Utrecht University

Summer Course Survey Research: Advanced Survey Design

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Adaptive and responsive designs

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Fieldwork design and nonresponse

The primary means of maximizing response rates is well-planned fieldwork efforts. These include

- Repeated contact attempts

- … at different times of the day and days of the week

- Refusal conversion efforts

- … with a fresh and more experienced interviewer

- Interviewer training of refusal avoidance

- Interviewer payment by the hour (instead of per interview) to make the hard cases worthwhile

- Respondent incentives (preferably cash and unconditional)

- Multi-mode approaches (e.g. advance letters)

The idea of Responsive designs

- Responsive design shift the focus of fieldwork away from maximizing response rates to minimizing nonresponse bias.

- In responsive designs key survey estimates are monitored during fieldwork.

- If, in a particular fieldwork design, survey estimates stop changing – i.e. „more of the same" respondents are recruited into the survey – the fieldwork design is changed.

- This process is repeated several times with different fieldwork designs.

Responsive design

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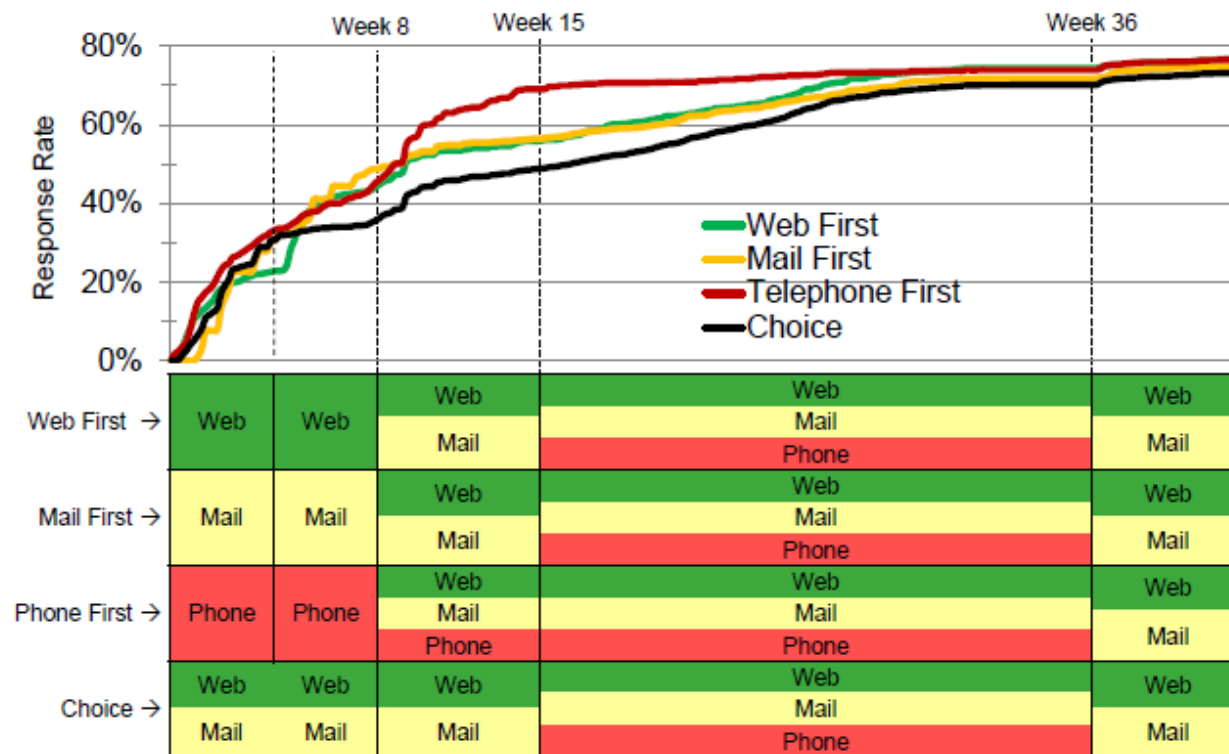
Example responsive design

- Work of Finnamore (2013) to inform later study (2015)
- Survey of college graduates
  - Experimental design: different modes offered first.

