

## Lab 5: Data Wrangling

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## Purpose

The purpose of today's lab is to introduce you to the `tidyverse`, which is a collection of packages designed for data science. We will focus on data wrangling, including how to extract specific observations and variables, how to generate new variables, and how to summarize data.

For further resources on these topics, check out [R for Data Science](#) by Hadley Wickham and [this cheatsheet on data wrangling](#) from RStudio.

---

## Intro to the tidyverse

Let's start by loading the `tidyverse`:

```
#install.packages("tidyverse")
library(tidyverse)

## -- Attaching packages ----- tidyverse
1.3.0 --

## v ggplot2 3.3.2      v purrr   0.3.4
## v tibble  3.0.4      v dplyr   1.0.2
## v tidyr   1.1.2      v stringr 1.4.0
## v readr   1.4.0      v forcats 0.5.0

## -- Conflicts -----
tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

- When you load the `tidyverse` into R, you are actually loading several different packages that are designed to work well together and help you complete common tasks in R. Some of these packages are...
  - data manipulation (`dplyr`) = **our focus today**
  - reshaping data (`tidyr`)
  - data visualization (`ggplot2`)
  - working with strings (`stringr`)
  - working with factors (`forcats`)

## Data wrangling with R

- Data wrangling means getting your data into a useful form for visualizing and modeling it. Before you analyze your data, you will need to clean and transform it. For example, you may want to remove a variable in your data set, or remove participants who do not fit a certain criteria.

- If you get your dataset ready for analysis in excel or SPSS, you can end up deleting important information. In contrast, when you clean and transform a dataset in R, you aren't editing the underlying file. Rather, you are editing the data frame in your global environment.

## Today's focus: {dplyr}

- Most of the functions we'll go over today come from the {dplyr} package. You can think of this package as a set of "pliers" that you can use to tweak data frames, hence its name "d(ataframe)plyr."
- The functions of {dplyr} are **verbs**:
  - mutate() adds new column(s).
  - select() selects column(s).
  - filter() selects rows based on a criteria.
  - summarize() summarizes multiple selected values (useful for mean, sd, n).
  - arrange() changes the ordering of the rows.

## Pipes

- Pipes come from the {magrittr} package and are available when you load the tidyverse. Pipes are a way to write strings of functions more easily, creating *pipelines*. A pipe looks like this:

`%>%`

- You can enter a pipe with the shortcut CTRL+Shift+M for PC or CMD+Shift+M for Mac. *#practice entering a pipe with the shortcut here*
- A pipe passes an object on the left-hand side as the first argument (or . argument) of whatever function is on the right-hand side.
  - `x %>% f(y)` is the same as `f(x, y)`
  - `y %>% f(x, ., z)` is the same as `f(x, y, z)`

Example: I want to calculate the mean of the mpg variable from the mtcars data set and round our answer to 2 decimal places. I can accomplish this by nesting:

```
round(mean(mtcars$mpg, na.rm = TRUE), 2)
```

```
## [1] 20.09
```

Or, we could use pipes. Grammatically, you can think of a pipe as “then.” I have a variable, the mile per gallon of cars, THEN I want to take the mean of that variable, and THEN I want to round that answer to two decimal places.

```
mtcars$mpg %>%
  mean(na.rm = TRUE) %>%
  round(2)

## [1] 20.09
```

Now, rewrite the following code using pipes.

```
round(sqrt(sum(mtcars$cyl)), 1)

## [1] 14.1

#Your code here
```

## Why use pipes?

1. Cleaner code
  - This is nice, because it helps make your code more readable by others (including your future self).
2. Cleaner environment
  - When you use pipes, you don't have to save objects from intermediary steps in your global environment because you can just pass output from function to function without saving it.
3. Efficiency in writing code
  - Naming objects is hard; piping means coming up with fewer names.
4. More error-proof
  - Because naming is hard, you might accidentally re-use a name and make an error.

## Example data set

- Because you are already familiar with the World Happiness data set, we will use this as an example today (we'll use the same version from Homework 1). You can import the data with the following code:

```
world_happiness <-
rio::import("https://raw.githubusercontent.com/uopsych/psy611/master/labs/resources/lab5/data/world_happiness.csv")
```

## Clean names

- If we look at the names of the variables in world\_happiness, we'll notice that all of the variable names are capitalized.

```
names(world_happiness)

## [1] "Country" "Happiness" "GDP" "Support" "Life"
## [6] "Freedom" "Generosity" "Corruption" "World"
```

- The `clean_names()` function from the `{janitor}` package will (by default) convert all variable names to `snake_case` (but there are several other options...see [here](#) for more info).

```
#install.packages("janitor")
library(janitor)

# clean variable names and re-save the data
world_happiness <- world_happiness %>%
  clean_names()
```

Now all of our variable names are lower case.

```
names(world_happiness)

## [1] "country"    "happiness"  "gdp"        "support"    "life"
## [6] "freedom"    "generosity" "corruption" "world"
```

**Note:** Remember to save your new data frame to an object of the same name as your old data frame if you want to overwrite the old one.

---

## Manipulating rows

### Select rows with `filter()`

- The `filter()` function is used to subset observations based on their values. The result of filtering is a data frame with the same number of columns as before but fewer rows.
- The first argument is data and subsequent arguments are logical expressions that tell you which observations to retain in the data frame.

For example, you can filter rows to choose only rows from the United States.

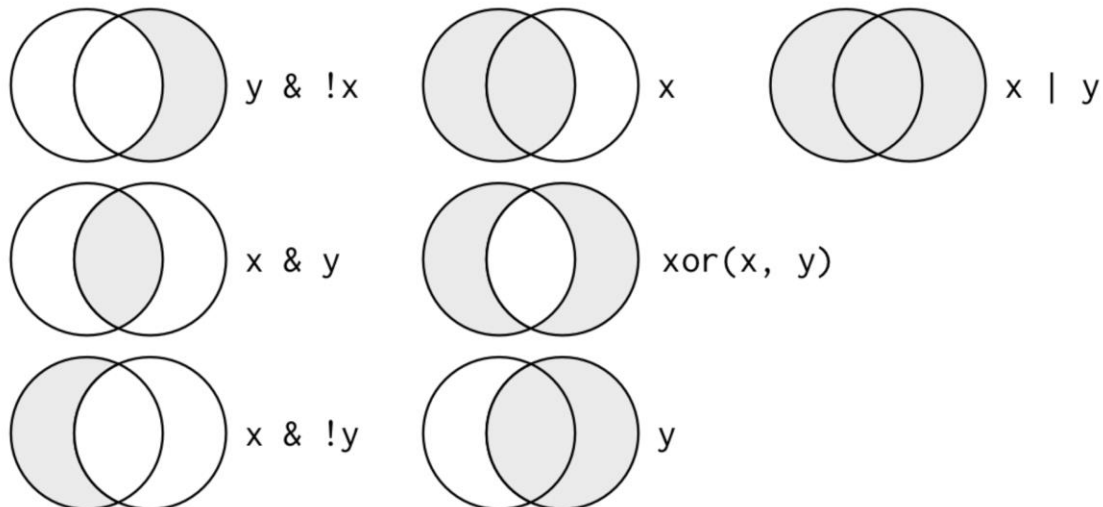
```
world_happiness %>%
  filter(country == "United States")

##      country happiness      gdp  support      life  freedom generosity
## 1 United States  6.863947 10.87796 0.9035711 70.03674 0.8487535  0.201776
##  corruption world
## 1  0.6975426      1
```

### Logical operators

- The `==` we just used is an example of a comparison operator that tests for equality. The other comparison operators available are:
  - `>` (greater than)
  - `>=` (greater than or equal to)
  - `<` (less than)

- `<=` (less than or equal to)
- `!=` (not equal to)
- You can combine multiple arguments to `filter()` with Boolean operators. The figure below from *R for Data Science* shows the complete set of Boolean operators.



- For example, let's select the rows United States, Mexico, and Canada. Since each row is one country, we are telling it to choose the rows where the variable country is either United States, Mexico, or Canada.

```
world_happiness %>%
  filter(country == "United States" |
         country == "Mexico" |
         country == "Canada")

##      country happiness      gdp  support   life  freedom
generosity
## 1      Canada  7.412773 10.664708 0.9390671 71.76053 0.9314690
0.2374864
## 2      Mexico  6.236287  9.707403 0.7606143 67.78441 0.7194660 -
0.1561588
## 3 United States  6.863947 10.877965 0.9035711 70.03674 0.8487535
0.2017760
## corruption world
## 1  0.4271522    1
## 2  0.7079719    4
## 3  0.6975426    1
```

- Since it is somewhat cumbersome to write country three times, we can use a special short-hand with the `%in%` operator. Generally speaking, specifying `x %in% y` will select every row where x is one of the values in y.

So we could have written our filter statement like this:

```
world_happiness %>%
  filter(country %in% c("United States", "Mexico", "Canada"))
```

## Examples

- Filter for countries that are greater than the mean of happiness

```
# your code here
```

- Filter for countries that are greater than the mean of happiness and are considered “second world” countries (world is coded as 2).

```
# your code here
```

## Sort rows with `arrange()`

- The `arrange()` function keeps the same number of rows but changes the *order* of the rows in your data frame.
- The first argument is `data` and subsequent arguments are `name(s)` of columns to order the rows by. If you provide more than one column name, each additional column will be used to break ties in the values of preceding columns.

For example, let's re-order observations by happiness. Note that rows are sorted in ascending order (smallest values first) by default.

