Chapter 7: Univariate and Descriptive Statistics

Exercises - Alternative with SIMD

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24 August 2018

Contents

EXERCISE I

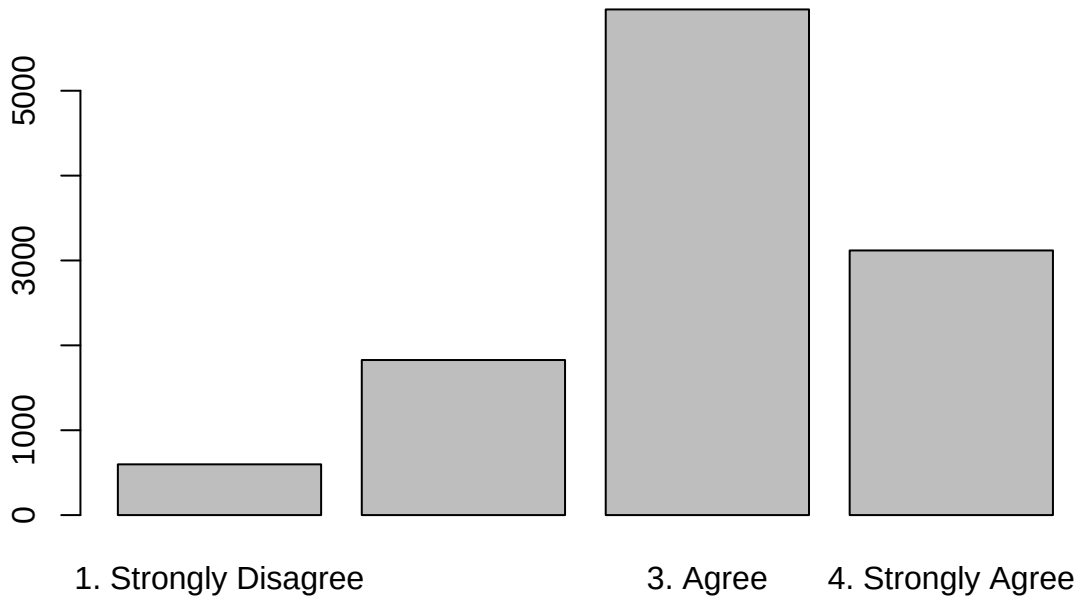
Using the six variables recoded in Exercise I of Chapter 5 from the abbreviated version of 2015 UK Millennium Cohort survey dataset (`mcs.dta`), provide the mode, median, mean, standard deviation, and variance (where appropriate). Note: you need to use the `haven` package to read-in the data.

ANSWERS FOR EXERCISE I

Question 1.1

Since `maths` is an ordinal-level variable, we can only look at the mode and median.

```
library(descr)
freq(mcs$maths)
```




```
mcs$maths
                     Frequency Percent Valid Percent
1. Strongly Disagree       598   5.037          5.20
2. Disagree               1827  15.389         15.89
3. Agree                  5958  50.185         51.80
4. Strongly Agree         3118  26.263         27.11
NA's                       371   3.125
Total                    11872 100.000        100.00
```

```
mcs$maths.num <- as.numeric(mcs$maths)
median(mcs$maths.num, na.rm=TRUE)
```

