



# ST551: HOMEWORK 1

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## Question 1

Suppose an observational study showed that people who carry lighters have a higher rate of lung cancer. There are four possibilities:

1. The association is spurious: this was just a particularly unusual dataset.
2. The observed association is causative: carrying lighters causes lung cancer.
3. The causality in the observed association is reversed: lung cancer causes carrying lighters.
4. There is a confounder: something else about people who carry lighters is the true cause of lung cancer. Perhaps people who carry lighters are more likely to be smokers, and so smoking is a confounding variable: it is associated with both the predictor (carrying lighters) and the outcome (lung cancer).

In each of the following settings, suggest a plausible alternative to the causal relationship suggested by the study: either propose a possible confounding factor, or describe why the causality might be reversed.



## Part A

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Observational studies show that smokers have a higher rate of liver cancer. Suggested causal relationship: Smoking causes liver cancer.



## Part B

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A study found that teenagers who smoke are more likely to be depressed as young adults. Suggested causal relationship: Smoking causes depression.



## Part C

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A study found that people who consume lots of artificial sweeteners in diet soda are more likely to be overweight than people who do not drink diet soda. Suggested causal relationship: Artificial sweeteners cause obesity.



## Part D

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Observational studies show that women on the pill have a higher incidence of cervical cancer. Suggested causal relationship: The pill causes cervical cancer.



## Part E

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A study showed that infants living in homes that have two or more dogs or cats are less likely than other babies to develop allergies. Suggested causal relationship: Living with pets as an infant reduces allergy incidence.



## Part F

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A study of 100,000 people (published in the Feb. 2003 issue of the journal Sleep) reported that people who reported sleeping eight or more hours per night had a