

# Assessing risk of nonresponse bias and dataset representativeness during survey data collection

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Day of strike today

# The Research Project

- is part of
  - ESRC National Centre for Research Methods, Workpackage 1 “Data Collection for Data Quality”
  - ESRC Administrative Research Centre for England (ADRCE).

# Introduction

- Focus has shifted from nonresponse rate to nonresponse bias
- Key question: How to monitor, assess and minimise (risk of) nonresponse bias?
  - Post or during data collection
- Questions from survey practice: when to stop calling?

## Introduction

- Fully observed information on both respondents and nonrespondents necessary
- Sample frame information from
  - register / **Census**
  - administrative data
  - **previous wave**
- Datasets (face-to-face surveys):
  - ONS Census nonresponse link study
  - Understanding Society

## How to assess the risk of nonresponse bias?

- **Main idea:** measure similarity between sample data obtained and frame data in terms of variation in response rates
- Use of a response propensity model to obtain estimated response propensities
- **Representativeness indicators:** estimate variation in these response propensities (SD = Standard deviation of the response propensities)
- Low variability in response propensities imply high representativeness

# Representativeness Indicators

- R indicator:

$$R = 1 - 2SD$$

SD= standard deviation of response propensities

Ranges between 0 and 1

Close to 1 indicates high representativeness

- CV (Coefficient of Variation):

$$CV = \frac{SD}{r}$$

r = response rate

CV close to 0 indicates high representativeness

- Here computed at each call (visit to a household by interviewer)

## Applying these Methods – Key Research Objectives

1. **Visualise** trends in dataset representativeness
2. Are trends in representativeness generalizable **across surveys** (of the same population)?
3. Can we derive **stopping points** for an adaptive data collection strategy – can these be generalised?