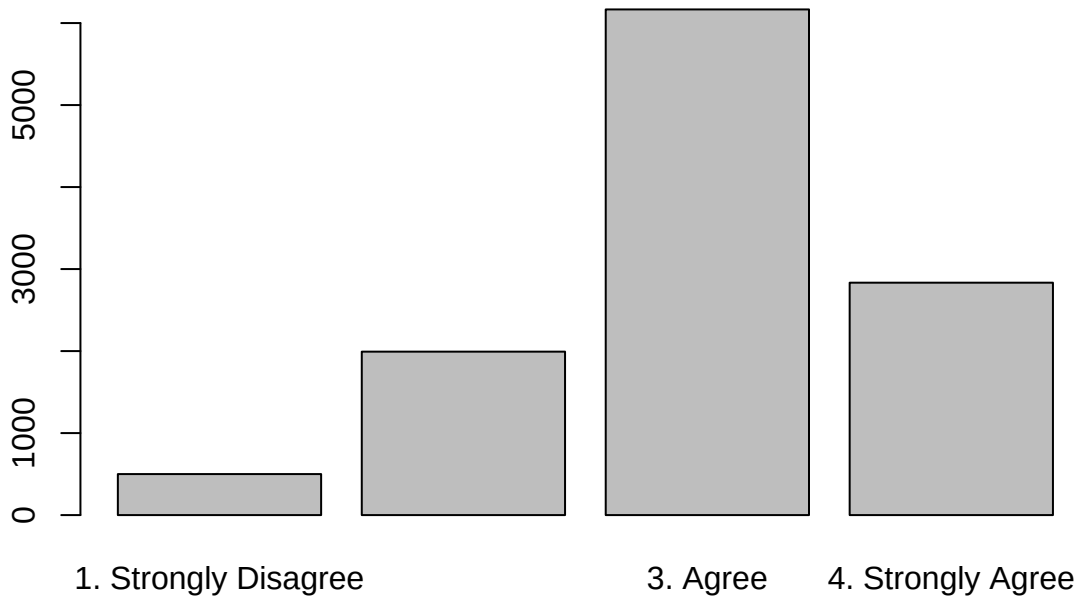
```
[1] 3
```

The mode is "agree" and the median is "agree". If we want to use the `median()` function, we need to convert `maths` to a numeric variable and run the function without missing values (`na.rm=TRUE`). Notice that the `median()` function gives us the numeric value, "3", and not the label. We need to simply check what the label is for "3" to see it is for "agree".

Question 1.2

Since `science` is an ordinal-level variable, we can only look at the mode and median.

```
freq(mcs$science)
```




```
mcs$science
                     Frequency Percent Valid Percent
1. Strongly Disagree       500   4.212          4.35
2. Disagree               1993  16.787         17.34
3. Agree                  6166  51.937         53.65
4. Strongly Agree         2834  23.871         24.66
NA's                       379   3.192
Total                    11872 100.000        100.00
```

```
mcs$science.num <- as.numeric(mcs$science)
median(mcs$science.num, na.rm=TRUE)
```

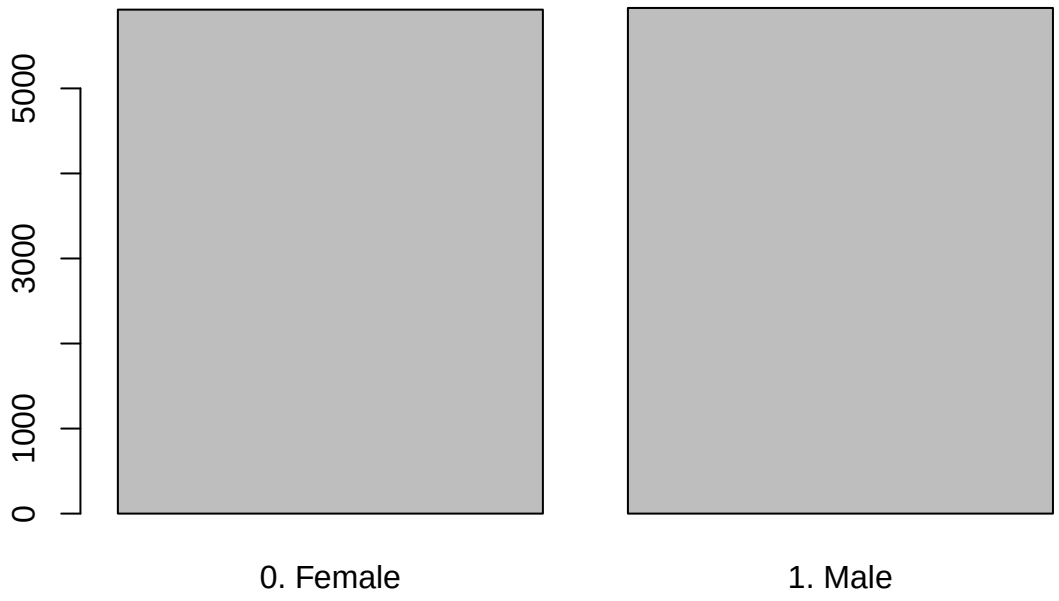
```
[1] 3
```

The mode is "agree" and the median is "agree". If we want to use the `median()` function, we need to convert `science` to a numeric variable.