```
world_happiness %>%  
  arrange(happiness)
```

```
##           country happiness      gdp  support  life  
freedom  
## 1      Liberia  2.701591  6.739805 0.6376660 51.28914  
0.6714309  
## 2           Yemen  2.982674  7.843260 0.6686835 54.08096  
0.6099808  
## 3           Syria  3.461913          NA 0.4639129 64.83573  
0.4482709  
## 4         Rwanda  3.483109  7.416408 0.6781436 54.64949  
0.9078923  
## 5         Guinea  3.504694  7.037234 0.5788596 50.16096  
0.6659530  
## 6          Haiti  3.569762  7.413352 0.5643197 52.95332  
0.3982955  
## 7    Madagascar  3.592514  7.228697 0.6467165 56.31346  
0.5447536  
## 8          Benin  3.624664  7.598665 0.4343885 50.58654  
0.7333836  
## 9        Tanzania  3.660597  7.831087 0.7902626 56.12052  
0.7586847  
## 10         Niger  3.671454  6.803244 0.7130196 52.82997  
0.7281283  
## 11        Zimbabwe  3.703191  7.430315 0.7358003 50.36258  
0.6671933  
## 12        Botswana  3.761965  9.654463 0.8156561 55.25417  
0.8571689  
## 13          Togo  3.768302  7.241591 0.4785934 51.97361
```

|           |                         |          |          |              |          |  |
|-----------|-------------------------|----------|----------|--------------|----------|--|
| 0.7715772 |                         |          |          |              |          |  |
| ## 14     | Malawi                  | 3.867638 | 6.660712 | 0.4943816    | 54.48933 |  |
| 0.8013907 |                         |          |          |              |          |  |
| ## 15     | Congo (Kinshasa)        | 3.902742 | 6.613966 | 0.7672356    | 50.01415 |  |
| 0.5737638 |                         |          |          |              |          |  |
| ## 16     | Mauritania              | 3.922664 | 8.231690 | 0.8749459    | 53.24210 |  |
| 0.4470866 |                         |          |          |              |          |  |
| ## 17     | Ukraine                 | 3.964543 | 8.895362 | 0.9094397    | 63.52374 |  |
| 0.4305920 |                         |          |          |              |          |  |
| ## 18     | Ghana                   | 3.985916 | 8.277353 | 0.6874486    | 53.54028 |  |
| 0.8520162 |                         |          |          |              |          |  |
| ## 19     | Georgia                 | 4.121941 | 8.902565 | 0.5173716    | 65.30637 |  |
| 0.6399450 |                         |          |          |              |          |  |
| ## 20     | Cambodia                | 4.162165 | 8.094646 | 0.7286103    | 58.16891 |  |
| 0.9563198 |                         |          |          |              |          |  |
| ## 21     | Myanmar                 | 4.223846 |          | NA 0.7520643 | 57.09218 |  |
| 0.8079711 |                         |          |          |              |          |  |
| ## 22     | Chad                    | 4.322675 | 7.695847 | 0.7512522    | 44.87283 |  |
| 0.4743609 |                         |          |          |              |          |  |
| ## 23     | India                   | 4.342079 | 8.659320 | 0.6101333    | 59.07401 |  |
| 0.7772253 |                         |          |          |              |          |  |
| ## 24     | Armenia                 | 4.348320 | 8.968936 | 0.7225510    | 65.30076 |  |
| 0.5510266 |                         |          |          |              |          |  |
| ## 25     | Kenya                   | 4.357618 | 7.970297 | 0.7769231    | 54.14322 |  |
| 0.7929903 |                         |          |          |              |          |  |
| ## 26     | Burkina Faso            | 4.418930 | 7.357180 | 0.7053935    | 50.83040 |  |
| 0.6591027 |                         |          |          |              |          |  |
| ## 27     | Ivory Coast             | 4.445039 | 8.095674 | 0.7039917    | 45.04416 |  |
| 0.7997455 |                         |          |          |              |          |  |
| ## 28     | Iraq                    | 4.493377 | 9.546689 | 0.6844348    | 60.94004 |  |
| 0.5994599 |                         |          |          |              |          |  |
| ## 29     | Ethiopia                | 4.573155 | 7.333114 | 0.6255968    | 55.63552 |  |
| 0.8026426 |                         |          |          |              |          |  |
| ## 30     | Mali                    | 4.582098 | 7.350600 | 0.8301892    | 49.19207 |  |
| 0.6337535 |                         |          |          |              |          |  |
| ## 31     | Albania                 | 4.606651 | 9.251464 | 0.6393561    | 68.43517 |  |
| 0.7038507 |                         |          |          |              |          |  |
| ## 32     | Sri Lanka               | 4.611607 | 9.319309 | 0.8625001    | 64.64014 |  |
| 0.9020748 |                         |          |          |              |          |  |
| ## 33     | Senegal                 | 4.617001 | 7.725880 | 0.7015345    | 57.57685 |  |
| 0.7195333 |                         |          |          |              |          |  |
| ## 34     | Bangladesh              | 4.633474 | 8.050836 | 0.6014683    | 61.72731 |  |
| 0.8147963 |                         |          |          |              |          |  |
| ## 35     | Gabon                   | 4.661013 | 9.845919 | 0.7558620    | 55.68797 |  |
| 0.6713007 |                         |          |          |              |          |  |
| ## 36     | Congo (Brazzaville)     | 4.690830 | 8.685216 | 0.6421362    | 53.51811 |  |
| 0.8501725 |                         |          |          |              |          |  |
| ## 37     | Palestinian Territories | 4.695239 | 8.365737 | 0.7661012    | 62.83750 |  |
| 0.5560409 |                         |          |          |              |          |  |
| ## 38     | Iran                    | 4.749956 | 9.717675 | 0.5724069    | 65.53881 |  |



|           |                        |          |           |              |          |  |
|-----------|------------------------|----------|-----------|--------------|----------|--|
| NA        |                        |          |           |              |          |  |
| ## 39     | Egypt                  | 4.762538 | 9.234282  | 0.7297443    | 61.27411 |  |
| 0.6592615 |                        |          |           |              |          |  |
| ## 40     | Nepal                  | 4.812437 | 7.746914  | 0.7476119    | 60.75210 |  |
| 0.7634472 |                        |          |           |              |          |  |
| ## 41     | Pakistan               | 4.823195 | 8.464853  | 0.5617201    | 57.25552 |  |
| 0.5865462 |                        |          |           |              |          |  |
| ## 42     | Honduras               | 4.845437 | 8.470057  | 0.7723755    | 63.41061 |  |
| 0.5340577 |                        |          |           |              |          |  |
| ## 43     | South Africa           | 4.887326 | 9.428298  | 0.8980963    | 50.14693 |  |
| 0.8624494 |                        |          |           |              |          |  |
| ## 44     | Kyrgyzstan             | 4.905376 | 8.061284  | 0.8565845    | 62.41665 |  |
| 0.8131759 |                        |          |           |              |          |  |
| ## 45     | Sierra Leone           | 4.908618 | 7.374071  | 0.6105937    | 43.74034 |  |
| 0.6242961 |                        |          |           |              |          |  |
| ## 46     | Nigeria                | 4.932915 | 8.644704  | 0.8116477    | 45.24734 |  |
| 0.6804703 |                        |          |           |              |          |  |
| ## 47     | Macedonia              | 4.975590 | 9.446383  | 0.7663682    | 65.56458 |  |
| 0.6603189 |                        |          |           |              |          |  |
| ## 48     | Mongolia               | 4.982720 | 9.346310  | 0.9055244    | 62.64931 |  |
| 0.6855108 |                        |          |           |              |          |  |
| ## 49     | Cameroon               | 5.037965 | 7.986924  | 0.6463125    | 47.95748 |  |
| 0.7914286 |                        |          |           |              |          |  |
| ## 50     | Indonesia              | 5.042800 | 9.247716  | 0.8094781    | 60.31876 |  |
| 0.7794183 |                        |          |           |              |          |  |
| ## 51     | Dominican Republic     | 5.061862 | 9.488247  | 0.8931978    | 63.16206 |  |
| 0.8560253 |                        |          |           |              |          |  |
| ## 52     | Vietnam                | 5.076315 | 8.637988  | 0.8486767    | 66.04872 |  |
| NA        |                        |          |           |              |          |  |
| ## 53     | Kosovo                 | 5.077461 |           | NA 0.8052708 | 62.00486 |  |
| 0.5610483 |                        |          |           |              |          |  |
| ## 54     | Portugal               | 5.080866 | 10.195284 | 0.8662139    | 70.45056 |  |
| 0.8004403 |                        |          |           |              |          |  |
| ## 55     | Bhutan                 | 5.082129 | 8.969653  | 0.8475744    | 60.61641 |  |
| 0.8301015 |                        |          |           |              |          |  |
| ## 56     | Bosnia and Herzegovina | 5.117178 | 9.178364  | 0.6557236    | 67.63831 |  |
| 0.6306980 |                        |          |           |              |          |  |
| ## 57     | Tajikistan             | 5.124211 | 7.869648  | 0.8439325    | 61.64697 |  |
| 0.8465421 |                        |          |           |              |          |  |
| ## 58     | Montenegro             | 5.124921 | 9.616770  | 0.7396305    | 65.11017 |  |
| 0.5833173 |                        |          |           |              |          |  |
| ## 59     | Tunisia                | 5.131612 | 9.292294  | 0.6094700    | 63.35026 |  |
| 0.7113734 |                        |          |           |              |          |  |
| ## 60     | Azerbaijan             | 5.146775 | 9.730904  | 0.7857028    | 61.97585 |  |
| 0.7642895 |                        |          |           |              |          |  |
| ## 61     | Morocco                | 5.160294 | 8.906810  | 0.6537850    | 63.91926 |  |
| 0.6934186 |                        |          |           |              |          |  |
| ## 62     | Lebanon                | 5.171971 | 9.728823  | 0.7417077    | 69.59850 |  |
| 0.5967498 |                        |          |           |              |          |  |
| ## 63     | Croatia                | 5.205438 | 9.919107  | 0.7683634    | 67.59174 |  |

|           |              |          |           |              |          |  |
|-----------|--------------|----------|-----------|--------------|----------|--|
| 0.6935230 |              |          |           |              |          |  |
| ## 64     | China        | 5.303878 | 9.501941  | 0.7937337    | 68.59845 |  |
| NA        |              |          |           |              |          |  |
| ## 65     | Serbia       | 5.317685 | 9.462955  | 0.8162510    | 65.63837 |  |
| 0.5458920 |              |          |           |              |          |  |
| ## 66     | Hungary      | 5.344383 | 10.107333 | 0.8587338    | 66.59668 |  |
| 0.5577214 |              |          |           |              |          |  |
| ## 67     | Somalia      | 5.353645 |           | NA 0.5992811 | 47.28276 |  |
| 0.9678693 |              |          |           |              |          |  |
| ## 68     | Jordan       | 5.404593 | 9.352019  | 0.8304439    | 64.18116 |  |
| 0.7665170 |              |          |           |              |          |  |
| ## 69     | Cyprus       | 5.439161 |           | NA 0.7695561 | 72.48824 |  |
| 0.6280348 |              |          |           |              |          |  |
| ## 70     | Turkey       | 5.514465 | 9.864202  | 0.8512246    | 65.69592 |  |
| 0.6531968 |              |          |           |              |          |  |
| ## 71     | Philippines  | 5.547489 | 8.843670  | 0.8535886    | 59.46133 |  |
| 0.9115336 |              |          |           |              |          |  |
| ## 72     | Paraguay     | 5.559724 | 9.065535  | 0.9141991    | 63.34425 |  |
| 0.8061247 |              |          |           |              |          |  |
| ## 73     | Venezuela    | 5.568800 |           | NA 0.9110869 | 64.58602 |  |
| 0.5121593 |              |          |           |              |          |  |
| ## 74     | Peru         | 5.577263 | 9.358279  | 0.7984183    | 65.03024 |  |
| 0.8022690 |              |          |           |              |          |  |
| ## 75     | Libya        | 5.615405 | 9.555550  | 0.8679877    | 61.16175 |  |
| 0.7745450 |              |          |           |              |          |  |
| ## 76     | Greece       | 5.622519 | 10.093509 | 0.8348247    | 70.67931 |  |
| 0.5317363 |              |          |           |              |          |  |
| ## 77     | Estonia      | 5.628909 | 10.210577 | 0.9179296    | 66.66893 |  |
| 0.8146924 |              |          |           |              |          |  |
| ## 78     | Lithuania    | 5.711378 | 10.185368 | 0.9285235    | 65.67057 |  |
| 0.6414702 |              |          |           |              |          |  |
| ## 79     | Belarus      | 5.718908 | 9.725568  | 0.9240726    | 65.31599 |  |
| 0.6227534 |              |          |           |              |          |  |
| ## 80     | Slovenia     | 5.740642 | 10.269225 | 0.9011638    | 70.51219 |  |
| 0.8960073 |              |          |           |              |          |  |
| ## 81     | Romania      | 5.777491 | 9.896219  | 0.7869673    | 66.41331 |  |
| 0.7958477 |              |          |           |              |          |  |
| ## 82     | South Korea  | 5.780211 | 10.446025 | 0.7683506    | 73.85837 |  |
| 0.6158488 |              |          |           |              |          |  |
| ## 83     | Turkmenistan | 5.791460 | 9.669529  | 0.9601585    | 58.44135 |  |
| 0.7013584 |              |          |           |              |          |  |
| ## 84     | Bolivia      | 5.834329 | 8.778191  | 0.8287058    | 59.73697 |  |
| 0.8836251 |              |          |           |              |          |  |
| ## 85     | North Cyprus | 5.842550 |           | NA 0.7913827 | NA       |  |
| 0.7853528 |              |          |           |              |          |  |
| ## 86     | Italy        | 5.847684 | 10.394681 | 0.9089865    | 72.46586 |  |
| 0.5747657 |              |          |           |              |          |  |
| ## 87     | Japan        | 5.879684 | 10.488579 | 0.9226572    | 74.82469 |  |
| 0.8316942 |              |          |           |              |          |  |
| ## 88     | Latvia       | 5.880598 | 10.037901 | 0.8793724    | 65.33850 |  |

|           |                      |          |           |           |           |          |
|-----------|----------------------|----------|-----------|-----------|-----------|----------|
| 0.6563932 |                      |          |           |           |           |          |
| ## 89     | Nicaragua            | 5.924113 | 8.480531  | 0.8269085 | 65.85806  |          |
| 0.8092592 |                      |          |           |           |           |          |
| ## 90     | Kazakhstan           | 5.949995 | 10.042273 | 0.9313493 | 63.64412  |          |
| 0.7401328 |                      |          |           |           |           |          |
| ## 91     | Ecuador              | 5.964075 | 9.270621  | 0.8558892 | 66.94999  |          |
| 0.8008705 |                      |          |           |           |           |          |
| ## 92     | Uzbekistan           | 5.972364 | 8.630272  | 0.9682252 | 60.53566  |          |
| 0.9799371 |                      |          |           |           |           |          |
| ## 93     | Russia               | 5.995539 | 10.012393 | 0.9243633 | 64.08343  |          |
| 0.6854547 |                      |          |           |           |           |          |
| ## 94     | Poland               | 6.007022 | 10.120240 | 0.8930904 | 66.95756  |          |
| 0.7934622 |                      |          |           |           |           |          |
| ## 95     | Bahrain              | 6.007375 |           | NA        | 0.8525507 | 65.84793 |
| 0.8495212 |                      |          |           |           |           |          |
| ## 96     | Moldova              | 6.017472 | 8.447127  | 0.8399055 | 61.26768  |          |
| 0.5952414 |                      |          |           |           |           |          |
| ## 97     | El Salvador          | 6.018496 | 9.001607  | 0.7907554 | 63.90189  |          |
| 0.7333559 |                      |          |           |           |           |          |
| ## 98     | Kuwait               | 6.146032 |           | NA        | 0.8230178 | 65.09716 |
| 0.8216624 |                      |          |           |           |           |          |
| ## 99     | Slovakia             | 6.162004 | 10.214083 | 0.9434537 | 67.49669  |          |
| 0.5871577 |                      |          |           |           |           |          |
| ## 100    | Thailand             | 6.201763 | 9.637293  | 0.8663245 | 65.64534  |          |
| 0.8849165 |                      |          |           |           |           |          |
| ## 101    | Mexico               | 6.236287 | 9.707403  | 0.7606143 | 67.78441  |          |
| 0.7194660 |                      |          |           |           |           |          |
| ## 102    | Malaysia             | 6.322121 | 10.136704 | 0.8176163 | 64.74024  |          |
| 0.6745945 |                      |          |           |           |           |          |
| ## 103    | Saudi Arabia         | 6.345492 | 10.815763 | 0.8197497 | 63.71784  |          |
| 0.8202072 |                      |          |           |           |           |          |
| ## 104    | France               | 6.357625 | 10.530862 | 0.8957194 | 71.97216  |          |
| 0.8170362 |                      |          |           |           |           |          |
| ## 105    | Qatar                | 6.374529 |           | NA        | NA        | 67.82797 |
| NA        |                      |          |           |           |           |          |
| ## 106    | Spain                | 6.380663 | 10.402864 | 0.9564719 | 73.37998  |          |
| 0.7320005 |                      |          |           |           |           |          |
| ## 107    | Colombia             | 6.387572 | 9.471478  | 0.8899000 | 63.84050  |          |
| 0.7908980 |                      |          |           |           |           |          |
| ## 108    | Taiwan               | 6.450088 |           | NA        | 0.8853889 | 70.75000 |
| 0.7008105 |                      |          |           |           |           |          |
| ## 109    | Guatemala            | 6.464987 | 8.886600  | 0.8228375 | 61.96589  |          |
| 0.8686398 |                      |          |           |           |           |          |
| ## 110    | United Kingdom       | 6.515445 | 10.567661 | 0.9359857 | 71.05131  |          |
| 0.8329261 |                      |          |           |           |           |          |
| ## 111    | Chile                | 6.532750 | 10.009483 | 0.8271419 | 71.57857  |          |
| 0.7688814 |                      |          |           |           |           |          |
| ## 112    | Brazil               | 6.546897 | 9.582796  | 0.9066931 | 64.59515  |          |
| 0.7989353 |                      |          |           |           |           |          |
| ## 113    | United Arab Emirates | 6.568398 |           | NA        | 0.8241367 | 68.35641 |

|           |                |            |           |              |          |  |
|-----------|----------------|------------|-----------|--------------|----------|--|
| 0.9150362 |                |            |           |              |          |  |
| ## 114    | Panama         | 6.605550   | 9.942081  | 0.8826150    | 67.68180 |  |
| 0.8466692 |                |            |           |              |          |  |
| ## 115    | Czech Republic | 6.608017   | 10.308098 | 0.9113626    | 69.60413 |  |
| 0.8084842 |                |            |           |              |          |  |
| ## 116    | Malta          | 6.613394   |           | NA 0.9187649 | 70.77766 |  |
| 0.9121780 |                |            |           |              |          |  |
| ## 117    | Singapore      | 6.619525   |           | NA 0.8664367 | 76.04466 |  |
| 0.8868909 |                |            |           |              |          |  |
| ## 118    | Uruguay        | 6.628080   | 9.917072  | 0.8914935    | 68.11640 |  |
| 0.9168797 |                |            |           |              |          |  |
| ## 119    | Argentina      | 6.697131   |           | NA 0.9264923 | 67.28722 |  |
| 0.8812237 |                |            |           |              |          |  |
| ## 120    | Luxembourg     | 6.701571   | 11.429970 | 0.9336046    | 72.53326 |  |
| 0.9322564 |                |            |           |              |          |  |
| ## 121    | Ireland        | 6.830125   | 10.839026 | 0.9529426    | 71.29931 |  |
| 0.8922769 |                |            |           |              |          |  |
| ## 122    | Costa Rica     | 6.854004   | 9.580832  | 0.8782730    | 69.49661 |  |
| 0.9069257 |                |            |           |              |          |  |
| ## 123    | United States  | 6.863947   | 10.877965 | 0.9035711    | 70.03674 |  |
| 0.8487535 |                |            |           |              |          |  |
| ## 124    | Belgium        | 6.904219   | 10.626178 | 0.8852088    | 71.34201 |  |
| 0.8694749 |                |            |           |              |          |  |
| ## 125    | Germany        | 7.037138   | 10.694968 | 0.9259232    | 71.30358 |  |
| 0.8894289 |                |            |           |              |          |  |
| ## 126    | Austria        | 7.076447   | 10.691354 | 0.9281103    | 70.82256 |  |
| 0.9003052 |                |            |           |              |          |  |
| ## 127    | Israel         | 7.079411   | 10.363305 | 0.8641302    | 72.66603 |  |
| 0.7527840 |                |            |           |              |          |  |
| ## 128    | Sweden         | 7.288922   | 10.712334 | 0.9294600    | 71.74087 |  |
| 0.9350721 |                |            |           |              |          |  |
| ## 129    | Australia      | 7.309061   | 10.680326 | 0.9518616    | 72.56024 |  |
| 0.9218710 |                |            |           |              |          |  |
| ## 130    | Netherlands    | 7.324437   | 10.748624 | 0.8790104    | 71.09193 |  |
| 0.9039788 |                |            |           |              |          |  |
| ## 131    | Canada         | 7.412773   | 10.664708 | 0.9390671    | 71.76053 |  |
| 0.9314690 |                |            |           |              |          |  |
| ## 132    | New Zealand    | 7.418121   | 10.431994 | 0.9873435    | 71.92076 |  |
| 0.9417843 |                |            |           |              |          |  |
| ## 133    | Finland        | 7.447926   | 10.553578 | 0.9478006    | 71.21165 |  |
| 0.9298619 |                |            |           |              |          |  |
| ## 134    | Denmark        | 7.514425   | 10.676427 | 0.9597013    | 70.70427 |  |
| 0.9414364 |                |            |           |              |          |  |
| ## 135    | Switzerland    | 7.572137   | 10.914726 | 0.9383337    | 72.86915 |  |
| 0.9278024 |                |            |           |              |          |  |
| ## 136    | Norway         | 7.603434   | 11.068009 | 0.9468340    | 70.52483 |  |
| 0.9476205 |                |            |           |              |          |  |
| ##        | generosity     | corruption | world     |              |          |  |
| ## 1      | -0.009916847   | 0.90267265 | 3         |              |          |  |
| ## 2      | -0.139901683   | 0.82909757 | 3         |              |          |  |

|       |              |            |            |   |
|-------|--------------|------------|------------|---|
| ## 3  |              | NA         | 0.68523693 | 4 |
| ## 4  | 0.035836529  | 0.09460447 |            | 3 |
| ## 5  | 0.054546587  | 0.76215202 |            | 3 |
| ## 6  | 0.312127113  | 0.77740395 |            | 3 |
| ## 7  | -0.029426256 | 0.86095339 |            | 3 |
| ## 8  | 0.001502594  | 0.85009819 |            | 3 |
| ## 9  | 0.142459080  | 0.90642261 |            | 3 |
| ## 10 | -0.009490362 | 0.70254970 |            | 3 |
| ## 11 | -0.081429422 | 0.81045735 |            | 4 |
| ## 12 | -0.126697809 | 0.86029297 |            | 4 |
| ## 13 | -0.063052811 | 0.73326176 |            | 3 |
| ## 14 | 0.085140154  | 0.83482540 |            | 3 |
| ## 15 | -0.014224946 | 0.86637801 |            | 3 |
| ## 16 | 0.073142350  | 0.71535844 |            | 3 |
| ## 17 | -0.012190276 | 0.95247275 |            | 2 |
| ## 18 | -0.030955523 | 0.94543612 |            | 3 |
| ## 19 | -0.175952777 | 0.50241679 |            | 2 |
| ## 20 | 0.212208703  | 0.82513022 |            | 3 |
| ## 21 |              | NA         | 0.63330519 | 3 |
| ## 22 | -0.041133381 | 0.88863939 |            | 3 |
| ## 23 | -0.016868994 | 0.77643496 |            | 4 |
| ## 24 | -0.186696529 | 0.90146220 |            | 2 |
| ## 25 | 0.238054082  | 0.85254985 |            | 4 |
| ## 26 | 0.020786475  | 0.69272399 |            | 3 |
| ## 27 | -0.035634797 | 0.74424964 |            | 4 |
| ## 28 | -0.016951477 | 0.76216716 |            | 4 |
| ## 29 | 0.125852734  | 0.56702733 |            | 3 |
| ## 30 | -0.042629778 | 0.80004674 |            | 3 |
| ## 31 | -0.082337685 | 0.88479304 |            | 2 |
| ## 32 | 0.310886711  | 0.85947096 |            | 4 |
| ## 33 | -0.092522651 | 0.76549017 |            | 3 |
| ## 34 | -0.059777591 | 0.72060090 |            | 3 |
| ## 35 | -0.224478483 | 0.86677748 |            | 4 |
| ## 36 | -0.143441707 | 0.84135950 |            | 3 |
| ## 37 | -0.150193453 | 0.77430135 |            | 4 |
| ## 38 | 0.141305760  |            | NA         | 4 |
| ## 39 | -0.098499060 | 0.68449807 |            | 4 |
| ## 40 | 0.242998511  | 0.82350838 |            | 3 |
| ## 41 | 0.071716130  | 0.71664119 |            | 4 |
| ## 42 | -0.095861293 | 0.84808272 |            | 4 |
| ## 43 | -0.138439283 | 0.85269475 |            | 4 |
| ## 44 | 0.226265088  | 0.85772502 |            | 2 |
| ## 45 | 0.050585665  | 0.82482803 |            | 3 |
| ## 46 | -0.045139253 | 0.92610925 |            | 4 |
| ## 47 | -0.048491806 | 0.82417899 |            | 2 |
| ## 48 | 0.157298073  | 0.90021819 |            | 4 |
| ## 49 | 0.058221977  | 0.86804903 |            | 4 |
| ## 50 | 0.457429528  | 0.94596726 |            | 4 |
| ## 51 | -0.068872340 | 0.75528818 |            | 4 |
| ## 52 | 0.087306730  |            | NA         | 4 |

|        |              |            |   |
|--------|--------------|------------|---|
| ## 53  | NA           | 0.85064709 | 4 |
| ## 54  | -0.171841606 | 0.94105077 | 1 |
| ## 55  | 0.285040438  | 0.63395578 | 3 |
| ## 56  | -0.046468392 | 0.95985365 | 2 |
| ## 57  | 0.025703574  | 0.74168962 | 2 |
| ## 58  | -0.145327449 | 0.78123259 | 2 |
| ## 59  | -0.240898952 | 0.81482500 | 4 |
| ## 60  | -0.222635135 | 0.61555255 | 2 |
| ## 61  | -0.248565361 | 0.86777443 | 4 |
| ## 62  | 0.054535788  | 0.88895327 | 4 |
| ## 63  | -0.100691713 | 0.84854555 | 2 |
| ## 64  | -0.262474209 | NA         | 4 |
| ## 65  | -0.062717922 | 0.85935801 | 2 |
| ## 66  | -0.208412573 | 0.90753031 | 2 |
| ## 67  | NA           | 0.41023576 | 3 |
| ## 68  | -0.069207847 | NA         | 4 |
| ## 69  | NA           | 0.89279515 | 4 |
| ## 70  | NA           | 0.80607623 | 1 |
| ## 71  | -0.056648508 | 0.75519156 | 4 |
| ## 72  | 0.003749649  | 0.86288828 | 4 |
| ## 73  | NA           | 0.81309682 | 4 |
| ## 74  | -0.100029737 | 0.88373041 | 4 |
| ## 75  | -0.076456018 | NA         | 4 |
| ## 76  | -0.278941423 | 0.82395965 | 1 |
| ## 77  | -0.173507467 | 0.56873447 | 2 |
| ## 78  | -0.262404770 | 0.92417407 | 2 |
| ## 79  | -0.100902960 | 0.66867816 | 2 |
| ## 80  | -0.000629284 | 0.89219791 | 2 |
| ## 81  | -0.145152822 | 0.96165097 | 2 |
| ## 82  | -0.048341293 | 0.84072161 | 1 |
| ## 83  | 0.063167505  | NA         | 2 |
| ## 84  | -0.023433717 | 0.86237395 | 4 |
| ## 85  | NA           | 0.65918028 | 4 |
| ## 86  | -0.070082054 | 0.91275305 | 1 |
| ## 87  | -0.169799194 | 0.65444309 | 1 |
| ## 88  | -0.085272886 | 0.80840039 | 2 |
| ## 89  | 0.081847742  | 0.72799838 | 4 |
| ## 90  | -0.051406134 | 0.71384430 | 2 |
| ## 91  | -0.118297137 | 0.66582751 | 4 |
| ## 92  | 0.373070538  | 0.47091693 | 2 |
| ## 93  | -0.179458767 | 0.91341829 | 2 |
| ## 94  | -0.103777371 | 0.81009632 | 2 |
| ## 95  | NA           | NA         | 4 |
| ## 96  | -0.038925178 | 0.94311881 | 2 |
| ## 97  | -0.166342810 | 0.80454427 | 4 |
| ## 98  | NA           | NA         | 4 |
| ## 99  | -0.142087966 | 0.92754513 | 2 |
| ## 100 | 0.305076480  | 0.91365111 | 4 |
| ## 101 | -0.156158805 | 0.70797193 | 4 |
| ## 102 | 0.201898143  | 0.83789223 | 4 |

```

## 103 -0.070376605      NA      4
## 104 -0.150623634 0.64060205      1
## 105      NA      NA      4
## 106 -0.084349990 0.82166493      1
## 107 -0.107555106 0.84289932      4
## 108      NA 0.85719484      4
## 109 0.050059937 0.82165492      4
## 110 0.288037807 0.45613372      1
## 111 0.026815979 0.81151134      4
## 112 -0.027783971 0.77133906      4
## 113      NA      NA      4
## 114 -0.002205028 0.80994290      4
## 115 -0.152868271 0.88646746      2
## 116      NA 0.66388631      4
## 117      NA 0.09894388      4
## 118 -0.048586730 0.67347568      4
## 119      NA 0.85090619      4
## 120 0.036430217 0.37539047      1
## 121 0.232017383 0.40875691      1
## 122 -0.058310181 0.76141941      4
## 123 0.201775953 0.69754261      1
## 124 0.052451991 0.46878463      1
## 125 0.164857537 0.41216829      1
## 126 0.089088559 0.55747962      1
## 127 0.099938810 0.78942990      1
## 128 0.197725981 0.23196414      1
## 129 0.315701962 0.35655439      1
## 130 0.247195244 0.41182211      1
## 131 0.237486422 0.42715225      1
## 132 0.320652515 0.18588871      1
## 133 0.100564413 0.22336966      4
## 134 0.213263184 0.19101639      1
## 135 0.097075745 0.20953351      1
## 136 0.228181615 0.29881436      1

```

If you want to see the happiest countries first, you need to sort in descending order (largest values first) using the desc function.

