STAT 110: Practice Problem 14

Fall 2017

Between 1967 and 1977, there was a moratorium on the death penalty in the U.S. One of the main reasons for this was the belief that there was a pattern of racial discrimination in death penalty sentencing. That is, some felt that black defendants were more likely to receive the penalty and that the law should therefore be considered null and void. When the racial bias argument was tested in court, defendants of the death penalty produced the following contingency table.

	Death Penalty?		
Defendant's Race	Yes	No	Totals
Black	17	149	166
White	19	141	160

Questions:

1. Find the risk of receiving the death penalty for black defendants.

2. Find the risk of receiving the death penalty for white defendants.

3. Find the relative risk of receiving the death penalty for black defendants compared to white defendants.

4. Interpret the relative risk from the previous question.

5. Find the odds of receiving the death penalty for white defendants.

6. Find the odds of receiving the death penalty for black defendants.

7. Find the odds ratio.

8. Interpret the odds ratio from the previous question.

9. At this point, who does it appear is more likely to receive the death penalty: white or black defendants? Explain.

After seeing these results, the death penalty supporters argued against the moratorium, claiming that there was no racial discrimination against black defendants in the use of the death penalty. However, we need to keep in mind the fact that this is an *OBSERVATIONAL STUDY*, and there may be some *CONFOUNDING VARIABLES* that have not yet been considered. For example, let's next consider the race of the victim in each crime. Two contingency tables are shown below: one for white victims and one for black victims.

For White Victims:

Defendant's Race	Death Penalty?		Totals
	Yes	No	
Black	11	52	63
White	19	132	151

For Black Victims:

Defendant's Race	Death Penalty?		Totals
	Yes	No	
Black	6	97	103
White	0	9	9

Questions:

10. Consider the contingency table for the white victims. Find the relative risk of receiving the death penalty <u>when the victim was white</u> (use the risk of receiving the death penalty for black defendants in the numerator).

11. Find the odds ratio for receiving the death penalty <u>when the victim was white</u>.

12. Also look at the data to determine who was more likely to receive the death penalty <u>when the victim was black</u>. At this point, who does it appear is more likely to receive the death penalty: white or black defendants? Explain.

13. Find 95% confidence intervals for both the relative risk ratio and the odds ratio <u>when the victim was white</u>. Do these ratios provide evidence for a statistically significant difference between white and black defendants? Explain.

This example illustrates a concept known as **<u>Simpson's Paradox</u>**:

> "An association or comparison that holds for all of several groups can reverse direction when the data are combined to form a single group" (*David Moore, The Basic Practice of Statistics, Fourth Edition*). That is, the effects of condounding variables can change (or even reverse) relationships between two categorical variables.

> When the victim's race is ignored, it appears that white defendants are more likely to receive the death penalty. However, after accounting for the victim's race (a lurking variable), the data shows that black defendants are more likely to receive the death penalty. The paradox occurred because juries applied the death penalty more frequently when the victim was white, and defendants in such cases were mostly white. This case is one extreme example of the fact that observed associations can be misleading in the presence of confounding variables!