Simulations Terms

simulation	the imitation of chance behavior, based on a model that accurately reflects the experiment under consideration
stopping rule	"continue selecting until ..."

How to Write Simulation Description

1. Select __ digit numbers to represent __.

2. Let __ - __ represent ___ and let __ - __ represent ___.

3. Select __ or Continue selecting ___ until ___.

4. Record ___.

5. Trial One : ___ ; Trial Two : ___ ; Trial Three : ___

Simulation Example

Alex needs a blood transfusion. She needs to find someone with B+ blood or she will die. 9% of all people have B+ blood. How many people on average would you need to check the blood type of until you find someone who can save Alex's life?

1. Select 2-digit numbers to represent people

2. Let 00-08 represent people with B+ blood and 09-99 represent people without B+ blood

3. Continue selecting people until you find someone with B+ blood

4. Record how many people you select before you find someone with B+ blood

5. Trial One:6 ; Trial Two:16 ; Trial Three:15

Sampling Design Example

a college professor wants to survey a sample of students taking her large lecture course. There are about 150 students in the course, and 10 of those students are graduate students. She wants to take a systematic random sample of approximately 30 students. Which strategy will accomplish her intended design?

randomly select one of the first 5 students to arrive to class, and every 5th student thereafter to take the survey.

Biases

bias	a systematic error in measuring the estimate that would repeatedly cause the data to be wrong
voluntary response bias	people select themselves to participate in the study
nonresponse bias	individuals who are randomly chosen for the sample cant be contacted or refuse to cooperate
convenience sampling	asking people who are easy to ask; convenient but not random
under coverage bias	some groups are left out of the selection process
response bias	the behavior of the respondent or interviewers causes you to get incorrect answers
wording bias	when wording of the question influences the answers that are given

Bias Examples

voluntary bias	online polls, facebook questionnaires
nonresponse bias	mailed polls, new apps on phone
convenience bias	friendly looking people, all people at the park
under coverage bias	only your neighborhood, phone books
response bias	cosplayer asking if people think cosplay is weird
wording	using strong vocabulary

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Sampling Design Terms

population	the entire group of individuals we want information about
census	a complete count of the population; when you gather general information about the entire population
sample	a part of the population we actually examine in order to gather information
sampling design	the method used to choose the sample from the population
sampling frame	a list of every individual in the population
simple random sample	every individual has an equal chance of being chosen
stratified random sample	population is divided into strata and then simple random sample is used on each stratum
systematic random sample	randomly select a number between one and n and survey every nth person after that
cluster random sample	randomly pick a location and sample all from that location
multistage sample	a combination of different sampling techniques

How to Describe Sampling Design

simple random sample	put the names/numbers of all ___ on slips of paper and place in a hat. Mix and randomly draw ___ slips of paper without replacement. Survey the corresponding people.

How to Describe Sampling Design (cont)

systematic random sample	number all ___ and place ___ numbers in a hat. Mix and randomly select one number and survey the corresponding person. Survey every nth person on the list after that.
cluster random design	number all clusters and put the numbers into a hat Mix and randomly select a number from the hat. Survey everyone in that cluster.
stratified random sample	sort everyone into strata then number ___ in all the stratum. place the numbers in a hat and draw __ numbers. survey the corresponding people in that specific stratum. repeat the process for all strata

Experimental Design Types

completely randomized design	experimental units are assigned completely at random to treatments
randomized block design	experimental units are blocked in homogeneous groups and then randomly assigned to treatments
matched pairs design	a special type of block design; match up experimental unit according to similar characteristics and randomly assign one to treatment A and the other get treatment B automatically

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Experimental Design Terms

|	
observational study	observe outcomes without imposing any treatment
experiment	actively impose a randomly assigned treatment in order to observe the response
experimental unit	the single individual to which the different treatments are randomly assigned
factor / explanatory variable	what we test or what we change
level	a specific value or type for the factor
response variable	what you measure or record at the end of the experiment
treatment	a specific experimental condition applied to the units
control group	a group that is used to compare the factor against; can be placebo
placebo	a "dummy" treatment that can have no physical effect; not required in every experiment
blinding	method used so that units or evaluators do not know which treatment units are getting
double blinding	neither the units nor the evaluators know which treatment a subject recieved
confounding variable	a third variable that potentially affects both the factor and the response variable

Three Principles of Experimental Design

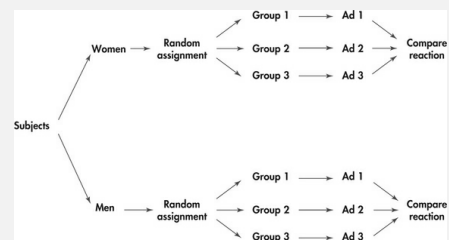| |
|---|
| control the effects of extraneous variables on the response |
| randomization used to assign subjects to treatments |
| replication of the experiment on many subjects to quantify the natural variation in the experiment |

Completely Randomized Design
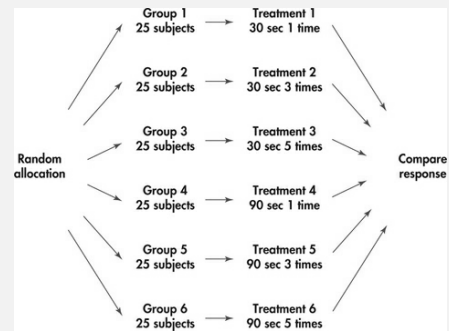
Randomized Block Design

Experiment Example

A consumer group wants to test cake pans to see which works the best. It will test aluminum, glass, and plastic pans in both gas and electric ovens
experimental unit: cake batter
factors: material of pan & type of oven
levels: aluminum, glass, or plastic & gas or electric
response variable: evenness of cake
amount of treatments: six

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