```

world_happiness %>%
  arrange(desc(happiness))

```

| ##        | country     | happiness | gdp       | support   | life     |
|-----------|-------------|-----------|-----------|-----------|----------|
| freedom   |             |           |           |           |          |
| ## 1      | Norway      | 7.603434  | 11.068009 | 0.9468340 | 70.52483 |
| 0.9476205 |             |           |           |           |          |
| ## 2      | Switzerland | 7.572137  | 10.914726 | 0.9383337 | 72.86915 |
| 0.9278024 |             |           |           |           |          |
| ## 3      | Denmark     | 7.514425  | 10.676427 | 0.9597013 | 70.70427 |
| 0.9414364 |             |           |           |           |          |
| ## 4      | Finland     | 7.447926  | 10.553578 | 0.9478006 | 71.21165 |

|           |                      |          |           |              |          |  |
|-----------|----------------------|----------|-----------|--------------|----------|--|
| 0.9298619 |                      |          |           |              |          |  |
| ## 5      | New Zealand          | 7.418121 | 10.431994 | 0.9873435    | 71.92076 |  |
| 0.9417843 |                      |          |           |              |          |  |
| ## 6      | Canada               | 7.412773 | 10.664708 | 0.9390671    | 71.76053 |  |
| 0.9314690 |                      |          |           |              |          |  |
| ## 7      | Netherlands          | 7.324437 | 10.748624 | 0.8790104    | 71.09193 |  |
| 0.9039788 |                      |          |           |              |          |  |
| ## 8      | Australia            | 7.309061 | 10.680326 | 0.9518616    | 72.56024 |  |
| 0.9218710 |                      |          |           |              |          |  |
| ## 9      | Sweden               | 7.288922 | 10.712334 | 0.9294600    | 71.74087 |  |
| 0.9350721 |                      |          |           |              |          |  |
| ## 10     | Israel               | 7.079411 | 10.363305 | 0.8641302    | 72.66603 |  |
| 0.7527840 |                      |          |           |              |          |  |
| ## 11     | Austria              | 7.076447 | 10.691354 | 0.9281103    | 70.82256 |  |
| 0.9003052 |                      |          |           |              |          |  |
| ## 12     | Germany              | 7.037138 | 10.694968 | 0.9259232    | 71.30358 |  |
| 0.8894289 |                      |          |           |              |          |  |
| ## 13     | Belgium              | 6.904219 | 10.626178 | 0.8852088    | 71.34201 |  |
| 0.8694749 |                      |          |           |              |          |  |
| ## 14     | United States        | 6.863947 | 10.877965 | 0.9035711    | 70.03674 |  |
| 0.8487535 |                      |          |           |              |          |  |
| ## 15     | Costa Rica           | 6.854004 | 9.580832  | 0.8782730    | 69.49661 |  |
| 0.9069257 |                      |          |           |              |          |  |
| ## 16     | Ireland              | 6.830125 | 10.839026 | 0.9529426    | 71.29931 |  |
| 0.8922769 |                      |          |           |              |          |  |
| ## 17     | Luxembourg           | 6.701571 | 11.429970 | 0.9336046    | 72.53326 |  |
| 0.9322564 |                      |          |           |              |          |  |
| ## 18     | Argentina            | 6.697131 |           | NA 0.9264923 | 67.28722 |  |
| 0.8812237 |                      |          |           |              |          |  |
| ## 19     | Uruguay              | 6.628080 | 9.917072  | 0.8914935    | 68.11640 |  |
| 0.9168797 |                      |          |           |              |          |  |
| ## 20     | Singapore            | 6.619525 |           | NA 0.8664367 | 76.04466 |  |
| 0.8868909 |                      |          |           |              |          |  |
| ## 21     | Malta                | 6.613394 |           | NA 0.9187649 | 70.77766 |  |
| 0.9121780 |                      |          |           |              |          |  |
| ## 22     | Czech Republic       | 6.608017 | 10.308098 | 0.9113626    | 69.60413 |  |
| 0.8084842 |                      |          |           |              |          |  |
| ## 23     | Panama               | 6.605550 | 9.942081  | 0.8826150    | 67.68180 |  |
| 0.8466692 |                      |          |           |              |          |  |
| ## 24     | United Arab Emirates | 6.568398 |           | NA 0.8241367 | 68.35641 |  |
| 0.9150362 |                      |          |           |              |          |  |
| ## 25     | Brazil               | 6.546897 | 9.582796  | 0.9066931    | 64.59515 |  |
| 0.7989353 |                      |          |           |              |          |  |
| ## 26     | Chile                | 6.532750 | 10.009483 | 0.8271419    | 71.57857 |  |
| 0.7688814 |                      |          |           |              |          |  |
| ## 27     | United Kingdom       | 6.515445 | 10.567661 | 0.9359857    | 71.05131 |  |
| 0.8329261 |                      |          |           |              |          |  |
| ## 28     | Guatemala            | 6.464987 | 8.886600  | 0.8228375    | 61.96589 |  |
| 0.8686398 |                      |          |           |              |          |  |
| ## 29     | Taiwan               | 6.450088 |           | NA 0.8853889 | 70.75000 |  |



|           |              |          |           |           |           |          |
|-----------|--------------|----------|-----------|-----------|-----------|----------|
| 0.7008105 |              |          |           |           |           |          |
| ## 30     | Colombia     | 6.387572 | 9.471478  | 0.8899000 | 63.84050  |          |
| 0.7908980 |              |          |           |           |           |          |
| ## 31     | Spain        | 6.380663 | 10.402864 | 0.9564719 | 73.37998  |          |
| 0.7320005 |              |          |           |           |           |          |
| ## 32     | Qatar        | 6.374529 |           | NA        | NA        | 67.82797 |
| NA        |              |          |           |           |           |          |
| ## 33     | France       | 6.357625 | 10.530862 | 0.8957194 | 71.97216  |          |
| 0.8170362 |              |          |           |           |           |          |
| ## 34     | Saudi Arabia | 6.345492 | 10.815763 | 0.8197497 | 63.71784  |          |
| 0.8202072 |              |          |           |           |           |          |
| ## 35     | Malaysia     | 6.322121 | 10.136704 | 0.8176163 | 64.74024  |          |
| 0.6745945 |              |          |           |           |           |          |
| ## 36     | Mexico       | 6.236287 | 9.707403  | 0.7606143 | 67.78441  |          |
| 0.7194660 |              |          |           |           |           |          |
| ## 37     | Thailand     | 6.201763 | 9.637293  | 0.8663245 | 65.64534  |          |
| 0.8849165 |              |          |           |           |           |          |
| ## 38     | Slovakia     | 6.162004 | 10.214083 | 0.9434537 | 67.49669  |          |
| 0.5871577 |              |          |           |           |           |          |
| ## 39     | Kuwait       | 6.146032 |           | NA        | 0.8230178 | 65.09716 |
| 0.8216624 |              |          |           |           |           |          |
| ## 40     | El Salvador  | 6.018496 | 9.001607  | 0.7907554 | 63.90189  |          |
| 0.7333559 |              |          |           |           |           |          |
| ## 41     | Moldova      | 6.017472 | 8.447127  | 0.8399055 | 61.26768  |          |
| 0.5952414 |              |          |           |           |           |          |
| ## 42     | Bahrain      | 6.007375 |           | NA        | 0.8525507 | 65.84793 |
| 0.8495212 |              |          |           |           |           |          |
| ## 43     | Poland       | 6.007022 | 10.120240 | 0.8930904 | 66.95756  |          |
| 0.7934622 |              |          |           |           |           |          |
| ## 44     | Russia       | 5.995539 | 10.012393 | 0.9243633 | 64.08343  |          |
| 0.6854547 |              |          |           |           |           |          |
| ## 45     | Uzbekistan   | 5.972364 | 8.630272  | 0.9682252 | 60.53566  |          |
| 0.9799371 |              |          |           |           |           |          |
| ## 46     | Ecuador      | 5.964075 | 9.270621  | 0.8558892 | 66.94999  |          |
| 0.8008705 |              |          |           |           |           |          |
| ## 47     | Kazakhstan   | 5.949995 | 10.042273 | 0.9313493 | 63.64412  |          |
| 0.7401328 |              |          |           |           |           |          |
| ## 48     | Nicaragua    | 5.924113 | 8.480531  | 0.8269085 | 65.85806  |          |
| 0.8092592 |              |          |           |           |           |          |
| ## 49     | Latvia       | 5.880598 | 10.037901 | 0.8793724 | 65.33850  |          |
| 0.6563932 |              |          |           |           |           |          |
| ## 50     | Japan        | 5.879684 | 10.488579 | 0.9226572 | 74.82469  |          |
| 0.8316942 |              |          |           |           |           |          |
| ## 51     | Italy        | 5.847684 | 10.394681 | 0.9089865 | 72.46586  |          |
| 0.5747657 |              |          |           |           |           |          |
| ## 52     | North Cyprus | 5.842550 |           | NA        | 0.7913827 | NA       |
| 0.7853528 |              |          |           |           |           |          |
| ## 53     | Bolivia      | 5.834329 | 8.778191  | 0.8287058 | 59.73697  |          |
| 0.8836251 |              |          |           |           |           |          |
| ## 54     | Turkmenistan | 5.791460 | 9.669529  | 0.9601585 | 58.44135  |          |

|           |             |          |           |              |          |  |
|-----------|-------------|----------|-----------|--------------|----------|--|
| 0.7013584 |             |          |           |              |          |  |
| ## 55     | South Korea | 5.780211 | 10.446025 | 0.7683506    | 73.85837 |  |
| 0.6158488 |             |          |           |              |          |  |
| ## 56     | Romania     | 5.777491 | 9.896219  | 0.7869673    | 66.41331 |  |
| 0.7958477 |             |          |           |              |          |  |
| ## 57     | Slovenia    | 5.740642 | 10.269225 | 0.9011638    | 70.51219 |  |
| 0.8960073 |             |          |           |              |          |  |
| ## 58     | Belarus     | 5.718908 | 9.725568  | 0.9240726    | 65.31599 |  |
| 0.6227534 |             |          |           |              |          |  |
| ## 59     | Lithuania   | 5.711378 | 10.185368 | 0.9285235    | 65.67057 |  |
| 0.6414702 |             |          |           |              |          |  |
| ## 60     | Estonia     | 5.628909 | 10.210577 | 0.9179296    | 66.66893 |  |
| 0.8146924 |             |          |           |              |          |  |
| ## 61     | Greece      | 5.622519 | 10.093509 | 0.8348247    | 70.67931 |  |
| 0.5317363 |             |          |           |              |          |  |
| ## 62     | Libya       | 5.615405 | 9.555550  | 0.8679877    | 61.16175 |  |
| 0.7745450 |             |          |           |              |          |  |
| ## 63     | Peru        | 5.577263 | 9.358279  | 0.7984183    | 65.03024 |  |
| 0.8022690 |             |          |           |              |          |  |
| ## 64     | Venezuela   | 5.568800 |           | NA 0.9110869 | 64.58602 |  |
| 0.5121593 |             |          |           |              |          |  |
| ## 65     | Paraguay    | 5.559724 | 9.065535  | 0.9141991    | 63.34425 |  |
| 0.8061247 |             |          |           |              |          |  |
| ## 66     | Philippines | 5.547489 | 8.843670  | 0.8535886    | 59.46133 |  |
| 0.9115336 |             |          |           |              |          |  |
| ## 67     | Turkey      | 5.514465 | 9.864202  | 0.8512246    | 65.69592 |  |
| 0.6531968 |             |          |           |              |          |  |
| ## 68     | Cyprus      | 5.439161 |           | NA 0.7695561 | 72.48824 |  |
| 0.6280348 |             |          |           |              |          |  |
| ## 69     | Jordan      | 5.404593 | 9.352019  | 0.8304439    | 64.18116 |  |
| 0.7665170 |             |          |           |              |          |  |
| ## 70     | Somalia     | 5.353645 |           | NA 0.5992811 | 47.28276 |  |
| 0.9678693 |             |          |           |              |          |  |
| ## 71     | Hungary     | 5.344383 | 10.107333 | 0.8587338    | 66.59668 |  |
| 0.5577214 |             |          |           |              |          |  |
| ## 72     | Serbia      | 5.317685 | 9.462955  | 0.8162510    | 65.63837 |  |
| 0.5458920 |             |          |           |              |          |  |
| ## 73     | China       | 5.303878 | 9.501941  | 0.7937337    | 68.59845 |  |
| NA        |             |          |           |              |          |  |
| ## 74     | Croatia     | 5.205438 | 9.919107  | 0.7683634    | 67.59174 |  |
| 0.6935230 |             |          |           |              |          |  |
| ## 75     | Lebanon     | 5.171971 | 9.728823  | 0.7417077    | 69.59850 |  |
| 0.5967498 |             |          |           |              |          |  |
| ## 76     | Morocco     | 5.160294 | 8.906810  | 0.6537850    | 63.91926 |  |
| 0.6934186 |             |          |           |              |          |  |
| ## 77     | Azerbaijan  | 5.146775 | 9.730904  | 0.7857028    | 61.97585 |  |
| 0.7642895 |             |          |           |              |          |  |
| ## 78     | Tunisia     | 5.131612 | 9.292294  | 0.6094700    | 63.35026 |  |
| 0.7113734 |             |          |           |              |          |  |
| ## 79     | Montenegro  | 5.124921 | 9.616770  | 0.7396305    | 65.11017 |  |

|           |                         |          |           |              |          |  |
|-----------|-------------------------|----------|-----------|--------------|----------|--|
| 0.5833173 |                         |          |           |              |          |  |
| ## 80     | Tajikistan              | 5.124211 | 7.869648  | 0.8439325    | 61.64697 |  |
| 0.8465421 |                         |          |           |              |          |  |
| ## 81     | Bosnia and Herzegovina  | 5.117178 | 9.178364  | 0.6557236    | 67.63831 |  |
| 0.6306980 |                         |          |           |              |          |  |
| ## 82     | Bhutan                  | 5.082129 | 8.969653  | 0.8475744    | 60.61641 |  |
| 0.8301015 |                         |          |           |              |          |  |
| ## 83     | Portugal                | 5.080866 | 10.195284 | 0.8662139    | 70.45056 |  |
| 0.8004403 |                         |          |           |              |          |  |
| ## 84     | Kosovo                  | 5.077461 |           | NA 0.8052708 | 62.00486 |  |
| 0.5610483 |                         |          |           |              |          |  |
| ## 85     | Vietnam                 | 5.076315 | 8.637988  | 0.8486767    | 66.04872 |  |
| NA        |                         |          |           |              |          |  |
| ## 86     | Dominican Republic      | 5.061862 | 9.488247  | 0.8931978    | 63.16206 |  |
| 0.8560253 |                         |          |           |              |          |  |
| ## 87     | Indonesia               | 5.042800 | 9.247716  | 0.8094781    | 60.31876 |  |
| 0.7794183 |                         |          |           |              |          |  |
| ## 88     | Cameroon                | 5.037965 | 7.986924  | 0.6463125    | 47.95748 |  |
| 0.7914286 |                         |          |           |              |          |  |
| ## 89     | Mongolia                | 4.982720 | 9.346310  | 0.9055244    | 62.64931 |  |
| 0.6855108 |                         |          |           |              |          |  |
| ## 90     | Macedonia               | 4.975590 | 9.446383  | 0.7663682    | 65.56458 |  |
| 0.6603189 |                         |          |           |              |          |  |
| ## 91     | Nigeria                 | 4.932915 | 8.644704  | 0.8116477    | 45.24734 |  |
| 0.6804703 |                         |          |           |              |          |  |
| ## 92     | Sierra Leone            | 4.908618 | 7.374071  | 0.6105937    | 43.74034 |  |
| 0.6242961 |                         |          |           |              |          |  |
| ## 93     | Kyrgyzstan              | 4.905376 | 8.061284  | 0.8565845    | 62.41665 |  |
| 0.8131759 |                         |          |           |              |          |  |
| ## 94     | South Africa            | 4.887326 | 9.428298  | 0.8980963    | 50.14693 |  |
| 0.8624494 |                         |          |           |              |          |  |
| ## 95     | Honduras                | 4.845437 | 8.470057  | 0.7723755    | 63.41061 |  |
| 0.5340577 |                         |          |           |              |          |  |
| ## 96     | Pakistan                | 4.823195 | 8.464853  | 0.5617201    | 57.25552 |  |
| 0.5865462 |                         |          |           |              |          |  |
| ## 97     | Nepal                   | 4.812437 | 7.746914  | 0.7476119    | 60.75210 |  |
| 0.7634472 |                         |          |           |              |          |  |
| ## 98     | Egypt                   | 4.762538 | 9.234282  | 0.7297443    | 61.27411 |  |
| 0.6592615 |                         |          |           |              |          |  |
| ## 99     | Iran                    | 4.749956 | 9.717675  | 0.5724069    | 65.53881 |  |
| NA        |                         |          |           |              |          |  |
| ## 100    | Palestinian Territories | 4.695239 | 8.365737  | 0.7661012    | 62.83750 |  |
| 0.5560409 |                         |          |           |              |          |  |
| ## 101    | Congo (Brazzaville)     | 4.690830 | 8.685216  | 0.6421362    | 53.51811 |  |
| 0.8501725 |                         |          |           |              |          |  |
| ## 102    | Gabon                   | 4.661013 | 9.845919  | 0.7558620    | 55.68797 |  |
| 0.6713007 |                         |          |           |              |          |  |
| ## 103    | Bangladesh              | 4.633474 | 8.050836  | 0.6014683    | 61.72731 |  |
| 0.8147963 |                         |          |           |              |          |  |
| ## 104    | Senegal                 | 4.617001 | 7.725880  | 0.7015345    | 57.57685 |  |

|           |                  |          |          |           |           |          |
|-----------|------------------|----------|----------|-----------|-----------|----------|
| 0.7195333 |                  |          |          |           |           |          |
| ## 105    | Sri Lanka        | 4.611607 | 9.319309 | 0.8625001 | 64.64014  |          |
| 0.9020748 |                  |          |          |           |           |          |
| ## 106    | Albania          | 4.606651 | 9.251464 | 0.6393561 | 68.43517  |          |
| 0.7038507 |                  |          |          |           |           |          |
| ## 107    | Mali             | 4.582098 | 7.350600 | 0.8301892 | 49.19207  |          |
| 0.6337535 |                  |          |          |           |           |          |
| ## 108    | Ethiopia         | 4.573155 | 7.333114 | 0.6255968 | 55.63552  |          |
| 0.8026426 |                  |          |          |           |           |          |
| ## 109    | Iraq             | 4.493377 | 9.546689 | 0.6844348 | 60.94004  |          |
| 0.5994599 |                  |          |          |           |           |          |
| ## 110    | Ivory Coast      | 4.445039 | 8.095674 | 0.7039917 | 45.04416  |          |
| 0.7997455 |                  |          |          |           |           |          |
| ## 111    | Burkina Faso     | 4.418930 | 7.357180 | 0.7053935 | 50.83040  |          |
| 0.6591027 |                  |          |          |           |           |          |
| ## 112    | Kenya            | 4.357618 | 7.970297 | 0.7769231 | 54.14322  |          |
| 0.7929903 |                  |          |          |           |           |          |
| ## 113    | Armenia          | 4.348320 | 8.968936 | 0.7225510 | 65.30076  |          |
| 0.5510266 |                  |          |          |           |           |          |
| ## 114    | India            | 4.342079 | 8.659320 | 0.6101333 | 59.07401  |          |
| 0.7772253 |                  |          |          |           |           |          |
| ## 115    | Chad             | 4.322675 | 7.695847 | 0.7512522 | 44.87283  |          |
| 0.4743609 |                  |          |          |           |           |          |
| ## 116    | Myanmar          | 4.223846 |          | NA        | 0.7520643 | 57.09218 |
| 0.8079711 |                  |          |          |           |           |          |
| ## 117    | Cambodia         | 4.162165 | 8.094646 | 0.7286103 | 58.16891  |          |
| 0.9563198 |                  |          |          |           |           |          |
| ## 118    | Georgia          | 4.121941 | 8.902565 | 0.5173716 | 65.30637  |          |
| 0.6399450 |                  |          |          |           |           |          |
| ## 119    | Ghana            | 3.985916 | 8.277353 | 0.6874486 | 53.54028  |          |
| 0.8520162 |                  |          |          |           |           |          |
| ## 120    | Ukraine          | 3.964543 | 8.895362 | 0.9094397 | 63.52374  |          |
| 0.4305920 |                  |          |          |           |           |          |
| ## 121    | Mauritania       | 3.922664 | 8.231690 | 0.8749459 | 53.24210  |          |
| 0.4470866 |                  |          |          |           |           |          |
| ## 122    | Congo (Kinshasa) | 3.902742 | 6.613966 | 0.7672356 | 50.01415  |          |
| 0.5737638 |                  |          |          |           |           |          |
| ## 123    | Malawi           | 3.867638 | 6.660712 | 0.4943816 | 54.48933  |          |
| 0.8013907 |                  |          |          |           |           |          |
| ## 124    | Togo             | 3.768302 | 7.241591 | 0.4785934 | 51.97361  |          |
| 0.7715772 |                  |          |          |           |           |          |
| ## 125    | Botswana         | 3.761965 | 9.654463 | 0.8156561 | 55.25417  |          |
| 0.8571689 |                  |          |          |           |           |          |
| ## 126    | Zimbabwe         | 3.703191 | 7.430315 | 0.7358003 | 50.36258  |          |
| 0.6671933 |                  |          |          |           |           |          |
| ## 127    | Niger            | 3.671454 | 6.803244 | 0.7130196 | 52.82997  |          |
| 0.7281283 |                  |          |          |           |           |          |
| ## 128    | Tanzania         | 3.660597 | 7.831087 | 0.7902626 | 56.12052  |          |
| 0.7586847 |                  |          |          |           |           |          |
| ## 129    | Benin            | 3.624664 | 7.598665 | 0.4343885 | 50.58654  |          |

|           |            |          |          |              |          |  |
|-----------|------------|----------|----------|--------------|----------|--|
| 0.7333836 |            |          |          |              |          |  |
| ## 130    | Madagascar | 3.592514 | 7.228697 | 0.6467165    | 56.31346 |  |
| 0.5447536 |            |          |          |              |          |  |
| ## 131    | Haiti      | 3.569762 | 7.413352 | 0.5643197    | 52.95332 |  |
| 0.3982955 |            |          |          |              |          |  |
| ## 132    | Guinea     | 3.504694 | 7.037234 | 0.5788596    | 50.16096 |  |
| 0.6659530 |            |          |          |              |          |  |
| ## 133    | Rwanda     | 3.483109 | 7.416408 | 0.6781436    | 54.64949 |  |
| 0.9078923 |            |          |          |              |          |  |
| ## 134    | Syria      | 3.461913 |          | NA 0.4639129 | 64.83573 |  |
| 0.4482709 |            |          |          |              |          |  |
| ## 135    | Yemen      | 2.982674 | 7.843260 | 0.6686835    | 54.08096 |  |
| 0.6099808 |            |          |          |              |          |  |
| ## 136    | Liberia    | 2.701591 | 6.739805 | 0.6376660    | 51.28914 |  |
| 0.6714309 |            |          |          |              |          |  |

| ##    | generosity   | corruption    | world |
|-------|--------------|---------------|-------|
| ## 1  | 0.228181615  | 0.29881436    | 1     |
| ## 2  | 0.097075745  | 0.20953351    | 1     |
| ## 3  | 0.213263184  | 0.19101639    | 1     |
| ## 4  | 0.100564413  | 0.22336966    | 4     |
| ## 5  | 0.320652515  | 0.18588871    | 1     |
| ## 6  | 0.237486422  | 0.42715225    | 1     |
| ## 7  | 0.247195244  | 0.41182211    | 1     |
| ## 8  | 0.315701962  | 0.35655439    | 1     |
| ## 9  | 0.197725981  | 0.23196414    | 1     |
| ## 10 | 0.099938810  | 0.78942990    | 1     |
| ## 11 | 0.089088559  | 0.55747962    | 1     |
| ## 12 | 0.164857537  | 0.41216829    | 1     |
| ## 13 | 0.052451991  | 0.46878463    | 1     |
| ## 14 | 0.201775953  | 0.69754261    | 1     |
| ## 15 | -0.058310181 | 0.76141941    | 4     |
| ## 16 | 0.232017383  | 0.40875691    | 1     |
| ## 17 | 0.036430217  | 0.37539047    | 1     |
| ## 18 |              | NA 0.85090619 | 4     |
| ## 19 | -0.048586730 | 0.67347568    | 4     |
| ## 20 |              | NA 0.09894388 | 4     |
| ## 21 |              | NA 0.66388631 | 4     |
| ## 22 | -0.152868271 | 0.88646746    | 2     |
| ## 23 | -0.002205028 | 0.80994290    | 4     |
| ## 24 |              | NA NA         | 4     |
| ## 25 | -0.027783971 | 0.77133906    | 4     |
| ## 26 | 0.026815979  | 0.81151134    | 4     |
| ## 27 | 0.288037807  | 0.45613372    | 1     |
| ## 28 | 0.050059937  | 0.82165492    | 4     |
| ## 29 |              | NA 0.85719484 | 4     |
| ## 30 | -0.107555106 | 0.84289932    | 4     |
| ## 31 | -0.084349990 | 0.82166493    | 1     |
| ## 32 |              | NA NA         | 4     |
| ## 33 | -0.150623634 | 0.64060205    | 1     |
| ## 34 | -0.070376605 |               | NA 4  |

|       |              |            |   |
|-------|--------------|------------|---|
| ## 35 | 0.201898143  | 0.83789223 | 4 |
| ## 36 | -0.156158805 | 0.70797193 | 4 |
| ## 37 | 0.305076480  | 0.91365111 | 4 |
| ## 38 | -0.142087966 | 0.92754513 | 2 |
| ## 39 | NA           | NA         | 4 |
| ## 40 | -0.166342810 | 0.80454427 | 4 |
| ## 41 | -0.038925178 | 0.94311881 | 2 |
| ## 42 | NA           | NA         | 4 |
| ## 43 | -0.103777371 | 0.81009632 | 2 |
| ## 44 | -0.179458767 | 0.91341829 | 2 |
| ## 45 | 0.373070538  | 0.47091693 | 2 |
| ## 46 | -0.118297137 | 0.66582751 | 4 |
| ## 47 | -0.051406134 | 0.71384430 | 2 |
| ## 48 | 0.081847742  | 0.72799838 | 4 |
| ## 49 | -0.085272886 | 0.80840039 | 2 |
| ## 50 | -0.169799194 | 0.65444309 | 1 |
| ## 51 | -0.070082054 | 0.91275305 | 1 |
| ## 52 | NA           | 0.65918028 | 4 |
| ## 53 | -0.023433717 | 0.86237395 | 4 |
| ## 54 | 0.063167505  | NA         | 2 |
| ## 55 | -0.048341293 | 0.84072161 | 1 |
| ## 56 | -0.145152822 | 0.96165097 | 2 |
| ## 57 | -0.000629284 | 0.89219791 | 2 |
| ## 58 | -0.100902960 | 0.66867816 | 2 |
| ## 59 | -0.262404770 | 0.92417407 | 2 |
| ## 60 | -0.173507467 | 0.56873447 | 2 |
| ## 61 | -0.278941423 | 0.82395965 | 1 |
| ## 62 | -0.076456018 | NA         | 4 |
| ## 63 | -0.100029737 | 0.88373041 | 4 |
| ## 64 | NA           | 0.81309682 | 4 |
| ## 65 | 0.003749649  | 0.86288828 | 4 |
| ## 66 | -0.056648508 | 0.75519156 | 4 |
| ## 67 | NA           | 0.80607623 | 1 |
| ## 68 | NA           | 0.89279515 | 4 |
| ## 69 | -0.069207847 | NA         | 4 |
| ## 70 | NA           | 0.41023576 | 3 |
| ## 71 | -0.208412573 | 0.90753031 | 2 |
| ## 72 | -0.062717922 | 0.85935801 | 2 |
| ## 73 | -0.262474209 | NA         | 4 |
| ## 74 | -0.100691713 | 0.84854555 | 2 |
| ## 75 | 0.054535788  | 0.88895327 | 4 |
| ## 76 | -0.248565361 | 0.86777443 | 4 |
| ## 77 | -0.222635135 | 0.61555255 | 2 |
| ## 78 | -0.240898952 | 0.81482500 | 4 |
| ## 79 | -0.145327449 | 0.78123259 | 2 |
| ## 80 | 0.025703574  | 0.74168962 | 2 |
| ## 81 | -0.046468392 | 0.95985365 | 2 |
| ## 82 | 0.285040438  | 0.63395578 | 3 |
| ## 83 | -0.171841606 | 0.94105077 | 1 |
| ## 84 | NA           | 0.85064709 | 4 |

|        |              |            |   |
|--------|--------------|------------|---|
| ## 85  | 0.087306730  | NA         | 4 |
| ## 86  | -0.068872340 | 0.75528818 | 4 |
| ## 87  | 0.457429528  | 0.94596726 | 4 |
| ## 88  | 0.058221977  | 0.86804903 | 4 |
| ## 89  | 0.157298073  | 0.90021819 | 4 |
| ## 90  | -0.048491806 | 0.82417899 | 2 |
| ## 91  | -0.045139253 | 0.92610925 | 4 |
| ## 92  | 0.050585665  | 0.82482803 | 3 |
| ## 93  | 0.226265088  | 0.85772502 | 2 |
| ## 94  | -0.138439283 | 0.85269475 | 4 |
| ## 95  | -0.095861293 | 0.84808272 | 4 |
| ## 96  | 0.071716130  | 0.71664119 | 4 |
| ## 97  | 0.242998511  | 0.82350838 | 3 |
| ## 98  | -0.098499060 | 0.68449807 | 4 |
| ## 99  | 0.141305760  | NA         | 4 |
| ## 100 | -0.150193453 | 0.77430135 | 4 |
| ## 101 | -0.143441707 | 0.84135950 | 3 |
| ## 102 | -0.224478483 | 0.86677748 | 4 |
| ## 103 | -0.059777591 | 0.72060090 | 3 |
| ## 104 | -0.092522651 | 0.76549017 | 3 |
| ## 105 | 0.310886711  | 0.85947096 | 4 |
| ## 106 | -0.082337685 | 0.88479304 | 2 |
| ## 107 | -0.042629778 | 0.80004674 | 3 |
| ## 108 | 0.125852734  | 0.56702733 | 3 |
| ## 109 | -0.016951477 | 0.76216716 | 4 |
| ## 110 | -0.035634797 | 0.74424964 | 4 |
| ## 111 | 0.020786475  | 0.69272399 | 3 |
| ## 112 | 0.238054082  | 0.85254985 | 4 |
| ## 113 | -0.186696529 | 0.90146220 | 2 |
| ## 114 | -0.016868994 | 0.77643496 | 4 |
| ## 115 | -0.041133381 | 0.88863939 | 3 |
| ## 116 | NA           | 0.63330519 | 3 |
| ## 117 | 0.212208703  | 0.82513022 | 3 |
| ## 118 | -0.175952777 | 0.50241679 | 2 |
| ## 119 | -0.030955523 | 0.94543612 | 3 |
| ## 120 | -0.012190276 | 0.95247275 | 2 |
| ## 121 | 0.073142350  | 0.71535844 | 3 |
| ## 122 | -0.014224946 | 0.86637801 | 3 |
| ## 123 | 0.085140154  | 0.83482540 | 3 |
| ## 124 | -0.063052811 | 0.73326176 | 3 |
| ## 125 | -0.126697809 | 0.86029297 | 4 |
| ## 126 | -0.081429422 | 0.81045735 | 4 |
| ## 127 | -0.009490362 | 0.70254970 | 3 |
| ## 128 | 0.142459080  | 0.90642261 | 3 |
| ## 129 | 0.001502594  | 0.85009819 | 3 |
| ## 130 | -0.029426256 | 0.86095339 | 3 |
| ## 131 | 0.312127113  | 0.77740395 | 3 |
| ## 132 | 0.054546587  | 0.76215202 | 3 |
| ## 133 | 0.035836529  | 0.09460447 | 3 |
| ## 134 | NA           | 0.68523693 | 4 |

