Homework 2: Sections 1.3, 2.1 - 2.4

STA209-04: Applied Statistics

February 1, 2019

From the Book:

Due Date: Friday, February 8
Questions: 1.85, 1.89

1.85 Three situations are described at the start of this section, on page 29. In the third bullet, we describe an association between the amount of salt spread on the roads and the number of accidents. Describe a possible confounding variable and explain how it fits the definition of a confounding variable.

Scenario: The local highway superintendent is looking at data on the amount of salt spread on the local roads and the number of auto accidents. (In northern climates, salt is spread on roads to help melt snow and ice and improve traction.) The data clearly show that weeks when lots of salt is used also tend to have more accidents. He wonders, "Should we cut down on the amount of salt we spread on the roads so that we have fewer accidents?"

1.89 "Antibiotics in infancy may cause obesity in adults," claims a recent headline. A study in mice randomly assigned infant mice to either be given antibiotics or not, and the mice given antibiotics were more likely to be obese as adults. A separate study in humans found that children who had been given antibiotics before they were a year old (for example, for an ear infection) were more likely to be obese as adults. (Researchers believe the effects may be due to changes in the gut microbiome.) Based on these studies, is the headline an appropriate conclusion to make:

(a) For mice?

(b) For humans?

Miscellaneous:

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S1 Consider the following two tables of applicant data for a university's graduate programs in 1973:

	Admitted	Denied
Male	1198	1493
Female	557	1278

	High Selectivity		Moderate Selectivity	
	Admitted	Denied	Admitted	Denied
Male	333	973	865	520
Female	451	1251	106	27

    (a) Compute the admission rates for males and females using the first table. Is there evidence of a gender bias?

    (b) Compute the admission rates for males and females for each level of selectivity using the second table. Have your conclusions changed? Explain.

    (c) Is this an example of Simpson's paradox? If so, state the confounding variable and explain the paradox.

S2 Read this article and write a response pointing out at least three things you found interesting. In addition to your response, find an example of a misleading graph and explain how it is misleading. (If you are having trouble finding an example, there is a subreddit chock-full of them.)