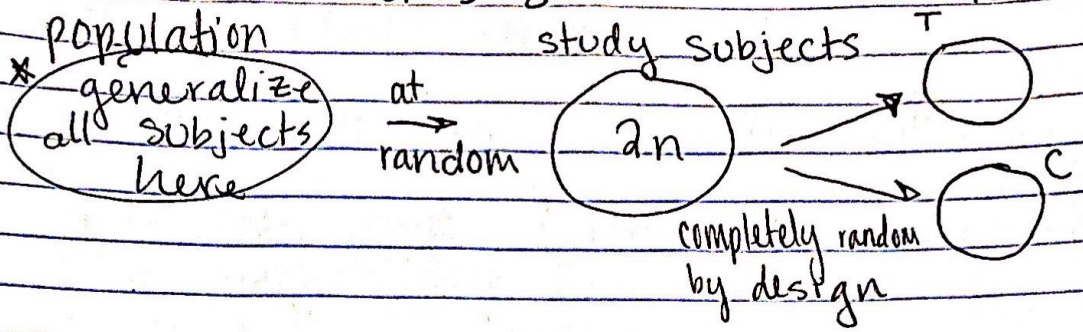
L-80

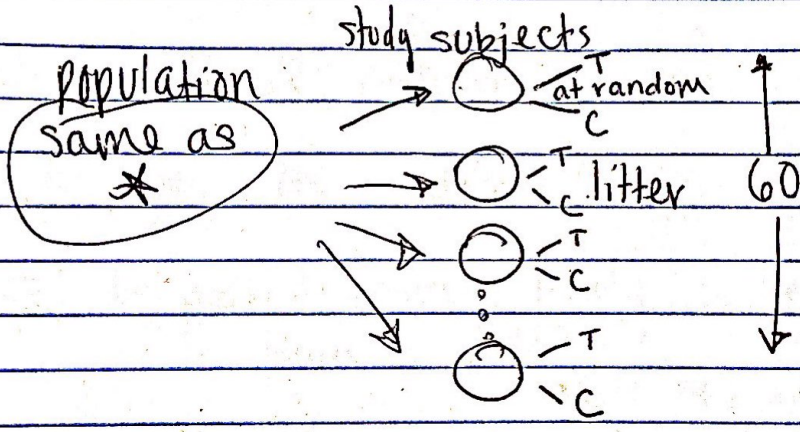
Stat 7 - class 8

10-22



RCT (randomized controlled trial): an experimental design is valid if it's unbiased

Q. IS RCT valid?
A. Yes.



Q. Does $\underline{X}$ cause $\underline{Y}$? → Do changes in $\underline{X}$ cause changes in $\underline{Y}$?

$\underline{Z}$: potential confounding factor (PCF)

Here $\underline{Z}$ = genetics

$\underline{Z}$ is a PCF if and only if
a) $\underline{Z}$, $\underline{Y}$ could be associated
b) $\underline{Z}$, $\underline{X}$ " "

How to Defeat a PCF:

Hold it constant

1) at design time
2) at analysis time

} how to defeat PCF

Cortex weight

paired comparison
↳ matched pairs

n = 60

litter	T	C	difference T−C
1	690	638	52
2	651	652	-1
⋮			
60	686	639	37

1 row for each litter

Q. Is this comparison design valid?

A. yes, its unbiased

Q. Is paired design likely to be more accurate than CRD?
↳ kill PCF by hoping that randomization has been balanced

A. yes, because paired design kills PCF by holding it constant

Q. If $\overline{X}$, $\overline{Y}$ are associated, is it always true that either $\overline{X}$ is causing $\overline{Y}$ or vice versa

$\overline{X} \rightarrow \overline{Y}$ $\quad \overline{X} \leftarrow \overline{Y}$

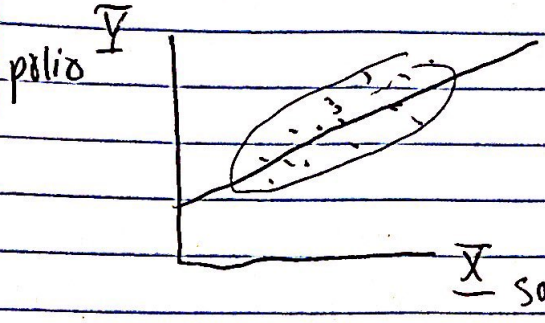
Is causation = association?

Ex drinking soda pop causes polio to spread

Season	consumption $\bar{X}$	Polio cases $\bar{Y}$ new
Su	H	H
F	M	M
W	L	L
Sp	M	M

Q. Are $\bar{X}$, $\bar{Y}$ associated?

A. Yes



← Scatter Plot

association is positive

Q. Does this prove $\bar{X}$ causes $\bar{Y}$?

A. No.

Association $\neq$ Causation

$\leq$ ← weaker than or equal to

Q. Why isn't assoc. = caus.?

A. PCFs

R-35 • Case Study: the Contraceptive Drug Study

Outcome
Y

[blood pressure]

Treatment
X

[1 = pill use (T)
0 = no pill (C)]

(T) (C)

[b.p.] [b.p.]

mean mean
SD SD

Q. If there is no difference between T and C can we conclude the pill does not affect blood pressure?

A. No

*If observational study, worry a lot about PCFs.

Z = age is a pcf

age ↑ bp ↑ ✓

age ↑ pill use ↓ ✓

*strongest method to defeat PCF is holding it constant

if we don't hold age constant, this would bias the results to make the pill look less harmful than it really is.

R-34 Table 2

After controlling for age, pill use associated with 5mm increase in systolic b.p.

Q. Is this difference practically significant?

A. No if pill use is short. Yes for long use

L-95 Ch 3 Probability

3.1 The meaning of Probability