Data



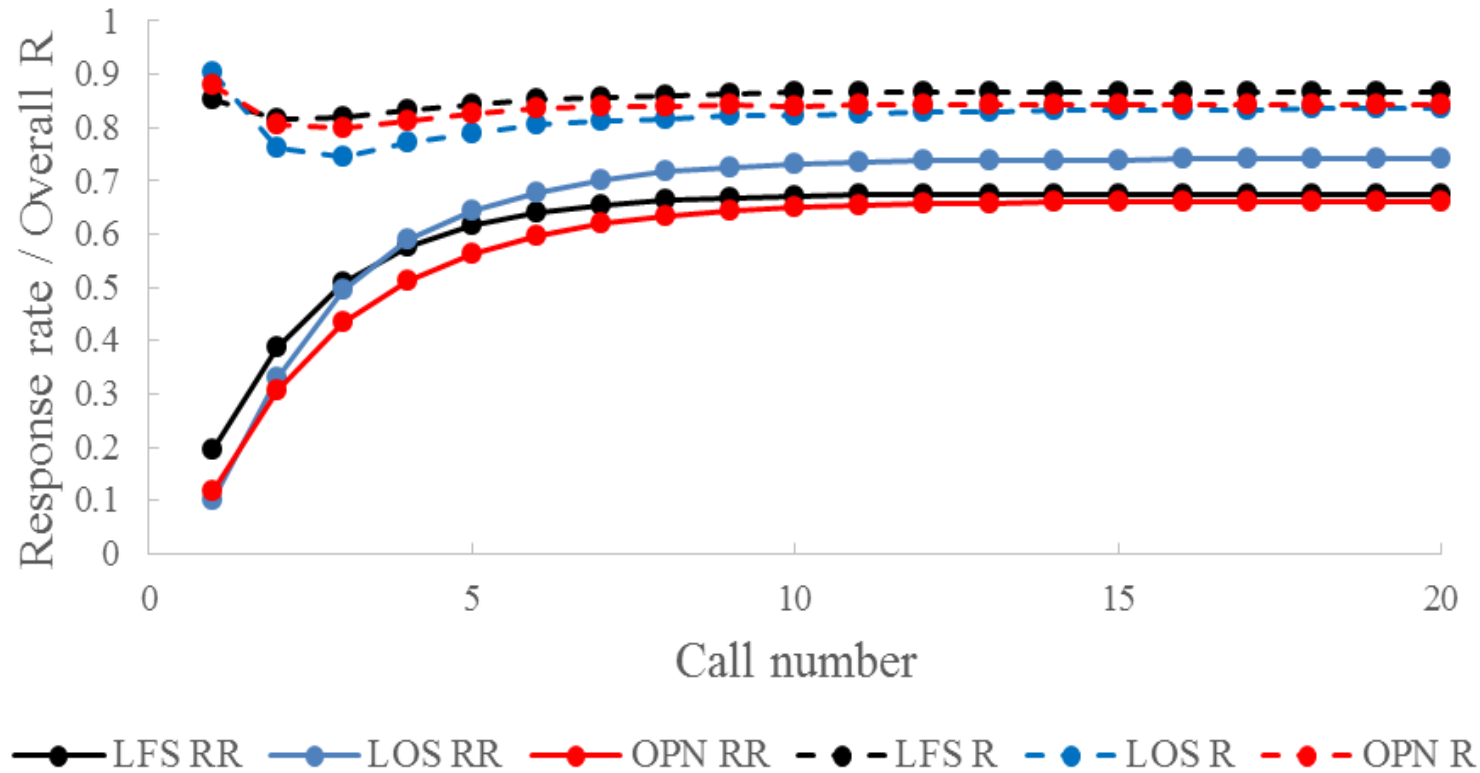
## Data

- **ONS 2011 Census Non-Response Link Study (CNRLS)**
- Links response indicator from three UK social surveys to survey call record data and census household (HH) information on sample frames
- 3 (cross-sectional) face-to-face surveys:
  - Labour Force Survey (LFS) (wave 1)
  - Life Opportunities Survey (LOS) (wave 1)
  - Opinions Survey (OPN)
- Up to 20 calls to a household

