

1. A study done at Kaiser Permanente in Walnut Creek, CA showed that users of oral contraceptives have a higher rate of cervical cancer than nonusers, even after adjusting for age, education and marital status. Researchers concluded that oral contraceptives causes cervical cancer.

- (a) (2 pts) Is this a controlled experiment or an observational study? Explain briefly.

This is an observational study because the subjects (the women) placed themselves in the treatment or control groups based on their own choice to take oral contraceptives or not.

- (b) (2 pts) Why did the investigators ‘adjust for age, education and marital status’?

They did this to account for the possible effect of confounding variables (like age, etc.) on the occurrence of cervical cancer.

- (c) (2 pts) Were the researchers right, or did they miss a confounding variable? Explain.

The researchers missed the crucial confounding variable of sexual activity. Women taking oral contraceptives were more sexually active than women who didn't. This is important because cervical cancer is (now) known to be caused by the human pappiloma virus (HPV), which is a sexually transmitted disease. Women who more sexually active were more likely to be exposed to HPV and therefore more likely to develop cervical cancer.

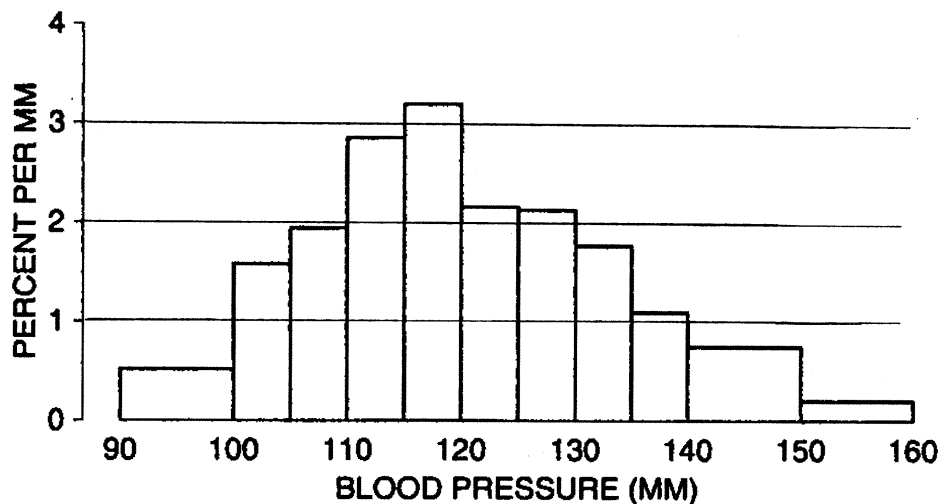
2. (6 pts) An advertisement for home security company says:

When you go on vacation, burglars go to work... According to FBI statistics, over 25% of home burglaries occur between Memorial day (last Monday of May) and Labor day (first Monday of September).

Do the FBI data support the claim that burglars go to work when people go on vacation? Answer yes or no and explain briefly.

*The FBI data does not support the home security company's claim. The period from Memorial day to Labor day is just a little more than 25% of the year, and the FBI statistics tell us that a little more than 25% of the burglaries occur in this period. This is consistent with burglaries occurring at a more or less constant rate throughout the year — **not** with disproportionately more burglaries occurring during the summer months.*

3. The histogram below shows the distribution of blood pressure for 14,148 women participating in a certain drug study. Use the histogram to answer the following questions. **Explain your answers and show your work.**



- (a) (3 pts) Is the percentage of women with blood pressure below 110 mm closer to 23%, 36% or 49%?

The percentage of women with blood pressure below 110mm is equal to the area of the histogram below 110. This area is approximately equal to...

$$(0.5) \times 10 + (1.6) \times 5 + 2 \times 5 = 23\%.$$

- (b) (3 pts) Is the percentage of women with blood pressure between 105mm and 120mm closer to 32%, 41% or 50%.

The percentage of women with blood pressure between 105 mm and 120 mm is equal to the area of the histogram between 105 and 120. This area is approximately equal to...

$$2 \times 5 + 2.9 \times 5 + 3.1 \times 5 = 40\%,$$

which is closer to 41%.

- (c) (2 pts) Is the **average** blood pressure for women in this study be greater or smaller than the **median** blood pressure? Justify your answer briefly.

Answer: *The mean of this data will be (a little) **greater** than the median because the data are skewed (a bit) to the **right**.*