Question 1.3

Since `gender` is a nominal-level variable, we can only look at the mode.

```
freq(mcs$gender)
```



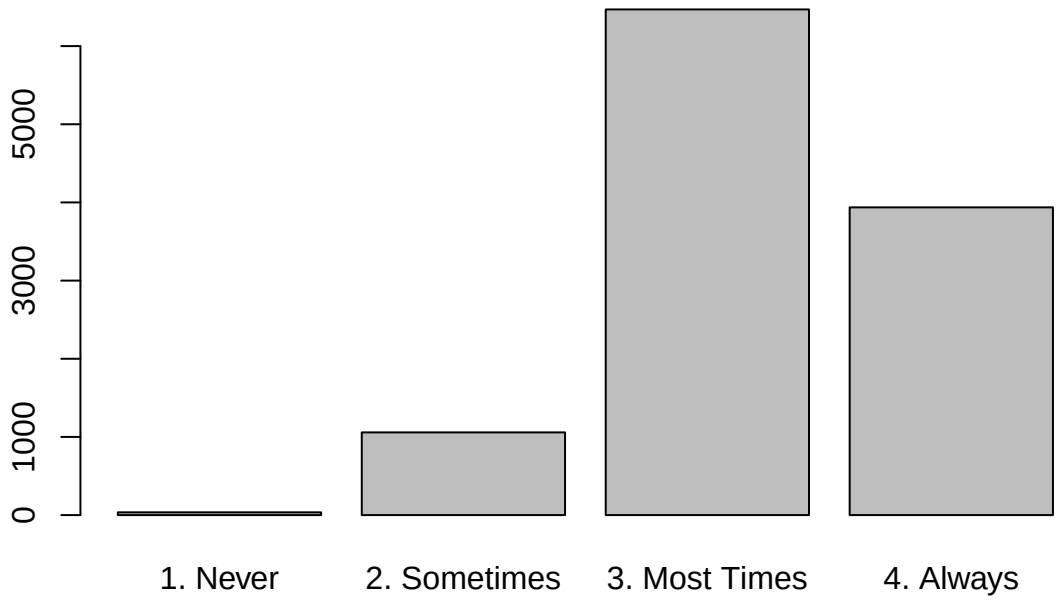

```
mcs$gender
          Frequency Percent
0. Female      5926   49.92
1. Male        5946   50.08
Total         11872  100.00
```

The mode is "male".

Question 1.4

Since `bestsch` is an ordinal-level variable, we can only look at the mode and median.

```
freq(mcs$bestsch)
```




```
mcs$bestsch
              Frequency  Percent Valid Percent
1. Never             35   0.2948        0.3044
2. Sometimes       1058   8.9117        9.2008
3. Most Times      6469  54.4896       56.2571
4. Always          3937  33.1621       34.2378
NA's                373   3.1418
Total             11872 100.0000      100.0000
```

```
mcs$bestsch.num <- as.numeric(mcs$bestsch)
median(mcs$bestsch.num, na.rm=TRUE)
```

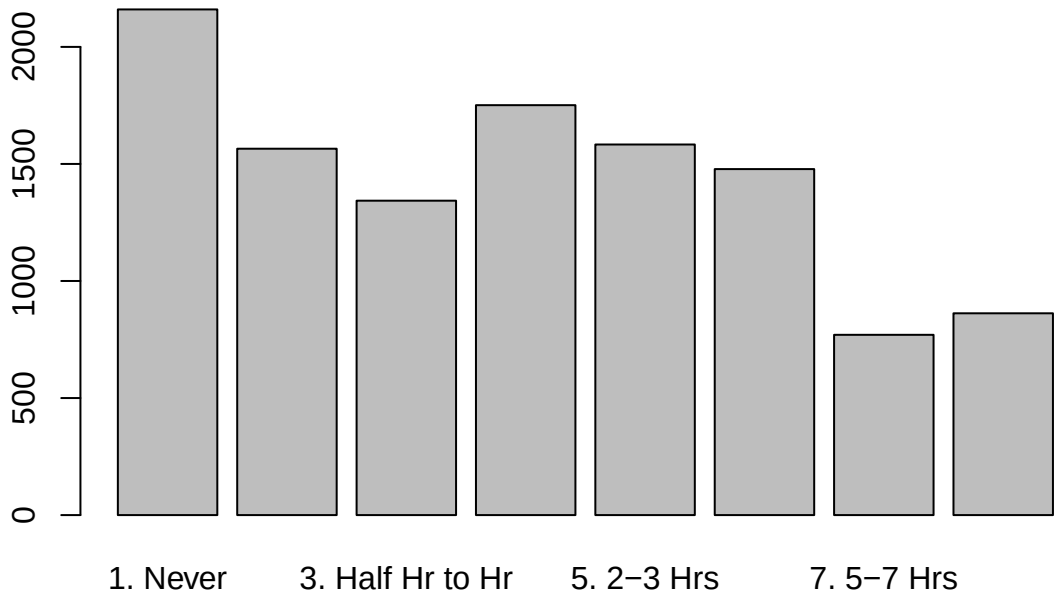
```
[1] 3
```

The mode is "most times" and the median is "most times". If we want to use the `median()` function, we need to convert `bestsch` to a numeric variable.

