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Identifying Patterns

Problem Set #1 p. 24-27 1, 4-12

1. A) I say that the investigator’s conclusion is wrong. Just because Michigan had more crimes then Minnesota in 2001 doesn’t necessarily mean Minnesotans are more law abiding. He is not taking into account the populations of each state in 2001. Michigan had a population of 10,006,266 people while Minnesota had a population of 4,972,294 people in 2001. So, if you take the populations into account, Minnesota, having the significantly smaller population, has a higher crime rate. Thus, the investigator’s conclusion is wrong.

B) I agree with the investigator that concludes the U.S. became more law-abiding between 1991 and 2001. Not only did the number of crimes decrease from 28,000 in 1991 to 22,000 in 2001, but the population actually increased from 252,127,402 people to 278,058,881 people over that time period. So, the number of crimes decreased even with a population increase which strengthens the conclusion of the investigator that the U.S. became more law abiding over that time period.

(Npg.org and US census bureau)

1. A) They studied men and women and the different age groups separately to eliminate confounders such as age and gender. That way you can see the true effects smoking has because you are comparing similar groups of people.

B) The results of this study could be slightly skewed. Many of the people who recently stopped smoking may have stopped due to other health related issues, so you probably should not conclude that once you’ve started smoking, don’t stop. There is a strong possibility that recent quitters were less healthy due to other factors then just smoking.

1. No, zinc sulfate should not be given to treat the disease. The double-blind experiment is much more credible then the other experiment where the doctors knew who was receiving the zinc sulfate and who was receiving the placebo. In the double-blind experiment, zinc sulfate had no effect, so it should not be given to treat the disease.
2. The subjects showing some improvement during the second half of the experiment because of two possible reasons. Since they knew of the design of the study, 3 out of the 4 groups were receiving zinc at some point in the study. So , reason one is that the zinc sulfate might have worked and actually improved the subjects. Or, reason two is that there could be a placebo effect, especially with the group receiving the placebo the entire experiment. It did say that all four groups showed some improvement, so the placebo effect could be the result of the improvement for that one group.
3. A) This is an observational study because one cannot control who contracts cervical cancer and who doesn’t.

B) Since cervical cancer is contracted through sexual contact, investigators decided to adjust for some factors. They adjusted for age because younger people are generally more sexually active and thus more likely to get cervical cancer. They adjusted for education because people who know about the oral contraceptives and are sexually active might want to use them more then someone who is unaware of them. They adjusted for marital status because many married couples are very sexually active and that could skew the results.

C) Women using the pill were likely to differ from non-users on another factor which affects the risk of cervical cancer greatly, which is sexual activity. The more sexually active a person is, the greater the chance of receiving cervical cancer. Thus, sexual activity is a confounding factor in this study.

D) The conclusions of the study were not justified by the data. Although certain confounders were adjusted for, there is not enough evidence to have a firm conclusion. You cannot conclude that the pill causes cervical cancer, because people who are on the pill are more likely to be more sexually active then non-users, thus at a higher risk of contracting cervical cancer. Although the pill may help in becoming more susceptible to cervical cancer, you cannot conclude that from this observational study.

1. Memorial Day is always at the end of May and Labor Day is always at the beginning of September. So, 3 months fall in between these holidays, which is equivalent to about a quarter of the year. If just over 25% of burglaries occur between these dates, then the statistics do not prove that burglars go to work when other people go on vacation. There are 3-quarters of the year left and close to 3-quarters of the burglaries still to occur not between Memorial Day and Labor Day. So having just over 25% of the burglaries occur during 25% of the year helps to conclude that the statistics in this study do not prove that burglars go to work when other people go on vacation.
2. A) False. The observational studies showed that lots of vitamins help lower the death rates for colon cancer and lung cancer. The randomized controlled experiments showed no difference in the death rate from colon cancer between the treatment and control groups, and there was an increase in the death rate from lung cancer. The experiments do not confirm the results of the observational studies.

B) True. There was confounding in the observational studies. It is very possible that people who get lots of vitamins in their diets lead much healthier lifestyles in general, which causes lower death rates in colon and lung cancer.

C) False. The randomized controlled experiments controlled for confounding, so that the subjects were random. Some subjects led healthier lifestyles then others, but because of the randomization the lifestyles of people will be so spread out that the experiment controls for confounding. The randomized controlled experiments are much more credible then the observational studies in this example.

1. A) This was an observational study.

B) The study found an association between mother’s behavior and her child’s level of body fat. It found that children with higher body fat tended to have more controlling mothers.

C) If the controlling behavior by the mother causes children to eat more, that would explain an association between controlling behavior by the mother and her child’s level of body fat. However, association does not prove causation so it doesn’t necessarily mean that the controlling mother causes higher body fat for her child.

D) A gene that causes obesity would not explain the association because there could be obese kids without controlling mothers. Having a controlling mother doesn’t necessarily mean you will be obese and if you are obese it doesn’t mean you have a controlling mother.

E) A controlling mother could control what her child eats. She may serve her child very fatty foods which lead to higher body fats. Also a mother could control a kids exercise. She might limit her child from playing sports and thus the child is less physically active which may lead to higher body fat.

F) The data does not support the *Chronicle’s* advice on child-rearing. Just because there is an association between controlling mothers and children with more body fat doesn’t mean that the high body fat is necessarily caused by the controlling mothers. This observational study establishes association; however association does not prove causation.

1. A) The treatment group is the volunteers for the rehabilitation program and the control group is the prisoners who are not participating in the program.

B) The prison spokesman’s comparison is based on an observational study because one cannot control who will volunteer for the program and who will not.

C) False. The data does not show that the boot camp worked. Many of the people in the treatment group could be much more devoted to bettering themselves than the control group even without the boot camp. Although the boot camp may help them to rehabilitate better, it doesn’t prove that the boot camp works because of other factors such as one’s determination to lead a better life.

1. False, just because in each ward the percentage of registered Democrats who vote is higher than the percentage of registered Republicans who vote, it does not mean that for the city as a whole, the percentage of registered Democrats who vote must be higher than the percentage of registered Republicans who vote. In certain wards the percentages of Democrats could be much larger than the percentages of Republicans, but there could be many less Republicans in those wards. Also some wards the percentages might be very close, and those wards could be more densely populated with Republicans. This is just like the Derek Jeter and David Justice example from class. In 1995, 1996, and 1997 Jeter batted, .250, .304, and .291. Justice batted .253, .321, and .329. So, Justice had a higher batting average each year. However, over the full 3 year period if you add up all the hits divided by the number of at bats, Jeter has a .300 batting average while Justice has a .298 batting average. This is an example of “Simpson’s Paradox,” just like in our problem with Democrats and Republicans. In the densely Republican populated wards the percentage must be high, although slightly lower than the Democrats. In the densely Democratic populated wards the percentage must be a little lower, although slightly higher than Republicans. If added as a whole city, the percentage of registered Republicans who vote could turn out to be greater than the percentage of registered Democrats who vote because of “Simpson’s Paradox.”