Response Options in Each Phase of Data Collection

|	Data Collection Phase				
	Invitation Phase (Weeks 1-4)	**Initial Reminder Phase** (Weeks 5-7)	**Additional Mode Phase** (Weeks 8-14)	**Production CATI Phase** (Weeks 15-35)	**Incentive Phase** (Weeks 36-42)
Web First	Web	Web	Web / Mail	Web / Mail / Telephone	Web / Mail
Mail First	Mail	Mail	Web / Mail	Web / Mail / Telephone	Web / Mail
Telephone First	Telephone	Telephone	Web / Mail / Telephone	Web / Mail / Telephone	Web / Mail
Choice	Web / Mail	Web / Mail	Web / Mail	Web / Mail / Telephone	Web / Mail

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Example responsive design (2)

Does mode sequence impact response rates?

See also: Stephanie Coffey and others, Interventions On-Call: Dynamic Adaptive Design in the 2015 National Survey of College Graduates, *Journal of Survey Statistics and Methodology*, Volume 8, Issue 4, September 2020, Pages 726–747, https://doi-org.proxy.library.uu.nl/10.1093/jssam/smz026

Example responsive design (3)

Mode of response gravitates toward initial mode offered
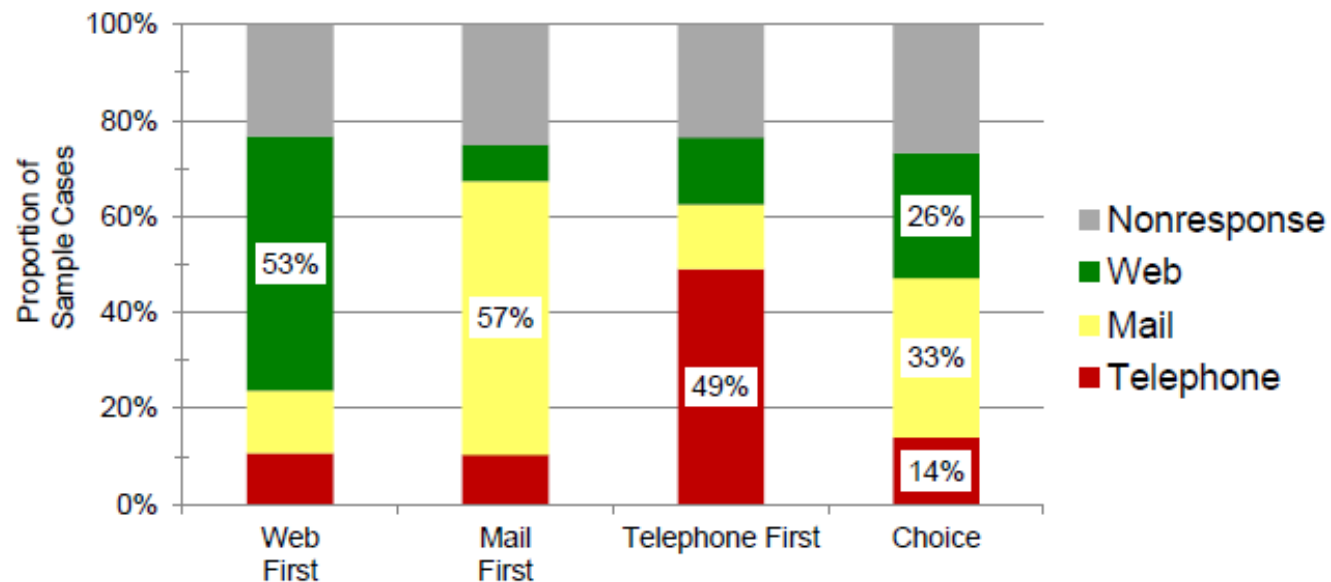
Representativeness of response

- How can higher response rates lead to an increased bias?

