Homework for Chapter 7: Drawing Causal Diagrams

1. You are making a simplified causal diagram to represent the data generating process of viewership for a TV show. Which of the following is true?
   1. The diagram should include a variable for “number of celebrities in the cast”
   2. The diagram should contain one variable for “show airs in the evening” and another for “show doesn’t air in the evening”
   3. The diagram should not contain a variable for “show budget” because budgets are often secret and the researcher can’t measure them
   4. The diagram should contain the variable “review score in the Jefferson Weekly,” which is the newspaper published by the students at Jefferson High School, with a readership of about 120 people.
2. Draw a causal diagram for the research question “do long shift hours make doctors give lower-quality care?” that incorporates the following features (and only the following features):
   1. Long shift hours affect both how tired doctors are, and how much experience they have, both of which affect the quality of care
   2. How long shifts are is often decided by the hospital the doctor works at. There are plenty of other things about a given hospital that also affect the quality of care, like its funding level, how crowded it is, and so on
   3. New policies that reduce shift times may be implemented at the same time (with the timing determined by some unobservable change in policy preferences) as other policies that also attempt to improve the quality of care
3. Consider this research question: Does the funding level of public schools affect student achievement for students in your country?
   1. What is the treatment and what is the outcome of interest?
   2. Write down a list of relevant variables.
   3. Which of the variables in your list in part b are causes of both treatment and outcome?
   4. Why might we want to pay extra attention to the variables listed in part c?
   5. Draw a causal diagram of the variables listed in part b.
   6. Simplify the diagram from part e.
4. Describe the kinds of situations that each of the following could be applied to in order to simplify a causal diagram.
   1. Unimportance
   2. Redundancy
   3. Mediators
   4. Irrelevance
5. How can a causal diagram be modified so as to avoid cyclic relationships?
6. Think of a research question in your field of interest.
   1. What is the cause variable and what is the outcome variable?
   2. Write down a list of between 5 and 10 relevant variables in the data generating process.
   3. Draw a causal diagram incorporating all the variables from part b.
   4. Stop working on this problem for fifteen minutes and do something else. Then come back, look at your causal diagram from part c again, and describe one bad assumption you think it made, or something it left out.
7. Consider the diagram below. It depicts a cyclical relationship between student achievement and motivation. If students achieve more (i.e., score well on exams), then their motivation goes up, and if their motivation goes up, they achieve more. Change the diagram so that the relationship is not cyclic anymore.  
   