

Survey data analysis
Week 9:
“Nonresponse and nonresponse
weights”

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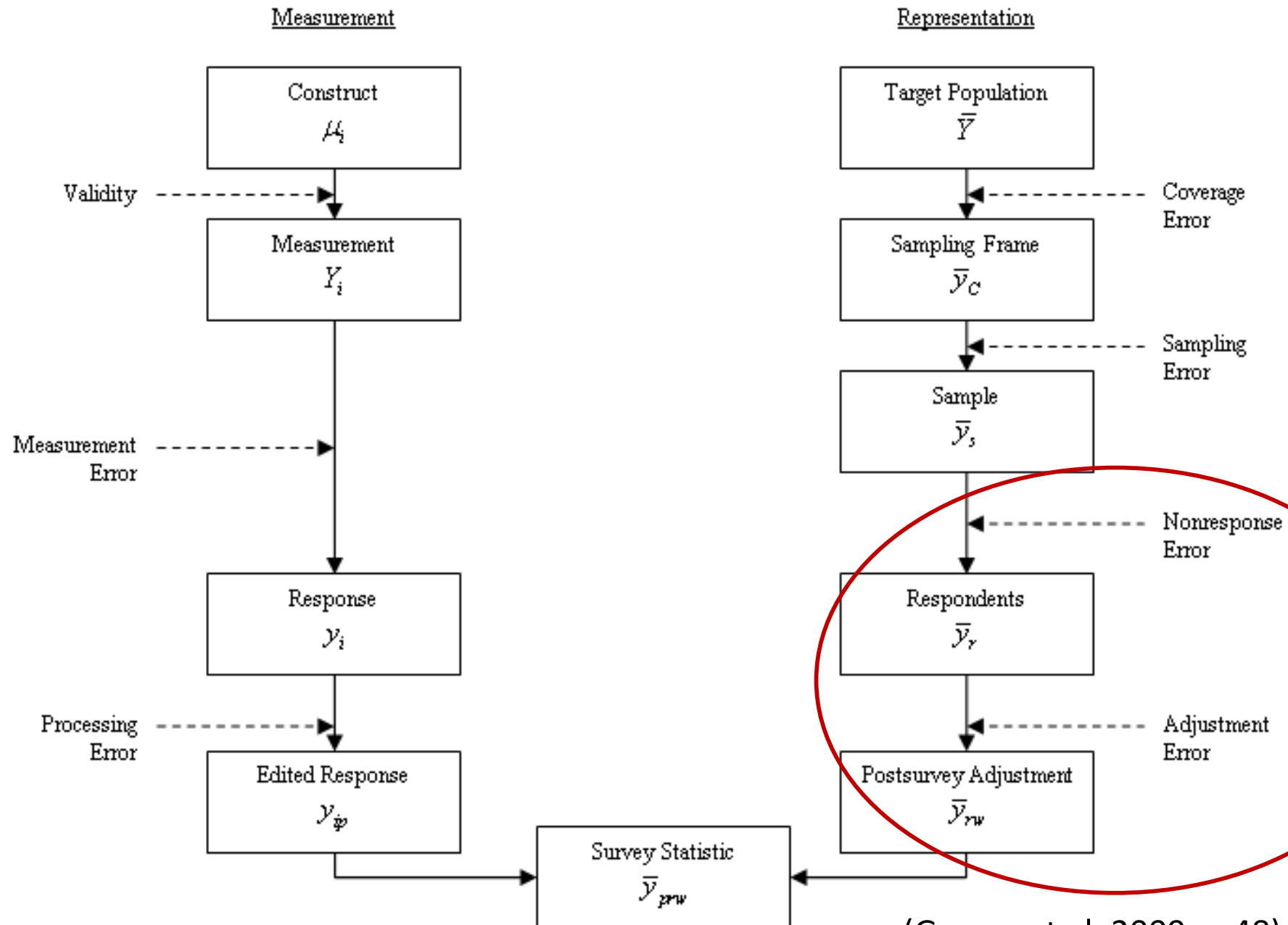
Today