  - Expected bias $$B(\bar{y}_R) = \frac{R_{\rho Y} S_\rho S_Y}{\bar{\rho}}$$

- About 10 years ago interest emerged in indicators that measure "representativeness"
  - To use as counterparts of response rates
  - To enable comparative research over time or over surveys
  - To get insight into the quality of the data collection
  - To monitor survey fieldwork
  - To use in allocation of fieldwork efforts → adaptive/responsive designs

Representativeness of response

- How to define representativity?
  - Representativity can only be investigated with respect to available auxiliary information.
  - *A response mechanism is **(weakly) representative** for auxiliary variable X if the average response propensity is the same within classes of X.*

- Could the weak definition be the basis for indicators?
  - Yes, definition can be tested using χ^2 statistics!
  - Estimate individual response propensities with a multivariate model incorporating available auxiliary information.

R-indicators

Without a specific population paramete in mind

R-indicator
$$R(X) = 1 - 2S(\rho_X) \in [0,1]$$

ρ_x probability of response

X vector of aux. variables

With population mean or total in mind

Coefficient of variation
$$CV(X) = \frac{S(\rho_X)}{\bar{\rho}} \in [0, \infty)$$

Manual, code in SAS and R available at www.risq-project.eu

"R-indicator measures the similarity between the response and the sample of a survey. The response is representative if the individual response propensities are equal for all units of the population." (Luiten & Schouten 2013)

Representativeness of response

Example: Survey on Informal Economy

X = age, house value, ethnicity, type of household, employment, urban

Response group	Response rate	R	Confidence interval	CV
Face-to-face	56.7%	77.8%	74.4% - 81.3%	0.102
Web/paper	33.9%	86.3%	83.1% - 89.4%	0.112
Web/paper + phone	49.0%	79.3%	75.6% - 83.0%	0.113

Representativeness app-based HBS

- App-based Household Budget Survey in 3 countries
- Representativeness at different stages of "response"/across countries
- R-indicators (1 – highest representativeness)
- Coefficient of variation CV (0 – highest representativeness)

	Registered		Active		Complete	
	R	CV	R	CV	R	CV
Combined	0.88	0.26	0.90	0.28	0.92	0.25
Netherlands	0.75	0.62	0.76	0.70	0.91	0.33
Luxembourg	0.82	0.31	0.84	0.37	0.88	0.32
Spain	0.84	0.45	0.84	0.50	0.92	0.32

Combined R & CV based on age, hh size
NL: age, hh size, ethnicity, education, urban, home owner, income
LU: age, hh size, income
ES: age, hh size, education, urban

As reference web-based 2020 HBS R-indicator (complete) = 0.94

Representativeness of response

☐ Partial R-indicators decompose R-indicator based on the impact of single variables

! Which category within *X* is responsible for the deviation of representativeness?

total variance = between variance + within variance

☐ Unconditional partial R-indicator for a single variable Z: *the between variance of response propensities*

☐ Conditional partial R-indicator for a single variable Z given X: *the within variation in response propensities given a stratification on X*

☐ Both type of indicators should ideally be close to 0 and allow for monitoring of data collection and resource allocation

! Large unconditional partial indicators = variable has a strong effect on representativeness

