

Homework 2

Math 243

Due June 29th at 11:59 PM

Textbook Exercises

Chapter 3: 28, 29, 30, 32, 35, 36, 37

Chapter 8: 26, 27, 29, 31, 33

Exercise 1: Test scores, height, and weight are often given in **percentiles**: the percent of the population with a lower score. The upper arm lengths of women in the US are approximately $N(35.8, 2.1)$, and those of men are approximately $N(39.1, 2.3)$, where the units are in centimeters.

- a) Cecile is a 73-year-old woman in the US with an upper arm length of 33.9. What percentile is she in?

The z-score is $z = \frac{33.9 - 35.8}{2.1} = -.905$, which the table gives as corresponding to 18.14%, so Cecile is in the 18th percentile.

- b) Measure your own upper arm length and find the percentile you're in. The length is measured from the bony part of the shoulder down the outside edge of the arm to the bony part of the elbow.

Obviously results will vary, but measuring my own arm gave me about 37 centimeters, so my z-score is $z = \frac{37 - 39.1}{2.3} = -.913$. By the table, I'm also in the 18th percentile.

Exercise 2: A common form of nonresponse in telephone surveys is “ring-no-answer.” That is, a call is made to an active number but no one answers. The Italian National Statistical Institute looked at nonresponse to a government survey of households in Italy during the periods January 1 to Easter and July 1 to August 31. All calls were made between 7 and 10 p.m., but 21.4% gave ring-no-answer in one period versus 41.5% ring-no-answer in the other period. Which period do you think had the higher rate of no answers? Why? Explain why a high rate of nonresponse makes sample results less reliable.

It’s reasonable to expect that the second period had the higher rate of ring-no-answer: one possible explanation is that households were called in both periods, and people screened their calls more the second time around. Another (probably more likely) explanation is that people were simply outside more at night in summer than in winter, and didn’t receive the calls in the first place. It’s important to stress that these are only possible explanations, and without data on the people who didn’t pick up, we do not know why.

The higher the rate of nonresponse, the larger the proportion of the population that is not included in the data, and the higher the likelihood that that proportion contains entire groups that will then be completely unrepresented. It’s similar to calling people in the first place — you’re already biasing the data toward people who have phones, and with a high rate of ring-no-answer, you’re biasing toward people who are willing to pick up.