- Lecture on NR
- Exercise working with weights

Literature today

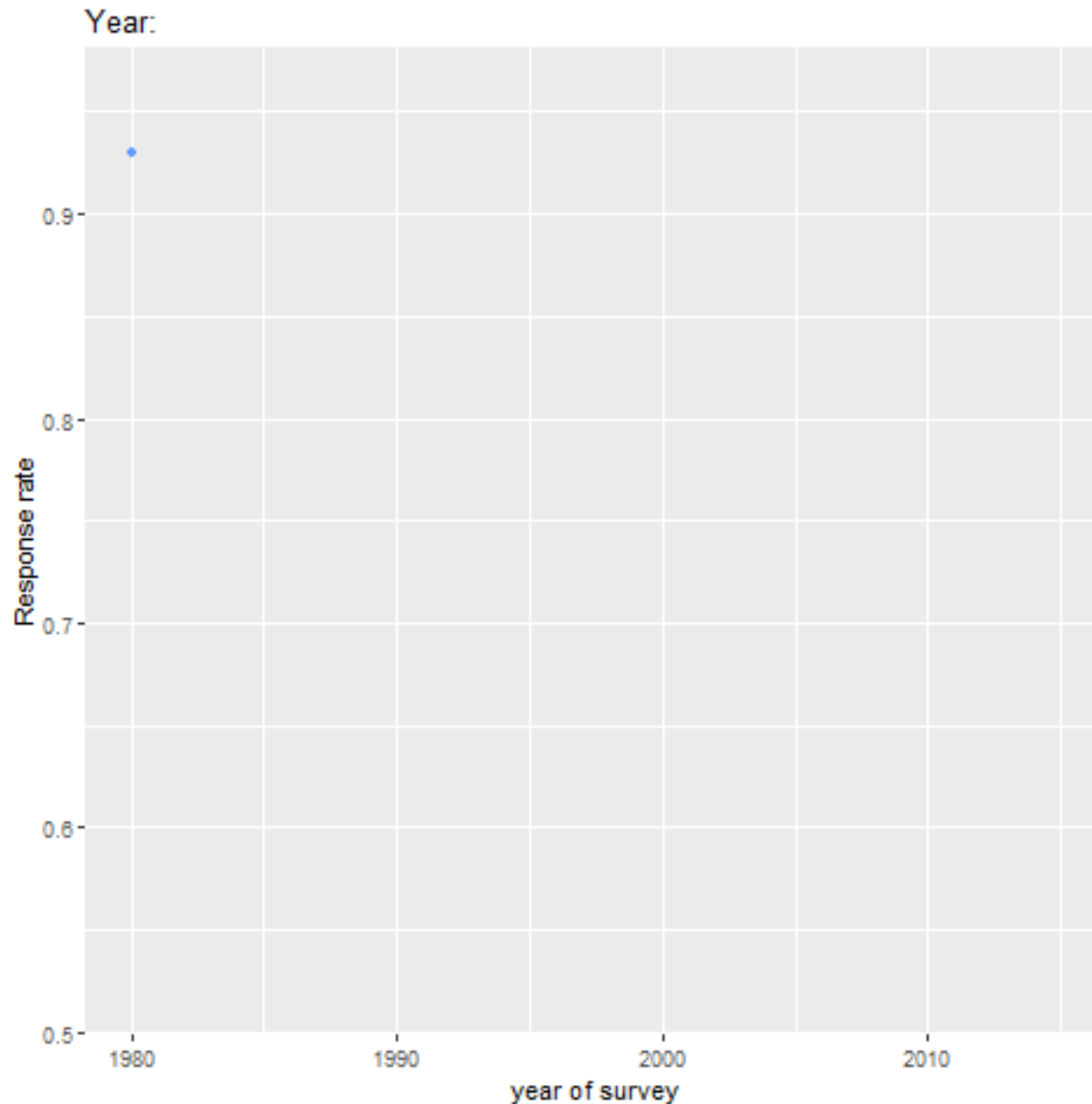
- The increasing problem of nonresponse
 - Luiten, de Leeuw & Hox (2018)
- Details of weighting methods
 - Kalton and Flores-cervantes (2003)
 - Brick (2013)

