

this design;  
 time: probability  
 next time:

real: DD  
 (A) ch. 1-3  
 (B) ch. 1-8  
 STAT 7  
 22 Oct 19  
 Quiz 3  
 due Fri night 25 Oct

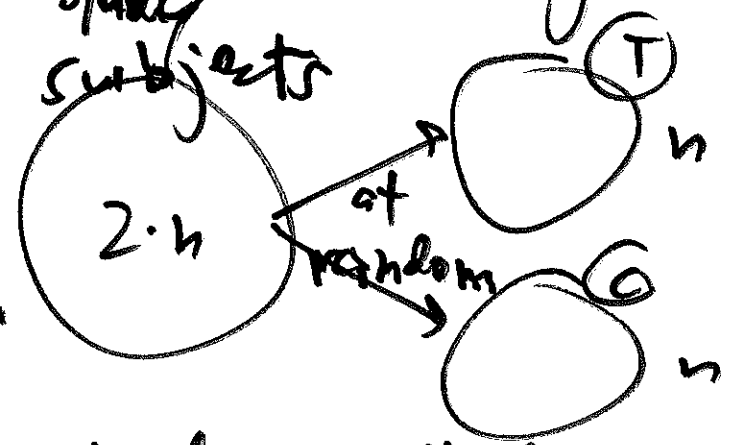
Quiz 4 due  
 Tue night  
 29 Oct

homework 2 due wed  
 night 30 Oct

population  
 we want to generalize  
 to all subjects  
 have

completely randomized  
 design  
 study subjects

like  
 at random



randomized controlled trial  
 (RCT)

good  
 Definition  
 design is  
 unbiased

An experimental  
 design is valid if it's

(L-77) (A) RCT valid?  
 (A) yes ✓ (CRD) ✓



how to defeat a PCF / strongest method ③  
hold it  
constant

2 moments to achieve this defeat:

- ① at design time
- ② at analysis time

Cortex weight

litter	①	②	difference ① - ②
1	690	638	+52
2	651	652	-1
...			<del>...</del>
6.	686	659	+37

1 vol for each litter

paired comparison  
 n=60

matched pairs

Q: Is this paired comparison design valid?

A: Yes, it's unbiased

Q: Is paired design likely to be more accurate?

than CRD? kill PCF by holding <sup>(4)</sup>

randomization bar under (1), (2)

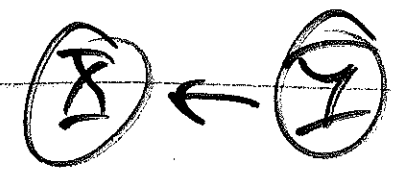
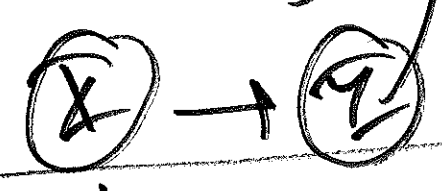
same similar to PCF

this will happen with high probability

A2] Yes, because paired design kills PCF by holding it constant.

new Q] if  $X - Y$  associated, ~~is~~

it always true that either  $X$  is causing  $Y$  or  $Y$  is causing  $X$



rephrase | is association = causation?

theory

drinking soda pop

(5)

(X) causes polio to be spread

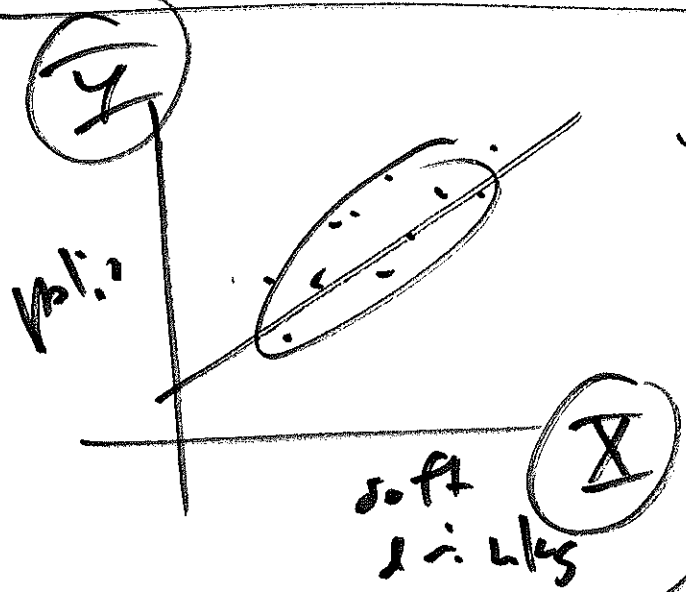
Season	soft drink consumption	new polio cases
Jun	H	H
F	M	M
w	L	L
Sp	M	M

H = high  
M = medium  
L = low

Q: Are X, Y associated?

A: yes, and the assoc.

Scatter plot



Q: Does this prove cancer?

A: no; this story was wrong

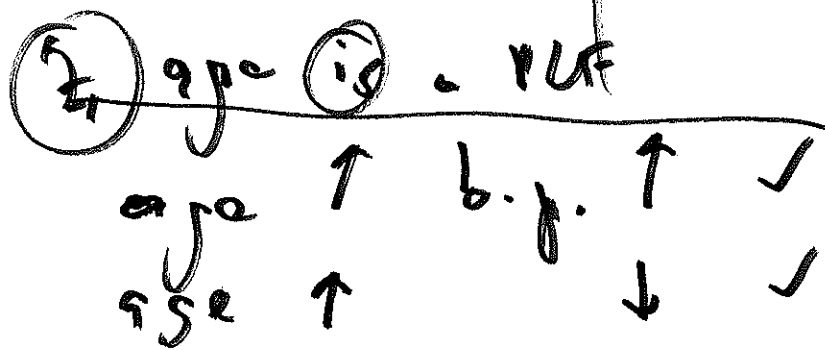
association  $\neq$  causation <sup>⑥</sup>

Q why isn't  
 assoc. = caus.?  
 $\leq$  weaker than or equivalent to

A PCFs



if obs. study,  
 then worry a lot  
 about PCFs



if we don't hold age constant ( "control for the PCF  $\frac{1}{4} =$  'eye' ), this would bias results to make pill look less harmful than it really is

after controlling for age, pill use associated with 5 mmHg increase in systemic b.p.

Q: is this difference practically significant? A) no if short (time) pill use; yes if long use