Exercices correction

Correction exercice .1. *To select a simple random sample of 100 students, you can follow these steps:*

1. *Assign a unique identifier to each of the 1,000 students, such as a student ID number.*
2. *Use a random number generator to select 100 random numbers between 1 and 1,000. These numbers will correspond to the selected students.*
3. *Contact the students corresponding to the selected numbers and invite them to participate in the survey.*

Correction exercice .2. *To select a systematic sample of 50 employees, follow these steps:*

1. *Determine the total number of employees in the list (500).*
2. *Calculate the sampling interval, which is the total number of employees divided by the desired sample size:* $500/50 = 10$.
3. *Randomly select a starting point between 1 and 10. Let's say you choose 3.*
4. *Then, select every 10th employee from the list, starting from the 3rd employee, until you have a sample of 50 employees.*

Correction exercice .3. *To ensure a representative sample in a diverse city, you can use stratified sampling as follows:*

1. *Identify relevant strata in the population, such as age groups (e.g., 18-30, 31-45, 46-60), gender, and residential areas.*
2. *Randomly select a sample from each stratum using simple random sampling or another appropriate sampling method.*
3. *Ensure that the sample size from each stratum is proportional to its population size to maintain representation.*
4. *Combine the samples from each stratum to form the final representative sample.*

Correction exercice .4. *To use cluster sampling for households in a large urban area, follow these steps:*

1. *Divide the urban area into clusters, which could be neighborhoods or city blocks.*
2. *Randomly select a subset of clusters to include in your sample. This can be done using simple random sampling or other methods.*

3. *Survey all households within the selected clusters.*

4. *Ensure that the chosen clusters are representative of the entire urban area to maintain the validity of your sample.*

Correction exercice .5. *Convenience Sampling:*
***Advantages**:*

- *Quick and easy to implement.*
- *Cost-effective and requires fewer resources.*
- *Useful for preliminary or exploratory research.*

***Disadvantages**:*

- *Highly prone to selection bias, as participants are chosen based on convenience.*
- *Results may not be representative of the population.*
- *Limited generalizability.*

Examples

- *(Appropriate Use): Conducting a quick survey of shoppers in a mall to gather initial feedback on a newly opened store's layout and products.*
- *(Biased Results): Using convenience sampling to assess public opinion on a political issue by surveying only individuals who attend a specific political rally, leading to a skewed perspective.*

Correction exercice .6. *Non-Probability Sampling:*
Non-probability sampling is a method of selecting participants for a research study in which not every member of the population has a known and equal chance of being included. It is typically used when probability sampling is not feasible or practical.
***Reasons for using non-probability sampling**:*

- *Accessibility: When it is difficult to access or identify all members of the population.*
- *Cost-efficiency: When conducting probability sampling is expensive or time-consuming.*
- *Specific research goals: When the focus is on certain groups or characteristics within the population.*

***Limitations of non-probability sampling**:*

- *Lack of representativeness: Non-probability samples may not accurately represent the entire population, leading to potential bias.*

- *Limited generalizability: Findings from non-probability samples may not generalize to the broader population.*
- *Difficulty in estimating sampling error: Non-probability samples make it challenging to estimate the margin of error and level of confidence in study results.*

Correction exercice .7. ***Sampling Error****:*

Sampling error is the difference between a sample statistic (e.g., sample mean or proportion) and the true population parameter it is meant to estimate. It arises because a sample is only a subset of the entire population, and random variation can lead to discrepancies between sample and population values.

Importance of considering sampling error*:*

- *Accuracy assessment: Sampling error allows researchers to quantify the degree of uncertainty associated with sample estimates.*
- *Confidence intervals: Sampling error is used to construct confidence intervals, which provide a range within which the population parameter is likely to fall.*
- *Decision-making: Understanding sampling error helps in making informed decisions and assessing the reliability of survey findings.*

Example*: Suppose a survey estimates that the average income of a city's residents is* $50,000$ *with a margin of error of* $2,000$*. This means that the true average income of the population is likely to fall within the range of* $48,000$ *to* $52,000$ *due to sampling error.*

Correction exercice .8. *To determine the appropriate sample size for estimating the proportion of customers satisfied with a new product with a desired level of confidence and margin of error, you can use the following steps:*

1. *Specify the desired level of confidence (e.g., 95*
2. *Estimate the population proportion from prior information or pilot data if available. If not, use a conservative estimate of 0.5 (maximum variability).*
3. *Use a sample size formula for estimating proportions, such as:*

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{E^2}$$

where:

- n *is the required sample size.*
- Z *is the critical value corresponding to the desired level of confidence (e.g., 1.96 for 95confidence).*
- p *is the estimated population proportion.*

- *E is the desired margin of error.*

4. *Calculate the sample size using the formula and round it up to the nearest whole number to ensure a sufficient sample.*

Correction exercice .9. *1. **Oversampling and Undersampling**:*

- ***Oversampling**: Oversampling involves deliberately selecting more individuals from a specific subgroup or stratum of the population than would be proportionally represented in a simple random sample. This technique is used to ensure an adequate sample size for rare or underrepresented groups within the population. It allows for more precise estimation of characteristics of the oversampled subgroup.*
- ***Undersampling**: Undersampling, on the other hand, involves selecting fewer individuals from a specific subgroup or stratum than their proportion in the population. Undersampling is often used when researchers want to reduce the cost or complexity of data collection or when the subgroup is well-represented in the population and does not require a large sample.*

2. *When and why to use these techniques:*

- *Oversampling is employed when researchers want to ensure that the sample includes enough individuals from a particular subgroup, especially when that subgroup is small or critical for the study's objectives. For example, in a nationwide health survey, oversampling might be used to ensure an adequate number of participants from minority communities.*
- *Undersampling can be used when a subgroup is large and already well-represented in the population. By undersampling, researchers can reduce survey costs and still obtain accurate estimates of overall population characteristics. For example, in a survey of educational attainment, the general population may already have a significant number of individuals with high school diplomas, making it unnecessary to oversample this group.*

Correction exercice .10. *In qualitative research, sampling is approached differently compared to quantitative research. Qualitative sampling focuses on selecting participants or sources of data based on their ability to provide rich and in-depth information relevant to the research questions. Here are key points about sampling in qualitative research and differences from quantitative sampling:*

- *Purposeful sampling: Qualitative researchers often use purposeful or purposive sampling, where participants are selected intentionally based on specific criteria, such as their expertise, experiences, or relevance to the research topic. This approach aims to gather diverse and information data.*

- *Sample size: Qualitative research typically involves smaller sample sizes compared to quantitative research. The emphasis is on depth rather than breadth, as researchers seek detailed insights from a limited number of participants.*

- *Non sampling: Qualitative sampling methods are often non probabilistic, meaning that every member of the population may not have an equal chance of being selected. The goal is to select participants who can provide unique perspectives and insights.*

- *Data saturation: In qualitative research, sampling may continue until data saturation is reached. Data saturation occurs when new participants or data no longer provide substantially different insights or themes, indicating that the sample size is sufficient for the research objectives.*

- *Snowball sampling: Snowball sampling is a technique often used in qualitative research, where participants refer or introduce other potential participants who meet the criteria. This approach is particularly useful when researching hidden or hard to reach populations.*

- *Emphasis on context: Qualitative sampling considers the context in which data are collected, acknowledging that the richness of data is often influenced by the environment and interactions between participants.*

In summary, qualitative sampling is characterized by purposeful selection, smaller sample sizes, non-probabilistic methods, and a focus on depth and context. It aims to capture the complexity of human experiences and perspectives rather than generalizability to a larger population, which is a primary focus of quantitative sampling.