ORGANICDATA NETWORK

Data network for better European organic market information

SAMPLING

and its relevance for sound data collection

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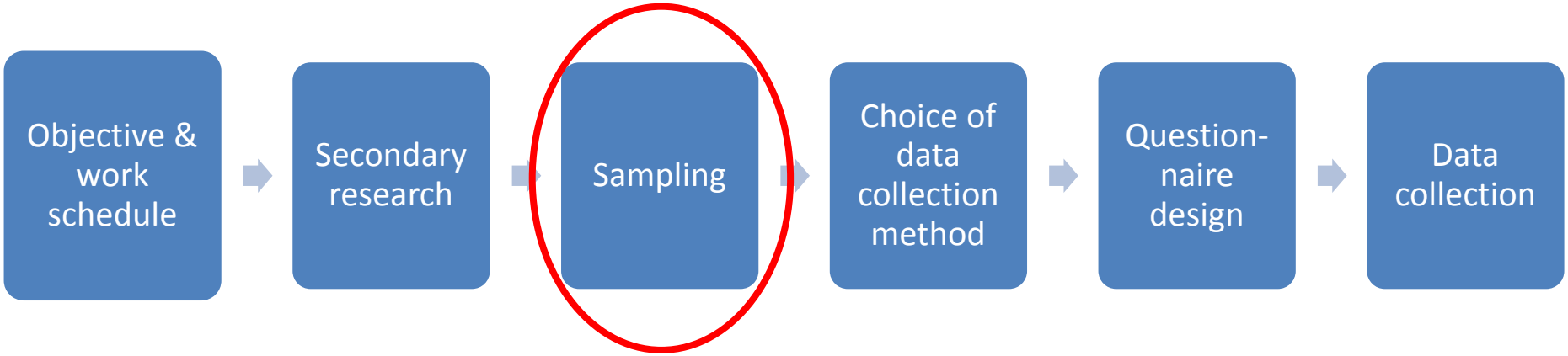
Introduction

Reasons for survey research

- ✓ to describe characteristics of certain groups
- ✓ to make specific predictions (Churchill and Brown 2007: p. 105)
- ✓ to get an idea about quantities of interest in target population
- ✓ to report means, totals, proportions for target population (Biemer and Lyberg 2003: p. 49)

Sampling

- ✓ choosing a subset of representative units from the target population (Shao and Zhou 2007: p. 237)



- ✓ important step in data collection process
- ✓ does not get enough attention
- ✓ determines the quality and validity of output

Important definitons

- ✓ Total population: All elements, sharing some common characteristics, which comprise the universe for the purpose of the research problem (e.g. all organic farmers within a country).
- ✓ Target population: The group of objects that is identified to participate in the study.
- ✓ Census: The whole population (e.g. all organic farmers in a country are approached with a questionnaire).
- ✓ Sample: A subgroup of the whole population is selected for data collection (e.g. every 10th organic farmer on a list of all farmers or only 20 organic farmers in every district are approached).
- ✓ Panel: A sample of participants who have agreed to provide information at specified intervals over a certain time period.

according to Malhotra (2012)

