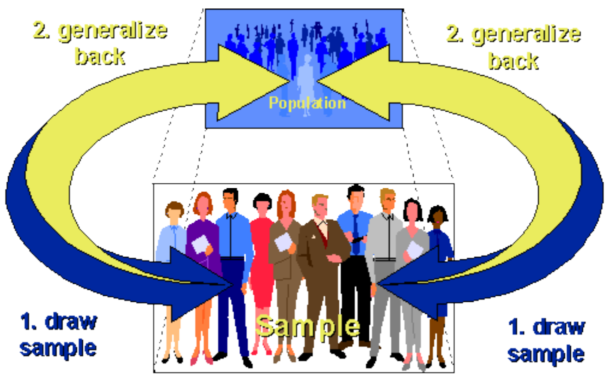
Sampling & External Validity

External Validity: Critiquing

- The sampling model…

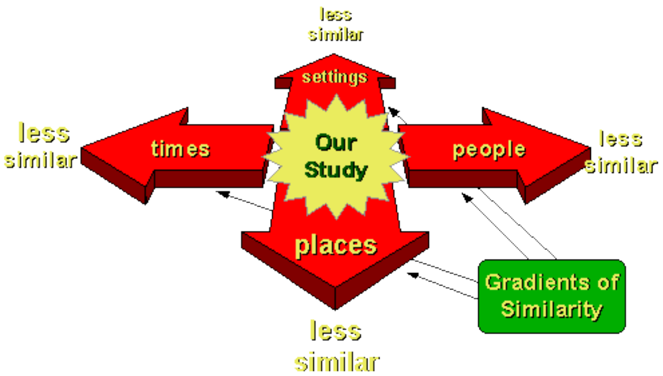


External Validity: Critiquing

- The sampling model…
  - Goal is representative sampling
    - Often not attainable -
      - Who to generalize to?
      - Availability of the true “representative” sample?
      - Will the sample be representative at other times?
- An alternative is to model differently

External Validity: Critiquing

- Proximal similarity model (Campbell, 1963)



External Validity: Critiquing

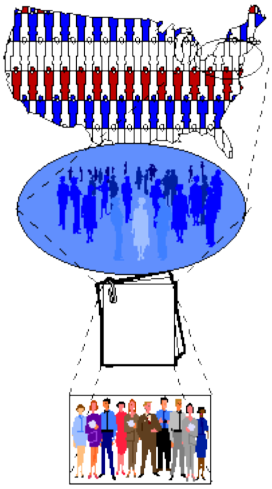
- Proximal similarity model (Campbell, 1963)
  - The idea here is to quantify the difference between the various properties of the study you are considering, and that to which you want to generalize, and then consider the likelihood that this difference would alter the research's findings

External Validity: Critiquing

- What can we do?
  - Evaluate, critique, consider…
  - And if that fails, replicate

Sampling Terminology

Who do you want to generalize to?		The Theoretical Population
What population can you get access to?		The Study Population
How can you get access to them?		The Sampling Frame
Who is in your study?		The Sample



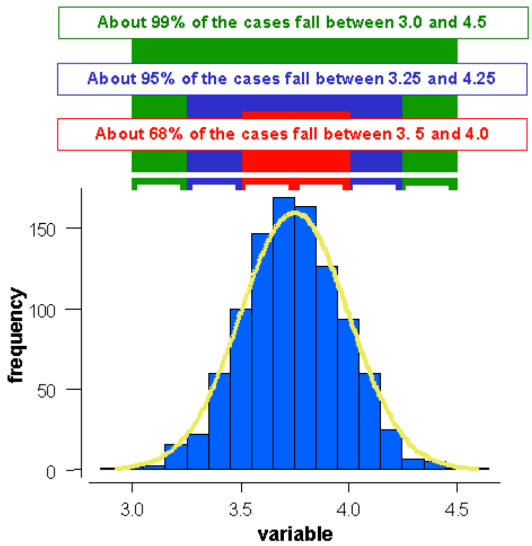
Statistical terms in sampling

- **Response:** is a specific measurement value that a sampling unit supplies
- If you measure the entire population and calculate a value like a mean or average, we don't refer to this as a statistic, we call it a **parameter** of the population
- The distribution of an infinite number of samples of the same size as the sample in your study is known as the **sampling distribution**.
- The standard deviation **(σ)** of the sampling distribution tells us something about how different samples would be distributed. In statistics it is referred to as the **standard error.**

Sampling error

- In sampling contexts, the standard error is called **sampling error**. Sampling error gives us some idea of the precision of our statistical estimate. A low sampling error means that we had relatively *less variability* or range in the sampling distribution.
- The greater the sample standard deviation, the greater the standard error (and the sampling error). The standard error is also related to the sample size.

Sampling error: standard units



Assuming a given average

There is a general rule that applies whenever we have a normal or bell-shaped distribution.

