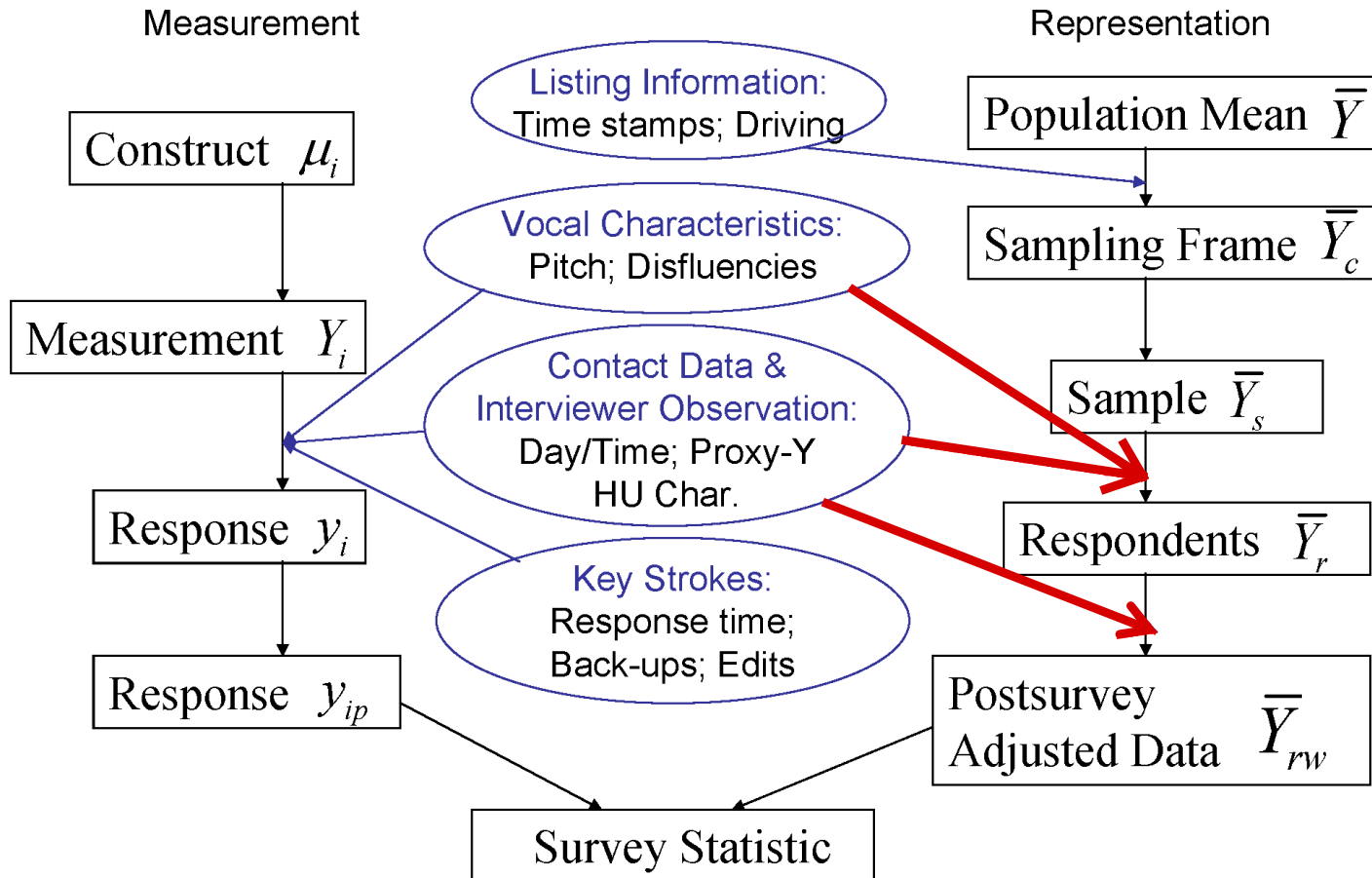
I. Identify Areas of Uncertainty

- Sampling Error
 - Insufficient number of interviews
 - Population variance higher than expected
- Nonresponse Error
 - Biased estimates
- Measurement Error
 - Interviewer variance higher than expected
 - Mode impact on social desirability bias
- *What risks have your projects faced?*