```
## 135 -0.139901683 0.82909757 3
## 136 -0.009916847 0.90267265 3
```

---

## Manipulating variables

### Extract columns with `select()`

- The `select()` function subsets columns in your data frame. This is particularly useful when you have a data set with a huge number of variables and you want to narrow down to the variables that are relevant for your analysis.
- The first argument is `data`, followed by the name(s) of the column(s) you want to subset. Let's go through some simple examples of common uses of `select()`.
- Select one variable

```
world_happiness %>%
  select(country)

##           country
## 1         Albania
## 2         Argentina
## 3           Armenia
## 4         Australia
## 5           Austria
## 6         Azerbaijan
## 7           Bahrain
## 8         Bangladesh
## 9           Belarus
## 10          Belgium
## 11           Benin
## 12           Bhutan
## 13          Bolivia
## 14 Bosnia and Herzegovina
## 15          Botswana
## 16           Brazil
## 17         Burkina Faso
## 18          Cambodia
## 19          Cameroon
## 20           Canada
## 21           Chad
## 22           Chile
## 23           China
## 24          Colombia
## 25 Congo (Brazzaville)
## 26 Congo (Kinshasa)
## 27          Costa Rica
## 28          Croatia
```



## 29 Cyprus  
## 30 Czech Republic  
## 31 Denmark  
## 32 Dominican Republic  
## 33 Ecuador  
## 34 Egypt  
## 35 El Salvador  
## 36 Estonia  
## 37 Ethiopia  
## 38 Finland  
## 39 France  
## 40 Gabon  
## 41 Georgia  
## 42 Germany  
## 43 Ghana  
## 44 Greece  
## 45 Guatemala  
## 46 Guinea  
## 47 Haiti  
## 48 Honduras  
## 49 Hungary  
## 50 India  
## 51 Indonesia  
## 52 Iran  
## 53 Iraq  
## 54 Ireland  
## 55 Israel  
## 56 Italy  
## 57 Ivory Coast  
## 58 Japan  
## 59 Jordan  
## 60 Kazakhstan  
## 61 Kenya  
## 62 Kosovo  
## 63 Kuwait  
## 64 Kyrgyzstan  
## 65 Latvia  
## 66 Lebanon  
## 67 Liberia  
## 68 Libya  
## 69 Lithuania  
## 70 Luxembourg  
## 71 Macedonia  
## 72 Madagascar  
## 73 Malawi  
## 74 Malaysia  
## 75 Mali  
## 76 Malta  
## 77 Mauritania  
## 78 Mexico

|        |                         |
|--------|-------------------------|
| ## 79  | Moldova                 |
| ## 80  | Mongolia                |
| ## 81  | Montenegro              |
| ## 82  | Morocco                 |
| ## 83  | Myanmar                 |
| ## 84  | Nepal                   |
| ## 85  | Netherlands             |
| ## 86  | New Zealand             |
| ## 87  | Nicaragua               |
| ## 88  | Niger                   |
| ## 89  | Nigeria                 |
| ## 90  | North Cyprus            |
| ## 91  | Norway                  |
| ## 92  | Pakistan                |
| ## 93  | Palestinian Territories |
| ## 94  | Panama                  |
| ## 95  | Paraguay                |
| ## 96  | Peru                    |
| ## 97  | Philippines             |
| ## 98  | Poland                  |
| ## 99  | Portugal                |
| ## 100 | Qatar                   |
| ## 101 | Romania                 |
| ## 102 | Russia                  |
| ## 103 | Rwanda                  |
| ## 104 | Saudi Arabia            |
| ## 105 | Senegal                 |
| ## 106 | Serbia                  |
| ## 107 | Sierra Leone            |
| ## 108 | Singapore               |
| ## 109 | Slovakia                |
| ## 110 | Slovenia                |
| ## 111 | Somalia                 |
| ## 112 | South Africa            |
| ## 113 | South Korea             |
| ## 114 | Spain                   |
| ## 115 | Sri Lanka               |
| ## 116 | Sweden                  |
| ## 117 | Switzerland             |
| ## 118 | Syria                   |
| ## 119 | Taiwan                  |
| ## 120 | Tajikistan              |
| ## 121 | Tanzania                |
| ## 122 | Thailand                |
| ## 123 | Togo                    |
| ## 124 | Tunisia                 |
| ## 125 | Turkey                  |
| ## 126 | Turkmenistan            |
| ## 127 | Ukraine                 |
| ## 128 | United Arab Emirates    |

```
## 129      United Kingdom
## 130      United States
## 131      Uruguay
## 132      Uzbekistan
## 133      Venezuela
## 134      Vietnam
## 135      Yemen
## 136      Zimbabwe
```

- Select multiple variables

```
world_happiness %>%
```

```
  select(country, freedom, corruption)
```

```
##      country  freedom corruption
## 1      Albania 0.7038507 0.88479304
## 2      Argentina 0.8812237 0.85090619
## 3      Armenia 0.5510266 0.90146220
## 4      Australia 0.9218710 0.35655439
## 5      Austria 0.9003052 0.55747962
## 6      Azerbaijan 0.7642895 0.61555255
## 7      Bahrain 0.8495212      NA
## 8      Bangladesh 0.8147963 0.72060090
## 9      Belarus 0.6227534 0.66867816
## 10     Belgium 0.8694749 0.46878463
## 11     Benin 0.7333836 0.85009819
## 12     Bhutan 0.8301015 0.63395578
## 13     Bolivia 0.8836251 0.86237395
## 14     Bosnia and Herzegovina 0.6306980 0.95985365
## 15     Botswana 0.8571689 0.86029297
## 16     Brazil 0.7989353 0.77133906
## 17     Burkina Faso 0.6591027 0.69272399
## 18     Cambodia 0.9563198 0.82513022
## 19     Cameroon 0.7914286 0.86804903
## 20     Canada 0.9314690 0.42715225
## 21     Chad 0.4743609 0.88863939
## 22     Chile 0.7688814 0.81151134
## 23     China      NA      NA
## 24     Colombia 0.7908980 0.84289932
## 25     Congo (Brazzaville) 0.8501725 0.84135950
## 26     Congo (Kinshasa) 0.5737638 0.86637801
## 27     Costa Rica 0.9069257 0.76141941
## 28     Croatia 0.6935230 0.84854555
## 29     Cyprus 0.6280348 0.89279515
## 30     Czech Republic 0.8084842 0.88646746
## 31     Denmark 0.9414364 0.19101639
## 32     Dominican Republic 0.8560253 0.75528818
## 33     Ecuador 0.8008705 0.66582751
## 34     Egypt 0.6592615 0.68449807
## 35     El Salvador 0.7333559 0.80454427
## 36     Estonia 0.8146924 0.56873447
```

|       |             |           |            |
|-------|-------------|-----------|------------|
| ## 37 | Ethiopia    | 0.8026426 | 0.56702733 |
| ## 38 | Finland     | 0.9298619 | 0.22336966 |
| ## 39 | France      | 0.8170362 | 0.64060205 |
| ## 40 | Gabon       | 0.6713007 | 0.86677748 |
| ## 41 | Georgia     | 0.6399450 | 0.50241679 |
| ## 42 | Germany     | 0.8894289 | 0.41216829 |
| ## 43 | Ghana       | 0.8520162 | 0.94543612 |
| ## 44 | Greece      | 0.5317363 | 0.82395965 |
| ## 45 | Guatemala   | 0.8686398 | 0.82165492 |
| ## 46 | Guinea      | 0.6659530 | 0.76215202 |
| ## 47 | Haiti       | 0.3982955 | 0.77740395 |
| ## 48 | Honduras    | 0.5340577 | 0.84808272 |
| ## 49 | Hungary     | 0.5577214 | 0.90753031 |
| ## 50 | India       | 0.7772253 | 0.77643496 |
| ## 51 | Indonesia   | 0.7794183 | 0.94596726 |
| ## 52 | Iran        | NA        | NA         |
| ## 53 | Iraq        | 0.5994599 | 0.76216716 |
| ## 54 | Ireland     | 0.8922769 | 0.40875691 |
| ## 55 | Israel      | 0.7527840 | 0.78942990 |
| ## 56 | Italy       | 0.5747657 | 0.91275305 |
| ## 57 | Ivory Coast | 0.7997455 | 0.74424964 |
| ## 58 | Japan       | 0.8316942 | 0.65444309 |
| ## 59 | Jordan      | 0.7665170 | NA         |
| ## 60 | Kazakhstan  | 0.7401328 | 0.71384430 |
| ## 61 | Kenya       | 0.7929903 | 0.85254985 |
| ## 62 | Kosovo      | 0.5610483 | 0.85064709 |
| ## 63 | Kuwait      | 0.8216624 | NA         |
| ## 64 | Kyrgyzstan  | 0.8131759 | 0.85772502 |
| ## 65 | Latvia      | 0.6563932 | 0.80840039 |
| ## 66 | Lebanon     | 0.5967498 | 0.88895327 |
| ## 67 | Liberia     | 0.6714309 | 0.90267265 |
| ## 68 | Libya       | 0.7745450 | NA         |
| ## 69 | Lithuania   | 0.6414702 | 0.92417407 |
| ## 70 | Luxembourg  | 0.9322564 | 0.37539047 |
| ## 71 | Macedonia   | 0.6603189 | 0.82417899 |
| ## 72 | Madagascar  | 0.5447536 | 0.86095339 |
| ## 73 | Malawi      | 0.8013907 | 0.83482540 |
| ## 74 | Malaysia    | 0.6745945 | 0.83789223 |
| ## 75 | Mali        | 0.6337535 | 0.80004674 |
| ## 76 | Malta       | 0.9121780 | 0.66388631 |
| ## 77 | Mauritania  | 0.4470866 | 0.71535844 |
| ## 78 | Mexico      | 0.7194660 | 0.70797193 |
| ## 79 | Moldova     | 0.5952414 | 0.94311881 |
| ## 80 | Mongolia    | 0.6855108 | 0.90021819 |
| ## 81 | Montenegro  | 0.5833173 | 0.78123259 |
| ## 82 | Morocco     | 0.6934186 | 0.86777443 |
| ## 83 | Myanmar     | 0.8079711 | 0.63330519 |
| ## 84 | Nepal       | 0.7634472 | 0.82350838 |
| ## 85 | Netherlands | 0.9039788 | 0.41182211 |
| ## 86 | New Zealand | 0.9417843 | 0.18588871 |

|        |                         |           |            |
|--------|-------------------------|-----------|------------|
| ## 87  | Nicaragua               | 0.8092592 | 0.72799838 |
| ## 88  | Niger                   | 0.7281283 | 0.70254970 |
| ## 89  | Nigeria                 | 0.6804703 | 0.92610925 |
| ## 90  | North Cyprus            | 0.7853528 | 0.65918028 |
| ## 91  | Norway                  | 0.9476205 | 0.29881436 |
| ## 92  | Pakistan                | 0.5865462 | 0.71664119 |
| ## 93  | Palestinian Territories | 0.5560409 | 0.77430135 |
| ## 94  | Panama                  | 0.8466692 | 0.80994290 |
| ## 95  | Paraguay                | 0.8061247 | 0.86288828 |
| ## 96  | Peru                    | 0.8022690 | 0.88373041 |
| ## 97  | Philippines             | 0.9115336 | 0.75519156 |
| ## 98  | Poland                  | 0.7934622 | 0.81009632 |
| ## 99  | Portugal                | 0.8004403 | 0.94105077 |
| ## 100 | Qatar                   | NA        | NA         |
| ## 101 | Romania                 | 0.7958477 | 0.96165097 |
| ## 102 | Russia                  | 0.6854547 | 0.91341829 |
| ## 103 | Rwanda                  | 0.9078923 | 0.09460447 |
| ## 104 | Saudi Arabia            | 0.8202072 | NA         |
| ## 105 | Senegal                 | 0.7195333 | 0.76549017 |
| ## 106 | Serbia                  | 0.5458920 | 0.85935801 |
| ## 107 | Sierra Leone            | 0.6242961 | 0.82482803 |
| ## 108 | Singapore               | 0.8868909 | 0.09894388 |
| ## 109 | Slovakia                | 0.5871577 | 0.92754513 |
| ## 110 | Slovenia                | 0.8960073 | 0.89219791 |
| ## 111 | Somalia                 | 0.9678693 | 0.41023576 |
| ## 112 | South Africa            | 0.8624494 | 0.85269475 |
| ## 113 | South Korea             | 0.6158488 | 0.84072161 |
| ## 114 | Spain                   | 0.7320005 | 0.82166493 |
| ## 115 | Sri Lanka               | 0.9020748 | 0.85947096 |
| ## 116 | Sweden                  | 0.9350721 | 0.23196414 |
| ## 117 | Switzerland             | 0.9278024 | 0.20953351 |
| ## 118 | Syria                   | 0.4482709 | 0.68523693 |
| ## 119 | Taiwan                  | 0.7008105 | 0.85719484 |
| ## 120 | Tajikistan              | 0.8465421 | 0.74168962 |
| ## 121 | Tanzania                | 0.7586847 | 0.90642261 |
| ## 122 | Thailand                | 0.8849165 | 0.91365111 |
| ## 123 | Togo                    | 0.7715772 | 0.73326176 |
| ## 124 | Tunisia                 | 0.7113734 | 0.81482500 |
| ## 125 | Turkey                  | 0.6531968 | 0.80607623 |
| ## 126 | Turkmenistan            | 0.7013584 | NA         |
| ## 127 | Ukraine                 | 0.4305920 | 0.95247275 |
| ## 128 | United Arab Emirates    | 0.9150362 | NA         |
| ## 129 | United Kingdom          | 0.8329261 | 0.45613372 |
| ## 130 | United States           | 0.8487535 | 0.69754261 |
| ## 131 | Uruguay                 | 0.9168797 | 0.67347568 |
| ## 132 | Uzbekistan              | 0.9799371 | 0.47091693 |
| ## 133 | Venezuela               | 0.5121593 | 0.81309682 |
| ## 134 | Vietnam                 | NA        | NA         |
| ## 135 | Yemen                   | 0.6099808 | 0.82909757 |
| ## 136 | Zimbabwe                | 0.6671933 | 0.81045735 |

- Select a range of variables

