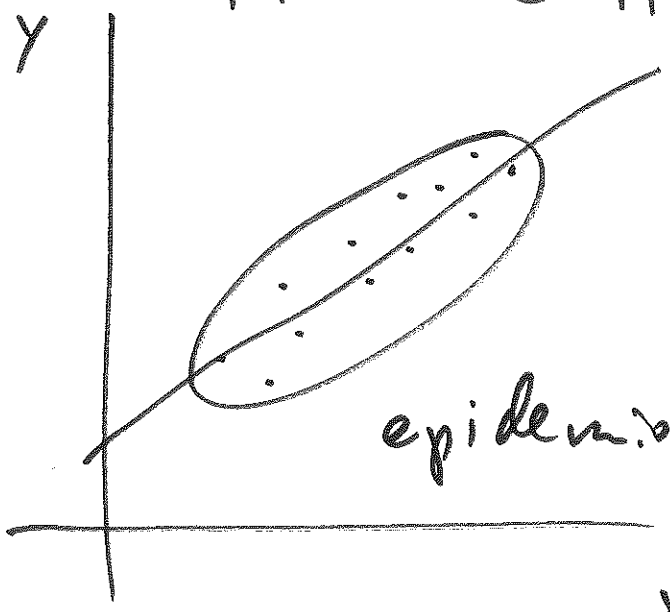
Discussion section 3 | #6 | P. R-42 | AM57 SOL1 2016

Sir Richard Doll



lung cancer rate		average cigarette consumption
Y	x	1 row for each country

(1)

(a) P(both smokers die first)

= P(HH in 2 tosses of a fair coin)

$= \frac{1}{4} = 25\%$

	2nd toss: H	2nd toss: T
1st toss: H	HH	HT
1st toss: T	TH	TT

P(~) = P(H on 1st and H on 2nd)

9

ELA? yes

$= P(H \text{ on } 1^{st}) \cdot P(H \text{ on } 2^{nd} \mid H \text{ on } 1^{st})$ ②

(indep) $\Rightarrow \left(\frac{1}{2}\right) \cdot P(H \text{ on } 2^{nd})$

$= \left(\frac{1}{2}\right) \cdot \left(\frac{1}{2}\right) = \frac{1}{4} = 25\%$

weak evidence against Fisher

(below 50% but not tiny)

(b) coronary heart disease

$P($ all 9 smokers die first $)$

$= P(\underbrace{H\,H\,H\,H\,H\,H\,H\,H\,H}_{\text{in 9 tosses}})$

(IID) $\Rightarrow \left(\frac{1}{2}\right)^9 = \frac{1}{512} \doteq 0.2\% = .00195\ldots$

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try Fisher on for size; something

extremely unusual happened if Fisher were correct; therefore Fisher is probably wrong

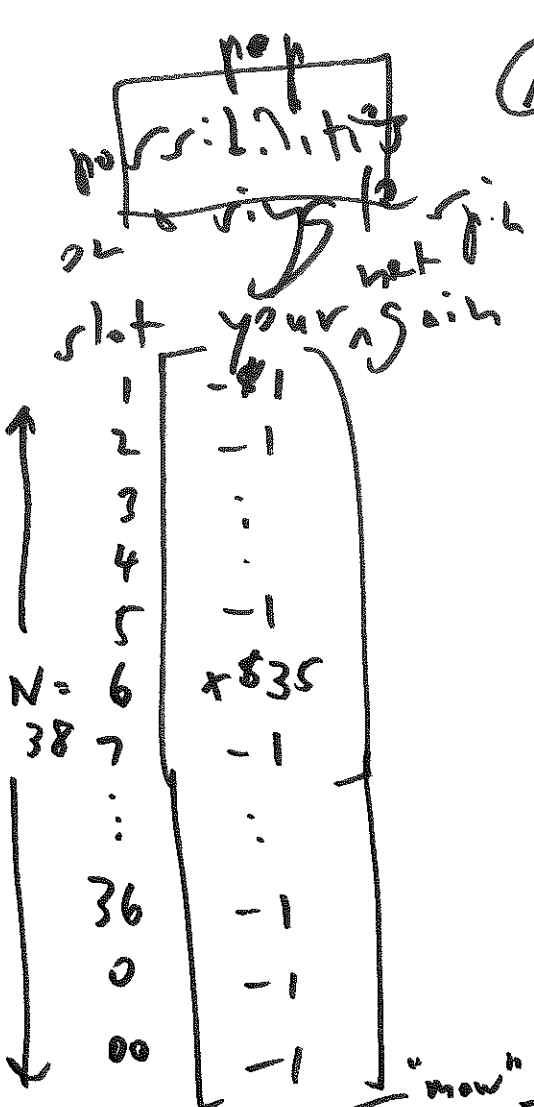
(c) (i) no; 0.2% is too low

(ii) no: smoothing held constant

(iii) yes: it probably was smoking causing this data set to come out the way it did

proof by contradiction: suppose temporarily that a theory is false; show that this supposition leads to a contradiction of known truth; therefore theory must be true

the argument that defeated Fisher is like a probability version of proof by contradiction



$$\text{mean } \mu = \frac{\overbrace{(-\$1) + (-\$1) + \dots + (-\$1) + (+\$35)}^{37}}{38}$$

$$= \frac{-\$37 + \$35}{38} = \frac{-\$2}{38} = \frac{-\$1}{19} \doteq -\$0.05$$