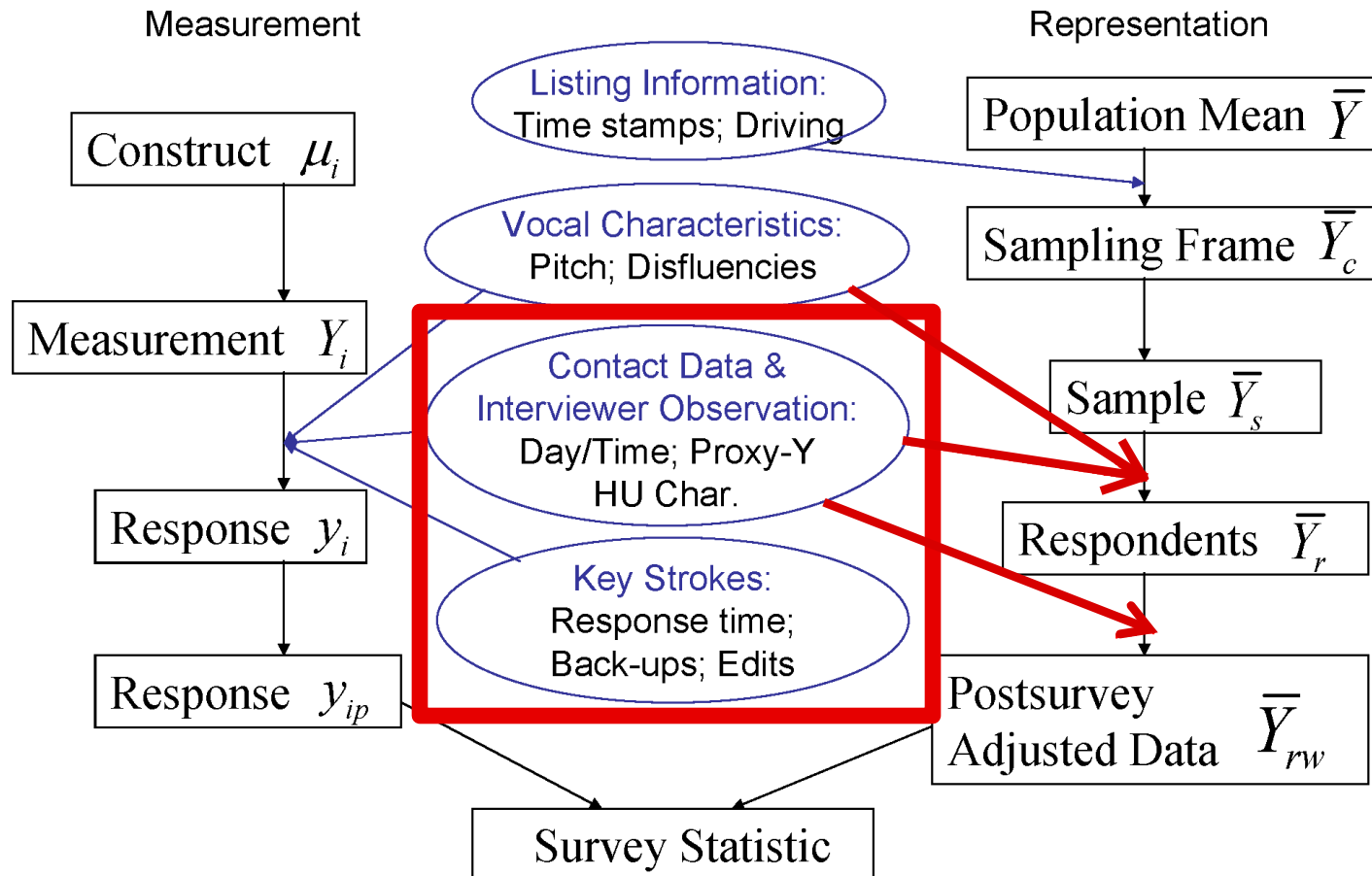
I. Example: RDSL Risks

- Risk #1: Sampled women not willing to participate
- Risk #2: Panel members begin participating but stop (attrition)
- Risk #3: Participate rarely

