AMS 7
Class / Lecture 5
6/29/16

Announcements:
- HW 2 due July 5 (make up class)
- Midterm 1 will be handed out July 6 and due Monday July 11

Single Blinded:
The experimenters are blinded if when collecting data they do not know which subjects are in the treatment group or not.
ex. when measuring cortex of rats, the investigator dissecting the brain does not know if the animal is in the treatment or control group, so they don't alter data

Placebo Effect: Subjects respond to the idea of treatment, rather than treatment itself.

Double Blinded Experiment: experimenters and subjects are blinded to treatment / control

RCTs: are good ideas but it cannot always be done on ethical grounds.

If experimenters don't have control over who gets into T/C, it is called an observational study.

If no comparison b/w 2 or more groups, neither.

A design is valid if it has no bias.
CRD valid? yes.

Can we improve accuracy of this design?
Yes - by holding PCF(s) constant

ex. How can we improve accuracy of CRD in the cortex exp?
- Y: cortex wt
- X: environment
- Z: genetics

idea: hold PCF constant at design time

Choose 2 rats from each of 60 litters to hold genetics constant, 1 rat T / 1 rat C (at random)
Matched Pairs design is more accurate than completely randomized design.

litter	T	C	T−C
1	683	656	+27
2	699	692	+7
...	...	...	...
60	714	716	−2

Analysis focuses on the difference b/w T and C in matched pairs design.

Are ↑ ↑ linked? Yes: matched pairs
NO: CRD

ex.
- enriched T_1
- normal T_2
- deprived T_3

Choose 3 rats from each litter to make a block.

Randomized Block Design if T_1 T_2 T_3 assigned at random w/in a block

ex. matched pairs: special case w/ block size of 2
Drugs to combat insomnia

	T(hrs)	C	T−C
1	4.6	2.2	+2.3
2	7.6	7.9	−.4
...	...	...	...
100	3.5	1.0	+2.5

idea: hold the person (subject) constant
T: drug
C: no drug
T−C: ind. person drug impact

Are ↑ ↗ linked? Yes, the same person (subject) is given both T and C on different days, but blinded.

This is called a longitudinal design and is an example of repeated measures design.

Longitudinal Design: Measure outcome at 2 or more time points on same subjects.

Repeated Measures: also valid, likely more accurate than CRD

Cross-Sectional: measure the outcome on many different subjects at one moment in time (cheaper + easier than longitudinal)

Designs for Controlled Exp.
1. CRD are cross sectional
2. MPD are cross sectional
3. RMD are longitudinal

Accuracy
CRD < MPD < RMD
but all valid

R-38 ex. Birth control Pill

T variable: pill (T) no pill (C)

Outcome variable: (systolic) blood pressure

This is an observational study. (Women choose T or C) We must be careful w/ PCFs when analysis being completed.

What PCFs are possible?

Age: age ↑, pill use ↓

age ↑, blood pressure ↑

Y (outcome): systolic blood pressure

X (SCF) : pill use (T) vs. non-use (C)

Z (PCF) : age ↑; sbp ↑ and pill use ↓

(SCF = supposed causal factor)

How can we defeat PCF of age at analysis time? Hold it constant. (control for)

Separate histograms in age categories to compare each category alone to see the effect of treatment on blood pressure holding age constant.

Controlling for age, we see that taking the pill IS bad for you because it does increase blood pressure.

Not bad if it only persisted short time, not 10-20 years.

Section 3: Probability   L-97

Probability Meaning

① Frequentist / Relative Frequency Approach
- only pay attention to things that are repeatable under identical conditions w/ each repetition logically independent of the others
- P(A) is probability of event A is regarded as the long-run relative frequency w/ which 'A' would occur in the repititions

② Bayesian Approach
- 'A' can be any (true/false) proposition you want
- Attention need <u>not</u> be restricted to repeatable phenomena
- P(A) is numerical measure of weight of evidence in favor of the statement that A is true
- More general but math is harder

Equally Likely Model (ELM)

$$P(A) = \frac{\text{number outcomes favorable to A}}{\text{total number of possible outcomes}}$$

* *if* all of the possible outcomes are equally likely for event A

ex. ELM for genetics

$P(\text{normal}) = \frac{1}{4}$

$P(\text{carrier}) = \frac{2}{4} = \frac{1}{2}$

$P(\text{T-S}) = \frac{1}{4} = 25\%$