Start with the average -- the center of the distribution. If you go up and down:

- **one** standard unit, you will include approximately **68**% of the cases in the distribution
- **two** standard units, you will include approximately **95**% of the cases.
- **three** standard units, you will include about **99**% of the cases

Probability Sampling

- A **probability sampling** method is any method of sampling that utilizes some form of ***random selection***.
- In order to have a random selection method, you must set up some procedure that assures that the different units in your population have ***equal*** probabilities of being chosen.

elements

- **N** = the number of cases in the sampling frame
- **n** = the number of cases in the sample
- $_{N}C_{n}$ = the number of combinations (subsets) of n from N
- **f** = n/N = the sampling fraction

Stratified Random Sampling

- **Stratified Random Sampling**, also sometimes called *proportional* or *quota* random sampling, involves dividing your population into homogeneous subgroups and then taking a simple random sample in each subgroup.
- **Objective**: Divide the population into non-overlapping groups (i.e., *strata*) N_1, N_2, N_3, ... N_i, such that $N_1 + N_2 + N_3 + ... + N_i = N$.
- Then do a simple random sample of f = n/N in each strata.

StRnSmp advantages

1. assures that you will be able to represent not only the overall population, but also key subgroups of the population, especially small minority groups
2. stratified random sampling will generally have more statistical precision than simple random sampling (This will only be true if the strata or groups are homogeneous: variability within-groups is lower than the variability for the population as a whole.)

Systematic Random Sampling

- number the units in the population from 1 to N
- decide on the n (sample size) that you want or need
- k = N/n = the interval size
- randomly select an integer between 1 to k
- then take every k^{th} unit

cluster or area random sampling

- divide population into clusters (usually along geographic boundaries)
- randomly sample clusters
- measure *all* units within sampled clusters

Multi-stage sampling

- We can combine the methods described earlier in a variety of useful ways that help us address our sampling needs in the most efficient and effective manner possible

Nonprobability sampling

- NPS cannot depend on the rationale of the probability theory
- with a probabilistic sample, we know the odds or probability that we have represented the population well
- We are able to estimate confidence intervals for the statistic.
- With nonprobability samples, we may or may not represent the population well, and it will often be hard for us to know how well we've done so.
- In general, researchers prefer probabilistic or random sampling methods over nonprobabilistic ones, and consider them to be more accurate and rigorous.

Accidental or *purposive*

- We can divide nonprobability sampling methods into two broad types: *accidental* or *purposive*.
- Most sampling methods are purposive in nature because we usually approach the sampling problem with a *specific plan* in mind.

Types

- *Accidental, Haphazard or Convenience Sampling* (In many research contexts, we sample simply by asking for volunteers. The problem with all of these types of samples is that we have no evidence that they are representative of the populations we're interested in generalizing to)
- In *purposive sampling*, we sample with a *purpose* in mind. We usually would have one or more specific predefined groups we are seeking.

Subcategories of purposive sampling

- **Modal Instance Sampling** (sampling the most frequent case)
- **Expert sampling** (involves the assembling of a sample of persons with known or demonstrable experience and expertise in some area)
- In **quota sampling**, you select people nonrandomly according to some fixed quota. There are two types of quota sampling: *proportional* and *non proportional*.

Subcategories of purposive sampling

- We **sample** for **heterogeneity** when we want to include all opinions or views, and we aren't concerned with representing these views proportionately
- In **snowball sampling**, you begin by identifying someone who meets the criteria for inclusion in your study. You then ask them to recommend others who they may know who also meet the criteria

TABLE 2.1 Summary of Sampling Methods

Sampling Method	Use	Advantages	Disadvantages
Simple random sampling	Anytime.	Simple to implement; easy to explain to nontechnical audiences.	Requires a sample list (sampling frame) to select from.
Stratified random sampling	When concerned about underrepresenting smaller subgroups.	Allows you to oversample minority groups to assure enough for subgroup analyses.	Requires a sample list (sampling frame) from which to select.
Systematic random sampling	When you want to sample every k^{th} element in an ordered set.	You don't have to count through all of the elements in the list to find the ones randomly selected.	If the order of elements is nonrandom, there could be systematic bias.
Cluster (area) random sampling	When organizing geographically makes sense.	More efficient than other methods when sampling across a geographically dispersed area.	Usually not used alone; coupled with other methods in a multi-stage approach.
Multi-stage random sampling	Anytime.	Combines sophistication with efficiency.	Can be complex and difficult to explain to nontechnical audiences.
Accidental, haphazard, or convenience nonprobability sampling	Anytime.	Very easy to do; almost like not sampling at all.	Very weak external validity; likely to be biased.
Modal instance purposive nonprobability sampling	When you only want to measure a typical respondent.	Easily understood by nontechnical audiences.	Results only limited to the modal case; little external validity.
Modal purposive nonprobability sampling	As an adjunct to other sampling strategies.	Experts can provide opinions to support research conclusions.	Likely to be biased; limited external validity.
Quota purposive nonprobability sampling	When you want to represent subgroups.	Allows for oversampling smaller subgroups.	Likely to be more biased than stratified random sampling; often depends on who comes along when.
Heterogeneity purposive nonprobability sampling	When you want to sample for diversity or variety.	Easy to implement and explain; useful when you're interested in sampling for variety rather than representativeness.	Won't represent population views proportionately.
Snowball purposive nonprobability sampling	With hard to reach populations.	Can be used when there is no sampling frame.	Low external validity.

Exercise

- Take a list of names
- Number it automatically
- Design n. 3 strata (your choise)
- Use an online calculator for designing a sample, representative of a 15000 sampling frame population with 95% of accuracy and a SE_x of 7
- Use RAND() xlsx function for designing the correct number of names for every strata