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Statistics for laboratory scientists

Solutions for the homework problems for lecture 4

1. The proportion of adherers in the treatment group ($558/1045=53\%$) is strikingly different than in the placebo group ($1813/2695=67\%$). Something probably went wrong with the blind; perhaps the treatment has unpleasant side effects.
2. (ii) is correct. A confounder must be associated with *both* variables.
3. No. One must consider the confounding factor of sexual activity.
4. Doctors might recommend to women who had previously aborted a pregnancy to exercise less.
5. False. Simpson's paradox says that relationships between variables within subgroups may be the opposite of what is observed overall. Here, the overall admission rates were 45% for men and 33% for women.
6.
 - a. Age and sex are confounders: older men, younger men, older women, and younger women differ in both their rates of smoking and of lung cancer.
 - b. No. Likely people stopped smoking *because* they were sick, rather than the reverse.
7.
 - a. Observational study.
 - b. These are all confounding variables...they are associated with both contraceptive use and rate of cervical cancer.
 - c. Sexual activity
 - d. No. The investigators didn't consider the confounding factor *sexual activity*, which could easily explain the associate between contraceptive use and cervical cancer.

- 8.
- a. Observational study.
 - b. Yes.
 - c. Yes.
 - d. No, unless it were associated with the controlling behavior of the mothers.
 - e. Obesity in the children may cause controlling behavior in the parents.
 - f. No. Correlation is not causation.
- 9.
- a. The treatment group consisted of prisoners who volunteered for the boot camp; the control group consisted of others that were released.
 - b. An observational study---the subjects themselves (rather than the investigators) chose whether they would receive treatment.
 - c. False. Those that volunteered probably differed from those that differed in other important ways (such as in their eagerness to avoid returning to prison).
10. False. Suppose that ward A has 1000 Democrats (of whom 30% vote) and 100 Republicans (of whom 20% vote), while ward B has 100 Democrats (of whom 60% vote) and 1000 Republican (of whom 50% vote). In this example, in each ward, the proportion of Democrats that vote is greater than the proportion of Republicans that vote, but overall the rates are 33% for Democrats and 47% for Republicans.