```
world_happiness %>%
```

```
  select(country: support)
```

```
##           country happiness      gdp  support
## 1           Albania 4.606651  9.251464 0.6393561
## 2           Argentina 6.697131           NA 0.9264923
## 3           Armenia 4.348320  8.968936 0.7225510
## 4           Australia 7.309061 10.680326 0.9518616
## 5           Austria 7.076447 10.691354 0.9281103
## 6           Azerbaijan 5.146775  9.730904 0.7857028
## 7           Bahrain 6.007375           NA 0.8525507
## 8           Bangladesh 4.633474  8.050836 0.6014683
## 9           Belarus 5.718908  9.725568 0.9240726
## 10          Belgium 6.904219 10.626178 0.8852088
## 11          Benin 3.624664  7.598665 0.4343885
## 12          Bhutan 5.082129  8.969653 0.8475744
## 13          Bolivia 5.834329  8.778191 0.8287058
## 14 Bosnia and Herzegovina 5.117178  9.178364 0.6557236
## 15          Botswana 3.761965  9.654463 0.8156561
## 16          Brazil 6.546897  9.582796 0.9066931
## 17          Burkina Faso 4.418930  7.357180 0.7053935
## 18          Cambodia 4.162165  8.094646 0.7286103
## 19          Cameroon 5.037965  7.986924 0.6463125
## 20          Canada 7.412773 10.664708 0.9390671
## 21          Chad 4.322675  7.695847 0.7512522
## 22          Chile 6.532750 10.009483 0.8271419
## 23          China 5.303878  9.501941 0.7937337
## 24          Colombia 6.387572  9.471478 0.8899000
## 25 Congo (Brazzaville) 4.690830  8.685216 0.6421362
## 26 Congo (Kinshasa) 3.902742  6.613966 0.7672356
## 27          Costa Rica 6.854004  9.580832 0.8782730
## 28          Croatia 5.205438  9.919107 0.7683634
## 29          Cyprus 5.439161           NA 0.7695561
## 30          Czech Republic 6.608017 10.308098 0.9113626
## 31          Denmark 7.514425 10.676427 0.9597013
## 32 Dominican Republic 5.061862  9.488247 0.8931978
## 33          Ecuador 5.964075  9.270621 0.8558892
## 34          Egypt 4.762538  9.234282 0.7297443
## 35          El Salvador 6.018496  9.001607 0.7907554
## 36          Estonia 5.628909 10.210577 0.9179296
## 37          Ethiopia 4.573155  7.333114 0.6255968
## 38          Finland 7.447926 10.553578 0.9478006
## 39          France 6.357625 10.530862 0.8957194
## 40          Gabon 4.661013  9.845919 0.7558620
## 41          Georgia 4.121941  8.902565 0.5173716
## 42          Germany 7.037138 10.694968 0.9259232
## 43          Ghana 3.985916  8.277353 0.6874486
## 44          Greece 5.622519 10.093509 0.8348247
## 45          Guatemala 6.464987  8.886600 0.8228375
```

|       |                         |          |           |           |
|-------|-------------------------|----------|-----------|-----------|
| ## 46 | Guinea                  | 3.504694 | 7.037234  | 0.5788596 |
| ## 47 | Haiti                   | 3.569762 | 7.413352  | 0.5643197 |
| ## 48 | Honduras                | 4.845437 | 8.470057  | 0.7723755 |
| ## 49 | Hungary                 | 5.344383 | 10.107333 | 0.8587338 |
| ## 50 | India                   | 4.342079 | 8.659320  | 0.6101333 |
| ## 51 | Indonesia               | 5.042800 | 9.247716  | 0.8094781 |
| ## 52 | Iran                    | 4.749956 | 9.717675  | 0.5724069 |
| ## 53 | Iraq                    | 4.493377 | 9.546689  | 0.6844348 |
| ## 54 | Ireland                 | 6.830125 | 10.839026 | 0.9529426 |
| ## 55 | Israel                  | 7.079411 | 10.363305 | 0.8641302 |
| ## 56 | Italy                   | 5.847684 | 10.394681 | 0.9089865 |
| ## 57 | Ivory Coast             | 4.445039 | 8.095674  | 0.7039917 |
| ## 58 | Japan                   | 5.879684 | 10.488579 | 0.9226572 |
| ## 59 | Jordan                  | 5.404593 | 9.352019  | 0.8304439 |
| ## 60 | Kazakhstan              | 5.949995 | 10.042273 | 0.9313493 |
| ## 61 | Kenya                   | 4.357618 | 7.970297  | 0.7769231 |
| ## 62 | Kosovo                  | 5.077461 | NA        | 0.8052708 |
| ## 63 | Kuwait                  | 6.146032 | NA        | 0.8230178 |
| ## 64 | Kyrgyzstan              | 4.905376 | 8.061284  | 0.8565845 |
| ## 65 | Latvia                  | 5.880598 | 10.037901 | 0.8793724 |
| ## 66 | Lebanon                 | 5.171971 | 9.728823  | 0.7417077 |
| ## 67 | Liberia                 | 2.701591 | 6.739805  | 0.6376660 |
| ## 68 | Libya                   | 5.615405 | 9.555550  | 0.8679877 |
| ## 69 | Lithuania               | 5.711378 | 10.185368 | 0.9285235 |
| ## 70 | Luxembourg              | 6.701571 | 11.429970 | 0.9336046 |
| ## 71 | Macedonia               | 4.975590 | 9.446383  | 0.7663682 |
| ## 72 | Madagascar              | 3.592514 | 7.228697  | 0.6467165 |
| ## 73 | Malawi                  | 3.867638 | 6.660712  | 0.4943816 |
| ## 74 | Malaysia                | 6.322121 | 10.136704 | 0.8176163 |
| ## 75 | Mali                    | 4.582098 | 7.350600  | 0.8301892 |
| ## 76 | Malta                   | 6.613394 | NA        | 0.9187649 |
| ## 77 | Mauritania              | 3.922664 | 8.231690  | 0.8749459 |
| ## 78 | Mexico                  | 6.236287 | 9.707403  | 0.7606143 |
| ## 79 | Moldova                 | 6.017472 | 8.447127  | 0.8399055 |
| ## 80 | Mongolia                | 4.982720 | 9.346310  | 0.9055244 |
| ## 81 | Montenegro              | 5.124921 | 9.616770  | 0.7396305 |
| ## 82 | Morocco                 | 5.160294 | 8.906810  | 0.6537850 |
| ## 83 | Myanmar                 | 4.223846 | NA        | 0.7520643 |
| ## 84 | Nepal                   | 4.812437 | 7.746914  | 0.7476119 |
| ## 85 | Netherlands             | 7.324437 | 10.748624 | 0.8790104 |
| ## 86 | New Zealand             | 7.418121 | 10.431994 | 0.9873435 |
| ## 87 | Nicaragua               | 5.924113 | 8.480531  | 0.8269085 |
| ## 88 | Niger                   | 3.671454 | 6.803244  | 0.7130196 |
| ## 89 | Nigeria                 | 4.932915 | 8.644704  | 0.8116477 |
| ## 90 | North Cyprus            | 5.842550 | NA        | 0.7913827 |
| ## 91 | Norway                  | 7.603434 | 11.068009 | 0.9468340 |
| ## 92 | Pakistan                | 4.823195 | 8.464853  | 0.5617201 |
| ## 93 | Palestinian Territories | 4.695239 | 8.365737  | 0.7661012 |
| ## 94 | Panama                  | 6.605550 | 9.942081  | 0.8826150 |
| ## 95 | Paraguay                | 5.559724 | 9.065535  | 0.9141991 |

```

## 96          Peru 5.577263 9.358279 0.7984183
## 97    Philippines 5.547489 8.843670 0.8535886
## 98          Poland 6.007022 10.120240 0.8930904
## 99          Portugal 5.080866 10.195284 0.8662139
## 100         Qatar 6.374529          NA          NA
## 101         Romania 5.777491 9.896219 0.7869673
## 102         Russia 5.995539 10.012393 0.9243633
## 103         Rwanda 3.483109 7.416408 0.6781436
## 104    Saudi Arabia 6.345492 10.815763 0.8197497
## 105         Senegal 4.617001 7.725880 0.7015345
## 106         Serbia 5.317685 9.462955 0.8162510
## 107    Sierra Leone 4.908618 7.374071 0.6105937
## 108         Singapore 6.619525          NA 0.8664367
## 109         Slovakia 6.162004 10.214083 0.9434537
## 110         Slovenia 5.740642 10.269225 0.9011638
## 111         Somalia 5.353645          NA 0.5992811
## 112    South Africa 4.887326 9.428298 0.8980963
## 113    South Korea 5.780211 10.446025 0.7683506
## 114         Spain 6.380663 10.402864 0.9564719
## 115    Sri Lanka 4.611607 9.319309 0.8625001
## 116         Sweden 7.288922 10.712334 0.9294600
## 117    Switzerland 7.572137 10.914726 0.9383337
## 118         Syria 3.461913          NA 0.4639129
## 119         Taiwan 6.450088          NA 0.8853889
## 120    Tajikistan 5.124211 7.869648 0.8439325
## 121    Tanzania 3.660597 7.831087 0.7902626
## 122    Thailand 6.201763 9.637293 0.8663245
## 123         Togo 3.768302 7.241591 0.4785934
## 124    Tunisia 5.131612 9.292294 0.6094700
## 125         Turkey 5.514465 9.864202 0.8512246
## 126    Turkmenistan 5.791460 9.669529 0.9601585
## 127         Ukraine 3.964543 8.895362 0.9094397
## 128    United Arab Emirates 6.568398          NA 0.8241367
## 129    United Kingdom 6.515445 10.567661 0.9359857
## 130    United States 6.863947 10.877965 0.9035711
## 131         Uruguay 6.628080 9.917072 0.8914935
## 132    Uzbekistan 5.972364 8.630272 0.9682252
## 133    Venezuela 5.568800          NA 0.9110869
## 134         Vietnam 5.076315 8.637988 0.8486767
## 135         Yemen 2.982674 7.843260 0.6686835
## 136         Zimbabwe 3.703191 7.430315 0.7358003

```

- Rearrange the order of variables
  - Note: everything() is a helper function that gives us all the remaining variables in the data frame (see more on [helper functions](#) below)

```

world_happiness %>%
  select(country, world, everything())

