

# Psy/Educ 6600: Unit 1 Homework

Exploratory Data Analysis

*Dr. Sarah Schwartz*

*Spring 2018*

## Contents

|  |           |
|--|-----------|
| <b>Chapter 1. DATA PREPARATION</b>                               | <b>2</b>  |
| Load Packages . . . . .  | 2         |
| Import Data, Define Factors, and Compute New Variables . . . . . | 2         |
| <b>Chapter 2. DISTRIBUTION and UNIVARIATE PLOTS</b>              | <b>3</b>  |
| 2C-1. Frequency Distribution and Bar Chart . . . . .             | 3         |
| 2C-2. Bar Charts . . . . .                                       | 4         |
| 2C-3. Frequency Distribution and Histogram . . . . .             | 5         |
| 2C-4. Frequency Distribution and Histogram . . . . .             | 6         |
| 2C-6. Histograms -by- a Factor . . . . .                         | 8         |
| 2C-9. Deciles and Quartiles . . . . .                            | 9         |
| 2C-10. Various Percentiles . . . . .                             | 9         |
| <b>Chapter 3. SUMMARY DESCRIPTIVE STATISTICS</b>                 | <b>10</b> |
| 3C-1/3. Descriptive Statistics -full- . . . . .                  | 10        |
| 3C-4 Boxplots . . . . .  | 11        |
| (a) Boxplot . . . . .  | 11        |
| (b) Boxplots -by- a Factor . . . . .                             | 12        |
| (c) Boxplot -for- a Subset . . . . .                             | 13        |
| (d) Boxplots -by- a Factor and -for- a Subset . . . . .          | 14        |
| 3C-5. Boxplots -for- Repeated Measures . . . . .                 | 15        |
| 3C-6. Descriptive Statistics -by- a Factor . . . . .             | 16        |
| <b>Chapter 4. STANDARDIZED SCORES</b>                            | <b>17</b> |
| 4C-1. Calculate z-Scores . . . . .                               | 17        |

# Chapter 1. DATA PREPARATION

## Load Packages

- Make sure the packages are **installed** (*Package tab*)

```
library(tidyverse)    # Loads several very helpful 'tidy' packages
library(readxl)       # Read in Excel datasets
library(furniture)    # Nice tables (by our own Tyson Barrett)
library(psych)        # Lots of nice tid-bits
```

## Import Data, Define Factors, and Compute New Variables

- Make sure the **dataset** is saved in the same *folder* as this file
- Make sure the that *folder* is the **working directory**

NOTE: I added the second line to convert all the variables names to lower case. I still kept the F as a capital letter at the end of the five factor variables.

```
data_clean <- read_excel("Ihmo_dataset.xls") %>%
dplyr::rename_all(tolower) %>%
dplyr::mutate(genderF = factor(gender,
                              levels = c(1, 2),
                              labels = c("Female",
                                          "Male"))) %>%

dplyr::mutate(majorF = factor(major,
                              levels = c(1, 2, 3, 4,5),
                              labels = c("Psychology",
                                          "Premed",
                                          "Biology",
                                          "Sociology",
                                          "Economics"))) %>%

dplyr::mutate(reasonF = factor(reason,
                              levels = c(1, 2, 3),
                              labels = c("Program requirement",
                                          "Personal interest",
                                          "Advisor recommendation"))) %>%

dplyr::mutate(exp_condF = factor(exp_cond,
                              levels = c(1, 2, 3, 4),
                              labels = c("Easy",
                                          "Moderate",
                                          "Difficult",
                                          "Impossible"))) %>%

dplyr::mutate(coffeeF = factor(coffee,
                              levels = c(0, 1),
                              labels = c("Not a regular coffee drinker",
                                          "Regularly drinks coffee"))) %>%

dplyr::mutate(hr_base_bps = hr_base / 60) %>%
dplyr::mutate(anx_plus = rowsums(anx_base, anx_pre, anx_post)) %>%
dplyr::mutate(hr_avg = rowmeans(hr_base + hr_pre + hr_post)) %>%
dplyr::mutate(statDiff = statquiz - exp_sqz)
```

## Chapter 2. DISTRIBUTION and UNIVARIATE PLOTS

### 2C-1. Frequency Distribution and Bar Chart

Request a frequency distribution using the `furniture::tableF(continuous_var)` function

```
# Frequency distribution: majorF
```

Create a bar chart using `geom_bar()` for the Undergraduate Major (`majorF`) variable for Ihno's students.

Make sure to add the variable of interest into the aesthetics: `ggplot(aes(continuous_var))`  
before adding the `geom_bar()` layer.

```
# Bar Plot: majorF
```

## 2C-2. Bar Charts

Repeat Exercise 1 for the variables `prevmath` and `phobia`.