# Application and Results



# R indicators

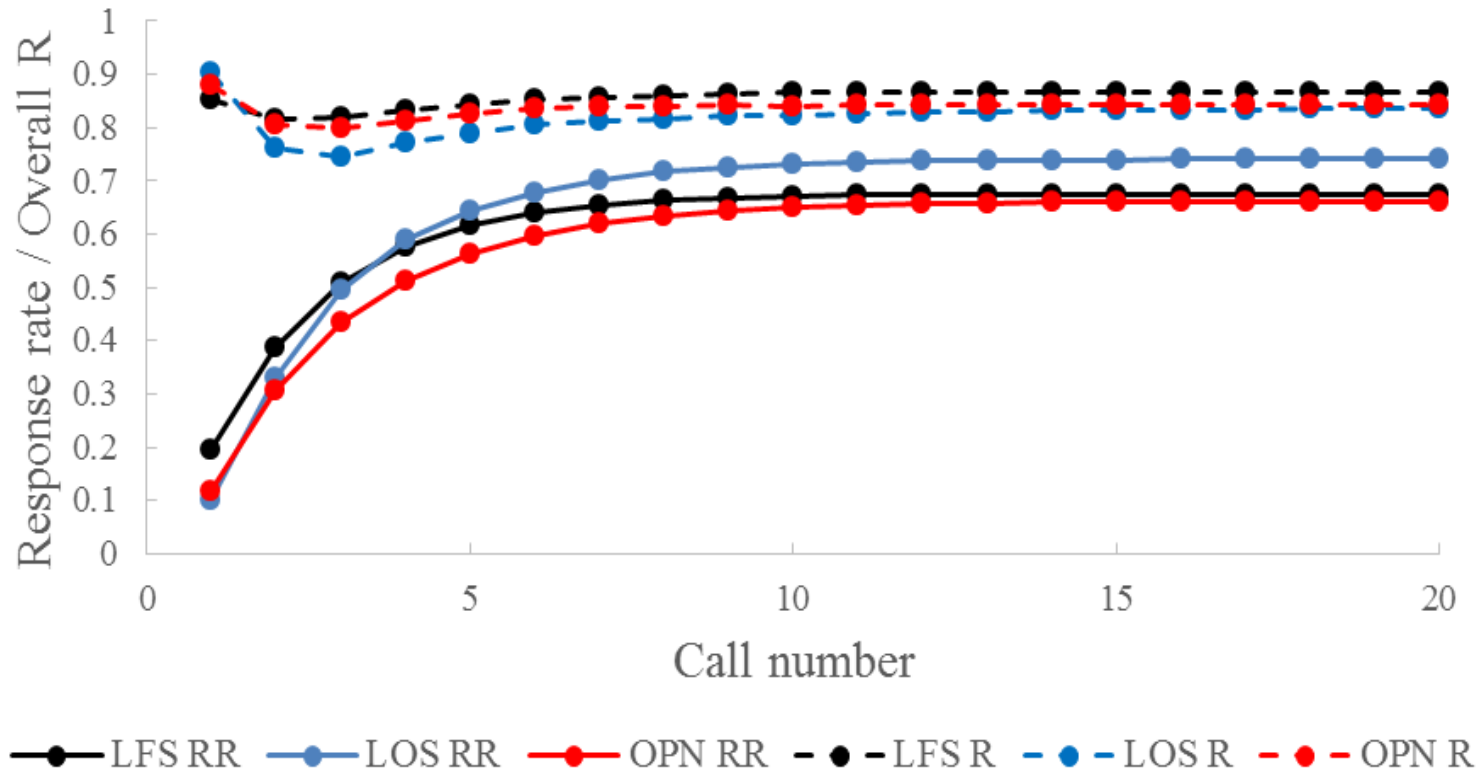