##          country world happiness          gdp  support          life
## 1          Albania      2  4.606651  9.251464 0.6393561 68.43517

```



|       |                        |   |          |           |           |          |
|-------|------------------------|---|----------|-----------|-----------|----------|
| ## 2  | Argentina              | 4 | 6.697131 | NA        | 0.9264923 | 67.28722 |
| ## 3  | Armenia                | 2 | 4.348320 | 8.968936  | 0.7225510 | 65.30076 |
| ## 4  | Australia              | 1 | 7.309061 | 10.680326 | 0.9518616 | 72.56024 |
| ## 5  | Austria                | 1 | 7.076447 | 10.691354 | 0.9281103 | 70.82256 |
| ## 6  | Azerbaijan             | 2 | 5.146775 | 9.730904  | 0.7857028 | 61.97585 |
| ## 7  | Bahrain                | 4 | 6.007375 | NA        | 0.8525507 | 65.84793 |
| ## 8  | Bangladesh             | 3 | 4.633474 | 8.050836  | 0.6014683 | 61.72731 |
| ## 9  | Belarus                | 2 | 5.718908 | 9.725568  | 0.9240726 | 65.31599 |
| ## 10 | Belgium                | 1 | 6.904219 | 10.626178 | 0.8852088 | 71.34201 |
| ## 11 | Benin                  | 3 | 3.624664 | 7.598665  | 0.4343885 | 50.58654 |
| ## 12 | Bhutan                 | 3 | 5.082129 | 8.969653  | 0.8475744 | 60.61641 |
| ## 13 | Bolivia                | 4 | 5.834329 | 8.778191  | 0.8287058 | 59.73697 |
| ## 14 | Bosnia and Herzegovina | 2 | 5.117178 | 9.178364  | 0.6557236 | 67.63831 |
| ## 15 | Botswana               | 4 | 3.761965 | 9.654463  | 0.8156561 | 55.25417 |
| ## 16 | Brazil                 | 4 | 6.546897 | 9.582796  | 0.9066931 | 64.59515 |
| ## 17 | Burkina Faso           | 3 | 4.418930 | 7.357180  | 0.7053935 | 50.83040 |
| ## 18 | Cambodia               | 3 | 4.162165 | 8.094646  | 0.7286103 | 58.16891 |
| ## 19 | Cameroon               | 4 | 5.037965 | 7.986924  | 0.6463125 | 47.95748 |
| ## 20 | Canada                 | 1 | 7.412773 | 10.664708 | 0.9390671 | 71.76053 |
| ## 21 | Chad                   | 3 | 4.322675 | 7.695847  | 0.7512522 | 44.87283 |
| ## 22 | Chile                  | 4 | 6.532750 | 10.009483 | 0.8271419 | 71.57857 |
| ## 23 | China                  | 4 | 5.303878 | 9.501941  | 0.7937337 | 68.59845 |
| ## 24 | Colombia               | 4 | 6.387572 | 9.471478  | 0.8899000 | 63.84050 |
| ## 25 | Congo (Brazzaville)    | 3 | 4.690830 | 8.685216  | 0.6421362 | 53.51811 |
| ## 26 | Congo (Kinshasa)       | 3 | 3.902742 | 6.613966  | 0.7672356 | 50.01415 |
| ## 27 | Costa Rica             | 4 | 6.854004 | 9.580832  | 0.8782730 | 69.49661 |
| ## 28 | Croatia                | 2 | 5.205438 | 9.919107  | 0.7683634 | 67.59174 |
| ## 29 | Cyprus                 | 4 | 5.439161 | NA        | 0.7695561 | 72.48824 |
| ## 30 | Czech Republic         | 2 | 6.608017 | 10.308098 | 0.9113626 | 69.60413 |
| ## 31 | Denmark                | 1 | 7.514425 | 10.676427 | 0.9597013 | 70.70427 |
| ## 32 | Dominican Republic     | 4 | 5.061862 | 9.488247  | 0.8931978 | 63.16206 |
| ## 33 | Ecuador                | 4 | 5.964075 | 9.270621  | 0.8558892 | 66.94999 |
| ## 34 | Egypt                  | 4 | 4.762538 | 9.234282  | 0.7297443 | 61.27411 |
| ## 35 | El Salvador            | 4 | 6.018496 | 9.001607  | 0.7907554 | 63.90189 |
| ## 36 | Estonia                | 2 | 5.628909 | 10.210577 | 0.9179296 | 66.66893 |
| ## 37 | Ethiopia               | 3 | 4.573155 | 7.333114  | 0.6255968 | 55.63552 |
| ## 38 | Finland                | 4 | 7.447926 | 10.553578 | 0.9478006 | 71.21165 |
| ## 39 | France                 | 1 | 6.357625 | 10.530862 | 0.8957194 | 71.97216 |
| ## 40 | Gabon                  | 4 | 4.661013 | 9.845919  | 0.7558620 | 55.68797 |
| ## 41 | Georgia                | 2 | 4.121941 | 8.902565  | 0.5173716 | 65.30637 |
| ## 42 | Germany                | 1 | 7.037138 | 10.694968 | 0.9259232 | 71.30358 |
| ## 43 | Ghana                  | 3 | 3.985916 | 8.277353  | 0.6874486 | 53.54028 |
| ## 44 | Greece                 | 1 | 5.622519 | 10.093509 | 0.8348247 | 70.67931 |
| ## 45 | Guatemala              | 4 | 6.464987 | 8.886600  | 0.8228375 | 61.96589 |
| ## 46 | Guinea                 | 3 | 3.504694 | 7.037234  | 0.5788596 | 50.16096 |
| ## 47 | Haiti                  | 3 | 3.569762 | 7.413352  | 0.5643197 | 52.95332 |
| ## 48 | Honduras               | 4 | 4.845437 | 8.470057  | 0.7723755 | 63.41061 |
| ## 49 | Hungary                | 2 | 5.344383 | 10.107333 | 0.8587338 | 66.59668 |
| ## 50 | India                  | 4 | 4.342079 | 8.659320  | 0.6101333 | 59.07401 |
| ## 51 | Indonesia              | 4 | 5.042800 | 9.247716  | 0.8094781 | 60.31876 |

|        |                         |   |          |           |              |          |
|--------|-------------------------|---|----------|-----------|--------------|----------|
| ## 52  | Iran                    | 4 | 4.749956 | 9.717675  | 0.5724069    | 65.53881 |
| ## 53  | Iraq                    | 4 | 4.493377 | 9.546689  | 0.6844348    | 60.94004 |
| ## 54  | Ireland                 | 1 | 6.830125 | 10.839026 | 0.9529426    | 71.29931 |
| ## 55  | Israel                  | 1 | 7.079411 | 10.363305 | 0.8641302    | 72.66603 |
| ## 56  | Italy                   | 1 | 5.847684 | 10.394681 | 0.9089865    | 72.46586 |
| ## 57  | Ivory Coast             | 4 | 4.445039 | 8.095674  | 0.7039917    | 45.04416 |
| ## 58  | Japan                   | 1 | 5.879684 | 10.488579 | 0.9226572    | 74.82469 |
| ## 59  | Jordan                  | 4 | 5.404593 | 9.352019  | 0.8304439    | 64.18116 |
| ## 60  | Kazakhstan              | 2 | 5.949995 | 10.042273 | 0.9313493    | 63.64412 |
| ## 61  | Kenya                   | 4 | 4.357618 | 7.970297  | 0.7769231    | 54.14322 |
| ## 62  | Kosovo                  | 4 | 5.077461 |           | NA 0.8052708 | 62.00486 |
| ## 63  | Kuwait                  | 4 | 6.146032 |           | NA 0.8230178 | 65.09716 |
| ## 64  | Kyrgyzstan              | 2 | 4.905376 | 8.061284  | 0.8565845    | 62.41665 |
| ## 65  | Latvia                  | 2 | 5.880598 | 10.037901 | 0.8793724    | 65.33850 |
| ## 66  | Lebanon                 | 4 | 5.171971 | 9.728823  | 0.7417077    | 69.59850 |
| ## 67  | Liberia                 | 3 | 2.701591 | 6.739805  | 0.6376660    | 51.28914 |
| ## 68  | Libya                   | 4 | 5.615405 | 9.555550  | 0.8679877    | 61.16175 |
| ## 69  | Lithuania               | 2 | 5.711378 | 10.185368 | 0.9285235    | 65.67057 |
| ## 70  | Luxembourg              | 1 | 6.701571 | 11.429970 | 0.9336046    | 72.53326 |
| ## 71  | Macedonia               | 2 | 4.975590 | 9.446383  | 0.7663682    | 65.56458 |
| ## 72  | Madagascar              | 3 | 3.592514 | 7.228697  | 0.6467165    | 56.31346 |
| ## 73  | Malawi                  | 3 | 3.867638 | 6.660712  | 0.4943816    | 54.48933 |
| ## 74  | Malaysia                | 4 | 6.322121 | 10.136704 | 0.8176163    | 64.74024 |
| ## 75  | Mali                    | 3 | 4.582098 | 7.350600  | 0.8301892    | 49.19207 |
| ## 76  | Malta                   | 4 | 6.613394 |           | NA 0.9187649 | 70.77766 |
| ## 77  | Mauritania              | 3 | 3.922664 | 8.231690  | 0.8749459    | 53.24210 |
| ## 78  | Mexico                  | 4 | 6.236287 | 9.707403  | 0.7606143    | 67.78441 |
| ## 79  | Moldova                 | 2 | 6.017472 | 8.447127  | 0.8399055    | 61.26768 |
| ## 80  | Mongolia                | 4 | 4.982720 | 9.346310  | 0.9055244    | 62.64931 |
| ## 81  | Montenegro              | 2 | 5.124921 | 9.616770  | 0.7396305    | 65.11017 |
| ## 82  | Morocco                 | 4 | 5.160294 | 8.906810  | 0.6537850    | 63.91926 |
| ## 83  | Myanmar                 | 3 | 4.223846 |           | NA 0.7520643 | 57.09218 |
| ## 84  | Nepal                   | 3 | 4.812437 | 7.746914  | 0.7476119    | 60.75210 |
| ## 85  | Netherlands             | 1 | 7.324437 | 10.748624 | 0.8790104    | 71.09193 |
| ## 86  | New Zealand             | 1 | 7.418121 | 10.431994 | 0.9873435    | 71.92076 |
| ## 87  | Nicaragua               | 4 | 5.924113 | 8.480531  | 0.8269085    | 65.85806 |
| ## 88  | Niger                   | 3 | 3.671454 | 6.803244  | 0.7130196    | 52.82997 |
| ## 89  | Nigeria                 | 4 | 4.932915 | 8.644704  | 0.8116477    | 45.24734 |
| ## 90  | North Cyprus            | 4 | 5.842550 |           | NA 0.7913827 | NA       |
| ## 91  | Norway                  | 1 | 7.603434 | 11.068009 | 0.9468340    | 70.52483 |
| ## 92  | Pakistan                | 4 | 4.823195 | 8.464853  | 0.5617201    | 57.25552 |
| ## 93  | Palestinian Territories | 4 | 4.695239 | 8.365737  | 0.7661012    | 62.83750 |
| ## 94  | Panama                  | 4 | 6.605550 | 9.942081  | 0.8826150    | 67.68180 |
| ## 95  | Paraguay                | 4 | 5.559724 | 9.065535  | 0.9141991    | 63.34425 |
| ## 96  | Peru                    | 4 | 5.577263 | 9.358279  | 0.7984183    | 65.03024 |
| ## 97  | Philippines             | 4 | 5.547489 | 8.843670  | 0.8535886    | 59.46133 |
| ## 98  | Poland                  | 2 | 6.007022 | 10.120240 | 0.8930904    | 66.95756 |
| ## 99  | Portugal                | 1 | 5.080866 | 10.195284 | 0.8662139    | 70.45056 |
| ## 100 | Qatar                   | 4 | 6.374529 |           | NA NA        | 67.82797 |
| ## 101 | Romania                 | 2 | 5.777491 | 9.896219  | 0.7869673    | 66.41331 |

|        |                      |   |          |           |              |          |
|--------|----------------------|---|----------|-----------|--------------|----------|
| ## 102 | Russia               | 2 | 5.995539 | 10.012393 | 0.9243633    | 64.08343 |
| ## 103 | Rwanda               | 3 | 3.483109 | 7.416408  | 0.6781436    | 54.64949 |
| ## 104 | Saudi Arabia         | 4 | 6.345492 | 10.815763 | 0.8197497    | 63.71784 |
| ## 105 | Senegal              | 3 | 4.617001 | 7.725880  | 0.7015345    | 57.57685 |
| ## 106 | Serbia               | 2 | 5.317685 | 9.462955  | 0.8162510    | 65.63837 |
| ## 107 | Sierra Leone         | 3 | 4.908618 | 7.374071  | 0.6105937    | 43.74034 |
| ## 108 | Singapore            | 4 | 6.619525 |           | NA 0.8664367 | 76.04466 |
| ## 109 | Slovakia             | 2 | 6.162004 | 10.214083 | 0.9434537    | 67.49669 |
| ## 110 | Slovenia             | 2 | 5.740642 | 10.269225 | 0.9011638    | 70.51219 |
| ## 111 | Somalia              | 3 | 5.353645 |           | NA 0.5992811 | 47.28276 |
| ## 112 | South Africa         | 4 | 4.887326 | 9.428298  | 0.8980963    | 50.14693 |
| ## 113 | South Korea          | 1 | 5.780211 | 10.446025 | 0.7683506    | 73.85837 |
| ## 114 | Spain                | 1 | 6.380663 | 10.402864 | 0.9564719    | 73.37998 |
| ## 115 | Sri Lanka            | 4 | 4.611607 | 9.319309  | 0.8625001    | 64.64014 |
| ## 116 | Sweden               | 1 | 7.288922 | 10.712334 | 0.9294600    | 71.74087 |
| ## 117 | Switzerland          | 1 | 7.572137 | 10.914726 | 0.9383337    | 72.86915 |
| ## 118 | Syria                | 4 | 3.461913 |           | NA 0.4639129 | 64.83573 |
| ## 119 | Taiwan               | 4 | 6.450088 |           | NA 0.8853889 | 70.75000 |
| ## 120 | Tajikistan           | 2 | 5.124211 | 7.869648  | 0.8439325    | 61.64697 |
| ## 121 | Tanzania             | 3 | 3.660597 | 7.831087  | 0.7902626    | 56.12052 |
| ## 122 | Thailand             | 4 | 6.201763 | 9.637293  | 0.8663245    | 65.64534 |
| ## 123 | Togo                 | 3 | 3.768302 | 7.241591  | 0.4785934    | 51.97361 |
| ## 124 | Tunisia              | 4 | 5.131612 | 9.292294  | 0.6094700    | 63.35026 |
| ## 125 | Turkey               | 1 | 5.514465 | 9.864202  | 0.8512246    | 65.69592 |
| ## 126 | Turkmenistan         | 2 | 5.791460 | 9.669529  | 0.9601585    | 58.44135 |
| ## 127 | Ukraine              | 2 | 3.964543 | 8.895362  | 0.9094397    | 63.52374 |
| ## 128 | United Arab Emirates | 4 | 6.568398 |           | NA 0.8241367 | 68.35641 |
| ## 129 | United Kingdom       | 1 | 6.515445 | 10.567661 | 0.9359857    | 71.05131 |
| ## 130 | United States        | 1 | 6.863947 | 10.877965 | 0.9035711    | 70.03674 |
| ## 131 | Uruguay              | 4 | 6.628080 | 9.917072  | 0.8914935    | 68.11640 |
| ## 132 | Uzbekistan           | 2 | 5.972364 | 8.630272  | 0.9682252    | 60.53566 |
| ## 133 | Venezuela            | 4 | 5.568800 |           | NA 0.9110869 | 64.58602 |
| ## 134 | Vietnam              | 4 | 5.076315 | 8.637988  | 0.8486767    | 66.04872 |
| ## 135 | Yemen                | 3 | 2.982674 | 7.843260  | 0.6686835    | 54.08096 |
| ## 136 | Zimbabwe             | 4 | 3.703191 | 7.430315  | 0.7358003    | 50.36258 |

| ##    | freedom   | generosity   | corruption    |
|-------|-----------|--------------|---------------|
| ## 1  | 0.7038507 | -0.082337685 | 0.88479304    |
| ## 2  | 0.8812237 |              | NA 0.85090619 |
| ## 3  | 0.5510266 | -0.186696529 | 0.90146220    |
| ## 4  | 0.9218710 | 0.315701962  | 0.35655439    |
| ## 5  | 0.9003052 | 0.089088559  | 0.55747962    |
| ## 6  | 0.7642895 | -0.222635135 | 0.61555255    |
| ## 7  | 0.8495212 |              | NA NA         |
| ## 8  | 0.8147963 | -0.059777591 | 0.72060090    |
| ## 9  | 0.6227534 | -0.100902960 | 0.66867816    |
| ## 10 | 0.8694749 | 0.052451991  | 0.46878463    |
| ## 11 | 0.7333836 | 0.001502594  | 0.85009819    |
| ## 12 | 0.8301015 | 0.285040438  | 0.63395578    |
| ## 13 | 0.8836251 | -0.023433717 | 0.86237395    |
| ## 14 | 0.6306980 | -0.046468392 | 0.95985365    |

## 15 0.8571689 -0.126697809 0.86029297  
## 16 0.7989353 -0.027783971 0.77133906  
## 17 0.6591027 0.020786475 0.69272399  
## 18 0.9563198 0.212208703 0.82513022  
## 19 0.7914286 0.058221977 0.86804903  
## 20 0.9314690 0.237486422 0.42715225  
## 21 0.4743609 -0.041133381 0.88863939  
## 22 0.7688814 0.026815979 0.81151134  
## 23 NA -0.262474209 NA  
## 24 0.7908980 -0.107555106 0.84289932  
## 25 0.8501725 -0.143441707 0.84135950  
## 26 0.5737638 -0.014224946 0.86637801  
## 27 0.9069257 -0.058310181 0.76141941  
## 28 0.6935230 -0.100691713 0.84854555  
## 29 0.6280348 NA 0.89279515  
## 30 0.8084842 -0.152868271 0.88646746  
## 31 0.9414364 0.213263184 0.19101639  
## 32 0.8560253 -0.068872340 0.75528818  
## 33 0.8008705 -0.118297137 0.66582751  
## 34 0.6592615 -0.098499060 0.68449807  
## 35 0.7333559 -0.166342810 0.80454427  
## 36 0.8146924 -0.173507467 0.56873447  
## 37 0.8026426 0.125852734 0.56702733  
## 38 0.9298619 0.100564413 0.22336966  
## 39 0.8170362 -0.150623634 0.64060205  
## 40 0.6713007 -0.224478483 0.86677748  
## 41 0.6399450 -0.175952777 0.50241679  
## 42 0.8894289 0.164857537 0.41216829  
## 43 0.8520162 -0.030955523 0.94543612  
## 44 0.5317363 -0.278941423 0.82395965  
## 45 0.8686398 0.050059937 0.82165492  
## 46 0.6659530 0.054546587 0.76215202  
## 47 0.3982955 0.312127113 0.77740395  
## 48 0.5340577 -0.095861293 0.84808272  
## 49 0.5577214 -0.208412573 0.90753031  
## 50 0.7772253 -0.016868994 0.77643496  
## 51 0.7794183 0.457429528 0.94596726  
## 52 NA 0.141305760 NA  
## 53 0.5994599 -0.016951477 0.76216716  
## 54 0.8922769 0.232017383 0.40875691  
## 55 0.7527840 0.099938810 0.78942990  
## 56 0.5747657 -0.070082054 0.91275305  
## 57 0.7997455 -0.035634797 0.74424964  
## 58 0.8316942 -0.169799194 0.65444309  
## 59 0.7665170 -0.069207847 NA  
## 60 0.7401328 -0.051406134 0.71384430  
## 61 0.7929903 0.238054082 0.85254985  
## 62 0.5610483 NA 0.85064709  
## 63 0.8216624 NA NA  
## 64 0.8131759 0.226265088 0.85772502

## 65 0.6563932 -0.085272886 0.80840039  
## 66 0.5967498 0.054535788 0.88895327  
## 67 0.6714309 -0.009916847 0.90267265  
## 68 0.7745450 -0.076456018 NA  
## 69 0.6414702 -0.262404770 0.92417407  
## 70 0.9322564 0.036430217 0.37539047  
## 71 0.6603189 -0.048491806 0.82417899  
## 72 0.5447536 -0.029426256 0.86095339  
## 73 0.8013907 0.085140154 0.83482540  
## 74 0.6745945 0.201898143 0.83789223  
## 75 0.6337535 -0.042629778 0.80004674  
## 76 0.9121780 NA 0.66388631  
## 77 0.4470866 0.073142350 0.71535844  
## 78 0.7194660 -0.156158805 0.70797193  
## 79 0.5952414 -0.038925178 0.94311881  
## 80 0.6855108 0.157298073 0.90021819  
## 81 0.5833173 -0.145327449 0.78123259  
## 82 0.6934186 -0.248565361 0.86777443  
## 83 0.8079711 NA 0.63330519  
## 84 0.7634472 0.242998511 0.82350838  
## 85 0.9039788 0.247195244 0.41182211  
## 86 0.9417843 0.320652515 0.18588871  
## 87 0.8092592 0.081847742 0.72799838  
## 88 0.7281283 -0.009490362 0.70254970  
## 89 0.6804703 -0.045139253 0.92610925  
## 90 0.7853528 NA 0.65918028  
## 91 0.9476205 0.228181615 0.29881436  
## 92 0.5865462 0.071716130 0.71664119  
## 93 0.5560409 -0.150193453 0.77430135  
## 94 0.8466692 -0.002205028 0.80994290  
## 95 0.8061247 0.003749649 0.86288828  
## 96 0.8022690 -0.100029737 0.88373041  
## 97 0.9115336 -0.056648508 0.75519156  
## 98 0.7934622 -0.103777371 0.81009632  
## 99 0.8004403 -0.171841606 0.94105077  
## 100 NA NA NA  
## 101 0.7958477 -0.145152822 0.96165097  
## 102 0.6854547 -0.179458767 0.91341829  
## 103 0.9078923 0.035836529 0.09460447  
## 104 0.8202072 -0.070376605 NA  
## 105 0.7195333 -0.092522651 0.76549017  
## 106 0.5458920 -0.062717922 0.85935801  
## 107 0.6242961 0.050585665 0.82482803  
## 108 0.8868909 NA 0.09894388  
## 109 0.5871577 -0.142087966 0.92754513  
## 110 0.8960073 -0.000629284 0.89219791  
## 111 0.9678693 NA 0.41023576  
## 112 0.8624494 -0.138439283 0.85269475  
## 113 0.6158488 -0.048341293 0.84072161  
## 114 0.7320005 -0.084349990 0.82166493

```

## 115 0.9020748 0.310886711 0.85947096
## 116 0.9350721 0.197725981 0.23196414
## 117 0.9278024 0.097075745 0.20953351
## 118 0.4482709          NA 0.68523693
## 119 0.7008105          NA 0.85719484
## 120 0.8465421 0.025703574 0.74168962
## 121 0.7586847 0.142459080 0.90642261
## 122 0.8849165 0.305076480 0.91365111
## 123 0.7715772 -0.063052811 0.73326176
## 124 0.7113734 -0.240898952 0.81482500
## 125 0.6531968          NA 0.80607623
## 126 0.7013584 0.063167505          NA
## 127 0.4305920 -0.012190276 0.95247275
## 128 0.9150362          NA          NA
## 129 0.8329261 0.288037807 0.45613372
## 130 0.8487535 0.201775953 0.69754261
## 131 0.9168797 -0.048586730 0.67347568
## 132 0.9799371 0.373070538 0.47091693
## 133 0.5121593          NA 0.81309682
## 134          NA 0.087306730          NA
## 135 0.6099808 -0.139901683 0.82909757
## 136 0.6671933 -0.081429422 0.81045735

```

- De-select variables with a minus sign (-)

