

Risk and Relative Risk Exercises #1

These exercises are originally from the University of Auckland Statistics Department (provided at the AMA Saturday workshop, 18 August 2012).



In 1988 the results of the Doctors' Health Study Research Group study were reported in the New England Journal of Medicine. In this study 22,071 male doctors (aged from 40 to 84) were randomly assigned to two groups. One group took an aspirin every second day and the other group took a placebo (a pill with no active ingredient which looked just like an aspirin). The participants did not know whether they were taking aspirin or the placebo.

After five years the number of participants in each group who had had a heart attack was recorded. The results are shown in the table below.

Treatment	Heart attack	No heart attack	Total
Aspirin	104	10 933	11 037
Placebo	189	10 845	11 034
Total	293	21 778	22 071

- (a) For those in the aspirin group:
- What proportion had a heart attack?
 - What was the probability that a randomly selected participant had a heart attack?
 - What percentage had a heart attack?
 - What was the risk of having a heart attack?
 - Write this risk as a rate per 1000 participants.
- (b) For those in the placebo group:
- What was the risk of having a heart attack?
 - Write this risk as a rate per 1000 participants.
- (c)
- Calculate the relative risk of having a heart attack, using the placebo group as the baseline risk.
 - Interpret this relative risk for male doctors.
 - Calculate the relative risk of having a heart attack, using the risk for the aspirin group as the baseline.
 - Interpret this relative risk.
 - Which group is more appropriate as the baseline group? Briefly explain.
- (d)
- Do male doctors who take aspirin every second day have an increased or decreased risk of having a heart attack compared to those who take a placebo?
 - Calculate the percentage change in risk relative to the baseline (placebo group) risk.
 - Interpret this percentage change in risk for male doctors.



Answers to Risk and Relative Risk Exercises #1

In 1988 the results of the Doctors' Health Study Research Group study were reported in the New England Journal of Medicine. In this study 22,071 male doctors (aged from 40 to 84) were randomly assigned to two groups. One group took an aspirin every second day and the other group took a placebo (a pill with no active ingredient which looked just like an aspirin). The participants did not know whether they were taking aspirin or the placebo.

After five years the number of participants in each group who had had a heart attack was recorded. The results are shown in the table below.

Treatment	Heart attack	No heart attack	Total
Aspirin	104	10 933	11 037
Placebo	189	10 845	11 034
Total	293	21 778	22 071

(a) For those in the aspirin group:

- What proportion had a heart attack? $104/11037 = 0.00942$
- What was the probability that a randomly selected participant had a heart attack? 0.00942
- What percentage had a heart attack? 0.942%
- What was the risk of having a heart attack? 0.00942
- Write this risk as a rate per 1000 participants. 9.42 per 1000

(b) For those in the placebo group:

- What was the risk of having a heart attack? $189/11034 = 0.01713$
- Write this risk as a rate per 1000 participants. 17.13 per 1000

(c) (i) Calculate the relative risk of having a heart attack using the placebo group as the baseline risk. $0.00942/0.01713 = 0.5501$

(ii) Interpret this relative risk for male doctors? **the risk of having a heart attack for those taking aspirin every second day is 55% of the risk for those taking a placebo.**

(iii) Calculate the relative risk of having a heart attack using the risk for the aspirin group as the baseline. $0.01713/0.00942 = 1.818$

(iv) Interpret this relative risk. **the risk of having a heart attack for those taking a placebo is about 1.8 times the risk for those taking aspirin every second day.**

(v) Which group is more appropriate as the baseline group? **Placebo**
Briefly explain. **It makes more sense to compare the risk for a treatment group to that for a non-treatment (control) group as the baseline (since that means the comparison is to the "normal" rate).**

(d) (i) Do male doctors who take aspirin every second day have an increased or decreased risk of having a heart attack compared to those who take a placebo? **Decreased**

(ii) Calculate the percentage change in risk relative to the baseline (placebo group) risk. $(0.00942 - 0.01713) \div 0.01713 = -0.45 = -45\%$

(iii) Interpret this percentage change in risk for male doctors. **There is a 45% decrease in the chances of having a heart attack for those taking aspirin every second day (compared to those taking a placebo).**