final response rate: LFS = 65.7%

LOS = 70.1%

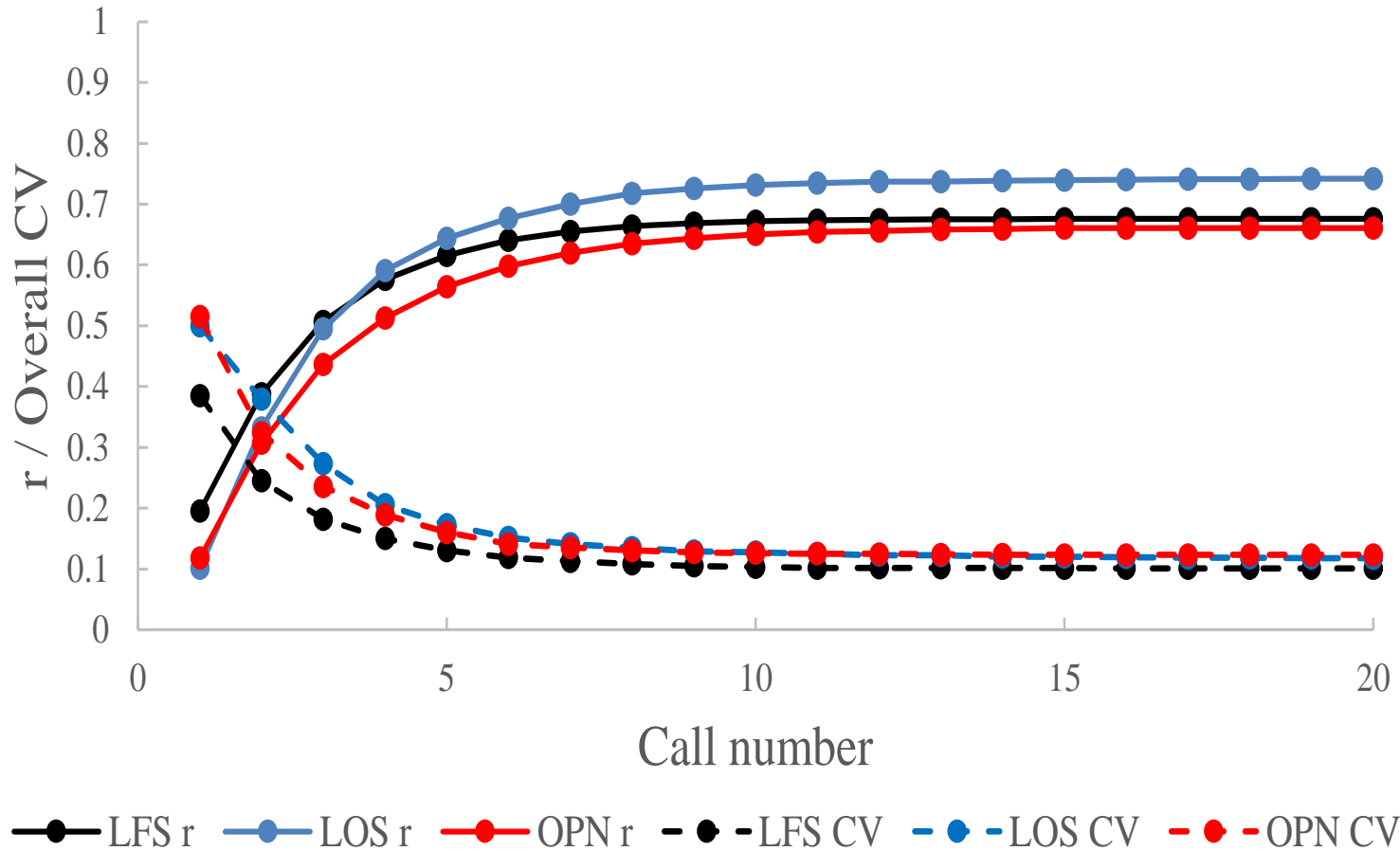
OPN= 64%.