Total Survey Error (TSE) Framework



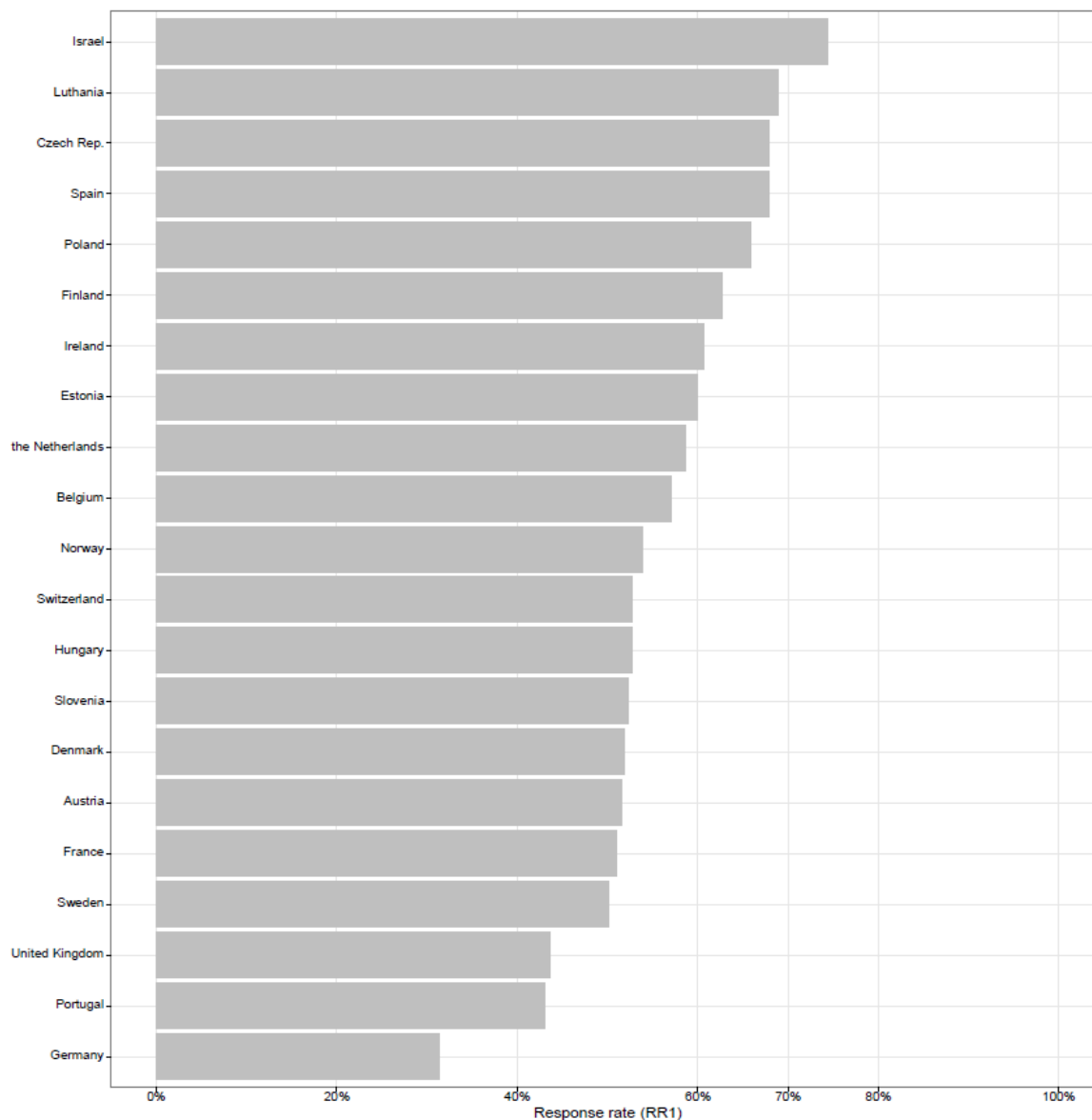
(Groves et al. 2009, p.48)

Nonresponse in LFS over time



Based on Luiten, De leeuw & Hox (2018) International Nonresponse Trends across Countries and Years: An analysis of 36 years of Labour Force Survey data. Survey Insights: Methods from the Field. Retrieved from <https://surveyinsights.org/?p=10452>.