Question 1.5

Since `vidgames` is an ordinal-level variable, we can look at the mode and median. But, we can also consider `vidgames` to be a high ordinal-level variable, which allows us to look at all the measures.

```
freq(mcs$vidgames)
```




```
mcs$vidgames
                Frequency Percent Valid Percent
1. Never             2160  18.194        18.763
2. Less Half Hr      1565  13.182        13.595
3. Half Hr to Hr     1343  11.312        11.666
4. 1-2 Hrs           1751  14.749        15.210
5. 2-3 Hrs           1583  13.334        13.751
6. 3-5 Hrs           1478  12.449        12.839
7. 5-7 Hrs            770   6.486         6.689
8. More 7 Hrs         862   7.261         7.488
NA's                  360   3.032
Total               11872 100.000       100.000
```

```
mcs$vidgames.num <- as.numeric(mcs$vidgames)
median(mcs$vidgames.num, na.rm=TRUE)
```

```
[1] 4
```

The mode is "never" and the median is "1-2 hours". If we want to use the `median()` function, we need to convert `vidgames` to a numeric variable.

For the high ordinal version, we can add in the mean, standard deviation, and variance. To do so, we need to use the numeric version of the variable.

```
mean(mcs$vidgames.num, na.rm=TRUE)
```

```
[1] 3.943016
```

```r
sd(mcs$vidgames.num, na.rm=TRUE)
```

```
[1] 2.190292
```

```r
var(mcs$vidgames.num, na.rm=TRUE)
```

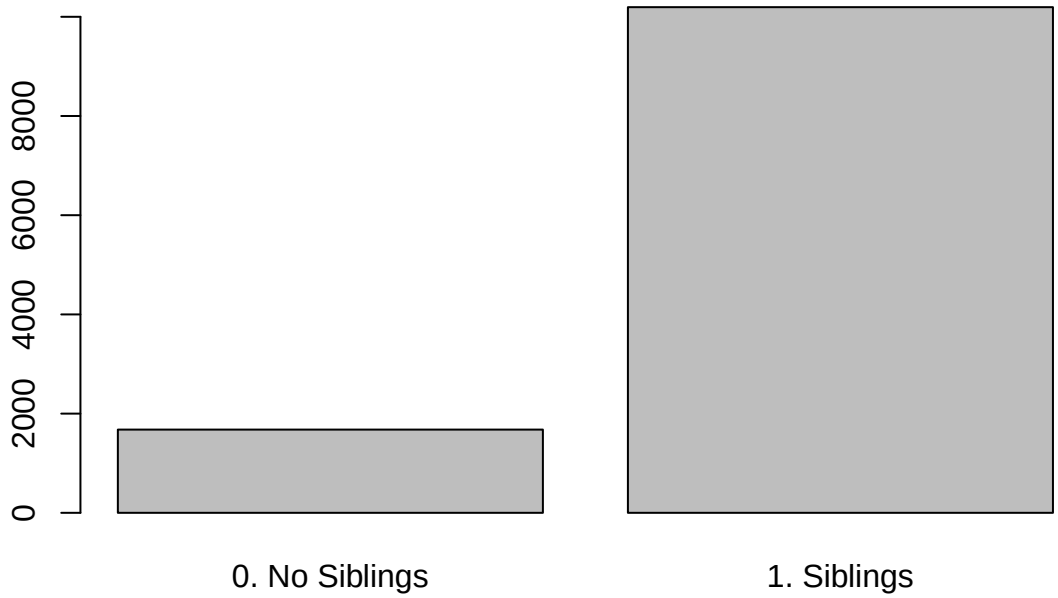
```
[1] 4.797378
```

The mean is 3.94, the standard deviation is 2.19, and the variance is 4.80.

Question 1.6

Since `siblings` is a nominal-level variable, we can only look at the mode.

```r
freq(mcs$siblings)
```




```
Number of siblings
               Frequency Percent
0. No Siblings      1678   14.13
1. Siblings        10194   85.87
Total              11872  100.00
```

The mode is "siblings".

EXERCISE II

Using the SIMD postcodes dataset (`depdata.csv`), provide the mode, median, mean, standard deviation, and variance (where appropriate) for the original version of `pct_depress` and the recoded version with labels from Exercise III in Chapter 5. Why is discussing the descriptive statistics for `pct_depress` likely more informative than for the recoded version?

