

Data Exploration in R

Counts and Tables

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Counts and Tables

In this presentation you will learn how to perform data exploration using counts and tables (also called contingency tables).

You should use counts and tables if the variable is:

- Categorical or
- discrete with only a few values.

Libraries

To use the code in this presentation, activate the following packages:

```
library(tidyverse)  
library(gt)
```

Data

- We use the dataset `wage`
- It contains wage and other data for a group of 3000 male workers.

```
library(tidyverse)

wage_df <- read_csv("https://raw.githubusercontent.com/kirenz/datasets/master/wage.csv")
```

- The data includes 3000 observations on 11 variables.

Data

- **year:** Year that wage information was recorded
- **age:** Age of worker
- **maritl:** A factor with levels:
 1. Never Married
 2. Married
 3. Widowed
 4. Divorced and
 5. Separated indicating marital status
- **race:** A factor with levels:
 1. White
 2. Black
 3. Asian and
 4. Other indicating race
- **education:** A factor with levels:
 1. < HS Grad
 2. HS Grad
 3. Some College
 4. College Grad and
 5. Advanced Degree indicating education level
- **jobclass:** A factor with levels:
 1. Industrial and
 2. Information indicating type of job
- **logwage:** Log of workers wage
- **wage:** Workers raw wage

Count

- Use data `wage_df`.
- Perform `count()` on `maritl`
- Sort the values.
- Use `gt()` to print the table.

```
count(maritl) %>%  
  arrange(desc(n)) %>%  
  filter(maritl != "Never Married") %>%  
  print()
```

maritl	n
2. Married	2074
1. Never Married	648
4. Divorced	204
5. Separated	55
3. Widowed	19

Count

- Use data `wage_df`.
- Perform `count()` on `maritl` and `education`
- Sort the values.
- Use `gt()` to print the table.

Count the combined appearances of `maritl` and `education` and sort the values:

```
count(wage_df$maritl, wage_df$education) %>%  
  arrange(desc(n)) %>%  
  filter(rank(n) < 6) %>%  
  print()
```

maritl	education	n
2. Married	2. HS Grad	651
2. Married	4. College Grad	487
2. Married	3. Some College	421
2. Married	5. Advanced Degree	341
1. Never Married	2. HS Grad	219
2. Married	1. < HS Grad	174

Count

- Use data `wage_df`.
- Obtain the sum of the quantitative variable `wage` for the different levels of `maritl`
- Name the new variable "Sum".
- Use `gt()` to print the table.

Read the [documentation for count\(\)](#) to learn how to perform this task.

```
count(
  data = wage_df,
  by = "maritl",
  sum = "Sum"
)
```

maritl	Sum
1. Never Married	60092.052
2. Married	246516.180
3. Widowed	1891.234
4. Divorced	21044.489
5. Separated	5566.868

Total counts

- Total counts are an useful way to represent the observations that fall into each combination of the levels of categorical variables.
- We create a contingency table of the two categorical variables `jobclass` and `race` and call the result `tab`:

```
tab <- table(wage_df$jobclass, wage_df$race)
kable(tab)
```

	1. White	2. Black	3. Asian	4. Other
1. Industrial	1325	111	86	22
2. Information	1155	182	104	15

Joint proportions

- We can also view the percentage of each cell in relation to the total amount of all observations (here $n = 3000$).
- Therefore, you have to simply divide the numbers from our total counts with 3.000.

The following code generates tables of *joint* proportions:

```
prop <- prop.table(tab)*100  
kable(prop, digits = 2)
```

	1. White	2. Black	3. Asian	4. Other
1. Industrial	44.17	3.70	2.87	0.73
2. Information	38.50	6.07	3.47	0.50

```
prop
```

```
##
```

```
##           1. White  2. Black  3. Asian  4. Other
```

```
## 1. Industrial 44.1666667  3.7000000  2.8666667  0.7333333
```

Conditional proportions

- You also may want to know the probability that workers have a certain jobclass, given that they have a particular ethnical background.
- This is a so called **conditional probability**.
- Conditional probability represents the chance that one event will occur given that a second event has already occurred.

Conditional proportions

- The following code generates tables of *conditional* proportions:

```
# conditional on columns  
prop_col <- prop.table(tab, 2)*100  
  
kable(prop_col, digits = 2)
```

	1. White	2. Black	3. Asian	4. Other
1. Industrial	53.43	37.88	45.26	59.46
2. Information	46.57	62.12	54.74	40.54

We performed a columnwise evaluation and are now able to answer the following question:

- Approximately what proportion of all white workers are industrial workers? The answer is: around 53 %.

Conditional proportions: rows

Now we want to obtain the probability that workers have a certain race, given their jobclass.

```
# conditional on rows  
prop_rows <- prop.table(tab, 1)  
  
kable(prop_rows, digits = 2)
```

	1. White	2. Black	3. Asian	4. Other
1. Industrial	0.86	0.07	0.06	0.01
2. Information	0.79	0.12	0.07	0.01

We performed a rowwise evaluation and are now able to answer the following question:

- Approximately what proportion of all industrial workers are white?
- The answer is: around %.



Thanks!

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