What's the Relationship?

Unit 1 - Lab 5

Directions: Follow along with the slides and answer the questions in **BOLDED** font in your journal.

I have data, now what?

- Load the `cdc` data set and run the following code in RStudio:

```
View(cdc)
```

- **Using only the output of the code, write down something you think is interesting about the data.**
- **How interesting do you think your observation is? Would anybody else find it interesting if you told them?**

Finding patterns in data.

- To discover (*really*) interesting observations or relationships in data, we need to find them!
  - Which is difficult if we only look at the data itself.
- The best tool for finding patterns is often . . . your own eyes.
  - Plots are an excellent way to help your eye search for patterns.

What do you observe?

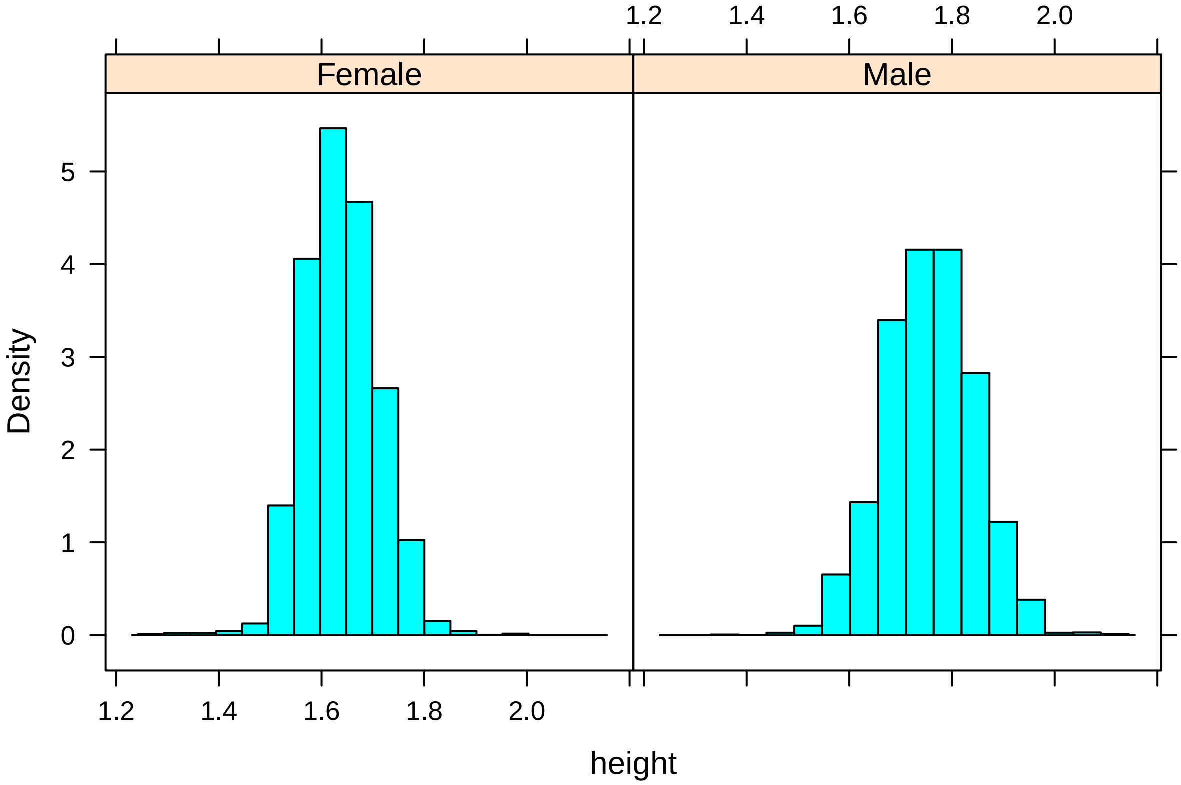
- Start by looking at a plot you've seen before:

```
histogram(~height, data = cdc)
```

- **How many variables did you need to make this plot?**
- **What sorts of observations can you make about the height of our data's high schoolers?**

What do you observe now?