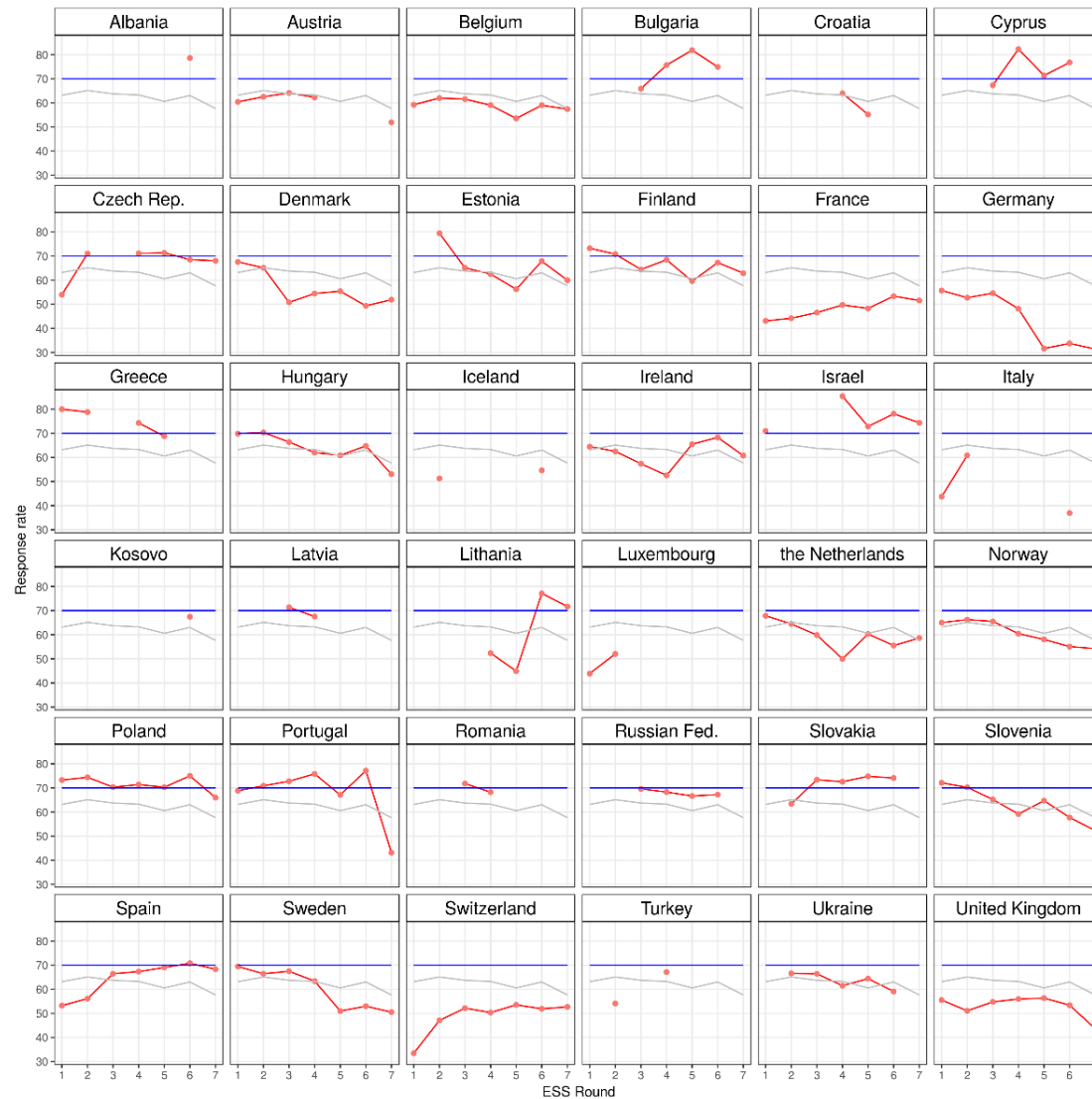
European Social Survey Nonresponse



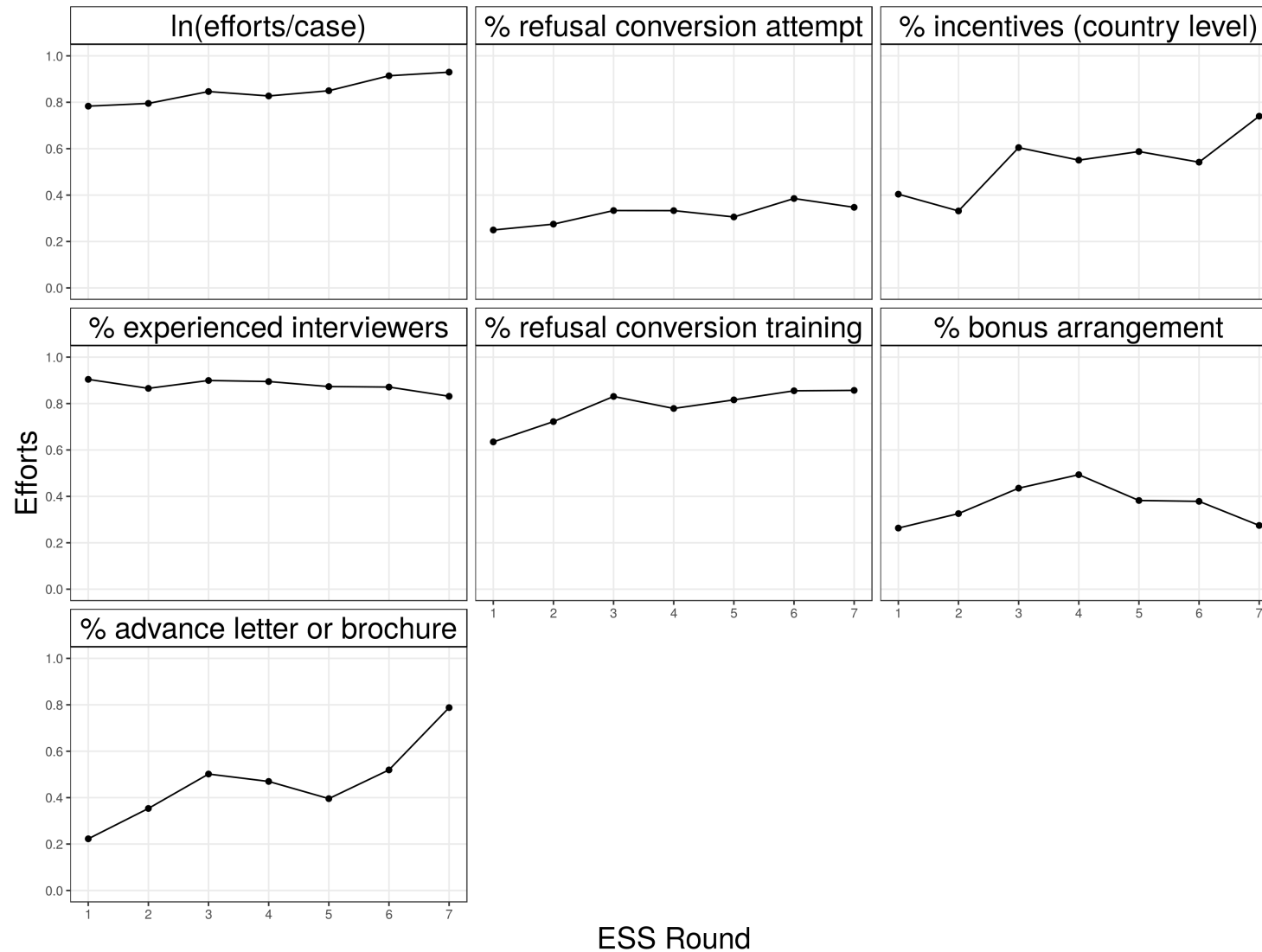
From: Beullens, K., Loosveldt G.,
Vandenplas C. & Stoop I.
(2018). Response Rates in the
European Social Survey: Increasing,
Decreasing, or a Matter of Fieldwork
Efforts? *Survey Methods: Insights from
the Field*. Retrieved from
<https://surveyinsights.org/?p=9673>