# R indicators



- In case of low response rates (as is the case early on in data collection) small response propensity variation, limited potential for response propensity divergence
- R indicators close to 1, falsely indicating high representativeness
- R-indicator can be misleading in this case

# CV (Coefficient of Variation)



- CV standardises SD by r; overcomes the problem of the R indicator
- CV decreasing, close to 0 indicating high representativeness

# (Unconditional) Partial Indicators

- Aim: estimate the extent to which response is representative with respect to a covariate or a particular category
- We found similarities across surveys, some variables improve across calls, some remain the same (but do not improve)

# Phase Capacity or Stopping Points

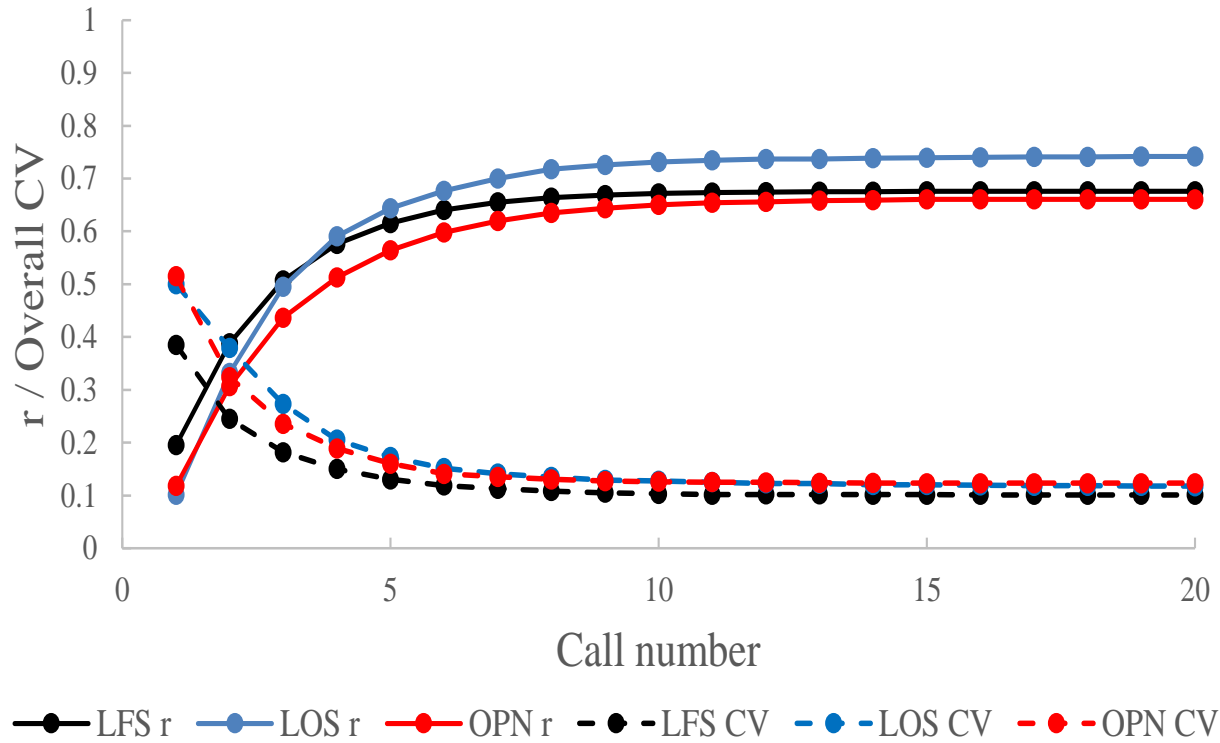




## Stopping or Phase Capacity Points

- When to change a survey data collection method?  
(Phase capacity point)
- When to stop calling?  
(Stopping point)

# Stopping or Phase Capacity Points



- Adaptive Strategy: stop when indicator within 0.02 of minimum value (points later when threshold decreased)
- Responsive strategy: stop when indicator within 0.02 of previous value

# Stopping or Phase Capacity (PC) Points

- Overall:

Survey	PC point (adaptive)	% calls saved	PC point (responsive)	% calls saved
LFS	6	8%	5	12%
LOS	8	15%	7	18%
OPN	6	13%	6	13%

- Also possible by variable

# Further Evidence from Understanding Society



## Understanding Society Data

- Longitudinal study
- Assess (risk of) nonresponse bias at each call for wave 2 for a range of survey variables as measured at wave 1

## Further Data Quality Indicators

- Proposed approach
  - Dissimilarity indices (e.g. Delta index)
  - Basic idea: compare two distributions (those for respondents and those if everyone had responded)
- Comparison to
  - Coefficient of Variation (CV)

