Survey Lifecycle from a Quality Perspective

Measurement		**Representation**	
Construct	μ_i	$\overline{Y}$	Target Population

Validity

Coverage Error

Measurement	Y_i	$\overline{Y}_C$	Sampling Frame

Measurement Error

Sampling Error

Response	y_i	$\overline{y}_a$	Sample

Nonresponse Error

Processing Error

Edited Response	y_{ip}	$\overline{y}_r$	Respondents

Adjustment Error

$\overline{y}_{rw}$	Postsurvey Adjustments

$\overline{y}_{prw}$ **Survey Statistic**
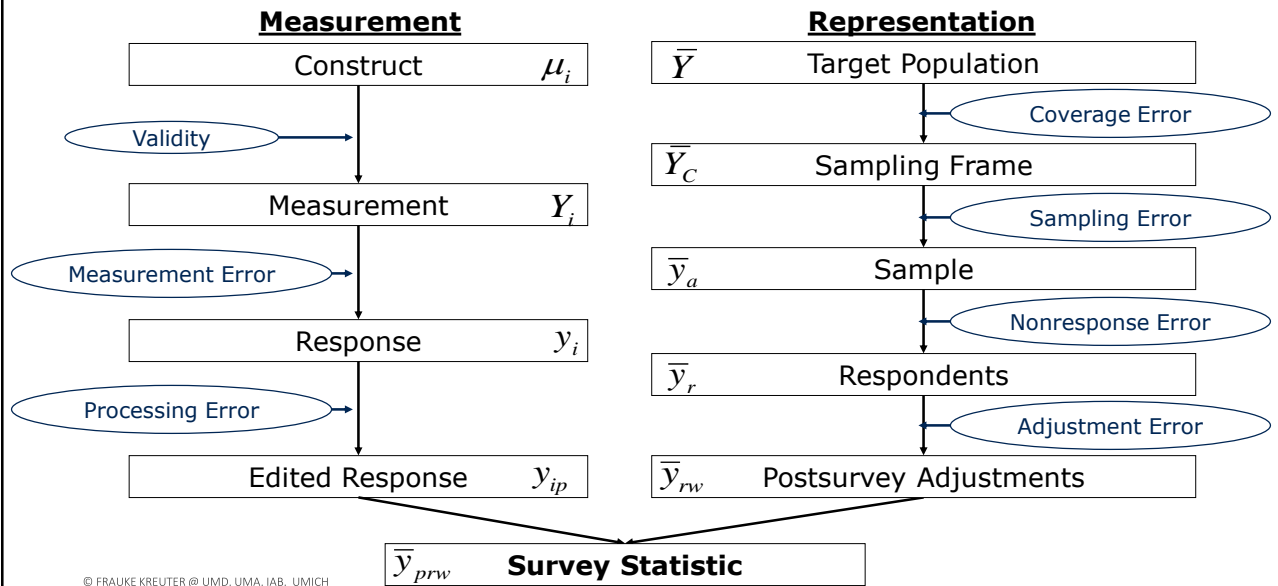
Another View of the Survey from a Quality Perspective

Total Survey Error

Errors of Nonobservation	**Errors of Observation**	**Errors of Processing**
Coverage	Questionnaire, Mode	Editing
Sampling	Interviewer	Coding
Nonresponse	Respondent	Postsurvey adjustment
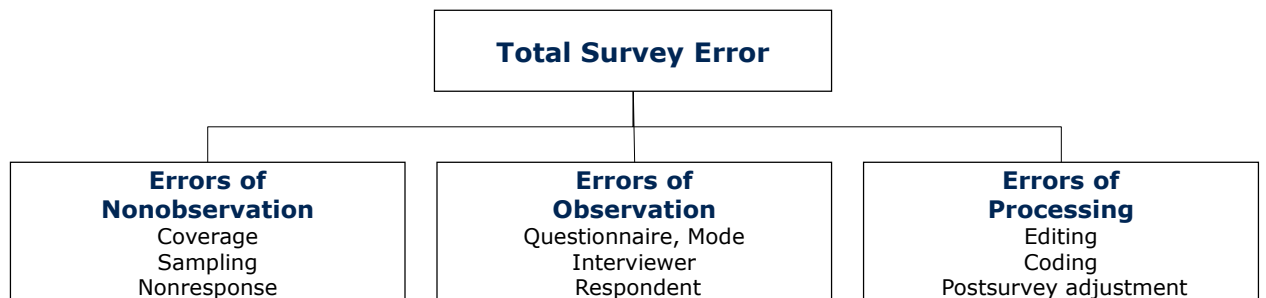
Total Survey Error

Concept, way of thinking about various sources of error that may affect survey statistics

"Error" ≠ "mistake", but rather reflects uncertainty (or lack of confidence) of inference

Survey quality/value:
    Minimize error for a given investment
    Success of TSE approach depends on good information on costs and errors

Need to assess level of error associated with alternative procedures and choose combination of approaches best suited to problem

Total Survey Error

Survey errors can arise from many sources
    Survey topic, available funding, sampling frame, data collection method, interviewer training, etc.

In sum, notion of TSE guides design decisions
    TSE framework helps understanding potential impact of design decisions on survey errors
    Together with costs, explicit part of design decisions

Statistical notion of error is expressed as mean square error (MSE)

$$MSE\left(\overline{y}\right) = \left(E\left(\overline{y}\right) - \mu\right)^2$$

    Squared sum of all variable errors and biases
    Errors are specific to a certain statistic or estimate
    In practice MSE rarely fully measured

True Value and Error

"True value: An *idealized* concept of a quantity which is to be measured..." (Census, 1976)

Theoretical view:

Absolute standard for comparison even if not knowable

Operational view:

True value defined in terms of measurement process

E.g., IQ is outcome of a psychological assessment; predicts performance across vast range of tasks
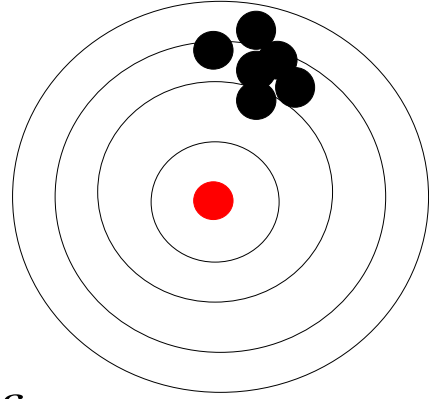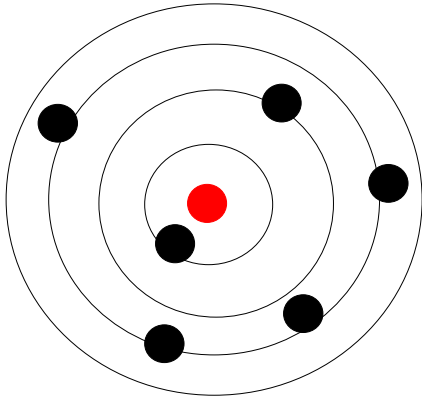
Variable Error and Bias

Variable error:
o Variation over replication
o Often represented by variance of a statistic
o Arises because achieved values vary over different units in the design (e.g., interviewers, sample persons, questions)
o Estimated from sample itself, using replication-based methods

Bias:
o Systematic deviation from "true value"
o Directional error, e.g., bigger reports than are actually the case
o To estimate bias requires external data ("truth") or assumptions about direction of effects

Variance and Bias

$$Y_i = \mu_i + \varepsilon_i$$