Figure 1: Response rates per country, ESS7¹

ESS: RR variation in response rate



ESS – increase in fieldwork efforts



Four main types of nonresponse

In survey research we typically distinguish four types of nonresponse:

- **Unit nonresponse**

The sample unit (e.g. person, household, institution) was sampled, i.e. belonged to the gross sample, but did not participate in the survey.

- **Item nonresponse**

The sample unit was sampled and interviewed, but failed to provide answers to all of the survey items.

- **Attrition**

The sample unit was sampled and initially interviewed for a longitudinal surveys, but did not complete all waves of the survey.

- **Partial (household) nonresponse**

The sample unit was sampled and at least one member of the unit interviewed. However, at least one member of the unit did not participate.

Main causes of nonresponse

- **Unit nonresponse**
non-contact, refusal, unable
- **Item nonresponse**
refusal, don't know, breakoff
- **Attrition**
non-location, non-contact, refusal, unable
- **Partial (household) nonresponse**
non-contact, refusal, unable

How to prevent nonresponse

- Things you noticed in your adopted survey?

How to prevent nonresponse

1. A good questionnaire, invitation letter, etc.
 - keep it simple, keep it simple, test it
2. Incentives
 - Preferable unconditional, and cash
3. Multiple contact attempts
4. Multiple modes (e-mail, mail, phone, f2f)
5. Refusal conversion
 - Interviewer training
6. Be responsive to questions/remarks/problems

Correction for nonresponse

- Item nonresponse
 - Rich information on individual
- Partial (household) nonresponse
 - Proxy-answers, information on household
- Attrition
 - Information from earlier waves
- Unit nonresponse
 - Weak individual information (only frame)

Imputation

weighting

What is nonresponse bias?

- Nonresponse bias occurs when the sampled units (e.g. individual, household, business ...) are not or only partially observed (e.g. interviewed)
- **AND** observed units are systematically different from unobserved units.

MCAR, MAR, NMAR

- Missing Completely At Random (MCAR):

The responding units are a random subsample of the gross sample.

- Missing At Random (MAR):

The responding units are not a random subsample of the gross sample.

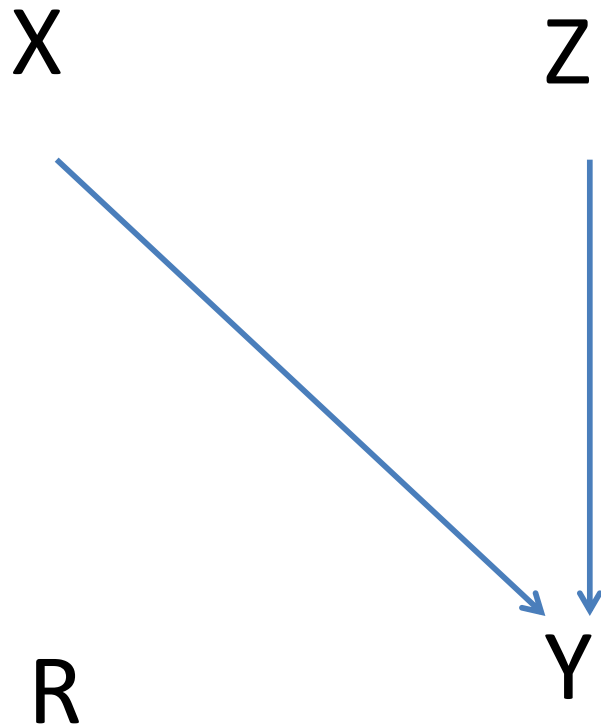
However, the auxiliary information x renders the relationship between y and response r independent.

- Not Missing At Random (NMAR):

The responding units are not a random subsample of the gross sample. In addition, the auxiliary information x does not render the relationship between y and response r independent.

