

# STATS 205: Final Project Write-Up

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## 1. Background of the data and why it is interesting or important

The data we are using is the data from WHO suicide statistics from Kaggle. This gives population-based statistics on suicide rate...

## 2. Explanation of the method studied and its properties

## 3. Data analysis or simulation study

We will use the crude rate of suicide per 100,000 people.

This analysis provides information on age-standardized rates...

```
who_suicide_statistics_df <- read.csv("who_suicide_statistics.csv")
head(who_suicide_statistics_df)
```

```
##   country year    sex      age suicides_no population
## 1 Albania 1985 female 15-24 years         NA      277900
## 2 Albania 1985 female 25-34 years         NA      246800
## 3 Albania 1985 female 35-54 years         NA      267500
## 4 Albania 1985 female  5-14 years         NA      298300
## 5 Albania 1985 female 55-74 years         NA      138700
## 6 Albania 1985 female  75+ years         NA       34200
```

```
colnames(who_suicide_statistics_df)
```

```
## [1] "country"      "year"         "sex"          "age"          "suicides_no"
## [6] "population"
```

Filter and save countries with missing suicide rate.

```
library(tidyverse)
```

```
## Registered S3 methods overwritten by 'ggplot2':
```

```
##   method      from
## [.quosures   rlang
## c.quosures   rlang
## print.quosures rlang
```

```
## -- Attaching packages ----- tidyverse 1.2.1 --
```

```
## v ggplot2 3.1.1    v purrr   0.3.2
## v tibble  2.1.1    v dplyr   0.8.1
## v tidyr   0.8.3    v stringr 1.4.0
## v readr   1.3.1    v forcats 0.4.0
```

```
## -- Conflicts ----- tidyverse_conflicts() --
```

```
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
filtered_suicide_df <- drop_na(who_suicide_statistics_df, "suicides_no")
head(filtered_suicide_df)
```

```
##   country year    sex      age suicides_no population
## 25 Albania 1987 female 15-24 years         14    289700
## 26 Albania 1987 female 25-34 years          4    257200
## 27 Albania 1987 female 35-54 years          6    278800
## 28 Albania 1987 female  5-14 years          0    311000
## 29 Albania 1987 female 55-74 years          0    144600
## 30 Albania 1987 female  75+ years          1     35600
```

After filtering countries with missing suicide rate, take a random sample of 100 countries and make sure each continent has approximately equal countries.

Filter countries by continent:

```
library(countrycode)
filtered_suicide_df$continent <- countrycode(sourcevar = filtered_suicide_df[, "country"],
                                             origin = "country.name",
                                             destination = "continent")
```

```
## Warning in countrycode(sourcevar = filtered_suicide_df[, "country"], origin = "country.name", : Some
## Warning in countrycode(sourcevar = filtered_suicide_df[, "country"], origin = "country.name", : Some
head(filtered_suicide_df)
```

```
##   country year    sex      age suicides_no population continent
## 25 Albania 1987 female 15-24 years         14    289700    Europe
## 26 Albania 1987 female 25-34 years          4    257200    Europe
## 27 Albania 1987 female 35-54 years          6    278800    Europe
## 28 Albania 1987 female  5-14 years          0    311000    Europe
## 29 Albania 1987 female 55-74 years          0    144600    Europe
## 30 Albania 1987 female  75+ years          1     35600    Europe
```

```
write.csv(filtered_suicide_df, 'filtered_suicide.csv')
```

Let us find out which continents are counted:

```
# Get list of continents
list_of_continents <- unique(filtered_suicide_df$continent); list_of_continents
```

```
## [1] "Europe" "Americas" "Asia" "Oceania" "Africa" NA
```

Therefore,

$$\frac{100 \text{ countries}}{6 \text{ continents}} \approx 16 \text{ to } 17 \text{ countries per continent}$$

we should randomly sample 17 countries from each continent.

Notably, there are countries that are not on any of the listed continents. Let us see which ones those are:

```
not_in_a_continent = filtered_suicide_df[is.na(filtered_suicide_df$continent),]
write.csv(not_in_a_continent, 'not_in_a_continent.csv')
head(not_in_a_continent)
```

```
##   country year    sex      age suicides_no population continent
## 32317 Rodrigues 2001 female 15-24 years          0      NA      <NA>
## 32318 Rodrigues 2001 female 25-34 years          0      NA      <NA>
```

```
## 32319 Rodrigues 2001 female 35-54 years      0      NA      <NA>
## 32320 Rodrigues 2001 female  5-14 years      0      NA      <NA>
## 32321 Rodrigues 2001 female 55-74 years      0      NA      <NA>
## 32322 Rodrigues 2001 female  75+ years      0      NA      <NA>
```

```
unique(not_in_a_continent$country)
```

```
## [1] Rodrigues      Virgin Islands (USA)
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
```