# Dissimilarity Index: Categorical

- Delta index

$$\Delta_z = \sum_{k=1}^K |\hat{\pi}_{z,k} - \pi_{z,k}| / 2$$

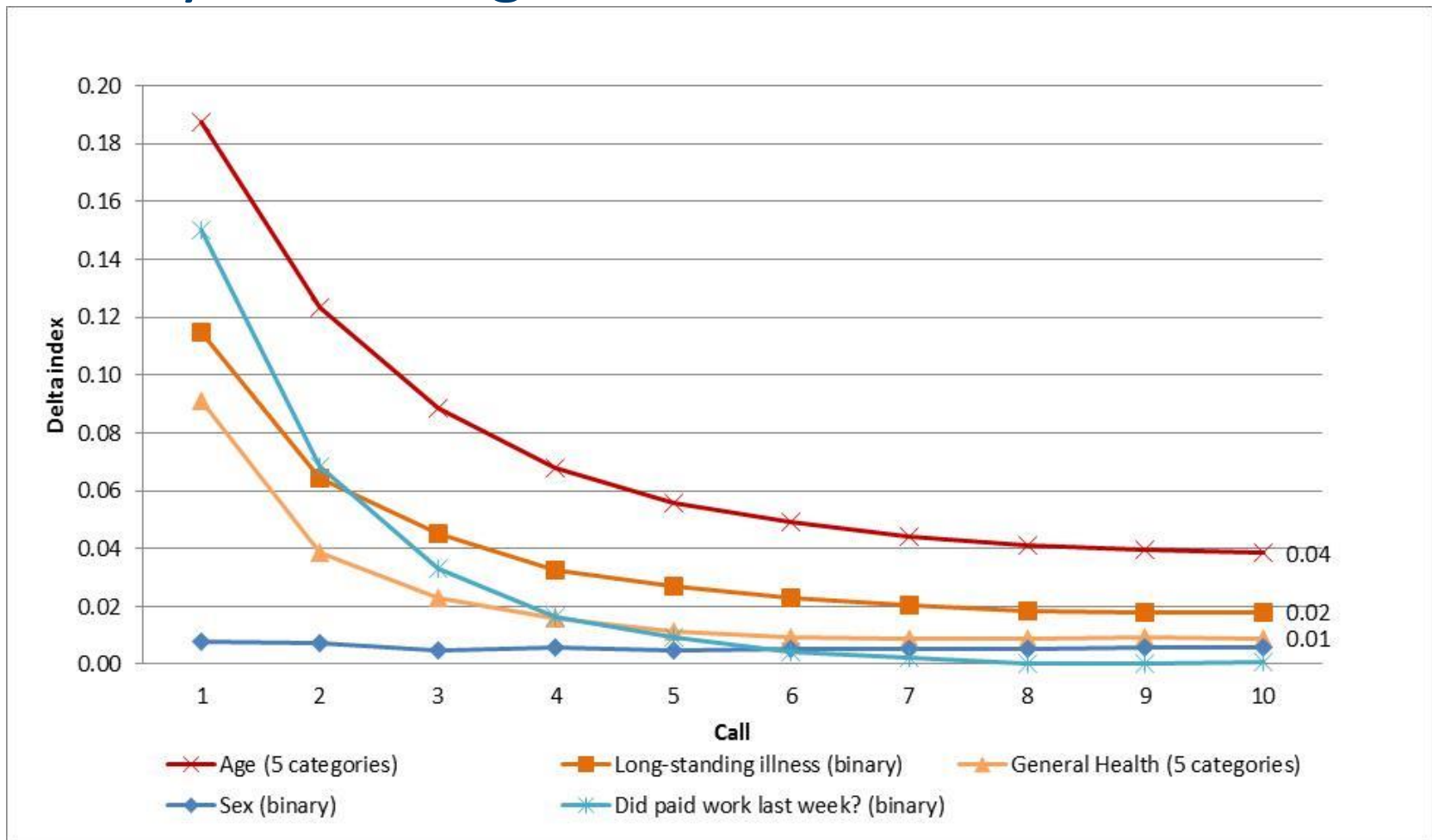
$\hat{\pi}_{z,k}$  observed proportion in category k of survey variable z

$\pi_{z,k}$  corresponding expected proportion

- ranges from 0 to 1
- the higher the delta index the more dissimilar is the estimated distribution to the true distribution
- values below 0.03 may indicate similarity (negligible nonresponse bias)
- **no model required**