```

world_happiness %>%
  select(-happiness)

```

```

##          country      gdp  support   life  freedom
generosity
## 1          Albania  9.251464 0.6393561 68.43517 0.7038507 -
0.082337685
## 2          Argentina      NA 0.9264923 67.28722 0.8812237
NA
## 3          Armenia  8.968936 0.7225510 65.30076 0.5510266 -
0.186696529
## 4          Australia 10.680326 0.9518616 72.56024 0.9218710
0.315701962
## 5          Austria 10.691354 0.9281103 70.82256 0.9003052
0.089088559
## 6          Azerbaijan 9.730904 0.7857028 61.97585 0.7642895 -
0.222635135
## 7          Bahrain      NA 0.8525507 65.84793 0.8495212
NA
## 8          Bangladesh 8.050836 0.6014683 61.72731 0.8147963 -
0.059777591
## 9          Belarus  9.725568 0.9240726 65.31599 0.6227534 -
0.100902960
## 10         Belgium 10.626178 0.8852088 71.34201 0.8694749
0.052451991
## 11         Benin    7.598665 0.4343885 50.58654 0.7333836

```

|             |                        |           |           |          |           |   |  |
|-------------|------------------------|-----------|-----------|----------|-----------|---|--|
| 0.001502594 |                        |           |           |          |           |   |  |
| ## 12       | Bhutan                 | 8.969653  | 0.8475744 | 60.61641 | 0.8301015 |   |  |
| 0.285040438 |                        |           |           |          |           |   |  |
| ## 13       | Bolivia                | 8.778191  | 0.8287058 | 59.73697 | 0.8836251 | - |  |
| 0.023433717 |                        |           |           |          |           |   |  |
| ## 14       | Bosnia and Herzegovina | 9.178364  | 0.6557236 | 67.63831 | 0.6306980 | - |  |
| 0.046468392 |                        |           |           |          |           |   |  |
| ## 15       | Botswana               | 9.654463  | 0.8156561 | 55.25417 | 0.8571689 | - |  |
| 0.126697809 |                        |           |           |          |           |   |  |
| ## 16       | Brazil                 | 9.582796  | 0.9066931 | 64.59515 | 0.7989353 | - |  |
| 0.027783971 |                        |           |           |          |           |   |  |
| ## 17       | Burkina Faso           | 7.357180  | 0.7053935 | 50.83040 | 0.6591027 |   |  |
| 0.020786475 |                        |           |           |          |           |   |  |
| ## 18       | Cambodia               | 8.094646  | 0.7286103 | 58.16891 | 0.9563198 |   |  |
| 0.212208703 |                        |           |           |          |           |   |  |
| ## 19       | Cameroon               | 7.986924  | 0.6463125 | 47.95748 | 0.7914286 |   |  |
| 0.058221977 |                        |           |           |          |           |   |  |
| ## 20       | Canada                 | 10.664708 | 0.9390671 | 71.76053 | 0.9314690 |   |  |
| 0.237486422 |                        |           |           |          |           |   |  |
| ## 21       | Chad                   | 7.695847  | 0.7512522 | 44.87283 | 0.4743609 | - |  |
| 0.041133381 |                        |           |           |          |           |   |  |
| ## 22       | Chile                  | 10.009483 | 0.8271419 | 71.57857 | 0.7688814 |   |  |
| 0.026815979 |                        |           |           |          |           |   |  |
| ## 23       | China                  | 9.501941  | 0.7937337 | 68.59845 | NA        | - |  |
| 0.262474209 |                        |           |           |          |           |   |  |
| ## 24       | Colombia               | 9.471478  | 0.8899000 | 63.84050 | 0.7908980 | - |  |
| 0.107555106 |                        |           |           |          |           |   |  |
| ## 25       | Congo (Brazzaville)    | 8.685216  | 0.6421362 | 53.51811 | 0.8501725 | - |  |
| 0.143441707 |                        |           |           |          |           |   |  |
| ## 26       | Congo (Kinshasa)       | 6.613966  | 0.7672356 | 50.01415 | 0.5737638 | - |  |
| 0.014224946 |                        |           |           |          |           |   |  |
| ## 27       | Costa Rica             | 9.580832  | 0.8782730 | 69.49661 | 0.9069257 | - |  |
| 0.058310181 |                        |           |           |          |           |   |  |
| ## 28       | Croatia                | 9.919107  | 0.7683634 | 67.59174 | 0.6935230 | - |  |
| 0.100691713 |                        |           |           |          |           |   |  |
| ## 29       | Cyprus                 | NA        | 0.7695561 | 72.48824 | 0.6280348 |   |  |
| NA          |                        |           |           |          |           |   |  |
| ## 30       | Czech Republic         | 10.308098 | 0.9113626 | 69.60413 | 0.8084842 | - |  |
| 0.152868271 |                        |           |           |          |           |   |  |
| ## 31       | Denmark                | 10.676427 | 0.9597013 | 70.70427 | 0.9414364 |   |  |
| 0.213263184 |                        |           |           |          |           |   |  |
| ## 32       | Dominican Republic     | 9.488247  | 0.8931978 | 63.16206 | 0.8560253 | - |  |
| 0.068872340 |                        |           |           |          |           |   |  |
| ## 33       | Ecuador                | 9.270621  | 0.8558892 | 66.94999 | 0.8008705 | - |  |
| 0.118297137 |                        |           |           |          |           |   |  |
| ## 34       | Egypt                  | 9.234282  | 0.7297443 | 61.27411 | 0.6592615 | - |  |
| 0.098499060 |                        |           |           |          |           |   |  |
| ## 35       | El Salvador            | 9.001607  | 0.7907554 | 63.90189 | 0.7333559 | - |  |
| 0.166342810 |                        |           |           |          |           |   |  |
| ## 36       | Estonia                | 10.210577 | 0.9179296 | 66.66893 | 0.8146924 | - |  |

|             |             |           |           |          |           |   |
|-------------|-------------|-----------|-----------|----------|-----------|---|
| 0.173507467 |             |           |           |          |           |   |
| ## 37       | Ethiopia    | 7.333114  | 0.6255968 | 55.63552 | 0.8026426 |   |
| 0.125852734 |             |           |           |          |           |   |
| ## 38       | Finland     | 10.553578 | 0.9478006 | 71.21165 | 0.9298619 |   |
| 0.100564413 |             |           |           |          |           |   |
| ## 39       | France      | 10.530862 | 0.8957194 | 71.97216 | 0.8170362 | - |
| 0.150623634 |             |           |           |          |           |   |
| ## 40       | Gabon       | 9.845919  | 0.7558620 | 55.68797 | 0.6713007 | - |
| 0.224478483 |             |           |           |          |           |   |
| ## 41       | Georgia     | 8.902565  | 0.5173716 | 65.30637 | 0.6399450 | - |
| 0.175952777 |             |           |           |          |           |   |
| ## 42       | Germany     | 10.694968 | 0.9259232 | 71.30358 | 0.8894289 |   |
| 0.164857537 |             |           |           |          |           |   |
| ## 43       | Ghana       | 8.277353  | 0.6874486 | 53.54028 | 0.8520162 | - |
| 0.030955523 |             |           |           |          |           |   |
| ## 44       | Greece      | 10.093509 | 0.8348247 | 70.67931 | 0.5317363 | - |
| 0.278941423 |             |           |           |          |           |   |
| ## 45       | Guatemala   | 8.886600  | 0.8228375 | 61.96589 | 0.8686398 |   |
| 0.050059937 |             |           |           |          |           |   |
| ## 46       | Guinea      | 7.037234  | 0.5788596 | 50.16096 | 0.6659530 |   |
| 0.054546587 |             |           |           |          |           |   |
| ## 47       | Haiti       | 7.413352  | 0.5643197 | 52.95332 | 0.3982955 |   |
| 0.312127113 |             |           |           |          |           |   |
| ## 48       | Honduras    | 8.470057  | 0.7723755 | 63.41061 | 0.5340577 | - |
| 0.095861293 |             |           |           |          |           |   |
| ## 49       | Hungary     | 10.107333 | 0.8587338 | 66.59668 | 0.5577214 | - |
| 0.208412573 |             |           |           |          |           |   |
| ## 50       | India       | 8.659320  | 0.6101333 | 59.07401 | 0.7772253 | - |
| 0.016868994 |             |           |           |          |           |   |
| ## 51       | Indonesia   | 9.247716  | 0.8094781 | 60.31876 | 0.7794183 |   |
| 0.457429528 |             |           |           |          |           |   |
| ## 52       | Iran        | 9.717675  | 0.5724069 | 65.53881 | NA        |   |
| 0.141305760 |             |           |           |          |           |   |
| ## 53       | Iraq        | 9.546689  | 0.6844348 | 60.94004 | 0.5994599 | - |
| 0.016951477 |             |           |           |          |           |   |
| ## 54       | Ireland     | 10.839026 | 0.9529426 | 71.29931 | 0.8922769 |   |
| 0.232017383 |             |           |           |          |           |   |
| ## 55       | Israel      | 10.363305 | 0.8641302 | 72.66603 | 0.7527840 |   |
| 0.099938810 |             |           |           |          |           |   |
| ## 56       | Italy       | 10.394681 | 0.9089865 | 72.46586 | 0.5747657 | - |
| 0.070082054 |             |           |           |          |           |   |
| ## 57       | Ivory Coast | 8.095674  | 0.7039917 | 45.04416 | 0.7997455 | - |
| 0.035634797 |             |           |           |          |           |   |
| ## 58       | Japan       | 10.488579 | 0.9226572 | 74.82469 | 0.8316942 | - |
| 0.169799194 |             |           |           |          |           |   |
| ## 59       | Jordan      | 9.352019  | 0.8304439 | 64.18116 | 0.7665170 | - |
| 0.069207847 |             |           |           |          |           |   |
| ## 60       | Kazakhstan  | 10.042273 | 0.9313493 | 63.64412 | 0.7401328 | - |
| 0.051406134 |             |           |           |          |           |   |
| ## 61       | Kenya       | 7.970297  | 0.7769231 | 54.14322 | 0.7929903 |   |



|             |             |           |           |          |           |   |
|-------------|-------------|-----------|-----------|----------|-----------|---|
| 0.238054082 |             |           |           |          |           |   |
| ## 62       | Kosovo      | NA        | 0.8052708 | 62.00486 | 0.5610483 |   |
| NA          |             |           |           |          |           |   |
| ## 63       | Kuwait      | NA        | 0.8230178 | 65.09716 | 0.8216624 |   |
| NA          |             |           |           |          |           |   |
| ## 64       | Kyrgyzstan  | 8.061284  | 0.8565845 | 62.41665 | 0.8131759 |   |
| 0.226265088 |             |           |           |          |           |   |
| ## 65       | Latvia      | 10.037901 | 0.8793724 | 65.33850 | 0.6563932 | - |
| 0.085272886 |             |           |           |          |           |   |
| ## 66       | Lebanon     | 9.728823  | 0.7417077 | 69.59850 | 0.5967498 |   |
| 0.054535788 |             |           |           |          |           |   |
| ## 67       | Liberia     | 6.739805  | 0.6376660 | 51.28914 | 0.6714309 | - |
| 0.009916847 |             |           |           |          |           |   |
| ## 68       | Libya       | 9.555550  | 0.8679877 | 61.16175 | 0.7745450 | - |
| 0.076456018 |             |           |           |          |           |   |
| ## 69       | Lithuania   | 10.185368 | 0.9285235 | 65.67057 | 0.6414702 | - |
| 0.262404770 |             |           |           |          |           |   |
| ## 70       | Luxembourg  | 11.429970 | 0.9336046 | 72.53326 | 0.9322564 |   |
| 0.036430217 |             |           |           |          |           |   |
| ## 71       | Macedonia   | 9.446383  | 0.7663682 | 65.56458 | 0.6603189 | - |
| 0.048491806 |             |           |           |          |           |   |
| ## 72       | Madagascar  | 7.228697  | 0.6467165 | 56.31346 | 0.5447536 | - |
| 0.029426256 |             |           |           |          |           |   |
| ## 73       | Malawi      | 6.660712  | 0.4943816 | 54.48933 | 0.8013907 |   |
| 0.085140154 |             |           |           |          |           |   |
| ## 74       | Malaysia    | 10.136704 | 0.8176163 | 64.74024 | 0.6745945 |   |
| 0.201898143 |             |           |           |          |           |   |
| ## 75       | Mali        | 7.350600  | 0.8301892 | 49.19207 | 0.6337535 | - |
| 0.042629778 |             |           |           |          |           |   |
| ## 76       | Malta       | NA        | 0.9187649 | 70.77766 | 0.9121780 |   |
| NA          |             |           |           |          |           |   |
| ## 77       | Mauritania  | 8.231690  | 0.8749459 | 53.24210 | 0.4470866 |   |
| 0.073142350 |             |           |           |          |           |   |
| ## 78       | Mexico      | 9.707403  | 0.7606143 | 67.78441 | 0.7194660 | - |
| 0.156158805 |             |           |           |          |           |   |
| ## 79       | Moldova     | 8.447127  | 0.8399055 | 61.26768 | 0.5952414 | - |
| 0.038925178 |             |           |           |          |           |   |
| ## 80       | Mongolia    | 9.346310  | 0.9055244 | 62.64931 | 0.6855108 |   |
| 0.157298073 |             |           |           |          |           |   |
| ## 81       | Montenegro  | 9.616770  | 0.7396305 | 65.11017 | 0.5833173 | - |
| 0.145327449 |             |           |           |          |           |   |
| ## 82       | Morocco     | 8.906810  | 0.6537850 | 63.91926 | 0.6934186 | - |
| 0.248565361 |             |           |           |          |           |   |
| ## 83       | Myanmar     | NA        | 0.7520643 | 57.09218 | 0.8079711 |   |
| NA          |             |           |           |          |           |   |
| ## 84       | Nepal       | 7.746914  | 0.7476119 | 60.75210 | 0.7634472 |   |
| 0.242998511 |             |           |           |          |           |   |
| ## 85       | Netherlands | 10.748624 | 0.8790104 | 71.09193 | 0.9039788 |   |
| 0.247195244 |             |           |           |          |           |   |
| ## 86       | New Zealand | 10.431994 | 0.9873435 | 71.92076 | 0.9417843 |   |

|             |                         |           |           |          |           |   |  |
|-------------|-------------------------|-----------|-----------|----------|-----------|---|--|
| 0.320652515 |                         |           |           |          |           |   |  |
| ## 87       | Nicaragua               | 8.480531  | 0.8269085 | 65.85806 | 0.8092592 |   |  |
| 0.081847742 |                         |           |           |          |           |   |  |
| ## 88       | Niger                   | 6.803244  | 0.7130196 | 52.82997 | 0.7281283 | - |  |
| 0.009490362 |                         |           |           |          |           |   |  |
| ## 89       | Nigeria                 | 8.644704  | 0.8116477 | 45.24734 | 0.6804703 | - |  |
| 0.045139253 |                         |           |           |          |           |   |  |
| ## 90       | North Cyprus            | NA        | 0.7913827 | NA       | 0.7853528 |   |  |
| NA          |                         |           |           |          |           |   |  |
| ## 91       | Norway                  | 11.068009 | 0.9468340 | 70.52483 | 0.9476205 |   |  |
| 0.228181615 |                         |           |           |          |           |   |  |
| ## 92       | Pakistan                | 8.464853  | 0.5617201 | 57.25552 | 0.5865462 |   |  |
| 0.071716130 |                         |           |           |          |           |   |  |
| ## 93       | Palestinian Territories | 8.365737  | 0.7661012 | 62.83750 | 0.5560409 | - |  |
| 0.150193453 |                         |           |           |          |           |   |  |
| ## 94       | Panama                  | 9.942081  | 0.8826150 | 67.68180 | 0.8466692 | - |  |
| 0.002205028 |                         |           |           |          |           |   |  |
| ## 95       | Paraguay                | 9.065535  | 0.9141991 | 63.34425 | 0.8061247 |   |  |
| 0.003749649 |                         |           |           |          |           |   |  |
| ## 96       | Peru                    | 9.358279  | 0.7984183 | 65.03024 | 0.8022690 | - |  |
| 0.100029737 |                         |           |           |          |           |   |  |
| ## 97       | Philippines             | 8.843670  | 0.8535886 | 59.46133 | 0.9115336 | - |  |
| 0.056648508 |                         |           |           |          |           |   |  |
| ## 98       | Poland                  | 10.120240 | 0.8930904 | 66.95756 | 0.7934622 | - |  |
| 0.103777371 |                         |           |           |          |           |   |  |
| ## 99       | Portugal                | 10.195284 | 0.8662139 | 70.45056 | 0.8004403 | - |  |
| 0.171841606 |                         |           |           |          |           |   |  |
| ## 100      | Qatar                   | NA        | NA        | 67.82797 | NA        |   |  |
| NA          |                         |           |           |          |           |   |  |
| ## 101      | Romania                 | 9.896219  | 0.7869673 | 66.41331 | 0.7958477 | - |  |
| 0.145152822 |                         |           |           |          |           |   |  |
| ## 102      | Russia                  | 10.012393 | 0.9243633 | 64.08343 | 0.6854547 | - |  |
| 0.179458767 |                         |           |           |          |           |   |  |
| ## 103      | Rwanda                  | 7.416408  | 0.6781436 | 54.64949 | 0.9078923 |   |  |
| 0.035836529 |                         |           |           |          |           |   |  |
| ## 104      | Saudi Arabia            | 10.815763 | 0.8197497 | 63.71784 | 0.8202072 | - |  |
| 0.070376605 |                         |           |           |          |           |   |  |
| ## 105      | Senegal                 | 7.725880  | 0.7015345 | 57.57685 | 0.7195333 | - |  |
| 0.092522651 |                         |           |           |          |           |   |  |
| ## 106      | Serbia                  | 9.462955  | 0.8162510 | 65.63837 | 0.5458920 | - |  |
| 0.062717922 |                         |           |           |          |           |   |  |
| ## 107      | Sierra Leone            | 7.374071  | 0.6105937 | 43.74034 | 0.6242961 |   |  |
| 0.050585665 |                         |           |           |          |           |   |  |
| ## 108      | Singapore               | NA        | 0.8664367 | 76.04466 | 0.8868909 |   |  |
| NA          |                         |           |           |          |           |   |  |
| ## 109      | Slovakia                | 10.214083 | 0.9434537 | 67.49669 | 0.5871577 | - |  |
| 0.142087966 |                         |           |           |          |           |   |  |
| ## 110      | Slovenia                | 10.269225 | 0.9011638 | 70.51219 | 0.8960073 | - |  |
| 0.000629284 |                         |           |           |          |           |   |  |
| ## 111      | Somalia                 | NA        | 0.5992811 | 47.28276 | 0.9678693 |   |  |

|             |                      |           |           |          |           |   |  |
|-------------|----------------------|-----------|-----------|----------|-----------|---|--|
| NA          |                      |           |           |          |           |   |  |
| ## 112      | South Africa         | 9.428298  | 0.8980963 | 50.14693 | 0.8624494 | - |  |
| 0.138439283 |                      |           |           |          |           |   |  |
| ## 113      | South Korea          | 10.446025 | 0.7683506 | 73.85837 | 0.6158488 | - |  |
| 0.048341293 |                      |           |           |          |           |   |  |
| ## 114      | Spain                | 10.402864 | 0.9564719 | 73.37998 | 0.7320005 | - |  |
| 0.084349990 |                      |           |           |          |           |   |  |
| ## 115      | Sri Lanka            | 9.319309  | 0.8625001 | 64.64014 | 0.9020748 |   |  |
| 0.310886711 |                      |           |           |          |           |   |  |
| ## 116      | Sweden               | 10.712334 | 0.9294600 | 71.74087 | 0.9350721 |   |  |
| 0.197725981 |                      |           |           |          |           |   |  |
| ## 117      | Switzerland          | 10.914726 | 0.9383337 | 72.86915 | 0.9278024 |   |  |
| 0.097075745 |                      |           |           |          |           |   |  |
| ## 118      | Syria                | NA        | 0.4639129 | 64.83573 | 0.4482709 |   |  |
| NA          |                      |           |           |          |           |   |  |
| ## 119      | Taiwan               | NA        | 0.8853889 | 70.75000 | 0.7008105 |   |  |
| NA          |                      |           |           |          |           |   |  |
| ## 120      | Tajikistan           | 7.869648  | 0.8439325 | 61.64697 | 0.8465421 |   |  |
| 0.025703574 |                      |           |           |          |           |   |  |
| ## 121      | Tanzania             | 7.831087  | 0.7902626 | 56.12052 | 0.7586847 |   |  |
| 0.142459080 |                      |           |           |          |           |   |  |
| ## 122      | Thailand             | 9.637293  | 0.8663245 | 65.64534 | 0.8849165 |   |  |
| 0.305076480 |                      |           |           |          |           |   |  |
| ## 123      | Togo                 | 7.241591  | 0.4785934 | 51.97361 | 0.7715772 | - |  |
| 0.063052811 |                      |           |           |          |           |   |  |
| ## 124      | Tunisia              | 9.292294  | 0.6094700 | 63.35026 | 0.7113734 | - |  |
| 0.240898952 |                      |           |           |          |           |   |  |
| ## 125      | Turkey               | 9.864202  | 0.8512246 | 65.69592 | 0.6531968 |   |  |
| NA          |                      |           |           |          |           |   |  |
| ## 126      | Turkmenistan         | 9.669529  | 0.9601585 | 58.44135 | 0.7013584 |   |  |
| 0.063167505 |                      |           |           |          |           |   |  |
| ## 127      | Ukraine              | 8.895362  | 0.9094397 | 63.52374 | 0.4305920 | - |  |
| 0.012190276 |                      |           |           |          |           |   |  |
| ## 128      | United Arab Emirates | NA        | 0.8241367 | 68.35641 | 0.9150362 |   |  |
| NA          |                      |           |           |          |           |   |  |
| ## 129      | United Kingdom       | 10.567661 | 0.9359857 | 71.05131 | 0.8329261 |   |  |
| 0.288037807 |                      |           |           |          |           |   |  |
| ## 130      | United States        | 10.877965 | 0.9035711 | 70.03674 | 0.8487535 |   |  |
| 0.201775953 |                      |           |           |          |           |   |  |
| ## 131      | Uruguay              | 9.917072  | 0.8914935 | 68.11640 | 0.9168797 | - |  |
| 0.048586730 |                      |           |           |          |           |   |  |
| ## 132      | Uzbekistan           | 8.630272  | 0.9682252 | 60.53566 | 0.9799371 |   |  |
| 0.373070538 |                      |           |           |          |           |   |  |
| ## 133      | Venezuela            | NA        | 0.9110869 | 64.58602 | 0.5121593 |   |  |
| NA          |                      |           |           |          |           |   |  |
| ## 134      | Vietnam              | 8.637988  | 0.8486767 | 66.04872 | NA        |   |  |
| 0.087306730 |                      |           |           |          |           |   |  |
| ## 135      | Yemen                | 7.843260  | 0.6686835 | 54.08096 | 0.6099808 | - |  |
| 0.139901683 |                      |           |           |          |           |   |  |
| ## 136      | Zimbabwe             | 7.430315  | 0.7358003 | 50.36258 | 0.6671933 | - |  |

0.081429422

| ##    | corruption | world |
|-------|------------|-------|
| ## 1  | 0.88479304 | 2     |
| ## 2  | 0.85090619 | 4     |
| ## 3  | 0.90146220 | 2     |
| ## 4  | 0.35655439 | 1     |
| ## 5  | 0.55747962 | 1     |
| ## 6  | 0.61555255 | 2     |
| ## 7  | NA         | 4     |
| ## 8  | 0.72060090 | 3     |
| ## 9  | 0.66867816 | 2     |
| ## 10 | 0.46878463 | 1     |
| ## 11 | 0.85009819 | 3     |
| ## 12 | 0.63395578 | 3     |
| ## 13 | 0.86237395 | 4     |
| ## 14 | 0.95985365 | 2     |
| ## 15 | 0.86029297 | 4     |
| ## 16 | 0.77133906 | 4     |
| ## 17 | 0.69272399 | 3     |
| ## 18 | 0.82513022 | 3     |
| ## 19 | 0.86804903 | 4     |
| ## 20 | 0.42715225 | 1     |
| ## 21 | 0.88863939 | 3     |
| ## 22 | 0.81151134 | 4     |
| ## 23 | NA         | 4     |
| ## 24 | 0.84289932 | 4     |
| ## 25 | 0.84135950 | 3     |
| ## 26 | 0.86637801 | 3     |
| ## 27 | 0.76141941 | 4     |
| ## 28 | 0.84854555 | 2     |
| ## 29 | 0.89279515 | 4     |
| ## 30 | 0.88646746 | 2     |
| ## 31 | 0.19101639 | 1     |
| ## 32 | 0.75528818 | 4     |
| ## 33 | 0.66582751 | 4     |
| ## 34 | 0.68449807 | 4     |
| ## 35 | 0.80454427 | 4     |
| ## 36 | 0.56873447 | 2     |
| ## 37 | 0.56702733 | 3     |
| ## 38 | 0.22336966 | 4     |
| ## 39 | 0.64060205 | 1     |
| ## 40 | 0.86677748 | 4     |
| ## 41 | 0.50241679 | 2     |
| ## 42 | 0.41216829 | 1     |
| ## 43 | 0.94543612 | 3     |
| ## 44 | 0.82395965 | 1     |
| ## 45 | 0.82165492 | 4     |
| ## 46 | 0.76215202 | 3     |
| ## 47 | 0.77740395 | 3     |
| ## 48 | 0.84808272 | 4     |

|       |            |   |
|-------|------------|---|
| ## 49 | 0.90753031 | 2 |
| ## 50 | 0.77643496 | 4 |
| ## 51 | 0.94596726 | 4 |
| ## 52 | NA         | 4 |
| ## 53 | 0.76216716 | 4 |
| ## 54 | 0.40875691 | 1 |
| ## 55 | 0.78942990 | 1 |
| ## 56 | 0.91275305 | 1 |
| ## 57 | 0.74424964 | 4 |
| ## 58 | 0.65444309 | 1 |
| ## 59 | NA         | 4 |
| ## 60 | 0.71384430 | 2 |
| ## 61 | 0.85254985 | 4 |
| ## 62 | 0.85064709 | 4 |
| ## 63 | NA         | 4 |
| ## 64 | 0.85772502 | 2 |
| ## 65 | 0.80840039 | 2 |
| ## 66 | 0.88895327 | 4 |
| ## 67 | 0.90267265 | 3 |
| ## 68 | NA         | 4 |
| ## 69 | 0.92417407 | 2 |
| ## 70 | 0.37539047 | 1 |
| ## 71 | 0.82417899 | 2 |
| ## 72 | 0.86095339 | 3 |
| ## 73 | 0.83482540 | 3 |
| ## 74 | 0.83789223 | 4 |
| ## 75 | 0.80004674 | 3 |
| ## 76 | 0.66388631 | 4 |
| ## 77 | 0.71535844 | 3 |
| ## 78 | 0.70797193 | 4 |
| ## 79 | 0.94311881 | 2 |
| ## 80 | 0.90021819 | 4 |
| ## 81 | 0.78123259 | 2 |
| ## 82 | 0.86777443 | 4 |
| ## 83 | 0.63330519 | 3 |
| ## 84 | 0.82350838 | 3 |
| ## 85 | 0.41182211 | 1 |
| ## 86 | 0.18588871 | 1 |
| ## 87 | 0.72799838 | 4 |
| ## 88 | 0.70254970 | 3 |
| ## 89 | 0.92610925 | 4 |
| ## 90 | 0.65918028 | 4 |
| ## 91 | 0.29881436 | 1 |
| ## 92 | 0.71664119 | 4 |
| ## 93 | 0.77430135 | 4 |
| ## 94 | 0.80994290 | 4 |
| ## 95 | 0.86288828 | 4 |
| ## 96 | 0.88373041 | 4 |
| ## 97 | 0.75519156 | 4 |
| ## 98 | 0.81009632 | 2 |