☐ Code in R and SAS available at www.risq-project.eu

The 2015 follow-up study

- Static design
  - Web -> web -> mail -> CATI -> mail -> web

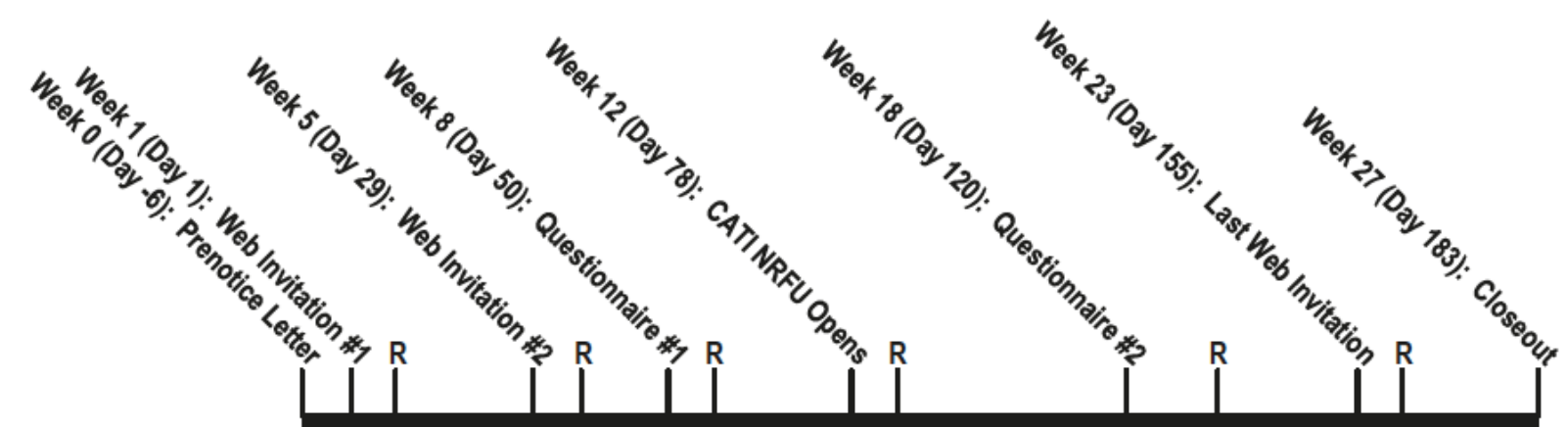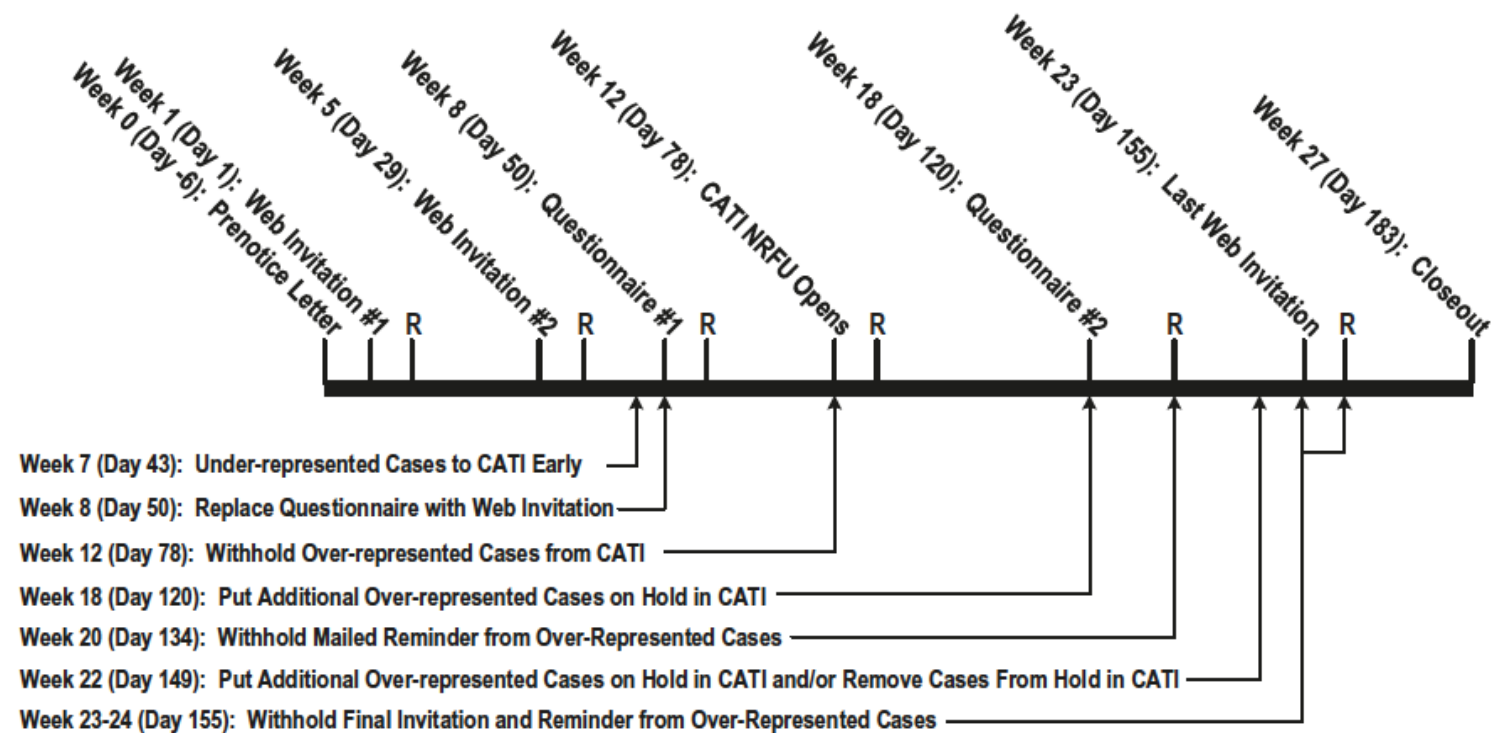**Figure 1. Scheduled Operations During NSCG 2015 Experiment.**

