Mixed-Mode Official Surveys. Design and Analysis
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Outline

Why (not) a synthesis of mixed-mode survey methodology?
Design of mixed-mode surveys
Analysis of mixed-mode surveys
Future developments
Why (not) a synthesis on mixed-mode surveys methodology?
Why not a synthesis?

- Modes strongly affect all errors in a TSE framework;
- Modes are communication channels that display strong dynamics over time;
- Often going mixed-mode is driven by costs and not so much by quality;

AND
There is already a very good book, Dillman, Smyth & Christian (2014)
Why a synthesis?

- Statistics Netherlands was one of the frontrunners in official stats going mixed-mode;
- Learned a lot from successes and mistakes;
- Mixed-mode surveys are omnipresent and modes represent a key design feature in survey decision making;
- Mixing modes can make design more robust;
- A comprehensive overview of terminology in design and analysis;

AND

Dillman, Smyth & Christian (2014) does not discuss analysis and estimation

The COVID-19 pandemic clearly pointed at the need of a backup plan both in design and analysis
Mode effects

There are as many types of mode effects as there are errors in a TSE framework, but distinguish at least:

- Mode-specific selection effects;
- Mode-specific measurement effects;

The term mode effect is meaningless without specifying a target population, an estimator, and a population parameter. In fact, they depend on how mode are mixed.

Mode-effects exist regardless of going mixed-mode, but they become more visible when you do.
Design of mixed-mode surveys
Outline

• Modes, mode combinations and mode sequence

• Costs

(in book but not now discussed: increasing web response; communication strategies and incentives)

• Mixed mode questionnaire design
  • Mixed device questionnaire design
## Modes and mode combinations Europe 2018

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The table above lists the modes and mode combinations used in various European countries for the 2018 survey. The columns represent different survey methods: LFS1, LFS2+, SILC1, EHIS, AES, ICT, and CATI. The table provides a comprehensive overview of the survey methods used in each country, including web-based and paper-based options.
Modes and mode combinations Europe 2018

- 46% of designs was mixed mode in 2018
- 61% of LFS1, LFS2, SILC, HBS and ICT in Q2 2021

- Surveys differ in their mode combinations:

<table>
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<tr>
<th>% of cases</th>
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- Countries differ in their mode combinations:

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<th>n different designs</th>
<th>Italy</th>
<th>Luxembourg</th>
<th>Austria</th>
<th>Estonia</th>
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Concurrent or sequential order?

- More than half of European NSIs use a concurrent design
  - Risk of lower response rates
    - Risk of lower response rates can be counteracted by careful survey design
  - Limits the possibility of costs saving
  - More complicated logistics and planning
- Sequential order may ‘push’ the respondent to the cheapest mode and has thus greater potential for costs saving.
- Sequential order is simpler logistically, but may impact subsequent interviewer modes (harder cases, more travel time)
Costs

- Costs are main reason to implement MM surveys in Europe
- FtF fieldwork may be 50 to 100 times as expensive as web
  - But large differences exist as a result of sampling frames, population density, costs of interviewers, mode coverage, etc.
- Field costs are but one component
  - Investments need to be made in IT systems
  - More complexity in other stages: questionnaire design, testing, methodology
Mixed-Mode Questionnaire Design

• Mode differences affect the way respondent understands the questions, e.g.,
  • presence of absence of an interviewer
  • are questions heard or read
  • the visual presentation of questions

• Mixed mode questionnaire design is an important tool in preventing or reducing mode-specific measurement effects.
  • In practice: focus on minimizing differences between modes (unified mode design)

• If one of the modes is web, design the questionnaire to fit on smartphone
  • In the book: list of criteria to determine if questionnaire could fit on smartphone
  • consider redesigning the questionnaire for smartphone!
Analysis of mixed-mode surveys
Outline

- Field Tests and Implementation of Mixed-Mode Surveys
- Re-interview Designs to Disentangle and Adjust for Mode-Effects
- Mixed-mode Data Analysis
Field Tests and Implementation of MM Surveys

- Repeated surveys: uninterrupted time series
- Implementing mixed-mode survey
  - Changes in questionnaire
  - Changes in fieldwork strategies
- \(\Rightarrow\) discontinuities
Field Tests and Implementation of MM Surveys

• Implementation of a mixed mode design:
  • Quantify discontinuities
  • Avoid confounding real period-to-period changes from differences in measurement and selection bias

• Methods:
  • Fieldtest
  • Time series methods
  • Small area estimation
Field Tests and Implementation of MM Surveys

Field test
- Design considerations and implementation in the fieldwork
- Design-based inference (Wald tests and t-type tests)

Time series models:
- Backup if a field test is not possible
- TSM for population parameter
- Level intervention for discontinuity
Field Tests and Implementation of MM Surveys

Small field test
- Insufficient sample size for experimental group
- Can be combined with a time series model
- Small area estimation methods:
  - Model-based inference to improve effective sample size
  - Multivariate multilevel (Fay Herriot) models
Re-interview Designs to Disentangle and Adjust for Mode-Effects

Mode-effects:
• Mode-specific measurement bias
• Mode-specific selection bias

Re-interview designs:
• Disentangle measurement bias and selection bias
• Adjustment measurement bias
Re-interview Designs to Disentangle and Adjust for Mode-Effects

Re-interview design to disentangle mode effects
Re-interview Designs to Disentangle and Adjust for Mode-Effects

Re-interview design to adjust for mode effects

Mode m1
- A
- B

Mode m2
- F
- D
- C
- E

Re-interview

Follow-up
Mixed-mode Data Analysis

Standard inference methods for sample surveys:
• Weighting and calibration
• Correct (at least partially) for selective non-response

(Sequential) mixed-mode designs for repeated surveys
• Varying distributions over modes $\Rightarrow$ variation in measurement bias
  • Cross-sectional: between domains
  • Temporal: between subsequent editions of the survey
• Are standard weighting methods appropriate?
Mixed-mode Data Analysis

Accommodate mode-specific measurement bias:
• Correction methods
• Balancing the mode distribution
  • Calibrate/weight the response to an assumed distribution of the population over the modes
  • Intends to keep the measurement bias constant such that period-to-period changes remain unbiased
Applications

All analysis methods discussed are illustrated with:

• Dutch Labour Force Survey
• Dutch Crime Victimization Survey
• Dutch Health Survey
• Simulations
COVID

- Mixed mode designs are more robust
- Dutch Health Survey:
  - Sequential mixed mode design using WI and CAPI
  - No CAPI during the lockdowns in 2020 and 2021
- Correction for change in measurement bias:
  - Time series based on full response and WI only
  - Bivariate structural time series model: nowcasts for the missing full response estimate in a lockdown
- Example: daily smoking:

![Graph showing STM and direct estimates over time]
Future of mixed-mode surveys
Future of mixed-mode surveys

What are the main open areas?
• Effects of devices on measurement;
• Estimation & adjustment of mode-specific measurement effects;
• Time series models to strengthen comparability in time;
• Reducing pure mode effects with chatbots/interactive features;
• Split questionnaire design;
• Adaptive mixed-mode survey designs;
• Smart surveys, i.e. using the features of smart devices

COVID-19:
• Surveys are vulnerable when leaning on a single mode
• Even in multi-mode setting, a basic understanding of mode-specific selection effects is imperative
Thank you for your attention!

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