

# Relative Risk

Obj. 9.8: Quantify the relationship between two variables using relative risk.



## Influenza & the Flu Shot

Today you will learn about the 2x2 contingency table, a tool used by epidemiologists to organize data in order to quantify relationships between variables. Use the table below to answer the questions that follow.

	Flu	No Flu
Did not get annual flu vaccine	1,934	18,567
Got annual flu vaccine	433	27,456

1. Describe the data shown in the table.
2. What can you learn from this information?
3. How might you determine the relationship between the two variables in this data?



## Relative Risk

What is a 2x2 contingency table?

A 2x2 contingency table is used in statistics to organize and display the frequency of variables. A 2x2 table setup is shown below:

### 2x2 Contingency Table

	Outcome	No Outcome	Total
Risk Factor	a	b	a + b
No Risk Factor	c	d	c + d
Total	a + c	b + d	a + b + c + d

So how can we use a 2x2 table to quantify the relationship between variables?

One calculation that allows us to put a numerical value on this relationship is called the relative risk.

**Relative Risk (RR):** A ratio of the probability of the event (outcome variable) occurring in the exposed (risk factor) group to the probability of the outcome occurring in a non-exposed (no risk factor) group.

$$RR = \frac{\text{incidence rate in exposed group}}{\text{incidence rate in unexposed group}}$$

$$RR = \frac{\left( \frac{a}{a+b} \right)}{\left( \frac{c}{c+d} \right)}$$

### Steps to calculating RR:

Step 1: Focus on the risk factor row (1<sup>st</sup> row) [i.e., *not* vaccinated]

Step 2: Calculate the **incidence** rate of the **outcome** [i.e., flu] for those who have the **risk factor**

Incidence for RISK FACTOR group:  $a/(a+b) = X$

Step 3: Focus on the NO risk factor row (2<sup>nd</sup> row) [i.e., vaccinated]

Step 4: Calculate the **incidence** rate of the **outcome** for those who are **do not have the risk factor**

Incidence Calculation for NO RISK FACTOR group:  $c/(c+d) = Y$

Step 5: Use the two calculations to find **Relative Risk (RR)**

Relative Risk Calculation:  $X/Y = [a/(a+b)] / [c/(c+d)]$

### What does my RR value mean?

#### RR = 1?

There is no association.

*The incidence in the risk factor group and no risk factor group were the same.*

#### RR > 1

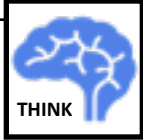
There is an association. (i.e., RR = 1.5 might indicate a strong association)

*The risk factor group is **1.5 times more likely** to experience the outcome than the non-risk factor group. **(50% more likely)***

#### RR < 1

There is an **inverse** association (i.e., RR = .8 indicates an inverse relationship--the non-risk factor group was actually more likely to have the outcome. In other words, a relationship opposite of the hypothesized one is occurring.)

*The risk factor group is only **0.8 times as likely** to experience the outcome than the non-risk factor group. **(20% less likely)***



## Relative Risk Practice

### Practice Problem #1:

A university is piloting a mandatory health education course for incoming freshmen. In the first year, half of the students take the course and the university decides to compare their health outcomes with those of the students who did not take the course. A small sample agrees to take a follow up survey four years later. One outcome studied is the rate of obesity in the two groups. Use the data below to calculate relative risk for obesity based on taking a health education course.

	Obese	Not Obese
Did not take health education course	35	122
Took health education course	21	137

1. Calculate the incidence of obesity for the risk factor group (those who did not take a health education course):
  
  
  
  
  
  
  
  
  
  
2. Calculate the incidence of obesity for the non-risk factor group (those who took the health education course):
  
  
  
  
  
  
  
  
  
  
3. Calculate the relative risk:
  
  
  
  
  
  
  
  
  
  
4. Write the relative risk in the form of a statement:

DISCUSS

**Limitations**

With a partner, discuss and list below the possible limitations or common errors that may come with the relative risk calculation.



**Calculate RR**

Calculate relative risk for the following example:

	Sleep Deprived	Not Sleep Deprived
Use social media	38	44
Do not use social media	12	18

Relative Risk:



**Be the Teacher!**

Explain the meaning of Relative Risk as if you were speaking to a 6th grader. Be sure to write our your explanation and include answers to the questions: How do you calculate it? What does it mean? Why is it useful?