The 2015 follow-up study

- Experimental adaptive survey design

Week 0 (Day -6): Prenotice Letter
Week 1 (Day 1): Web Invitation #1
Week 5 (Day 29): Web Invitation #2
Week 8 (Day 50): Questionnaire #1
Week 12 (Day 78): CATI NRFU Opens
Week 18 (Day 120): Questionnaire #2
Week 23 (Day 155): Last Web Invitation
Week 27 (Day 183): Closeout

R R R R R R R

Week 7 (Day 43): Under-represented Cases to CATI Early
Week 8 (Day 50): Replace Questionnaire with Web Invitation
Week 12 (Day 78): Withhold Over-represented Cases from CATI
Week 18 (Day 120): Put Additional Over-represented Cases on Hold in CATI
Week 20 (Day 134): Withhold Mailed Reminder from Over-Represented Cases
Week 22 (Day 149): Put Additional Over-represented Cases on Hold in CATI and/or Remove Cases From Hold in CATI
Week 23-24 (Day 155): Withhold Final Invitation and Reminder from Over-Represented Cases

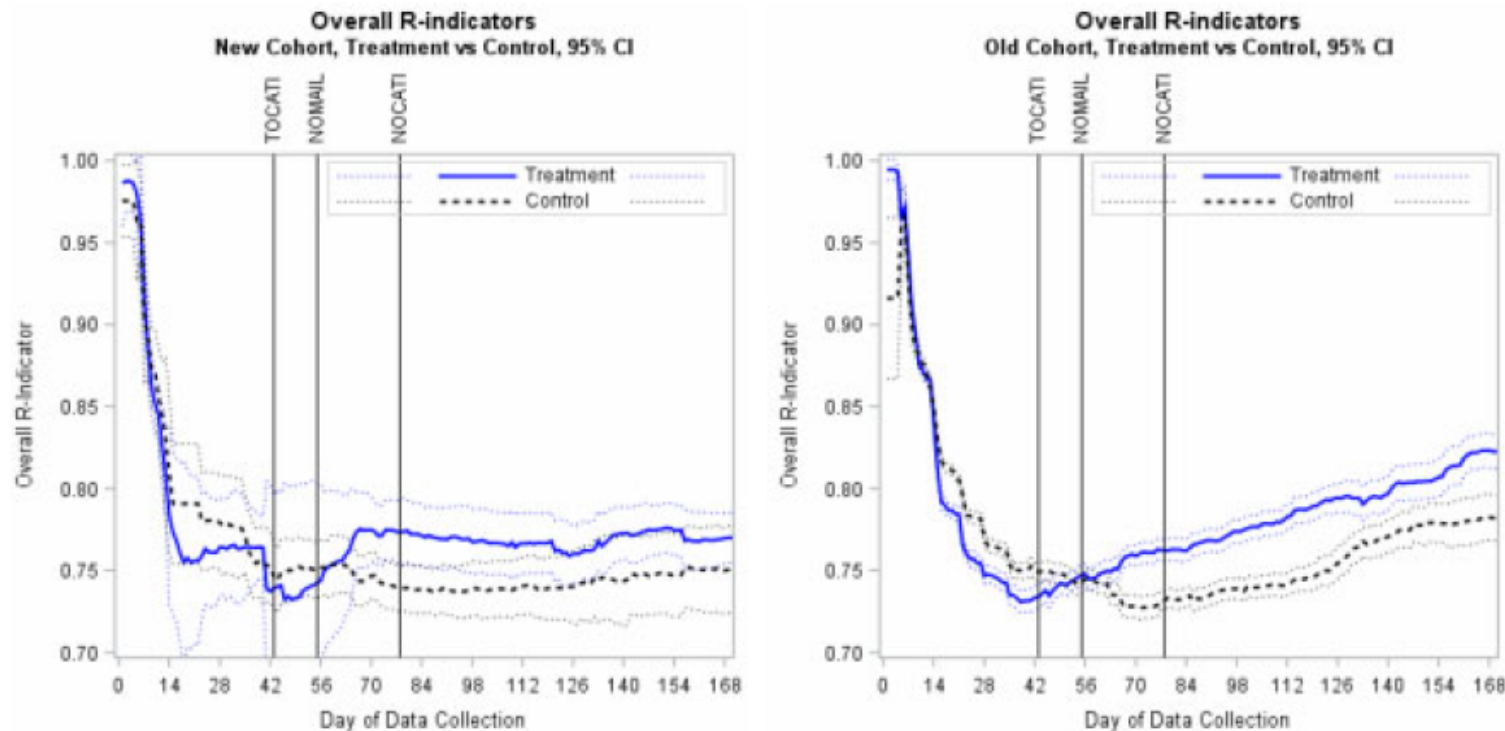# R-indicators throughout phases

Figure 4. Overall R-Indicators for the New and Old Cohort (95 Percent Confidence Intervals).
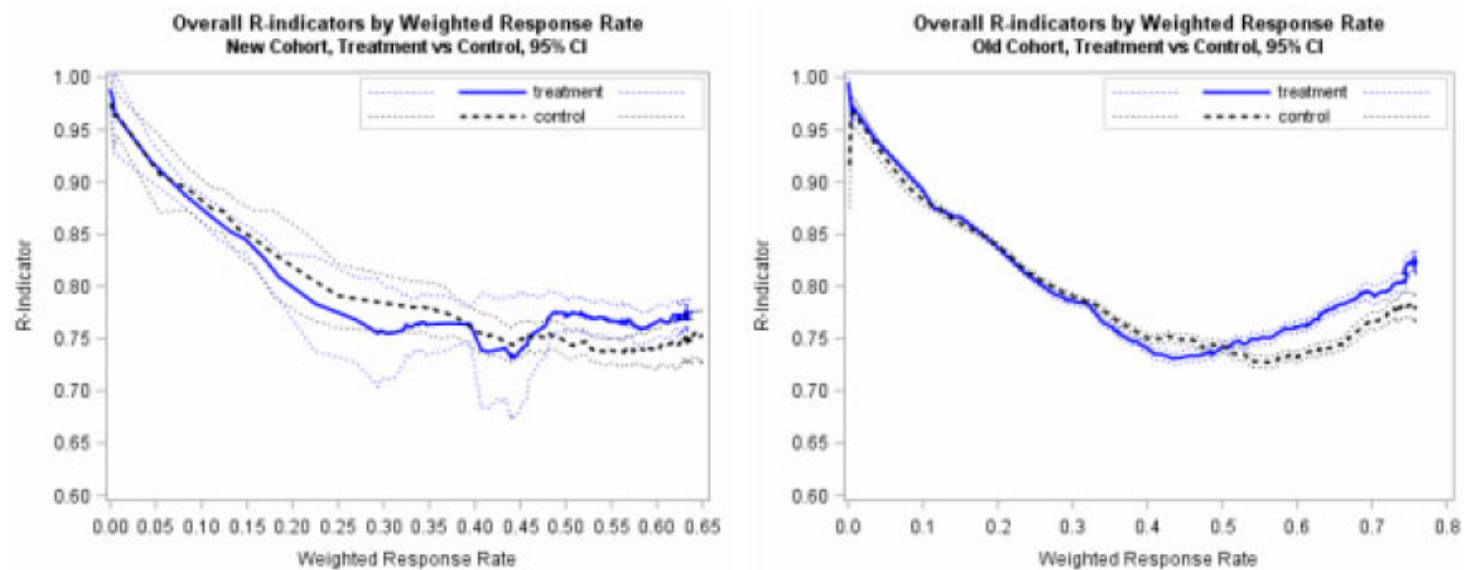
Figure 5. R-Indicators by Weighted Response Rate (95 Percent Confidence Intervals).