- Using what you learned in *lab 1.4*, create this plot **BUT** stack one graph on top of the other.

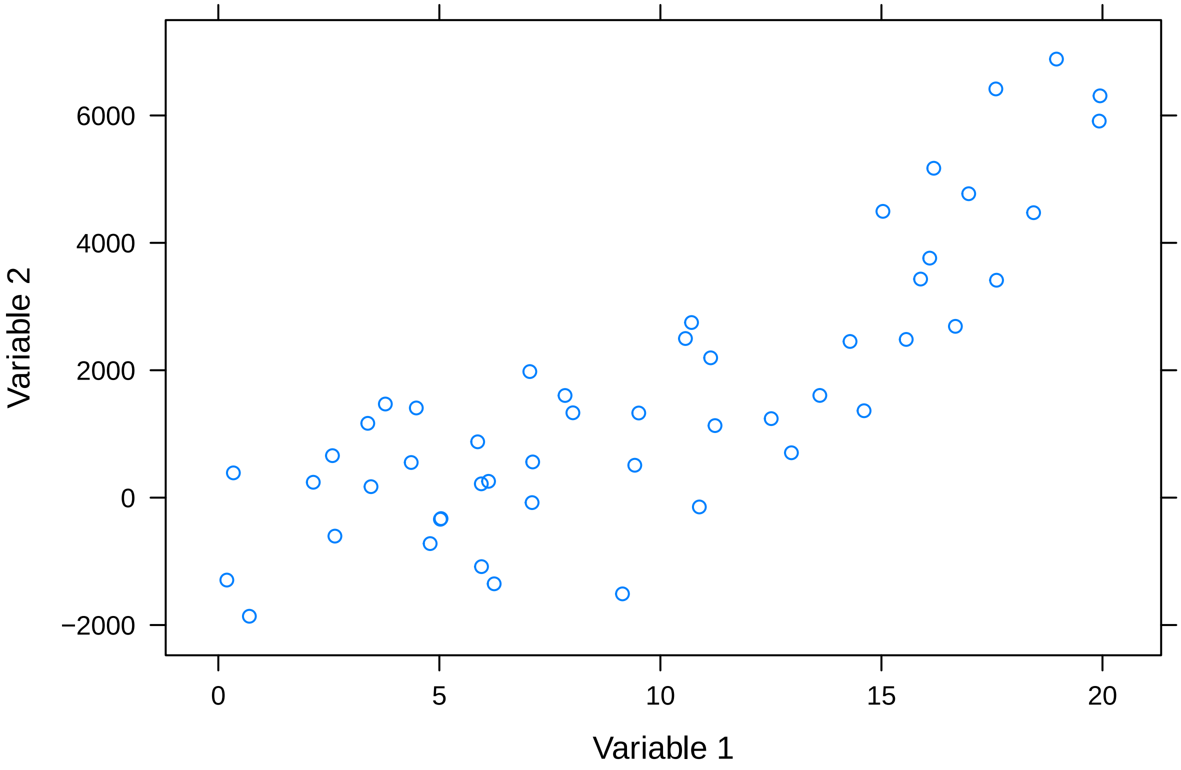


- **How many variables did you need to make your plot?**
- **In your plot, what do you notice about the heights of *males* and *females*?**
- **Compare your plot to the one above. Which is easier to see the difference in heights?**

Multiple variable plots

- The plot you just made is an example of a *multiple variable plot*
- Often shorten this to *multivariate plot*
- Variable 1: *height*
- Variable 2: *gender*
- Multivariate plots are tools for finding *relationships* between data.
- Let's make some new multiple variable plots you haven't created before!

