this time: (see syllabus)
next time:

reading: see syllabus

AMS131
9 Apr 19

①

P(inf. in 100 acts)

= P(1 or more inf. in 100 acts)

(T-S)
= 1 − P(0 inf. in 100)

= 1 − P(not inf on 1st and not inf on 2nd and … and not inf. on 100th)

biology
(I) ID
$$= 1 - P\left(\begin{matrix}\text{not}\\ \text{inf.}\\ \text{on } 1^{st}\end{matrix}\right) P\left(\begin{matrix}\text{not}\\ \text{inf.}\\ \text{on } 2^{nd}\end{matrix}\right) \cdots P\left(\begin{matrix}\text{not}\\ \text{inf.}\\ \text{on } 100^{th}\end{matrix}\right)$$

1st-order biology
IID
$$= 1 - \left(1 - \frac{1}{500}\right)\left(1 - \frac{1}{500}\right) \cdots \left(1 - \frac{1}{500}\right)$$

$$= 1 - \left(1 - \frac{1}{500}\right)^{100} = 0.18 \doteq 18\%$$

n = # acts

p = P(inf. on one act)

P(inf. in n acts)

$$= 1 - (1 - p)^n$$

n	Dr. Schram	correct
1	$p = \frac{1}{500}$	p
100	$0.20 = 20\%$	$1-\left(1-\frac{1}{500}\right)^{100} = 0.18$
500	$1 = 100\%$	$1-\left(1-\frac{1}{500}\right)^{500} \approx 0.63$
n	np	$1-(1-p)^n$

$$= 1 - \left(1 - np + (\cdots)\right)$$

$$p_i = P(\text{you get inf. from partner } i) = np - \boxed{\quad}$$

$P(\text{inf in } n \text{ rels with } n \text{ partners})$

$$= 1 - (1-p_1)(1-p_2)\cdots(1-p_n)$$

$$= 1 - \prod_{i=1}^{n}(1-p_i)$$

P(both smokers die first)

$$= P_{H^*}(H \text{ and } H) = P(HH \mid H^*)$$

Fisher's theory H^*

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

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

fair: 50/50 indep.

$$= \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

		2^{nd} H	2^{nd} T
1^{st}	H	HH	HT
	T	TH	TT

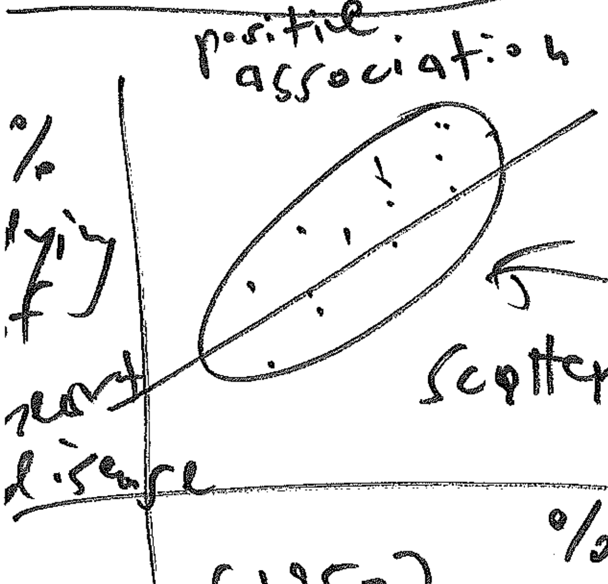
insufficient evidence to rule on H^*

$$P(\text{all 9 smokers die first} \mid H^*) = \frac{1}{2^9} = \frac{1}{512} = 0.2\%$$

statistical inference

if H^* true, data highly unlikely; therefore H^* is probably false this idea = probabilistic version of proof by contradiction

R.A. Fisher FRS (1890 – 1962) $\boxed{\sim 1925}$



scatterplot

(1957)

Dr. Richard Doll

(epidemiologist)