ANSWERS FOR EXERCISE II

Question 2.1

`pcnt_unemployed` is a ratio-level variable, so we can look at all the measures.

```
simd <- read.csv("simd.csv")

options(max.print=9999)
freq(simd$pct_depress, plot=FALSE)
```

```
median(simd$pct_depress, na.rm=TRUE)
```

```
[1] 17
```

```
mean(simd$pct_depress, na.rm=TRUE)
```

```
[1] 17.53929
```

```
sd(simd$pct_depress, na.rm=TRUE)
```

```
[1] 5.032103
```

```
var(simd$pct_depress, na.rm=TRUE)
```

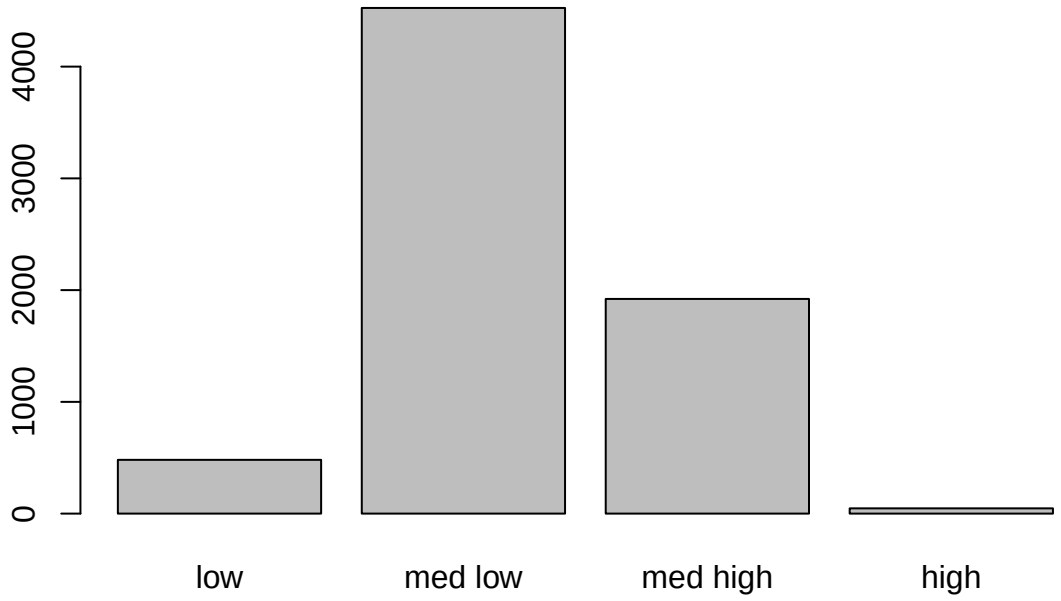
```
[1] 25.32206
```

The mode is 15 percent. The median is 17, the mean is 17.54, the standard deviation is 5.03, and the variance is 25.32.

Question 2.2

Since `pct_depress3` is an ordinal-level variable, we can only look at the mode and median.

```
freq(simd$pct_depress3)
```




```
simd$pct_depress3
          Frequency   Percent Valid Percent
low             481   6.89507        6.8970
med low        4525  64.86525       64.8839
med high       1921  27.53727       27.5452
high             47   0.67374        0.6739
NA's              2   0.02867
Total          6976 100.00000      100.0000
```

The mode is "med low" and the median is "med low".

The original `pct_depress` gives us a more precise understanding of psychiatric prescriptions across Scotland. We can say that the median psychiatric prescription percentage is 17%, which is more informative than saying the median psychiatric prescription is "med low". The relatively small standard deviation suggests that most Scottish datazones' psychiatric prescription percentages are clustered near the mean of 17.54%; which is something we cannot determine from the recoded version.

EXERCISE III

Mama Llama wants to know whether her cigarette smoking is excessive in the Glasgow llama population. You need to help her figure it out.

1. Mama Llama smokes 40 cigarettes a week (x), while the mean llama smoking is 30 cigarettes a week (μ) and the standard deviation is 10 cigarettes a week (σ). Calculate the z-score.

2. Using the `pnorm()` function and the calculated z-score, find the probability.
3. Interpret the probability using plain language.

ANSWERS TO EXERCISE III

Question 3.1

$$z = \frac{40 - 30}{10} = 1.00$$

Question 3.2

```
pnorm(1.00)
```

```
[1] 0.8413447
```

The probability is .841.

Question 3.3

We interpret this as *Mama Llama smokes more or the same number of cigarettes per week than* 84.1% *of the Glasgow llama population.* This can be phrased differently by using the .159 probability - 15.9% *of the Glasgow llama population smokes more or the same number of cigarettes per week than Mama Llama.*