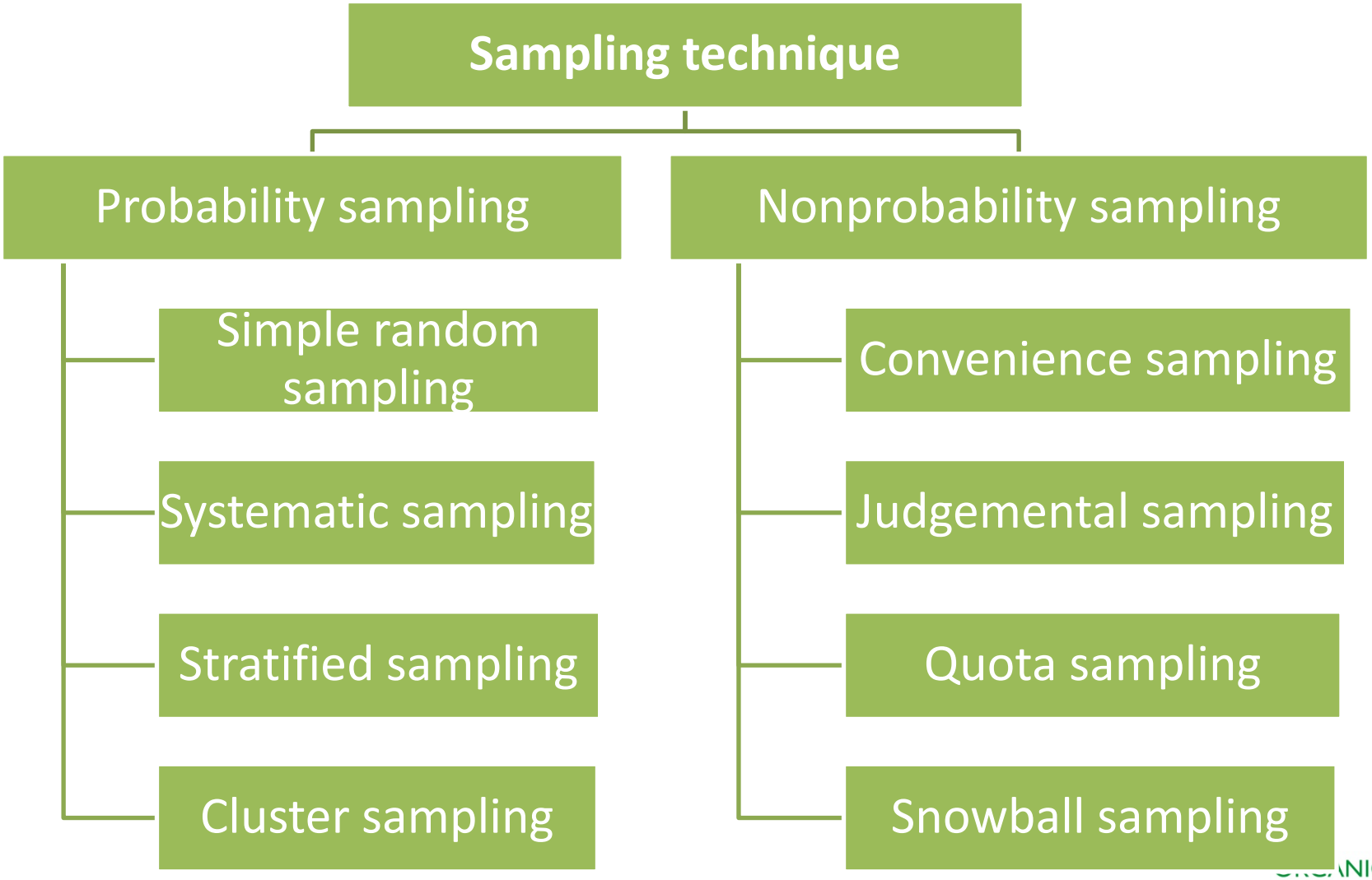
Representativeness of a sample

- ✓ reflecting the target population in all relevant variables (sample as a ‘microcosm’ of the target population)
- ✓ precondition for generalisation of survey results (Bryman 2008: p. 168)
- ✓ if not fulfilled for all relevant variables → needs to be communicated (“representative according to age, income etc.”)

Sampling process

target population	The enumeration of objects that possess the necessary information, which needs to be collected (e.g. organic dairy farmers).
sampling frame	The determination of objects within a target population that will be part of the sampling process (e.g. x farmers in every district).
sampling technique	*Most important decision*: Probability or nonprobability sampling (e.g. probability: all farmers have the same chance of being included in the sample; nonprobability: not all farmers have the same chance of being included in the sample, e.g. due to an incomplete address list)?
sample size	The determination of the sample size is either based on arithmetic means or on proportions (e.g. 100 farmers or 5% of all farmers). Examples of calculations will be presented below.
sampling process	A specification of how the sampling design (decided upon at a prior stage - shown above) will be implemented (search for complete and up-to-date address lists of organic farmers or approach organic farmers' organisations to receive address lists; nonprobability, if not all farmers are members of an organisation or if one organisation refuses cooperation).
Validate the sample	Screening of the participants in the data collection phase (e.g. for a study on animal husbandry it makes no sense to include farms without animals; a screening question would then be: "Do you keep animals on your farm?" If no, the interview is finished).

