

Part II: Producing Data

Chapter 5: Producing Data

5.1 Designing Samples

OBJ: You will be able to determine the pop. sample and design of an experiment or observational study.

Observational Study - Observes individuals, measures variables of interest but does not attempt to influence the response.

Experiment - Deliberately imposes some treatment of an individual in order to observe their responses.

Population - The entire group of indiv. we want info about.

Sample - The part of the pop. that we actually examine.

Census - Attempts to contact every indiv. in the pop.

Design - The method used to choose the sample from the pop.

Example 5.2 - pg 272

Voluntary Response Sample - People who choose themselves by responding to a General Appeal. Biased; People with strong negative opinions are most likely to respond.

→ Bias - A study is biased if it systematically favors certain outcomes.

→ Convenience Sampling - chooses indiv. easiest to reach.

Example 5.3

5.2, 5.3, 5.7

Simple Random Sample (SRS) - Top pg. 275 (+ TP Before)

Random Digits - Mid pg 275 + see Table B.

Example 5.4

Choosing an SRS - Label, Table (Label each indiv, use table B)

How do you Label?

How do you use the table?

} Turn the Page for

More Random Fun!!! =>

Use the Shortest Possible Labels!

<u>Amt. in Pop</u>	<u># of Digits</u>	<u>Label (From - to)</u>
10	1	0-9 or 1-0
100	2	00-99 or 01-00
1000	3	000-999 or 001-000
212	3	001-212

Table B can be read in any order - Across, Down, etc.
However, common practice is to read rows across then
drop to the next row if needed. (Don't Restart ①
the beginning for different samples unless you state
you are doing so.)

5.9, 5.10 - pg 279

HW: 5.1, 5.8, 5.11, 5.12

5.1 Designing Samples - Day 2

Probability Sample - A sample chosen by chance.

*** The use of chance to select the sample is the essential principle of statistical sampling. ***

Stratified Random Sample - (NOT SRS!!) To select - first, divide the pop. into groups of similar indiv. called strata. Then, choose an SRS from each stratum + combine these SRS's to form the full sample.
(FHS $\rightarrow$ FR, SO, JR, SR)

Multi-stage Sampling Design - Bottom pg 278 + Top Pg 279

Undercoverage - when some groups in the pop. are left out of the process of choosing the sample. (Homeless, Prison, Dorms, etc) Most samples suffer from this.

Non Response - when an indiv. chosen for the sample can't be contacted or Does NOT Cooperate. (Higher in urban areas - why?) Most serious source of Bias.

Last P on Pg 281 - Response Bias

Wording of Questions - Top Pg 282
- Examples 5.7 and 5.8
- P. Affl $\rightarrow$

5.13, 5.14

HW: 5.19, 5.21, 5.23-5.25 Quiz Tomorrow!

5.2 Designing Experiments - Day 1

OBS. You will begin to design experiments.

Experimental Units - The indiv. on which the experiment is done (Rats, Bunnies, Frogs).

Subjects - when the units are human beings.

Treatment - A special experimental condition applied to the units.

Factors - The exp. vars. in an experiment.

Placebo - A dummy pill (sugar pill) that looks and tastes like a drug being tested, but has no active ingredient.

Example 5.9 + Following PP - pg 290.

Example 5.10 + Following PP.

Design of an experiment w/a single treatment (in a lab setting): Units $\rightarrow$ Treatment $\rightarrow$ OBS. Response.

Example 5.11 + Following PP.

5.32, 5.36

Example 5.12 + Randomized comparative experiments @ bottom of pg 295 to pg 296.

Principles of Experimental Design - mid pg 296

Statistical Significance - An observed effect so large that it would rarely occur by chance.

HW: 5.37, 5.38, 5.40, 5.41

5.2 Designing Experiments - Day 2

OBS: You will start describing various experiments.

Experimenters must take great care to deal w/ all experimental units/subjects in exactly the same way, so the treatments are the only diff. present.

Double-Blind Experiment - Neither the subjects nor the people who have contact with them know which treatment a subject received.

Lack of Realism - The subjects, treatments, or setting of an experiment may not realistically duplicate the conditions you want to study.