Missing data mechanisms

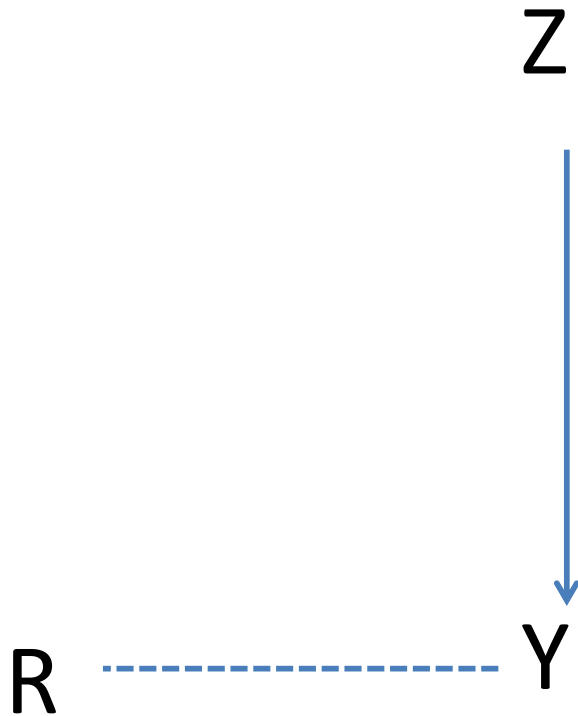
MCAR



Missing data mechanisms

MCAR

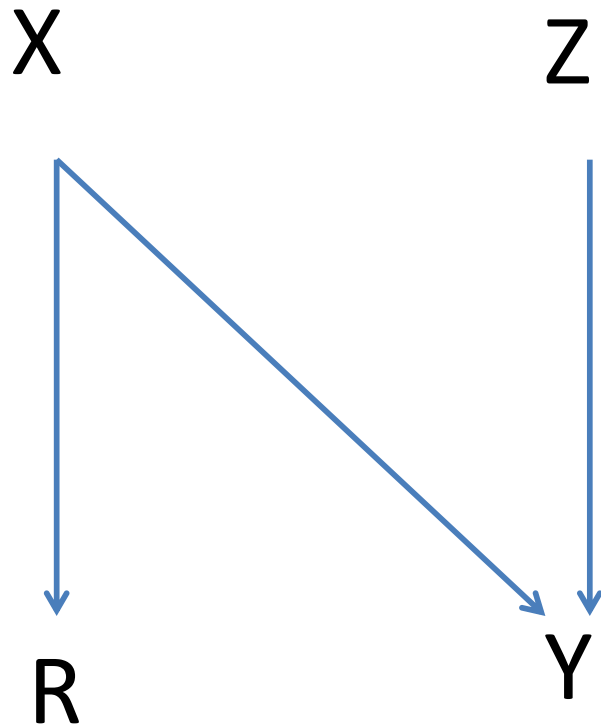
MAR - before



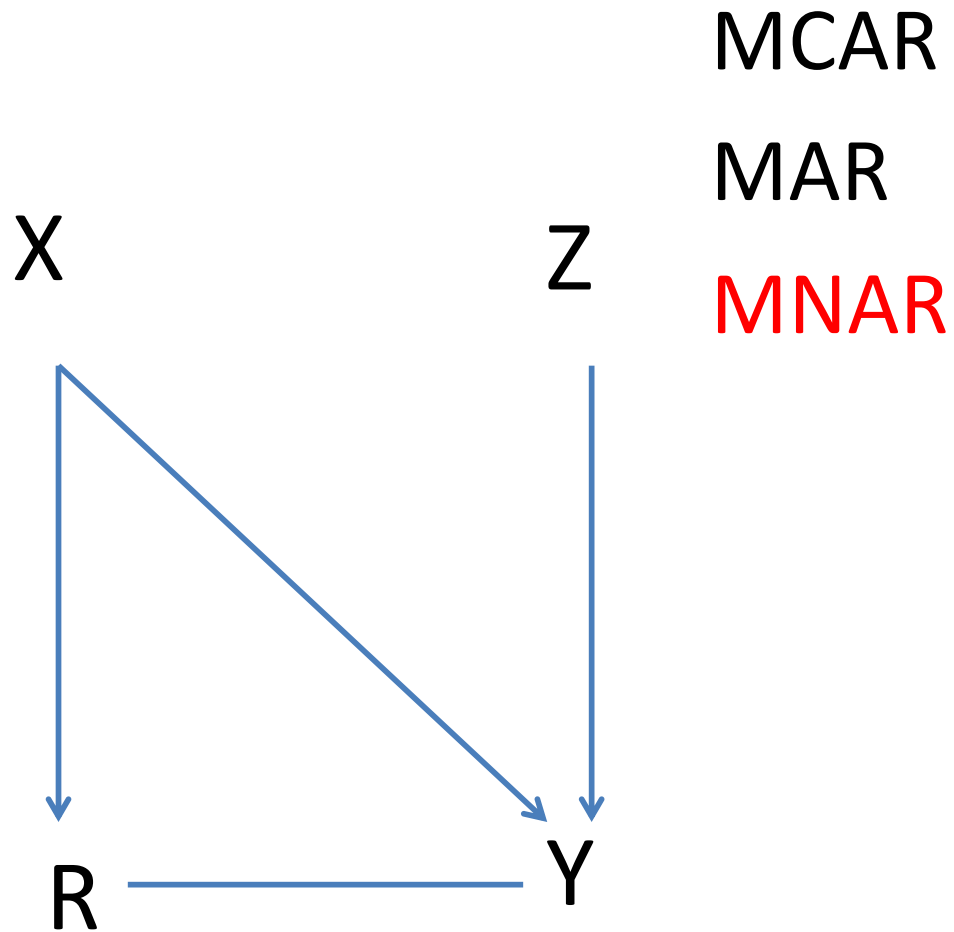
Missing data mechanisms

MCAR

MAR - after



Missing data mechanisms

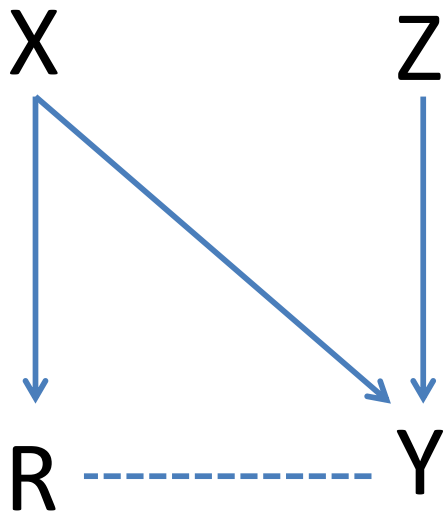


Example: income

- Unit response rates in surveys:
 - ~5-50%
 - Nonresponse: 50-95%!
- Item-nonresponse for income question:
 - ~25%
- What do we have: MCAR, MAR, or MNAR?
 - Discuss!

Item nonresponse (weeks 11,12)

- Use covariates (x) at level of respondent
- Strongly related to both response (R) and Y
- MCAR, MAR, MNAR models

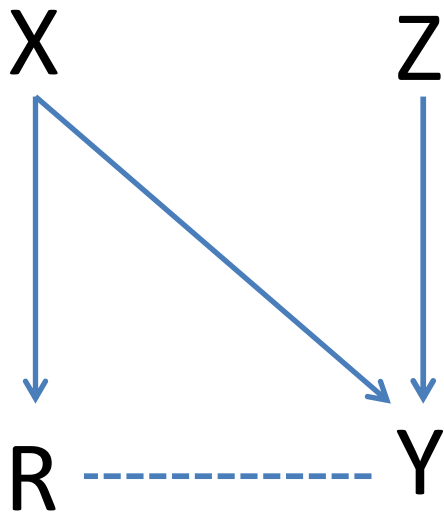


Example item missings in income:

- Education, wealth, age, gender, value of house (X)
- To predict income (Y) and
- Take away relation R-Y

Unit nonresponse

- Few covariates (x) at level of respondent
 - Often only address, or e-mail