Sampling techniques



Comparison of probability and nonprobability sampling

Probability sampling

- ✓ Sample units are chosen randomly – inclusion of units is objective
- ✓ Reduced coverage error
- ✓ Sampling error can be calculated
- ✓ Usually very expensive
- ✓ Used for aim of representative results, official statistics
- ✓ With increasing sample size chance increases that sample corresponds in its structure to the basic population

Nonprobability sampling

- ✓ Sample relies on personal judgement
- ✓ No calculation of sampling error possible
- ✓ Representativeness cannot be ensured
- ✓ Comparatively low cost
- ✓ Often used for market research or for preliminary work (e.g. pre-test of questionnaires in focus groups)
- ✓ More accurate information with very small sample size (< 10 units)

Biemer and Lyberg 2003: p. 310, Lohr 2008: p. 105 f., Shao and Zhou 2007: p. 238 ff.

Errors in sampling process

- ✓ Sampling error: An error that occurs, because the selected sample is an imperfect representation of the population
- ✓ Non-sampling error: An error that can be attributed to sources other than sampling. Non-sampling errors can be random or non-random (e.g. respondents refuse to take part or are not available).
- ✓ Random error: An error that arises from random changes or differences in participants or in measurement situations.

Determination of sample size

- ✓ Determination of sample size is based on both managerial and financial considerations
- ✓ No direct relationship between population size and sample size
- ✓ Typically the larger the sample size, the smaller the sampling error

Important statistical terms

- ✓ Statistic: Measure of the sample used to describe a certain characteristic (e.g. arithmetic mean, standard deviation)
- ✓ Standard deviation: Square root of arithmetic mean of individual deviations squared (most common measure of dispersion)
- ✓ Variance: Standard deviation squared (measure of dispersion)
- ✓ Confidence: Amount of confidence one wishes to have in estimates
- ✓ Standard error: Standard deviation of the sampling distribution of the mean
- ✓ Precision: Possible tolerance of sampling error within a given confidence level

Example: determination of sample size

$$n = \frac{Z^2 s^2}{E^2}$$

n = sample size

Z = standardised value indicating level of **confidence**

s = estimator of population **standard deviation**

E = acceptable magnitude of sampling error (**precision**)

Example: The sample size that is needed to determine the average size of an organic farm in Germany is estimated.

Z = 1.96 (95%-level of confidence)
s = 55 ha (value derived from a previous study)
E = 7 ha (maximum error of $\pm$ 7 ha is accepted)

$$n = \frac{1.96^2 55^2}{7^2} = 237.16 \approx 238$$

The outcome is a sample size of 238 farms to get a reasonable result on the average size of organic farms in Germany.

More information in the Organic Data Network - Manual

Additional slides…

Probability sampling I

- ✓ Every unit of target population has a known and nonzero chance of being included in sample
- ✓ Sample selection is objective → Sampling error can be estimated
- ✓ Probability samples have found to be more accurate than nonprobability samples (Shao and Zhou 2007: p. 238)
- ✓ Probability samples are chosen according to statistical aspects

Probability sampling II

- ✓ Probability sampling methods are most frequently used for face-to-face, mail, email, and telephone surveys (Lohr, 2010)
- ✓ Simple random and stratified sampling are basic forms of probability sampling, selection through random procedure, e.g. survey every fifth person on a list of organic dairy farmers
- ✓ Both are not applicable - necessary to have very good knowledge on the total population (i.e. a complete and up-to-date list of the total population) - otherwise, the sample might have very unusual properties
- ✓ Stratified sampling and cluster sampling, as well as combinations of both, are most applicable in this context.

Nonprobability sampling I

- ✓ Sample selection is judgmental, probability of being chosen is unknown
- ✓ Findings are not projectable to population (Shao and Zhou 2007: p. 238)
- ✓ Sampling error cannot be assessed (Shao and Zhou 2007: p. 243)
- ✓ Usually easier and cheaper to conduct than probability sampling methods (Shao and Zhou 2007: p. 238)

Nonprobability sampling II

- ✓ Only **quota** sampling might be a relevant option for organic market data collection
- ✓ Use of a certain percentage of the target population with particular characteristics of interest (e.g. farm type, farm size, type of product produced)
- ✓ Data collector determines the percentage and specifies the number of objects to be included into the sample
- ✓ The proportion of objects with a chosen characteristic in the sample should be the same as the proportion in the total population (e.g. if 30% of all dairy farms are located in mountainous areas, then 30% of dairy farms included into the survey should be farms in mountainous areas)
- ✓ Good knowledge of the total population is necessary
- ✓ Suitable method, if groups with certain characteristics are examined
- ✓ Quota plan always has to be set up