Example 5.14

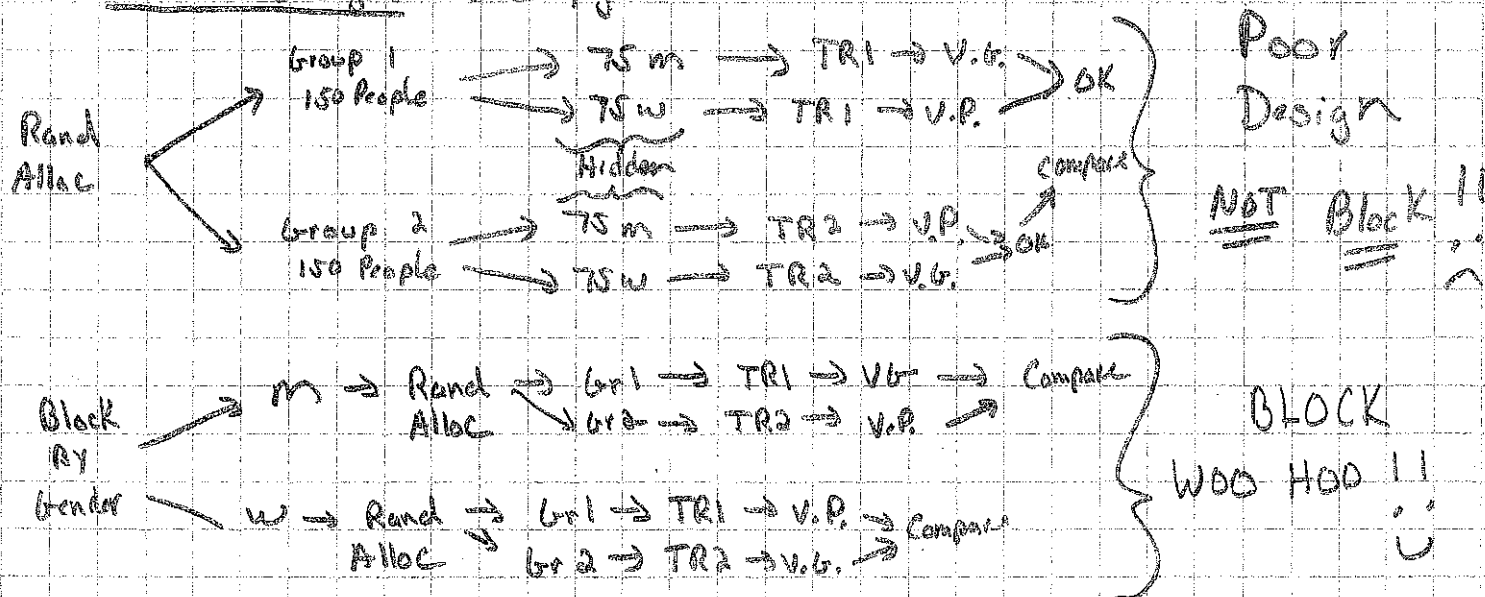
Example 5.15

Blue Tail Lights

Most experimenters want to generalize their conclusions to some setting wider than that of the actual experiment.

Matched Pairs Design - Compares two treatments. The order may influence the response. ∴ Rand. Assign (coin Toss)
(Ex 5.16)

Block Design - See pg 302



Outline of a Block Design - Example 5.17
5.43

HW: 5.44, 5.46, 5.47

5.3 Simulating Experiments - Day 1

OBS: You will simulate experiments using the table of random digits.

Simulation - The imitation of chance behavior using the table of random digits.

Example 5.21

- Steps:
- State the problem or describe the experiment:
What is the likelihood of a run of at least 3 consecutive H or T in 10 Tosses of a coin?
 - State the assumptions: A Head or Tail is equally likely to occur AND Tosses are independent of each other.
 - Assign Digits to represent outcomes: ODD - Heads
EVEN - Tails
ONE DIGIT = 1 Toss
 - Simulate many repetitions. (Say 25 for this one)

Line 101 19223 95034 05756 28713 96409 12531 ...
 HTTTH HHTHT THTHT TTHTH HTTTH HTHTH
 Yes Yes Yes
Do 22
More 11

22 More Blocks of 10 were done and...

$\frac{23}{25}$ Had a run of 3 or more H or T

- 5 State your conclusions: Est. Prob = $\frac{23}{25} = .92$ (Actual is .826)

5.63

HW: Read Example 5.23 + 5.24
5.61, 5.62, 5.64

5.3 Simulating Experiments - Day 2 + 3

OBJ: You will simulate experiments using your calculator.

randInt (min, max, # of Trials)

Math - PRB - 5

Toss a Die 4 Times: randInt (1, 6, 4)

Day 2: Class: 5.70, 5.72
Mw. 5.68, 5.69, 5.71

Day 3: Class: 5.73