

Chapter 7 Exercises

1. For each of the four types of causes listed below, identify an association in which the exposure meets the description. Explain your choice.

Example: Birth and death

Necessary and sufficient. Everyone who is born will die. Everyone who dies was born.

- a. Necessary and sufficient
- b. Necessary but insufficient
- c. Unnecessary but sufficient
- d. Unnecessary and insufficient

2. You are called in to investigate an outbreak of diarrhea after a dinner party. At the dinner party there were two dishes served, rare beef and three-bean salad. There were 25 people at the party. Thirteen people ate the rare beef (12 did not), and 10 of them are complaining of diarrhea. Of those that did not eat the rare beef, two people report diarrhea. Further, twenty people ate the three-bean salad (5 did not), and 7 of them are complaining of diarrhea. Of those that did not eat the three-bean salad, 5 report diarrhea.

- a. Based on the information above, construct a 2 x 2 table for the exposure of rare beef and the outcome of diarrhea.

	Diarrhea	No Diarrhea	Total
Rare roast beef			
No rare roast beef			
Total			

- b. Calculate and interpret the appropriate measure of association for assessing the relationship between eating rare roast beef and getting diarrhea with its 95% confidence interval.

c. Now construct a 2 x 2 table for the exposure of three-bean salad and the outcome of diarrhea.

	Diarrhea	No Diarrhea	Total
Three-bean salad			
No three-bean salad			
Total			

d. Calculate and interpret the appropriate measure of association for assessing the relationship between eating three-bean salad and getting diarrhea with its 95% confidence interval.

e. What is your preliminary conclusion about the cause of diarrhea at the picnic?

f. Is the cause you selected necessary? Sufficient? Both? Neither? Please justify your answer based on the evidence given.

3. Skin cancer is multifactorial and can result from numerous different combinations of causes. Let us restrict ourselves to the following three:

- Fair skin + Family history + Living at high altitude + Inadequate sunscreen use
- Moles + Tanning salon use + History of sunburns + Inadequate sunscreen use
- Family history + Precancerous lesions + History of sunburns + Inadequate sunscreen use

For the purpose of this exercise, we will assume these are the only possible ways to get skin cancer.

In a population of 100 people, researchers found the following distribution of risk factors for skin cancer:

# people with combination	Fair skin	Family History	High Altitude	Inadequate Sunscreen	Moles	Tanning Salon	History of Sunburns	Precancerous Lesions	Probability of disease
12	√	√	√	√					100%
15	√			√				√	0%
6		√			√		√		0%
14				√	√	√	√		100%
9	√	√	√		√	√		√	0%
18			√	√		√			0%
10		√		√			√	√	100%
16				√		√		√	0%

Thirty percent of the population had a history of sunburns and seventy percent had no history of sunburns.

- a. Is any of the causes listed above necessary and/or sufficient to cause skin cancer on a population level?
- b. Calculate the probability of skin cancer among those with a history of sunburns.
- c. Calculate the probability of skin cancer among those without a history of sunburns.
- d. Now construct a 2 x 2 table for the exposure of history of sunburns and the outcome of skin cancer.

	Skin cancer	No skin cancer	Total
Sunburns			
No sunburns			
Total			

- e. Calculate and interpret the risk ratio and its 95% confidence interval.