

You may work with one partner on this assignment, submitting one report with both names, provided that both students contribute substantially to the work. Word-processed reports are preferred to hand-written ones. Please copy/paste relevant computer output into your report as appropriate.

Simpler CPR?

For many years, if a person experienced a heart attack and a bystander called 911, the dispatcher instructed the bystander in how to administer chest compression plus mouth-to-mouth ventilation (a combination known as standard CPR) until the emergency response team arrived. Some researchers believe that giving instruction in chest compression alone (CC) would be a more effective approach, in part because bystanders are often reluctant to administer mouth-to-mouth ventilation or do so incorrectly.

In the 1990's a study was conducted in Seattle involving 518 cases. In 278 of these cases (determined at random) the dispatcher gave instructions in standard CPR, and in 240 cases the dispatcher gave instructions in to CC alone. A total of 64 patients survived to discharge from the hospital: 29 in the group receiving standard CPR, and 35 in the group receiving CC alone.

a) Identify the explanatory variable and the response variable in this study.

This is an experiment because the researchers randomly assigned the treatment condition (CC alone vs. standard CPR) to subjects.

b) Identify the explanatory variable and the response variable in this study.

The explanatory variable is the technique that the dispatcher told the person to administer. The response variable is whether or not the person survived to be discharged from the hospital.

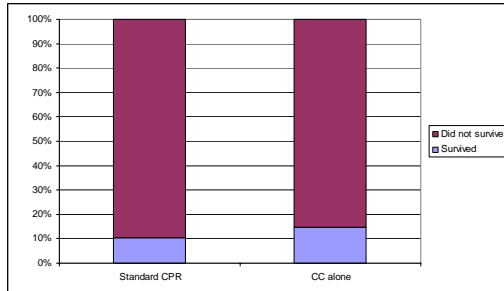
c) Organize the data in a two-way table, with the explanatory variable in columns.

The two-way table is:

	Standard CPR	CC alone	Total
Survived	29	35	64
Did not survive	249	205	454
Total	278	240	518

d) Produce a segmented bar graph, and comment on what it reveals.

The segmented bar graph is:



The survival rate is slightly higher for the CC group (.146 vs. .104).

e) Calculate the relative risk of survival between the CC group and the CPR group, and write a sentence interpreting its value.

The relative risk of survival, comparing CC to CPR, is $.146 / .104 = 1.40$.

This provides preliminary evidence that the CC group is more likely to survive to discharge, because the sample results show that the CC subjects were 1.40 times more likely to survive to discharge than the CPR group.

f) Explain why the relative risk is a better measure for comparing these groups than the difference in proportion of survivors.

The difference in proportions of survivors appears to be quite small ($.146 - .104 = .042$). Because the survival rates themselves are quite small, the relative risk provides a more meaningful comparison of the groups.

g) Calculate the odds ratio, and write a sentence interpreting its value.

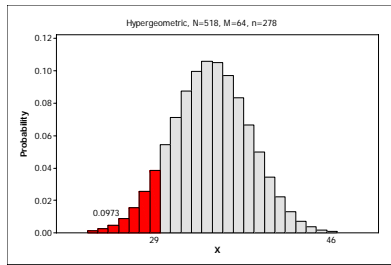
The odds ratio is: $(35 \times 249) / (205 \times 29) = 1.46$.

The odds of survival to discharge were 1.46 times larger for the CC only group than for the CPR group. This value is quite similar to the relative risk in this case.

h) Determine the p-value for applying Fisher's exact test to the researchers' conjecture. Also submit a relevant Minitab graph to accompany this calculation.

The p-value is the probability of getting 29 or fewer successes in the standard CPR group, if the 64 successes had been randomly distributed between the two groups. In other words, the p-value is $\Pr(X \leq 29)$, where X has a hypergeometric distribution with $N = 518$, $M = 64$, $n = 278$.

Minitab reveals this p-value to be .0973, as seen in the graph:



i) Summarize your conclusion from this study. Be sure to address the issue of causation as well as significance.

The p-value is somewhat small but not very small. At the $\alpha = .05$ level, we do not have enough evidence to conclude that CC alone produces a higher survival rate than standard CPR. There is some evidence that CC alone is better (the difference between the groups is significant at the .10 level), but not strong evidence. If there had been strong evidence, we would have been able to draw a cause-and-effect conclusion between the use of CC alone and the higher survival rate, because this was a randomized experiment.