Let us make the choice not to include these countries in the analysis, since there are only two countries.

```
# Take off `NA` from list of continents
list_of_continents <- list_of_continents[-length(list_of_continents)]
list_of_continents
```

```
## [1] "Europe"    "Americas"  "Asia"      "Oceania"   "Africa"
```

We will now create six dataframes, filtered by list of countries for each continent.

```
# library(rlist)
countries_per_continent <- list()

for (i in seq_along(list_of_continents))
{
  countries_per_continent[[i]] <- filtered_suicide_df[filtered_suicide_df$continent == list_of_continents[i]]
}

length(countries_per_continent)
```

```
## [1] 5
```

```
length(countries_per_continent)
```

```
## [1] 5
```

```
for (i in seq_along(countries_per_continent))
{
  print(head(countries_per_continent[[i]]))
  print(length(countries_per_continent[[i]]))
  cat("\n")
}
```

```
##   country year  sex      age suicides_no population continent
## 25 Albania 1987 female 15-24 years      14      289700   Europe
## 26 Albania 1987 female 25-34 years       4      257200   Europe
## 27 Albania 1987 female 35-54 years       6      278800   Europe
## 28 Albania 1987 female  5-14 years       0      311000   Europe
## 29 Albania 1987 female 55-74 years       0      144600   Europe
## 30 Albania 1987 female  75+ years       1       35600   Europe
## [1] 7
##
##   country year  sex      age suicides_no population continent
## 373 Anguilla 1983 female 15-24 years       0        NA  Americas
## 374 Anguilla 1983 female 25-34 years       0        NA  Americas
## 375 Anguilla 1983 female 35-54 years       0        NA  Americas
## 376 Anguilla 1983 female  5-14 years       0        NA  Americas
## 377 Anguilla 1983 female 55-74 years       0        NA  Americas
## 378 Anguilla 1983 female  75+ years       0        NA  Americas
```

```
## [1] 7
##
##      country year    sex      age suicides_no population continent
## 1501 Armenia 1981 female 15-24 years         5      348000      Asia
## 1502 Armenia 1981 female 25-34 years         6      242200      Asia
## 1503 Armenia 1981 female 35-54 years         6      333500      Asia
## 1504 Armenia 1981 female 5-14 years          0      295200      Asia
## 1505 Armenia 1981 female 55-74 years        10      164300      Asia
## 1506 Armenia 1981 female 75+ years          7       43100      Asia
## [1] 7
##
##      country year    sex      age suicides_no population continent
## 2161 Australia 1979 female 15-24 years        71     1236800     Oceania
## 2162 Australia 1979 female 25-34 years        86     1138500     Oceania
## 2163 Australia 1979 female 35-54 years       171     1572100     Oceania
## 2164 Australia 1979 female 5-14 years         1     1246500     Oceania
## 2165 Australia 1979 female 55-74 years       135     1137800     Oceania
## 2166 Australia 1979 female 75+ years         15       309900     Oceania
## [1] 7
##
##      country year    sex      age suicides_no population continent
## 7669 Cabo Verde 2011 female 15-24 years         1       56039      Africa
## 7670 Cabo Verde 2011 female 25-34 years         0       38528      Africa
## 7671 Cabo Verde 2011 female 35-54 years         2       49078      Africa
## 7672 Cabo Verde 2011 female 5-14 years          0       56558      Africa
## 7673 Cabo Verde 2011 female 55-74 years         2       19887      Africa
## 7674 Cabo Verde 2011 female 75+ years          0        7582      Africa
## [1] 7
```

This text links to very important information about why a `for` loop doesn't print anything.<sup>1</sup>

[Link to Pandoc Markdown formatting](#)

Randomly sample 17 countries from each continent:

```
list_of_continents
```

```
## [1] "Europe" "Americas" "Asia" "Oceania" "Africa"
for (i in seq_along(countries_per_continent))
{
  print(list_of_continents[i])
  countries <- unique(countries_per_continent[[i]]$country)
  print(countries)
  print(length(countries))
  cat("\n")
}
```

```
## [1] "Europe"
## [1] Albania          Austria            Belarus
## [4] Belgium          Bosnia and Herzegovina Bulgaria
## [7] Croatia          Czech Republic    Denmark
## [10] Estonia          Finland           France
```

<sup>1</sup>Basically, `for` loops are functions themselves. R prints out the result of a command automatically, but functions are not inherently a command, and since `for` loops are functions, nothing will be printed. The solution is to have `print(command())` within the `for` loop to get output for your `for` loop. You will never again spend hours trying to find out why a `for` loop doesn't print anything because you're no longer an R newbie.