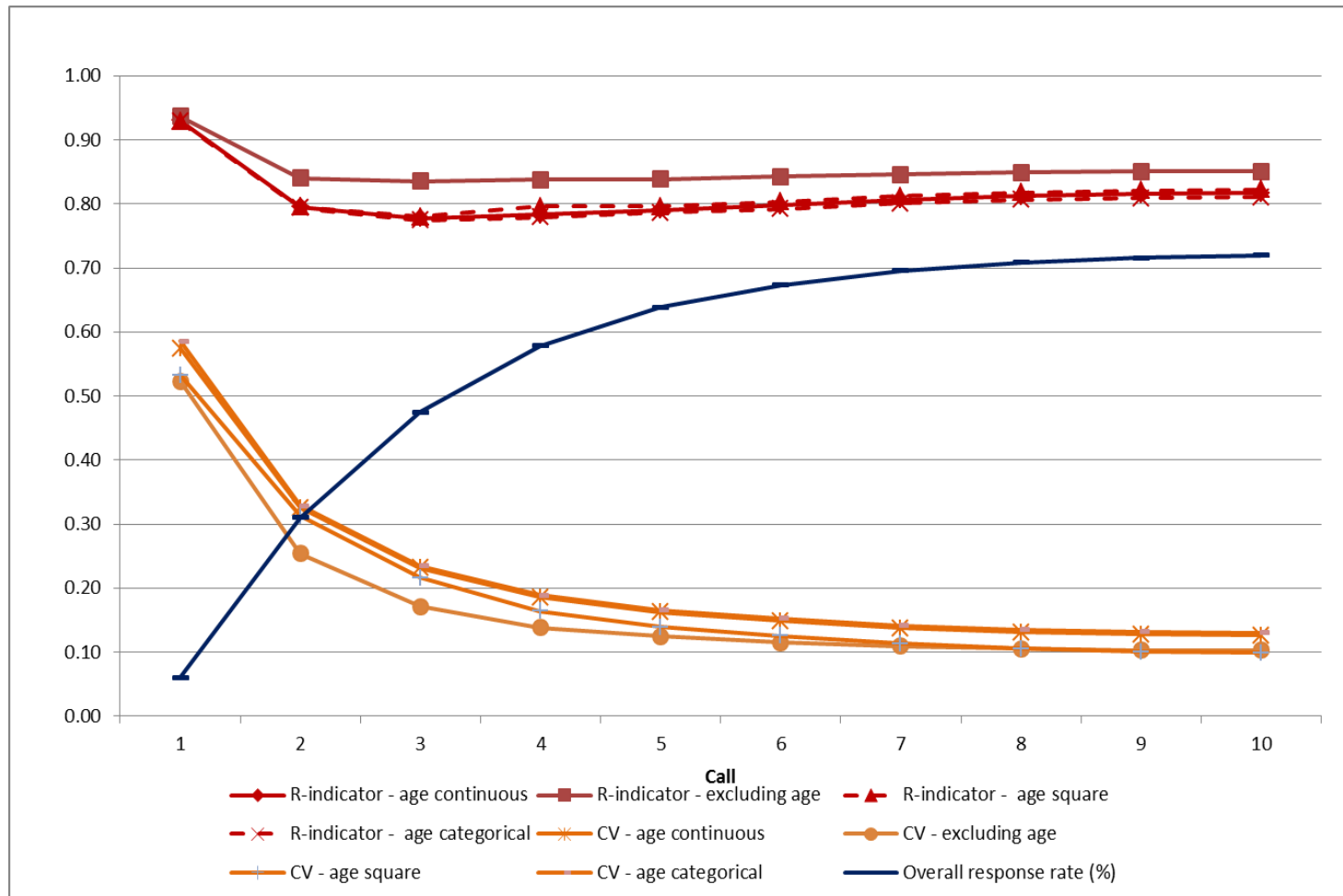
# Delta Index

## Binary and Categorical Variables





# Response Rate, R-indicator and CV



# Summary

- Representativeness increases similarly in the surveys over call records
  - Sources of non-representativeness are under-representation of economically active HHs, HHs located in London / SE, and single adult HHs
- CV preferred over the R-indicator
- Data collection stopping points differ (slightly) between surveys
- Dissimilarity index:
  - Can monitor categorical variables with several categories
  - Allows monitoring of several variables in the same graph
  - Does not require the fit of a model at every call
- Results for CV very similar to Dissimilarity Indices – reassuring

## Implications for Survey Practice

- Number of calls could be reduced (no more than 8 calls)
- Implications for cost savings without potentially much loss of data quality

## References

- Moore, Durrant and Smith (2016) Dataset representativeness during data collection in three UK social surveys: generalizability and the effects of auxiliary covariate choice, submitted.
- Correa, Durrant and Smith (2016) Assessing Nonresponse Bias using Call Record Data with Applications to a Longitudinal Study, submitted.



**Thank you.**

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## Acknowledgements

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