IN THE WRITEUP: Would it make sense to request a histogram instead of a bar chart for `phobia`? Discuss.

```
# Bar Plot: prevmath
```

```
# Bar Plot: phobia
```

### 2C-3. Frequency Distribution and Histogram

Request a frequency distribution and a histogram for the variable `statquiz`. Use the option in the function `geom_histogram(bins = #)` to change the number of bins or `geom_histogram(binwidth = #)` to change the bin width to give a better figure.

IN THE WRITEUP: Describe the shape of this distribution.

```
# Frequency distrubution: statquiz
```

```
# Histogram: statquiz, with a different number/width of bins
```

## 2C-4. Frequency Distribution and Histogram

Request a frequency distribution and a histogram for the variables baseline anxiety (**anx\_base**) and baseline heart rate (**hr\_base**).

IN THE WRITEUP: Comment on R's choice of class intervals for each histogram.

```
# Frequency distribution: anx_base
```

```
# Histogram: anx_base
```

```
# Frequency distribution: hr_base
```

```
# Histogram: hr_base
```

## 2C-6. Histograms -by- a Factor

Request Histograms for the variables `anx_base` and `hr_base` divided by `genderF` using an additional `facet_grid(group_var ~ .)` layer to create two plots.

```
# Histogram: anx_base, by genderF
```

```
# Histogram: hr_base, by genderF
```



## 2C-9. Deciles and Quartiles

Using the `quantile(probs = c(#, #, ..., #))` function, request the deciles and quartiles for the `phobia` variable.

Make sure to add a `dplyr::pull(varname)` step to pull out only the one variable you are interested in.

```
# Deciles: phobia
```

```
# Quartiles: phobia
```

## 2C-10. Various Percentiles

Request the following percentiles for the variables `hr_base` and `hr_pre`: 15, 30, 42.5, 81, and 96.

```
# Percentiles: hr_base
```

```
# Percentiles: hr_pre
```

## Chapter 3. SUMMARY DESCRIPTIVE STATISTICS

### 3C-1/3. Descriptive Statistics -full-

Use the `psych::describe()` function to find the ~~the~~ **mode**, **median**, and **mean**, as well as the **range**, ~~semi-interquartile range~~, *unbiased* **variance**, and *unbiased* **standard deviation** for each of the *quantitative variables* in Ihmo's data set.

Make sure to use a `dplyr::select(var1, var2, ..., var12)` step to select only the variables of interest.

```
# Descriptive Stats: all quant vars
```

## 3C-4 Boxplots

### (a) Boxplot

Create a plot for the `statquiz` variable using a `geom_boxplot()` layer.

Make sure to specify the aesthetics in `ggplot(aes(...))`. Since you want to plot the entire sample together, set `x = "Full Sample"` and `y = continuous_var`

```
# Boxplot: statquiz
```

## (b) Boxplots -by- a Factor

Create a plot for the `statquiz` variable by `majorF`.

Make sure to set `x = grouping_var` and `y = continuous_var` in the aesthetics.

```
# Boxplot: statquiz, by majorF
```

### (c) Boxplot -for- a Subset

Use a `dplyr::filter()` step filter the subjects in the dataset to create a **Boxplot** for the `statquiz` variable for just the `female` `Biology` majors.

Make sure to use `==` instead of `=` to test for equality within the filter step. It will be helpful to set the aesthetics such that `x = one_grouping_var` and `fill = another_grouping_var`, while letting `y = continuous_var`.

```
# Boxplot: statquiz, for a subset
```

#### (d) Boxplots -by- a Factor and -for- a Subset

Use `dplyr::filter()` to create a SIDE-by-SIDE Boxplots for the `statquiz` variable that compares the female Psychology majors to the female Biology majors.

A helpful symbol-set is `%in%` which test if the thing before it is included in the concatenated list of elements that comes after it.

```
# Boxplot: statquiz, by a factor, for a subset
```

### 3C-5. Boxplots -for- Repeated Measures

Create Boxplots for both baseline and prequiz **anxiety**, so that they appear side-by-side on the same graph.

Some data manipulations is needed to “stack” the two variables (baseline and pre-test) into a single variable. This is done with with the `tidyr::gather(key = new_key_var, value = new_value_var, old_var_1, old_var_2, ...)` function.

```
# Boxplot: anxiety, compare two repeated measures
```

### 3C-6. Descriptive Statistics -by- a Factor

Use `furniture::table1()` to find the *mean* and *standard deviation* for each of the *quantitative variables* separately for the `male` and `female` econ majors.

Make sure to use the `splitby = ~ grouping_var` option.

```
# Descriptive Stats: all quant vars, by genderF
```



## Chapter 4. STANDARDIZED SCORES

### 4C-1. Calculate z-Scores

Use the `dplyr::mutate(new_zscore_var = scale(old_orig_var))` function to create two new variables consisting of the *z scores* for the **anxiety** and **heart rate** measures at **baseline** in Ilhno's data set.

Request *means* and *SD's* of the *z-score* variables to demonstrate that the means and SD s are 0 and 1, respectively, in each case.

```
# Descriptive Stats: baseline anx & hr, original and z-scores
```