Discrete Response Model Lecture 1

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Relative Risk

Why Is the Notion of Relative Risk Important?

A shortcoming of basing inference on $\pi_1 - \pi_2$ is that it measures a quantity whose meaning changes depending on the sizes of $\pi_1 - \pi_2$.

	Adverse reactions		Total
	Yes	No	
Drug	$\pi_1 = 0.510$	$1 - \pi_1 = 0.490$	1
Placebo	$\pi_2 = 0.501$	$1 - \pi_2 = 0.499$	1

$\pi_1 - \pi_2 = 0.510 - 0.501 = 0.009$

	Adverse reactions		Total
	Yes	No	
Drug	$\pi_1 = 0.010$	$1 - \pi_1 = 0.990$	1
Placebo	$\pi_2 = 0.001$	$1 - \pi_2 = 0.999$	1

$\pi_1 - \pi_2 = 0.010 - 0.001 = 0.009$

In the first scenario, an increase of 0.009 is rather small **relative** to the already sizable probabilities given for the two groups. On the other hand, the second scenario has a much larger adverse reaction probability for the drug group **relative** to the placebo group.

Defining Relative Risk

Convey the relative magnitudes of these changes better than differences allow.

$$RR = \frac{\pi_1}{\pi_2}$$

For scenario 2 above, the relative risk is RR = 0.010/0.001 = 10.

Interpretation:

An adverse reaction is **10** *times as likely* for those individuals taking the drug than those individuals taking the placebo, or the probability of an adverse reaction is 10 *times as large* for those individuals taking the drug than those individuals taking the placebo.

An adverse reaction is **nine** *times more likely* for individuals taking the drug than those individuals taking the placebo, or the probability of an adverse reaction is nine *times larger* for individuals taking the drug than those individuals taking the placebo.

Interpretation

- "One times as likely" is equivalent to $\pi_1/\pi_2 = 1$. In other words, they are equal. "Two times as likely" is equivalent to $\pi_1/\pi_2 = 2$. In other words, π_1 is twice the size of π_2; $\pi_1 = 2 \times \pi_2$.

- "Two times more likely" is equivalent to $\pi_1/\pi_2 = 3$. The "more" is what causes the difference from the previous interpretation.

- As another example, $\pi_1/\pi_2 = 1.5$ means that a success is 50% more likely for Group 1 than for Group 2. Alternatively, a success is 1.5 times as likely for Group 1 than for Group 2.