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(1) Lecture #6 Observational Studies

AMS 7
1/22/08

next time: Probability

- Matched pairs = randomized blocks with block size 2

- Idea: hold entire person constant (ex: with & without drugs)
- cross sectional data: snapshots of lots of subjects at one moment in time
- longitudinal design: measure outcome at 2 or more time points on the same subject (repeated measures design)

^ easier to do cross sectional because you only have to do it one time

*Oral Contraceptives Study
- can't run RCT on this because it is not ethical
- monitor systolic blood pressure
- CAN do an observational study, need to control PCFs
- treatment: pill vs. no pill
- PCF: age

y: blood pressure   x: pill use   z: age

- y/z association? → yes y goes up with z(age)
- x/z association? → yes, age(z)↑ then pill use (x) ↓

∴ therefore age (z) is a PCF (the enemy)

- Control PCF: hold constant by making age categories
  - age can't confound data within each age category

★ reminder: PCF = Potential Confounding Factor

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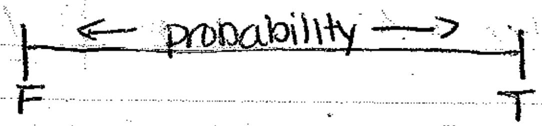
## (2) Lecture #6 Probability

- 350 yrs ago, want new games/ways to gamble
  → probability "invented" in 1650

main way used in this class • **Frequentist Probability** - phenomena: repeatable under identical conditions (each repetition independent). Probability P(A) of event A: long-run relative frequency

better measure • **Bayesian** - A can be any (true/false) proposition (not restricted to repeatable phenomena) & P(A) is a numerical measure of the weight of evidence of the true statement




- Bayesian math is much more difficult (calculus)

$\begin{bmatrix} 1 \\ 2 \\ 9 \end{bmatrix}$ → at random $[y_1]$ n = 1

pop

Equally likely Model? Yes (at random)

$p(y_1 = 9) = \frac{1}{3} = 33\%$
$p(y_1 = \text{odd}) = \frac{2}{3} = 67\%$

(1 or more T-S in 5 babies)
= (exactly 1 T-S) **or** (exactly 2 T-S) **or** ... **or** (exactly 5 T-S)

$P(A \text{ or } B) \overset{?}{=} P(A) \ ? \ P(B)$

not (1 or more T-S babies) = (exactly 0 T-S babies)

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# Lecture #6 Probability

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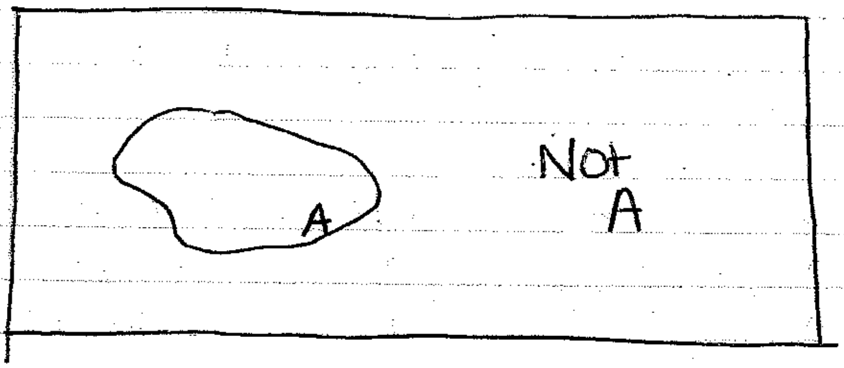
(3)

(exactly 0 T-S babies) ~ (1st baby not T-S) (and) (2nd baby not T-S) (and) … (and) (5th baby not T-S)

$P(A \text{ and } B) \overset{?}{=} P(A) \; ? \; P(B)$




all the ways things could come out

$P(A) + P(\text{not } A) = 100\%$

$P(\square) = 100\% = 1$

useful rule: $P(A) = 1 - P(\text{not } A)$

$(0)\ 0\% \le P(A) \le 100\%\ (1)$

False, never ↗ ... ↖ always, true