

What does *Adaptive Design* mean to you?

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Some Questions to Consider

- What do *responsive* and *adaptive design* mean? Are they the same?
- Do these terms refer to something new in survey research?
- What do they imply about survey goals?
- What do they say about how surveys are executed?
- What do adaptive or responsive designs actually achieve?
- What do they portend for the future of surveys?

Data Collection Management

- No matter which term we use, responsive and adaptive design are about how to manage fieldwork
- Both involve striving for efficiency
- Both concerned with striking a balance between costs and errors

Responsive

- All about website design?
- Latin: *re* (again); *spondere* (to swear)
- Respond: “To say or do something in reply or as a reaction”
- *Responsive*: “Reacting quickly and positively”

Adaptive

- All about clinical trials?
- Latin: *ad* (to); *aptare* (to fit)
- *Adapt*: “To fit or suit to something”
- Modify to meet new circumstances
- *Adaptive*: “fitting, apposite”

Comparison of Terms

- Both have change in behavior
- Both have external trigger
- The meanings are very close: “adapt in response to...”
- A sense that *adaptive* is more active, controlling; adapt something to conditions

Adaptive and Responsive in Survey Methodology

- Terms have been appropriated differently by individuals and organizations
- *Responsive* used by Groves and Heeringa (2006), Couper and Wagner (2011), Laflamme and St-Jean (2011), inter alia.
- *Adaptive* employed by Schouten et al. (2013) and Wagner (2008), inter alia.
- Census: from CreD to CAD
- Propose that we settle on *adaptive*

Adaptation is NOT New

- Many surveys have adaptive elements, e.g.:
- Sub-sampling non-respondents
- Increasing contacts
- Timing contacts
- Increasing incentives
- Tailoring survey invitations
- Tailoring refusal letters
- Switching modes

Some Adaptations ARE New

- More centralized, less *ad hoc*, more timely efforts, e.g.
- Using auxiliary data to tailor contacts
- Using auxiliary data, paradata and response data to alter contacts
- Switching modes based on auxiliary data, paradata and response data
- Motivated by a plan and enabled by new systems

Adaptive Design

- A data collection is adaptive to the extent that it:
- **Plans** fieldwork to achieve cost and quality goals
- **Monitors** process data and cost and quality indicators
- Uses auxiliary frame data to **tailor** contact approaches (or impute or adjust)
- Uses auxiliary data, paradata and response data to **change** contact approaches rapidly
- Strikes data-based cost/quality tradeoffs

Similarities to Adaptive Design in Clinical Trials

FDA Guidance to Industry --

An adaptive design clinical study:

- includes a prospectively planned opportunity for modification of one or more specified aspects of the study design
- based on analysis of data from subjects in the study.
- Analyses of the accumulating study data are performed at prospectively planned time points within the study.

New Survey Goals

- Adaptive design gives further impetus to reconsider the response rate as the arbiter of quality
- Must consider, too, sample quality measures, key survey estimates quality
- Consider more explicitly the tradeoffs among different survey goals and between those goals and costs
- Adaptive design advances the total survey error perspective

Illustration: 2013 Census Test

- An operational study of NRFU procedures
- Use administrative records to “enumerate” some housing units
- Try an adaptive design approach for cases not enumerated with records
- Compare with a fixed enumeration approach
- Examine two telephone methods
- Reduced contacts

Sample

- Two matched sets of block groups in the Philadelphia area
- Block groups randomly assigned to adaptive or fixed case management approaches
- 2000 sample housing units selected from a universe of 2010 NRFU HHs within these block groups
- 1000 housing units for adaptive and 1000 for fixed case management treatments

2013 Census Test Design

	Adaptive Design	Fixed
ADRECs used for “enumeration”	<p>N=528</p> <ul style="list-style-type: none"> -Use administrative records to enumerate before field -CATI telephone -Max in-person Contacts 3 -Model determines days to contact 	<p>N=511</p> <ul style="list-style-type: none"> -Use administrative records to enumerate before field -Decentralized telephone -Max in-person Contacts 3 -FRs determine days to contact
ADRECs not used for “enumeration”	<p>N=528</p> <ul style="list-style-type: none"> -Use administrative records to inform business rules -CATI telephone -1 or 3 contacts -Model determines days to contact 	<p>N=510</p> <ul style="list-style-type: none"> -No use of administrative records -Decentralized telephone -Max in-person Contacts 3 -FRs determine days to contact

Adaptive Components of 2013 Census Test

- Auxiliary data (phone numbers) added to frame
- Mode allocation and dynamic switching
- Auxiliary data (Admin Records) used to determine number of contacts
- Auxiliary data (2010 NRFU) used for initial response propensity model for case assignment
- Contact history paradata added to response propensity model during fieldwork

More Census Adaptive Design Research

- Some examples:
- Upcoming Decennial tests
- National Survey of College Graduates
- NHIS collaboration: interviewer observations and stopping rules
- Subsampling in Economic Census
- Various capabilities in ACS
- Response propensity scores in several surveys

Example Early Adaptive Design Achievements

- Impressive cost reductions in National Survey of Family Growth due, in part, to AD implementation
- Promising results from CATI implementations at Statistics Canada
- Suggestive findings in Decennial research and testing.
- Ancillary effects on research capabilities across organizations:
 - Systems
 - Employment models
 - Complementary capabilities – e.g. routing

Agenda

- We need much more research on all aspects of adaptive design
- Contributions from different kinds of survey organizations are essential
- Transparency is crucial.
- Understanding where adaptive design fits in current regulatory framework is important
- Resolving the “chicken and egg” problem

The Future

- The survey enterprise faces major challenges
- If we are going to collect data, we will have to do it differently
- Adaptive design is one key element in the Census plan for change
- Whether “full blown” or partial, the adaptive design perspective offers a way to manage the challenges of the current survey environment

References

- Couper, M. and J. Wagner (2011). “Using paradata and responsive design to manage survey nonresponse.” Proceedings of the 58th World Statistical Congress.
- Groves, R. and S. Heeringa (2006). “Responsive design for household surveys: Tools for actively controlling survey errors and costs” *Journal of the Royal Statistical Society. Series A.* 169:3 pp. 439-457.
- Laflamme, F. and H. St-Jean (2011). “Highlights and Lessons from the First Two Pilots of Responsive Collection Design for CATI Surveys.” Proceedings of the Joint Statistical Meeting.
- Schouten, B., M. Calinescu and A Luiten (2013). “Optimizing the quality of response through adaptive survey designs.” *Survey Methodology.* 39:1 pp. 29-58.
- Wagner, J. (2008), *Adaptive Survey Design to Reduce Nonresponse Bias.* Ann Arbor, MI: University of Michigan, Ph.D. thesis.

Thank you

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