2. Indicators



2. Indicators



2. Example: RDSL Error Indicators

- Risk #1: Not willing to participate
 - *% who complete web survey #2*
- Risk #2: Begins participating but stops (attrition)
 - *% who stop completing web surveys*
- Risk #3: Participates rarely
 - *% completing subsequent survey 14 days or more after prior survey*

3. Develop Interventions

- Two components to interventions
 1. A rule specifying when to implement it.

For instance:

“If a subgroup response rate is more than X% below the next lowest group, then take an action.”

2. The planned design change.

3. Develop Interventions

- Ideally, the *timing* coincides with the boundaries defined by “phase capacity.”
- Ideally, the intervention introduces complementary design features

3. Example: RDSL RSD Interventions

- Use experience on early replicates to alter protocol on later replicates
 - Replicate=subsample of full sample
 - Allow each user multiple options for mode of response (see next slide)
 - Use reminders (**email** and **telephone** to prompt web response)
- Rule: If second interview is not complete after 7 days, start email reminder protocol
- Rule: If previous interview is not complete after 14 days, start telephone reminder protocol

3. RDSL Levels of Mode Switching

- 947 respondents completed 2 or more weekly journals
- Of the 872 who began journal keeping by web interview, 60% completed at least one journal by phone
 - The range was from 1-78 journals completed by phone (again, these all would have been lost otherwise!)
- Of the 75 who began the journal keeping by phone, 39% completed at least one journal by web interview

4. Evaluate and Document

- This is a very important part of the process!
- Lessons learned need to be accumulated
- Goal: replicability

Characteristic	Total Sample (n=947)	Subsample who used same mode at every journal (n=504)	Subsample with at least one mode switch (n=443)	p-value
	%	%	%	
Received public assistance	.25	.19	.32	***
Changed residence	.40	.33	.49	***
Sex	.78	.73	.82	**
Sex without contraception	.50	.41	.59	***
Sex with a new partner	.45	.38	.52	***
Sex with someone other than current partner	.18	.13	.24	***
Conflict with a partner	.16	.11	.21	***
Lived with a partner	.41	.35	.48	***
Pregnant	.13	.10	.18	***

4. Logistic regression estimates of the effects of positive and negative pregnancy desires on the hazard of pregnancy

Characteristic	Full sample	Subsample without mode switchers
Desire to become pregnant	.22 (.10)	.17 (.12)
Desire to avoid pregnancy	-.24 (.09)	-.26 (.10)
Sociodemographic Characteristics		
Controls not shown...		

Summary of RSD Concepts

- Responsive survey design arose in the face of **uncertainty** about key design parameters
- Responsive design is a **pre-planned** procedure
 - Framework for optimizing decisions
 - Replicable research

Questions?

Thank You!

- Please do not hesitate to contact me after the webinar with any questions

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So What Is *Adaptive* Design?

- Responsive design: Uncertainty
- Adaptive design: Prior Knowledge
- Both: Heterogeneity
- Adaptive design starts from the idea that the optimal survey protocol might differ across persons
- Create subgroups, assign different design protocols to subgroups based on pre-existing knowledge
 - Does not involve phases!

Elements of Adaptive Design

- Subgroups in population (strata)
 - Implies data on sampling frame
 - Differ in how they respond to various protocols
- A set of survey protocols (interventions)
- Knowledge of how subgroups respond across all protocols
- Optimize assignment of protocols to subgroups
 - Cost-error tradeoffs

(Schouten, Peytchev, Wagner, 2017)