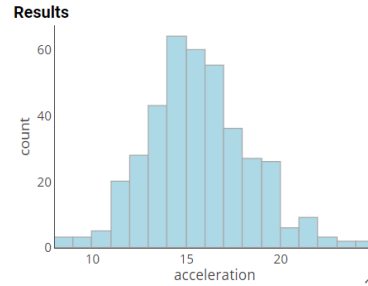**Stat 414 – Day 0**
Introduction to Multilevel Data

Example 1: To the right is a histogram of acceleration times (how long it takes to go from 0 to 60 mph) for a sample of cars.

Results

(a) What are the "cases" or "observational units" in this dataset?

cars

(b) What is the "variable" in this dataset? Is it quantitative or categorical? *acceleration (Quantitative)*   *time in seconds*
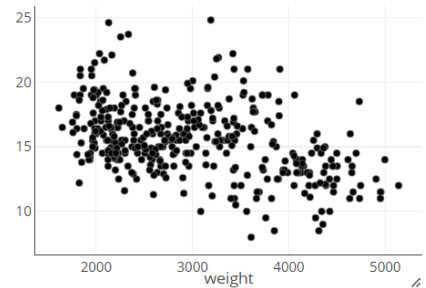
(c) Why are these values not all the same?

horsepower, weight, engine size, type of car, age

(d) Suppose we want to predict acceleration time from weight. What do you learn from this graph?
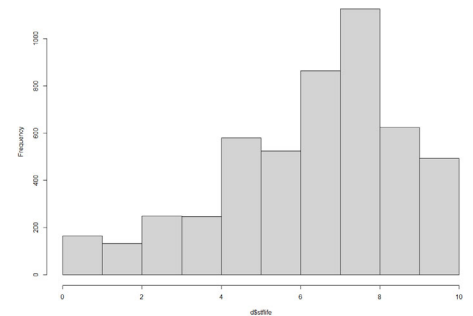
negative association between weight & acceleration

Example 2: The next histogram shows (realistic) salary data on 24 recent graduates

(a) What are the "cases" in this dataset? Why are these values not all the same? What is wrong with the graph?
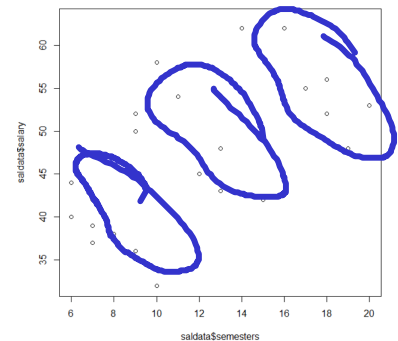
24 students

Fix axis labels

(b) Suppose we want to predict salary for number of semesters in school. What should we worry about?

hidden patterns
missing variables

Grouped or Nested data arise in many applications. *When observations are correlated within groups, it is critical to include the grouping variable in the analysis.* Oftentimes the "partitioning" of the variability is a key research question. For example, evolutionary ecologists and geneticists want to know how much variation in a character (e.g., behavior) is between individuals/families (reflecting environment variation?) and how much is within individuals/families (reflecting genetic variation?). Organizations want to know whether employee satisfaction is more of an individual trait or due to team/leader characteristic.

Example 3: Consider the following "level 1 units." Identify potential "level 2 units" that could contribute to clustering effects/where observations within a level 2 unit are correlated = significant differences between the Level 2 units. Identify a possible Level 1 variable and a Level 2 variable in each case.

(a) Grade 8 students in the Netherlands

(b) Cancer patients

(c) Homes in the United States

(d) Voters in the United States

(e) Sea shells

Quiz 0: In Canvas, due 9am tomorrow, submit <u>one</u> of your answers for Example 3.