## [13] Germany	Greece	Hungary
## [16] Iceland	Ireland	Italy
## [19] Latvia	Lithuania	Luxembourg
## [22] Malta	Monaco	Montenegro
## [25] Netherlands	Norway	Poland
## [28] Portugal	Republic of Moldova	<NA>
## [31] Romania	Russian Federation	San Marino
## [34] Serbia	Slovakia	Slovenia
## [37] Spain	Sweden	Switzerland
## [40] TFYR Macedonia	Ukraine	United Kingdom
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe		
## [1] 42		
##		
## [1] "Americas"		
## [1] Anguilla	Antigua and Barbuda	
## [3] Argentina	Aruba	
## [5] Bahamas	Barbados	
## [7] Belize	Bermuda	
## [9] Bolivia	Brazil	
## [11] British Virgin Islands	Canada	
## [13] Cayman Islands	Chile	
## [15] Colombia	Costa Rica	
## [17] Cuba	Dominica	
## [19] Dominican Republic	Ecuador	
## [21] El Salvador	Falkland Islands (Malvinas)	
## [23] French Guiana	Grenada	
## [25] Guadeloupe	Guatemala	
## [27] Guyana	Haiti	
## [29] Honduras	Jamaica	
## [31] Martinique	Mexico	
## [33] Montserrat	Netherlands Antilles	
## [35] Nicaragua	Panama	
## [37] Paraguay	Peru	
## [39] Puerto Rico	<NA>	
## [41] Saint Kitts and Nevis	Saint Lucia	
## [43] Saint Pierre and Miquelon	Saint Vincent and Grenadines	
## [45] Suriname	Trinidad and Tobago	
## [47] Turks and Caicos Islands	United States of America	
## [49] Uruguay	Venezuela (Bolivarian Republic of)	
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe		
## [1] 50		
##		
## [1] "Asia"		
## [1] Armenia	Azerbaijan	
## [3] Bahrain	Brunei Darussalam	
## [5] Cyprus	Georgia	
## [7] Hong Kong SAR	Iran (Islamic Rep of)	
## [9] Iraq	Israel	
## [11] Japan	Jordan	
## [13] Kazakhstan	Kuwait	
## [15] Kyrgyzstan	Macau	
## [17] Malaysia	Maldives	
## [19] Mongolia	Occupied Palestinian Territory	
## [21] Oman	Philippines	

```
## [23] Qatar                Republic of Korea
## [25] <NA>                  Saudi Arabia
## [27] Singapore             Sri Lanka
## [29] Syrian Arab Republic  Tajikistan
## [31] Thailand              Turkey
## [33] Turkmenistan          United Arab Emirates
## [35] Uzbekistan
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 35
##
## [1] "Oceania"
## [1] Australia   Fiji           Kiribati      New Zealand <NA>
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 5
##
## [1] "Africa"
## [1] Cabo Verde      Egypt           Mauritius
## [4] Mayotte         Morocco         Reunion
## [7] <NA>            Sao Tome and Principe Seychelles
## [10] South Africa    Tunisia         Zimbabwe
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 12
```

Since there are only 5 countries in Oceania and 12 countries in Africa, we will use all 5 countries of Oceania and all 12 countries of Africa.

```
samples_of_countries <- list()
num_samples <- 17
for (i in seq_along(countries_per_continent))
{
  countries <- unique(countries_per_continent[[i]]$country)
  current_sample <- list()
  if (length(countries) >= num_samples)
  {
    current_sample <- sample(countries, 17)
  } else {
    current_sample <- sample(countries, length(countries))
  }
  samples_of_countries[[i]] <- current_sample
}
```

Let's see the countries that we will be sampling:

```
total <- 0
for (i in seq_along(samples_of_countries))
{
  print(list_of_continents[i])
  print(samples_of_countries[[i]])
  print(length(samples_of_countries[[i]]))
  total <- total + length(samples_of_countries[[i]])
  cat("\n")
}
```

```
## [1] "Europe"
## [1] Montenegro      Finland          Albania
## [4] Ireland         Greece           Netherlands
```

```
## [7] Italy San Marino Republic of Moldova
## [10] Portugal Denmark Switzerland
## [13] Bosnia and Herzegovina Slovakia Luxembourg
## [16] Slovenia Spain
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 17
##
## [1] "Americas"
## [1] Costa Rica Bolivia
## [3] Montserrat Nicaragua
## [5] Saint Pierre and Miquelon Barbados
## [7] Falkland Islands (Malvinas) Saint Lucia
## [9] Brazil Bahamas
## [11] British Virgin Islands Bermuda
## [13] Venezuela (Bolivarian Republic of) Cuba
## [15] Chile Antigua and Barbuda
## [17] Jamaica
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 17
##
## [1] "Asia"
## [1] <NA> Israel Philippines
## [4] Hong Kong SAR Georgia Republic of Korea
## [7] Thailand Turkmenistan Brunei Darussalam
## [10] Cyprus Qatar Tajikistan
## [13] Kazakhstan Armenia Oman
## [16] United Arab Emirates Malaysia
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 17
##
## [1] "Oceania"
## [1] New Zealand Fiji Kiribati <NA> Australia
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 5
##
## [1] "Africa"
## [1] Tunisia Sao Tome and Principe Cabo Verde
## [4] Mayotte Zimbabwe Mauritius
## [7] Egypt Morocco <NA>
## [10] Reunion Seychelles South Africa
## 141 Levels: Albania Anguilla Antigua and Barbuda Argentina ... Zimbabwe
## [1] 12
```

```
total
```

```
## [1] 68
```