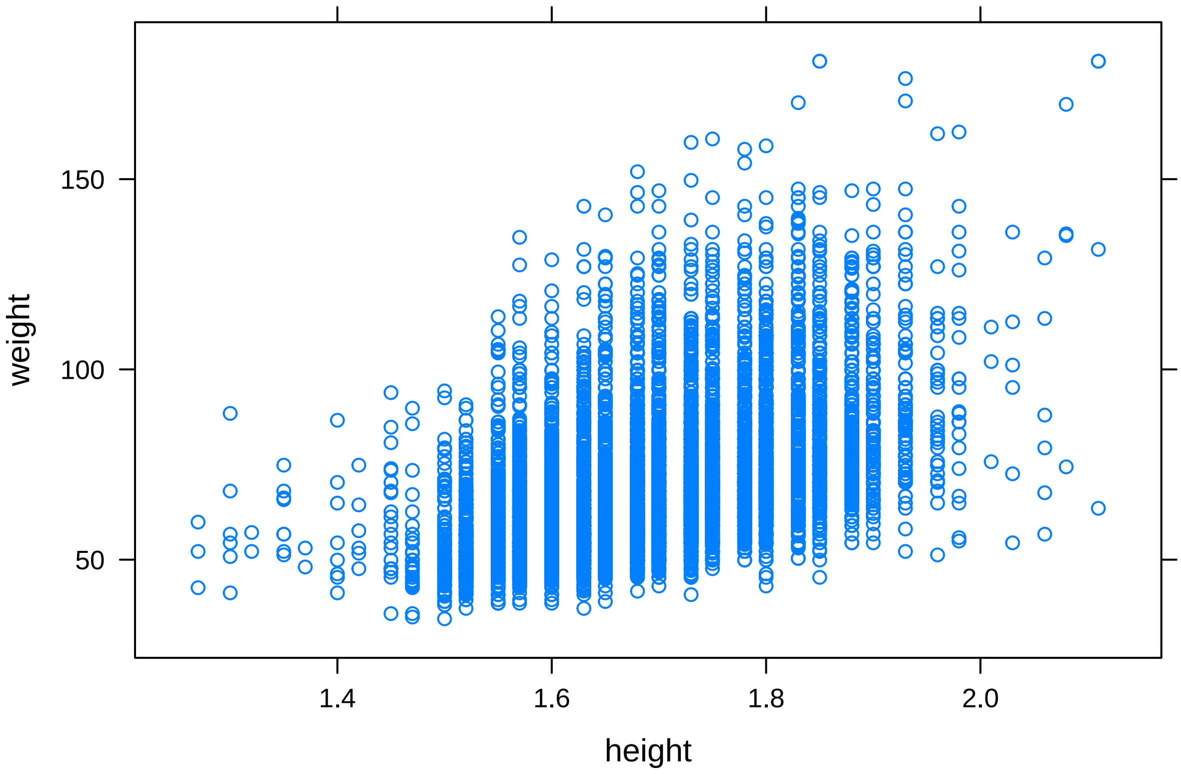
Scatter plots



- Useful for viewing how one *numerical* variable relates to another *numerical* variable.
- Before we begin:
- **How do you think *height* and *weight* are related?**

Creating scatter plots

- To create scatter plots, use the following function:
  xyplot (y ~ x, data = ______)
- Use the *height* and *weight* variables to create this plot:



Answer the questions based on your plot

- **As people grow taller, what happens to their *weight*?**
- **Pick a single *height*, does weight vary a lot or a little? Why do you think that is?**
- **Does the weight of shorter people vary less, more, or the same amount as taller people?**
- **What happens if you swap the *height* and *weight* variables in your code? Does the relationship between the variables change?**

More complex scatter plots

- What happens to your plot if you run this code:

```
xyplot(weight ~ height | gender, data = cdc)
```

- **How is this code different than the one you ran previously?**
- **Do you think the relationship between *heights* and *weights* for *males* and *females* are more similar or different?**
- **How many variables did you need to create this plot?**