Adaptive/responsive survey designs

- Reduction of nonresponse implies that survey budget needs to be increased or reallocated

- Adaptive survey designs (ASD) and responsive survey designs (RSD) arise from the following viewpoints:
    - Persons/households may prefer different forms of communication and interview, i.e. react differently to different design features
    - Different design features are associated with different costs

- In other words, there is a quality-cost differential

- The emergence of web, the technological advance of case management systems and the gradual decrease of response rates are the main drivers for such designs

Adaptive/responsive survey designs

- ASD/RSD are extensions to sampling designs where instead of a single (uniform) strategy multiple candidate strategies can be drawn.

- Components of ASD/RSD:
    - Registry data/frame data: static designs
    - Paradata: dynamic designs
    - Quality indicators of survey response
    - Cost functions
    - Design choices (survey mode, call strategy, interviewer)

- Response rate and R-indicators may be used as quality indicators in ASD/RSD

Adaptive/responsive survey designs

Example Consumer Sentiments Survey 2009, Luiten & Schouten (2013)

Tailored fieldwork design to increase representative household survey response: an experiment in the Survey of Consumer Satisfaction

Annemieke Luiten and Barry Schouten

Statistics Netherlands, Heerlen, The Netherlands

Summary. We used a tailored survey design to obtain a more representative response. Para-data from previous consumer sentiments surveys and register information were used to stratify the sample into groups that differed in contact and co-operation propensity. We approached an experimental sample of 3000 households with a Web–mail–computer-assisted telephone interviewing sequential mixed mode strategy. The choice of initial mode and the subsequent computer-assisted telephone interviewing approach were tailored to the expected contact and co-operation propensities of the sample units. In the computer-assisted telephone interviewing follow-up of non-respondents, co-operation was manipulated by assigning specific interviewers to specific sample units. Contact was manipulated by timing, spacing and prioritizing calls. The tailored fieldwork strategy was successful in significantly increasing representativeness, while maintaining the level of response and costs. Representativeness was determined by *R*-indicators.

Adaptive/responsive survey designs

- **Example Consumer Sentiments Survey 2009** (Luiten & Schouten, 2013)

  - Control: CATI SCS, experiment: responsive design
  - Used paradata from previous consumer sentiment surveys & administrative variables from registers
  - To predict contact and cooperation propensities and at-home patterns in a new wave of SCS
  - Tailored design sought to reduce the variability in response propensities of sociodemographic and socio-economic groups
  - Stimulated response from units with low response propensity, curbing those with high response propensity
  - Assigned sample units to different modes (Web and mail) in an initial approach, and differentiated the timing and number of CATI contact attempts, and the interviewers assigned to specific sample units in the follow-up

Adaptive/responsive survey designs

Example Consumer Sentiments Survey 2009, Luiten & Schouten (2013)

	SCS				Experiment			
	N	R	CI		N	R	CI	
Sample	3000				3000			
Eligible	2774	0,84	(0,813 -	0,865)	2856	0,85	(0,856 -	0,905)
Contacted	2578	0,83	(0,801 -	0,856)	2673	0,89	(0,842 -	0,895)°
Able	2350	0,86	(0,832 -	0,881)	2463	0,85	(0,831 -	0,877)
Cooperating	1884	0,87	(0,842 -	0,896)	1915	0,89	(0,862 -	0,911)
Response	1884	0,77	(0,743 -	0,799)	1915	0,85	(0,821 -	0,872)*

p<.05 ○ p < .10

Summary

- Nonresponse analysis is a prerequisite to nonresponse reduction, possibly through adaptation or tailoring to population units;
- Auxiliary variables from linked administrative data or data collection process data (paradata) play a crucial role;
- The response rate limits the maximal damage caused by nonresponse, but bias is only created when response propensities differ over population units. Additional measures are needed to analyze nonresponse;
- Adaptation to the population seems a natural choice but is limited by the strength of auxiliary information;

References

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