- Weakly related to both response (R) and Y



Example Unit Nonresponse:

- Only use address (house price)
- Can predict income (Y), but
- Cannot explain relation R - Y
- Not successful in NR correction

Why weight?

Sampling: selection probabilities may differ

-> design weights

Coverage: sampling list may not cover target population

Nonresponse: not all people in sample will end up in data

-> adjustment weights for coverage/NR

Design weights (repeat from weeks 3-6)

SRS: equal probabilities

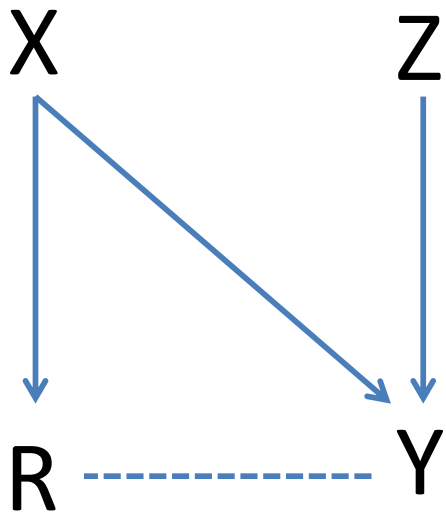
- no design weights

Stratified, cluster, multistage

- need design weights for unbiased estimates See slides for those weeks
- Weights not needed if:
 - you specify correct svydesign (ids=~ , strata=~ ,)
 - You use a HT-estimator (weight = ~inclusionprobabilities)

The idea behind weighting

- X values at level of (sub)population
- One weighting model for all substantive analysis
 - In imputation model often Y-specific.