Let's filter the original dataframe only to include countries that we have sampled:

```
countries_to_test <- list()
a <- 0
for (i in seq_along(samples_of_countries))
{
  # find out a way to access each country name
  # print each country name
  for (j in seq_along(samples_of_countries[[i]]))
```

```

    {
      sample <- samples_of_countries[[i]]
      country_string <- toString(sample[[j]])
      countries_to_test[a] <- country_string
      a <- a + 1
    }
  }

length(countries_to_test)

```

```
## [1] 67
```

```
countries_to_test
```

```

## [[1]]
## [1] "Finland"
##
## [[2]]
## [1] "Albania"
##
## [[3]]
## [1] "Ireland"
##
## [[4]]
## [1] "Greece"
##
## [[5]]
## [1] "Netherlands"
##
## [[6]]
## [1] "Italy"
##
## [[7]]
## [1] "San Marino"
##
## [[8]]
## [1] "Republic of Moldova"
##
## [[9]]
## [1] "Portugal"
##
## [[10]]
## [1] "Denmark"
##
## [[11]]
## [1] "Switzerland"
##
## [[12]]
## [1] "Bosnia and Herzegovina"
##
## [[13]]
## [1] "Slovakia"
##
## [[14]]

```



```

## [1] "Luxembourg"
##
## [[15]]
## [1] "Slovenia"
##
## [[16]]
## [1] "Spain"
##
## [[17]]
## [1] "Costa Rica"
##
## [[18]]
## [1] "Bolivia"
##
## [[19]]
## [1] "Montserrat"
##
## [[20]]
## [1] "Nicaragua"
##
## [[21]]
## [1] "Saint Pierre and Miquelon"
##
## [[22]]
## [1] "Barbados"
##
## [[23]]
## [1] "Falkland Islands (Malvinas)"
##
## [[24]]
## [1] "Saint Lucia"
##
## [[25]]
## [1] "Brazil"
##
## [[26]]
## [1] "Bahamas"
##
## [[27]]
## [1] "British Virgin Islands"
##
## [[28]]
## [1] "Bermuda"
##
## [[29]]
## [1] "Venezuela (Bolivarian Republic of)"
##
## [[30]]
## [1] "Cuba"
##
## [[31]]
## [1] "Chile"
##
## [[32]]

```

```

## [1] "Antigua and Barbuda"
##
## [[33]]
## [1] "Jamaica"
##
## [[34]]
## [1] "NA"
##
## [[35]]
## [1] "Israel"
##
## [[36]]
## [1] "Philippines"
##
## [[37]]
## [1] "Hong Kong SAR"
##
## [[38]]
## [1] "Georgia"
##
## [[39]]
## [1] "Republic of Korea"
##
## [[40]]
## [1] "Thailand"
##
## [[41]]
## [1] "Turkmenistan"
##
## [[42]]
## [1] "Brunei Darussalam"
##
## [[43]]
## [1] "Cyprus"
##
## [[44]]
## [1] "Qatar"
##
## [[45]]
## [1] "Tajikistan"
##
## [[46]]
## [1] "Kazakhstan"
##
## [[47]]
## [1] "Armenia"
##
## [[48]]
## [1] "Oman"
##
## [[49]]
## [1] "United Arab Emirates"
##
## [[50]]

```

```

## [1] "Malaysia"
##
## [[51]]
## [1] "New Zealand"
##
## [[52]]
## [1] "Fiji"
##
## [[53]]
## [1] "Kiribati"
##
## [[54]]
## [1] "NA"
##
## [[55]]
## [1] "Australia"
##
## [[56]]
## [1] "Tunisia"
##
## [[57]]
## [1] "Sao Tome and Principe"
##
## [[58]]
## [1] "Cabo Verde"
##
## [[59]]
## [1] "Mayotte"
##
## [[60]]
## [1] "Zimbabwe"
##
## [[61]]
## [1] "Mauritius"
##
## [[62]]
## [1] "Egypt"
##
## [[63]]
## [1] "Morocco"
##
## [[64]]
## [1] "NA"
##
## [[65]]
## [1] "Reunion"
##
## [[66]]
## [1] "Seychelles"
##
## [[67]]
## [1] "South Africa"

```

#### 4. Interpretation of the results or discussion