In time: (see next syllabus)

Reading: see syllabus

\[ p(\text{inf. in 100 acts}) = p(\text{1 or more inf. in 100 acts}) \]
\[ = 1 - p(0 \text{ inf. in 100}) \]
\[ = 1 - p(\text{not inf.}) \]
\[ = 1 - p(\text{not inf.}) \]
\[ = 1 - (1 - \frac{1}{500})^{100} = 0.18 = 18\% \]

\[ n = \# \text{ acts} \quad p(\text{inf. in } n \text{ acts}) \]
\[ p = p(\text{inf. in } 1 \text{ act}) \quad = 1 - (1 - p)^n \]
<table>
<thead>
<tr>
<th>n</th>
<th>Dr. Schram</th>
<th>correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( p = \frac{1}{500} )</td>
<td>( p )</td>
</tr>
<tr>
<td>100</td>
<td>0.20 = 20%</td>
<td>( 1 - (1 - \frac{1}{500})^{100} = 0.18 )</td>
</tr>
<tr>
<td>500</td>
<td>1 = 100%</td>
<td>( 1 - (1 - \frac{1}{500})^{500} = 0.63 )</td>
</tr>
</tbody>
</table>

\[
p_i = P(\text{inf in } n \text{ sets with } n \text{ partners})
\]

\[
= 1 - (1 - p_1)(1 - p_2) \cdots (1 - p_n)
\]

\[
= 1 - \prod_{i=1}^{n} (1 - p_i)
\]
(both smokers die first)

\[ P(H^*) = P(C \mid H^*) \]

= \[ P(H \text{ on } 1^{st} \text{ and } H \text{ on } 2^{nd}) \]

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

= \[ \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4} \]

\[ \frac{1}{2} \]

insufficient evidence to rule out \( H^* \)

\[ \frac{1}{9} \]

\[ \frac{1}{2} \]

statistical inference

if \( H^* \) true, data

highly unlikely; therefore \( H^* \) is probably false
this idea = probabilistic version of proof by contradiction
Dr. Richard Doll (epidemiologist) suggested a positive association between smoking and lung cancer in 1957. The scatterplot shows the percentage of smokers and the incidence of lung cancer for each country.

\[ P(HH | F) = P(H \text{ on 1st flip and } H \text{ on 2nd flip}) \]

\[ = P(H \text{ on 1st flip}) \cdot P(H \text{ on 2nd flip}) \]

\[ = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4} \]

In conclusion, because 25% is still fairly large, P. A. Fisher FRS (1890 - 1962) noted that this percentage is statistically significant.
\[ P(A) = P[(A \text{ and } B_1) \text{ or } (A \text{ and } B_2) \text{ or } \ldots \text{ or } (A \text{ and } B_n)] \]

mut. = \[ P(A \text{ and } B_1) + \ldots + P(A \text{ and } B_n) \]

excl. = \[ \text{if } A_1 = A_2 \text{ then } P_{\mathbb{F}}(A_1) = P_{\mathbb{F}}(A_2) \]