Population level data?

1. Sampling frame (nonresponse)

- Address.

- Can be enriched (e.g. use google streetview)

- Statistics Netherlands: admin data

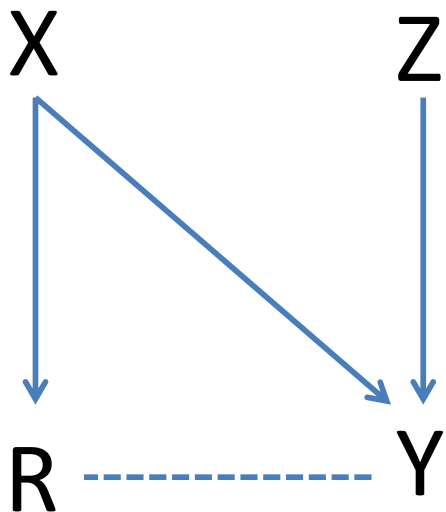
• 2. Population level statistics (coverage + NR)

- Gender (50/50), age, income, region, nationality

- Next week...

How weighting works

1. This week: X variables on sampling frame
2. Predict $R_{0,1}$ with X
3. Get predicted probabilities
4. Weight by inverse of probabilities



Propensity-score weights

For **propensity-score weights** (logistic regression) models estimate the response propensity (**predicted probability**) of each sample unit given a set of covariates.

- Response rate for all linear combinations of for example:
 - $\text{response}[0;1] \sim \text{gender} + \text{age} + \text{region} + \text{typehouse}$

Weight is the scaled inverse of the predicted response propensity of each sample unit.

- Design weight = **sample inclusion** probability
- Propensity weight = **participation** probability
- Nonresponse+design weight = **design weight * propensity weight**

Brick (2013)

- Review of weighting approaches
 - Propensity score models
 - Sampling frame data is limited
 - Population information is limited
 - Other weighting models
- Can we use more information?
 - Next week:
 - Section 7: paradata?
 - Population data

Brick (2013)

- Review of weighting approaches
- RHG – response homogeneity groups
 - Groups of propensity score models
- Responsive design models
 - Adjust fieldwork efforts so that $P_{\text{respond}} = \text{equal}$
 - $\text{Var}(p_{\text{respond}}) = 0$

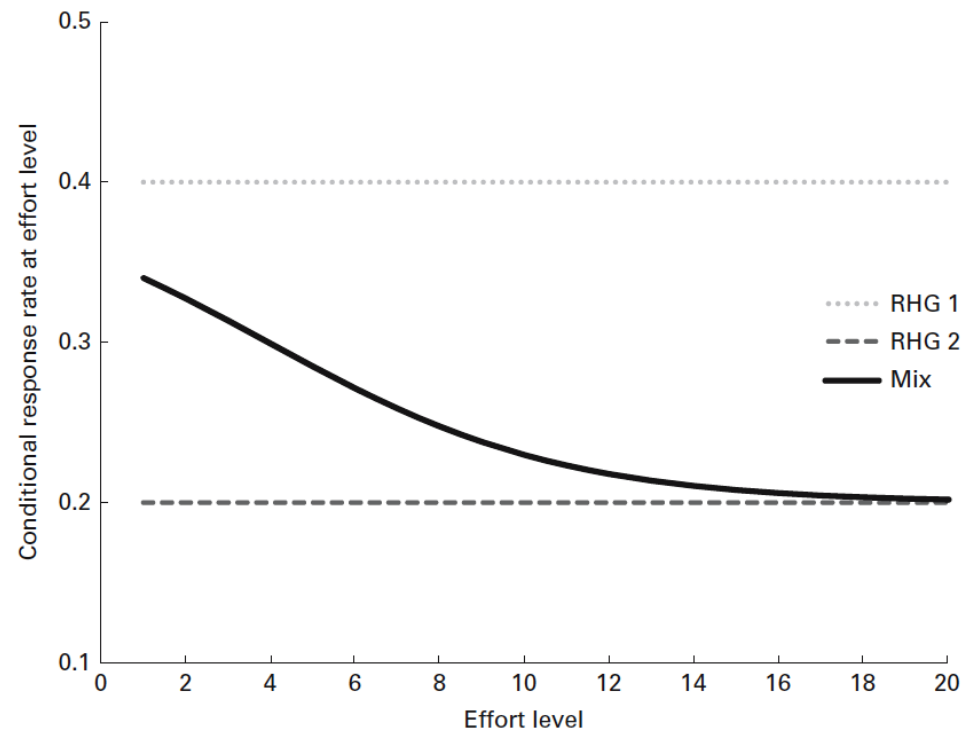


Fig. 1. Observed response propensities for a sample composed of two RHGs

Next weeks

- Next week: designing weights
- In 2+3 weeks -> imputation (by Stef van Buuren)
- Assignment 2