Adding some color

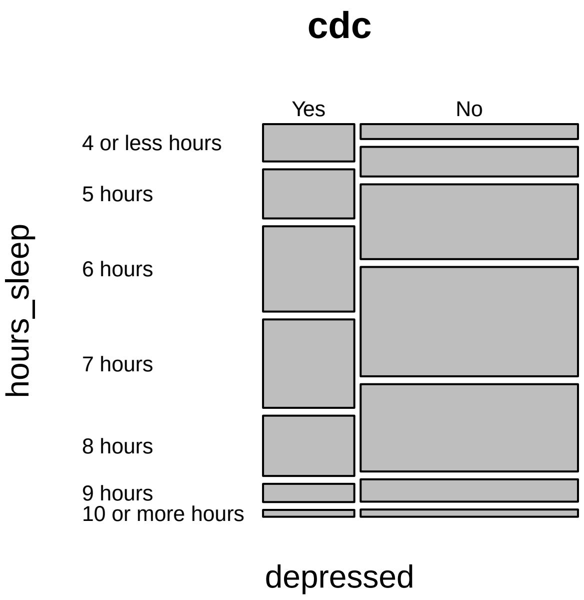
- In the previous plot, we looked at how different gender's *heights* and *weights* varied seperately.
- What if we wanted to overlay (combine) them?

- Run the following code:

```
xyplot(weight ~ height, data = cdc, groups = gender)
```

- **How is this graph different than the previous graph? What changed in the code to make it different?**

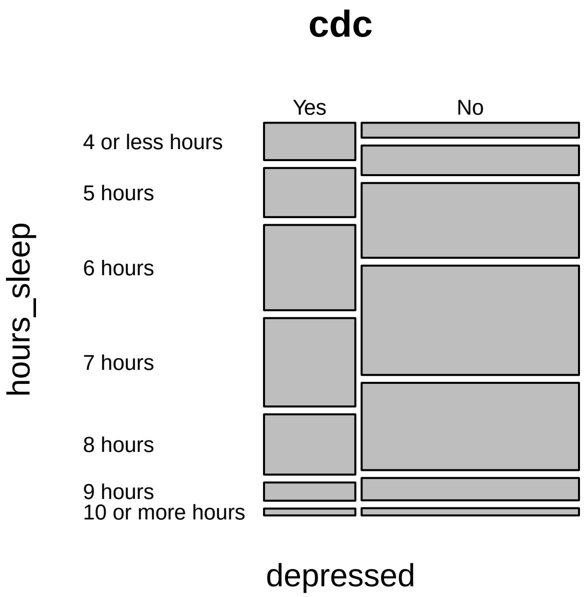
Mosaic Plots



- Scatter plots are helpful for finding relationships between two *numeric* variables.
- Mosaic plots are helpful for finding relationships between two *categorical* variables.
- We use the following function to create them: **
  mosaicplot (y ~ x, data = _______, las = 1)
  NOTE:** We include `las=1` to ensure our labels are readable.

Create the following:

- Use the variables *depressed* and *hours_sleep* to create this mosaic plot:



Playing with labels

```
mosaicplot(depressed~hours_sleep, data=cdc, las=1)
```

- **What happens to the labels if you set `las = 0`? Or `las = 2`?**
- **What happens if you don't include `las = 1` at all?**

Interpreting mosaic plots

- To interpret mosaic plots, we need to look for differences in the width and height of the boxes.
- For the mosaic plot you've created:
- The width of the boxes is the **percentage** of students who said they have or have not felt depressed.
- The height of the boxes is the **percentage** of students who said they sleep however many hours.
- The width/height of the *entire* plot represents 100 percent of the students.
- Compare the width of the *Yes* and *No* stack for the *depressed* variable:
- **Have more high schoolers reported feeling depressed or not depressed?**
- Now look at the heights of the boxes in the *yes* stack:
- **For high schoolers who have reported feeling depressed, which are the two most common amounts of sleep?**
- Look at the heights of the boxes in the *no* stack:
- **For high schoolers who not have reported feeling depressed, which are the two most common amounts of sleep?**
- Finally, look at the people who reported sleeping *4 or less hours*:

- **How does the percentage of students who reported feeling depressed and sleeping 4 or fewer hours compare to the students who did not report feeling depressed and sleeping 4 or fewer hours?**