1 point for each country

F = Fisher's hypothesis

H = heads
T = tails

$P(HH \mid F) = P(H \text{ on } 1^{ST} \text{ and } H \text{ on } 2^{nd} \mid F)$

lung cancer

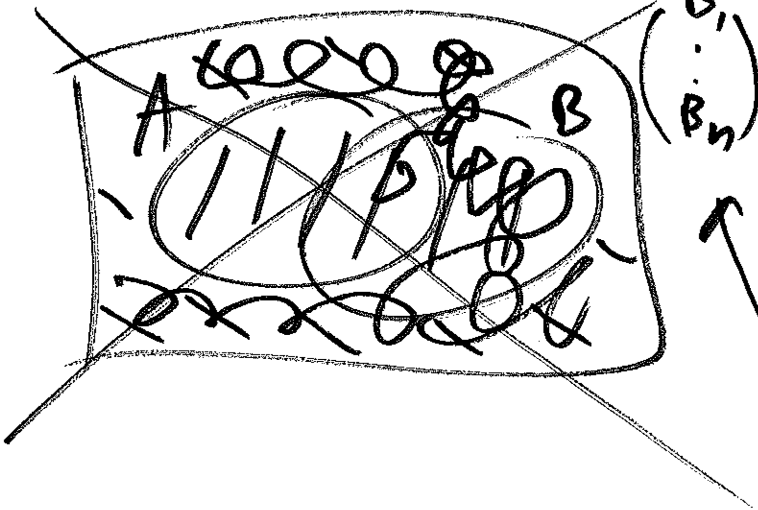
$= P(H \text{ on } 1^{ST}) \cdot P(H \text{ on } 2^{nd})$

$= \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

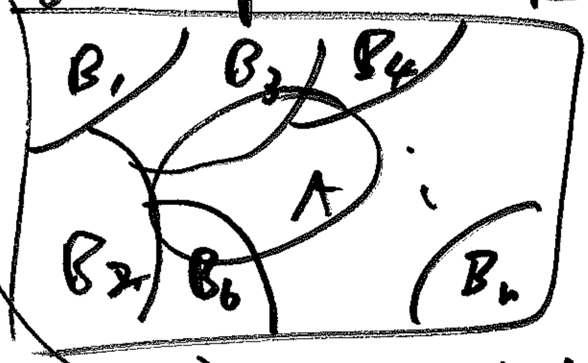
$= 25\%$

inconclusive

because 25% is still fairly large



$\begin{pmatrix} B_1 \\ \vdots \\ B_n \end{pmatrix}$ jigsaw puzzle S

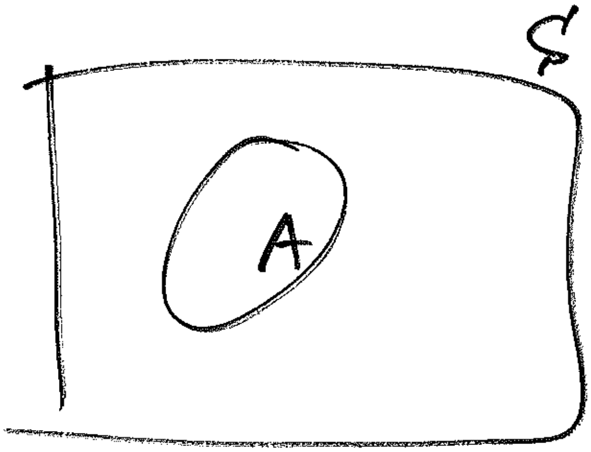


partition of S

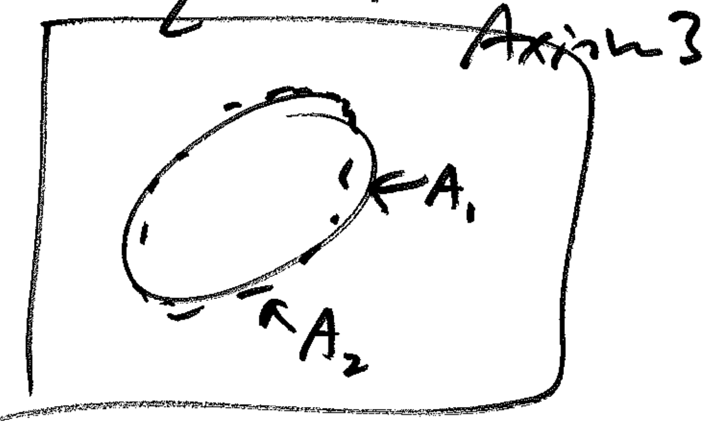
$$P(A) = P[(A \text{ and } B_1) \text{ or } (A \text{ and } B_2) \text{ or } \dots \text{ or } (A \text{ and } B_n)]$$

$\emptyset$

$$\overset{\text{mut.}}{\underset{\text{excl.}}{=}} P(\underline{A \text{ and } B_1}) + \dots + P(\underline{A \text{ and } B_n})$$



equivalent to Axiom 3



Continuity

if $A_1 \doteq A_2$

then $P_E(A_1) \doteq P_E(A_2)$