```

## 99 0.94105077 1
## 100 NA 4
## 101 0.96165097 2
## 102 0.91341829 2
## 103 0.09460447 3
## 104 NA 4
## 105 0.76549017 3
## 106 0.85935801 2
## 107 0.82482803 3
## 108 0.09894388 4
## 109 0.92754513 2
## 110 0.89219791 2
## 111 0.41023576 3
## 112 0.85269475 4
## 113 0.84072161 1
## 114 0.82166493 1
## 115 0.85947096 4
## 116 0.23196414 1
## 117 0.20953351 1
## 118 0.68523693 4
## 119 0.85719484 4
## 120 0.74168962 2
## 121 0.90642261 3
## 122 0.91365111 4
## 123 0.73326176 3
## 124 0.81482500 4
## 125 0.80607623 1
## 126 NA 2
## 127 0.95247275 2
## 128 NA 4
## 129 0.45613372 1
## 130 0.69754261 1
## 131 0.67347568 4
## 132 0.47091693 2
## 133 0.81309682 4
## 134 NA 4
## 135 0.82909757 3
## 136 0.81045735 4

```

- De-select range of variables

```

world_happiness %>%
  select(-(gdp:world))

```

```

##           country happiness
## 1         Albania 4.606651
## 2       Argentina 6.697131
## 3         Armenia 4.348320
## 4       Australia 7.309061
## 5         Austria 7.076447
## 6     Azerbaijan 5.146775

```

|       |                        |          |
|-------|------------------------|----------|
| ## 7  | Bahrain                | 6.007375 |
| ## 8  | Bangladesh             | 4.633474 |
| ## 9  | Belarus                | 5.718908 |
| ## 10 | Belgium                | 6.904219 |
| ## 11 | Benin                  | 3.624664 |
| ## 12 | Bhutan                 | 5.082129 |
| ## 13 | Bolivia                | 5.834329 |
| ## 14 | Bosnia and Herzegovina | 5.117178 |
| ## 15 | Botswana               | 3.761965 |
| ## 16 | Brazil                 | 6.546897 |
| ## 17 | Burkina Faso           | 4.418930 |
| ## 18 | Cambodia               | 4.162165 |
| ## 19 | Cameroon               | 5.037965 |
| ## 20 | Canada                 | 7.412773 |
| ## 21 | Chad                   | 4.322675 |
| ## 22 | Chile                  | 6.532750 |
| ## 23 | China                  | 5.303878 |
| ## 24 | Colombia               | 6.387572 |
| ## 25 | Congo (Brazzaville)    | 4.690830 |
| ## 26 | Congo (Kinshasa)       | 3.902742 |
| ## 27 | Costa Rica             | 6.854004 |
| ## 28 | Croatia                | 5.205438 |
| ## 29 | Cyprus                 | 5.439161 |
| ## 30 | Czech Republic         | 6.608017 |
| ## 31 | Denmark                | 7.514425 |
| ## 32 | Dominican Republic     | 5.061862 |
| ## 33 | Ecuador                | 5.964075 |
| ## 34 | Egypt                  | 4.762538 |
| ## 35 | El Salvador            | 6.018496 |
| ## 36 | Estonia                | 5.628909 |
| ## 37 | Ethiopia               | 4.573155 |
| ## 38 | Finland                | 7.447926 |
| ## 39 | France                 | 6.357625 |
| ## 40 | Gabon                  | 4.661013 |
| ## 41 | Georgia                | 4.121941 |
| ## 42 | Germany                | 7.037138 |
| ## 43 | Ghana                  | 3.985916 |
| ## 44 | Greece                 | 5.622519 |
| ## 45 | Guatemala              | 6.464987 |
| ## 46 | Guinea                 | 3.504694 |
| ## 47 | Haiti                  | 3.569762 |
| ## 48 | Honduras               | 4.845437 |
| ## 49 | Hungary                | 5.344383 |
| ## 50 | India                  | 4.342079 |
| ## 51 | Indonesia              | 5.042800 |
| ## 52 | Iran                   | 4.749956 |
| ## 53 | Iraq                   | 4.493377 |
| ## 54 | Ireland                | 6.830125 |
| ## 55 | Israel                 | 7.079411 |
| ## 56 | Italy                  | 5.847684 |

|        |                         |          |
|--------|-------------------------|----------|
| ## 57  | Ivory Coast             | 4.445039 |
| ## 58  | Japan                   | 5.879684 |
| ## 59  | Jordan                  | 5.404593 |
| ## 60  | Kazakhstan              | 5.949995 |
| ## 61  | Kenya                   | 4.357618 |
| ## 62  | Kosovo                  | 5.077461 |
| ## 63  | Kuwait                  | 6.146032 |
| ## 64  | Kyrgyzstan              | 4.905376 |
| ## 65  | Latvia                  | 5.880598 |
| ## 66  | Lebanon                 | 5.171971 |
| ## 67  | Liberia                 | 2.701591 |
| ## 68  | Libya                   | 5.615405 |
| ## 69  | Lithuania               | 5.711378 |
| ## 70  | Luxembourg              | 6.701571 |
| ## 71  | Macedonia               | 4.975590 |
| ## 72  | Madagascar              | 3.592514 |
| ## 73  | Malawi                  | 3.867638 |
| ## 74  | Malaysia                | 6.322121 |
| ## 75  | Mali                    | 4.582098 |
| ## 76  | Malta                   | 6.613394 |
| ## 77  | Mauritania              | 3.922664 |
| ## 78  | Mexico                  | 6.236287 |
| ## 79  | Moldova                 | 6.017472 |
| ## 80  | Mongolia                | 4.982720 |
| ## 81  | Montenegro              | 5.124921 |
| ## 82  | Morocco                 | 5.160294 |
| ## 83  | Myanmar                 | 4.223846 |
| ## 84  | Nepal                   | 4.812437 |
| ## 85  | Netherlands             | 7.324437 |
| ## 86  | New Zealand             | 7.418121 |
| ## 87  | Nicaragua               | 5.924113 |
| ## 88  | Niger                   | 3.671454 |
| ## 89  | Nigeria                 | 4.932915 |
| ## 90  | North Cyprus            | 5.842550 |
| ## 91  | Norway                  | 7.603434 |
| ## 92  | Pakistan                | 4.823195 |
| ## 93  | Palestinian Territories | 4.695239 |
| ## 94  | Panama                  | 6.605550 |
| ## 95  | Paraguay                | 5.559724 |
| ## 96  | Peru                    | 5.577263 |
| ## 97  | Philippines             | 5.547489 |
| ## 98  | Poland                  | 6.007022 |
| ## 99  | Portugal                | 5.080866 |
| ## 100 | Qatar                   | 6.374529 |
| ## 101 | Romania                 | 5.777491 |
| ## 102 | Russia                  | 5.995539 |
| ## 103 | Rwanda                  | 3.483109 |
| ## 104 | Saudi Arabia            | 6.345492 |
| ## 105 | Senegal                 | 4.617001 |
| ## 106 | Serbia                  | 5.317685 |



```

## 107      Sierra Leone  4.908618
## 108      Singapore    6.619525
## 109      Slovakia     6.162004
## 110      Slovenia     5.740642
## 111      Somalia      5.353645
## 112      South Africa  4.887326
## 113      South Korea   5.780211
## 114      Spain        6.380663
## 115      Sri Lanka    4.611607
## 116      Sweden       7.288922
## 117      Switzerland  7.572137
## 118      Syria        3.461913
## 119      Taiwan       6.450088
## 120      Tajikistan   5.124211
## 121      Tanzania     3.660597
## 122      Thailand     6.201763
## 123      Togo         3.768302
## 124      Tunisia      5.131612
## 125      Turkey       5.514465
## 126      Turkmenistan  5.791460
## 127      Ukraine      3.964543
## 128      United Arab Emirates 6.568398
## 129      United Kingdom 6.515445
## 130      United States 6.863947
## 131      Uruguay      6.628080
## 132      Uzbekistan   5.972364
## 133      Venezuela    5.568800
## 134      Vietnam      5.076315
## 135      Yemen        2.982674
## 136      Zimbabwe     3.703191

```

## Examples

- Produce a data frame of the variables `country`, `gdp`, and `happiness` for countries whose `gdp` is greater than average.

```
# your code here
```

- Produce a data frame that has “first world” countries (`world = 1`) with greater than average levels of freedom. Arrange the rows by freedom scores so that the highest freedom scores are at the top of the data set. Only display the `country` and `freedom` variables (in that order). How many observations are you left with?

```
# your code here
```

## Helper functions for `select()`

There are some “helper” functions that you can use along with `select()` that can sometimes be more efficient than selecting your variables explicitly by name.

| function | what it does |
|----------|--------------|
|----------|--------------|

starts\_with() selects columns starting with a string  
ends\_with() selects columns that end with a string  
contains() selects columns that contain a string  
matches() selects columns that match a regular expression  
num\_ranges() selects columns that match a numerical range  
one\_of() selects columns whose names match entries in a character vector  
everything() selects all columns  
last\_col() selects last column; can include an offset.

Quick example:

```
world_happiness %>%  
  select(starts_with("c"))  
  
##           country corruption  
## 1           Albania 0.88479304  
## 2           Argentina 0.85090619  
## 3           Armenia 0.90146220  
## 4           Australia 0.35655439  
## 5           Austria 0.55747962  
## 6           Azerbaijan 0.61555255  
## 7           Bahrain      NA  
## 8           Bangladesh 0.72060090  
## 9           Belarus 0.66867816  
## 10          Belgium 0.46878463  
## 11          Benin 0.85009819  
## 12          Bhutan 0.63395578  
## 13          Bolivia 0.86237395  
## 14 Bosnia and Herzegovina 0.95985365  
## 15          Botswana 0.86029297  
## 16          Brazil 0.77133906  
## 17          Burkina Faso 0.69272399  
## 18          Cambodia 0.82513022  
## 19          Cameroon 0.86804903  
## 20          Canada 0.42715225  
## 21          Chad 0.88863939  
## 22          Chile 0.81151134  
## 23          China      NA  
## 24          Colombia 0.84289932  
## 25 Congo (Brazzaville) 0.84135950  
## 26 Congo (Kinshasa) 0.86637801  
## 27          Costa Rica 0.76141941  
## 28          Croatia 0.84854555  
## 29          Cyprus 0.89279515  
## 30          Czech Republic 0.88646746  
## 31          Denmark 0.19101639  
## 32 Dominican Republic 0.75528818  
## 33          Ecuador 0.66582751
```

|       |             |            |
|-------|-------------|------------|
| ## 34 | Egypt       | 0.68449807 |
| ## 35 | El Salvador | 0.80454427 |
| ## 36 | Estonia     | 0.56873447 |
| ## 37 | Ethiopia    | 0.56702733 |
| ## 38 | Finland     | 0.22336966 |
| ## 39 | France      | 0.64060205 |
| ## 40 | Gabon       | 0.86677748 |
| ## 41 | Georgia     | 0.50241679 |
| ## 42 | Germany     | 0.41216829 |
| ## 43 | Ghana       | 0.94543612 |
| ## 44 | Greece      | 0.82395965 |
| ## 45 | Guatemala   | 0.82165492 |
| ## 46 | Guinea      | 0.76215202 |
| ## 47 | Haiti       | 0.77740395 |
| ## 48 | Honduras    | 0.84808272 |
| ## 49 | Hungary     | 0.90753031 |
| ## 50 | India       | 0.77643496 |
| ## 51 | Indonesia   | 0.94596726 |
| ## 52 | Iran        | NA         |
| ## 53 | Iraq        | 0.76216716 |
| ## 54 | Ireland     | 0.40875691 |
| ## 55 | Israel      | 0.78942990 |
| ## 56 | Italy       | 0.91275305 |
| ## 57 | Ivory Coast | 0.74424964 |
| ## 58 | Japan       | 0.65444309 |
| ## 59 | Jordan      | NA         |
| ## 60 | Kazakhstan  | 0.71384430 |
| ## 61 | Kenya       | 0.85254985 |
| ## 62 | Kosovo      | 0.85064709 |
| ## 63 | Kuwait      | NA         |
| ## 64 | Kyrgyzstan  | 0.85772502 |
| ## 65 | Latvia      | 0.80840039 |
| ## 66 | Lebanon     | 0.88895327 |
| ## 67 | Liberia     | 0.90267265 |
| ## 68 | Libya       | NA         |
| ## 69 | Lithuania   | 0.92417407 |
| ## 70 | Luxembourg  | 0.37539047 |
| ## 71 | Macedonia   | 0.82417899 |
| ## 72 | Madagascar  | 0.86095339 |
| ## 73 | Malawi      | 0.83482540 |
| ## 74 | Malaysia    | 0.83789223 |
| ## 75 | Mali        | 0.80004674 |
| ## 76 | Malta       | 0.66388631 |
| ## 77 | Mauritania  | 0.71535844 |
| ## 78 | Mexico      | 0.70797193 |
| ## 79 | Moldova     | 0.94311881 |
| ## 80 | Mongolia    | 0.90021819 |
| ## 81 | Montenegro  | 0.78123259 |
| ## 82 | Morocco     | 0.86777443 |
| ## 83 | Myanmar     | 0.63330519 |

|        |                         |            |
|--------|-------------------------|------------|
| ## 84  | Nepal                   | 0.82350838 |
| ## 85  | Netherlands             | 0.41182211 |
| ## 86  | New Zealand             | 0.18588871 |
| ## 87  | Nicaragua               | 0.72799838 |
| ## 88  | Niger                   | 0.70254970 |
| ## 89  | Nigeria                 | 0.92610925 |
| ## 90  | North Cyprus            | 0.65918028 |
| ## 91  | Norway                  | 0.29881436 |
| ## 92  | Pakistan                | 0.71664119 |
| ## 93  | Palestinian Territories | 0.77430135 |
| ## 94  | Panama                  | 0.80994290 |
| ## 95  | Paraguay                | 0.86288828 |
| ## 96  | Peru                    | 0.88373041 |
| ## 97  | Philippines             | 0.75519156 |
| ## 98  | Poland                  | 0.81009632 |
| ## 99  | Portugal                | 0.94105077 |
| ## 100 | Qatar                   | NA         |
| ## 101 | Romania                 | 0.96165097 |
| ## 102 | Russia                  | 0.91341829 |
| ## 103 | Rwanda                  | 0.09460447 |
| ## 104 | Saudi Arabia            | NA         |
| ## 105 | Senegal                 | 0.76549017 |
| ## 106 | Serbia                  | 0.85935801 |
| ## 107 | Sierra Leone            | 0.82482803 |
| ## 108 | Singapore               | 0.09894388 |
| ## 109 | Slovakia                | 0.92754513 |
| ## 110 | Slovenia                | 0.89219791 |
| ## 111 | Somalia                 | 0.41023576 |
| ## 112 | South Africa            | 0.85269475 |
| ## 113 | South Korea             | 0.84072161 |
| ## 114 | Spain                   | 0.82166493 |
| ## 115 | Sri Lanka               | 0.85947096 |
| ## 116 | Sweden                  | 0.23196414 |
| ## 117 | Switzerland             | 0.20953351 |
| ## 118 | Syria                   | 0.68523693 |
| ## 119 | Taiwan                  | 0.85719484 |
| ## 120 | Tajikistan              | 0.74168962 |
| ## 121 | Tanzania                | 0.90642261 |
| ## 122 | Thailand                | 0.91365111 |
| ## 123 | Togo                    | 0.73326176 |
| ## 124 | Tunisia                 | 0.81482500 |
| ## 125 | Turkey                  | 0.80607623 |
| ## 126 | Turkmenistan            | NA         |
| ## 127 | Ukraine                 | 0.95247275 |
| ## 128 | United Arab Emirates    | NA         |
| ## 129 | United Kingdom          | 0.45613372 |
| ## 130 | United States           | 0.69754261 |
| ## 131 | Uruguay                 | 0.67347568 |
| ## 132 | Uzbekistan              | 0.47091693 |
| ## 133 | Venezuela               | 0.81309682 |

```
## 134          Vietnam          NA
## 135          Yemen 0.82909757
## 136          Zimbabwe 0.81045735
```

## Create new variables with `mutate()`

- The `mutate()` function is most commonly used to add new columns to your data frame that are functions of existing columns.
- `mutate()` requires data as its first argument, followed by a set of expressions defining new columns. Let's take a couple examples...
- Create new variables
  - **Note:** New variables are automatically added at the end of the data frame (scroll to the right to see them)

Here, we are creating a new variable called `corruption_z`, which standardizes the corruption scores, and a new variable `life_int`, which rounds the life scores to the nearest integer.

```
world_happiness %>%
  mutate(corruption_z = scale(corruption),
         life_int = round(life, 0))

##           country happiness      gdp  support    life
freedom
## 1           Albania 4.606651  9.251464 0.6393561 68.43517
0.7038507
## 2           Argentina 6.697131      NA 0.9264923 67.28722
0.8812237
## 3           Armenia 4.348320  8.968936 0.7225510 65.30076
0.5510266
## 4           Australia 7.309061 10.680326 0.9518616 72.56024
0.9218710
## 5           Austria 7.076447 10.691354 0.9281103 70.82256
0.9003052
## 6           Azerbaijan 5.146775  9.730904 0.7857028 61.97585
0.7642895
## 7           Bahrain 6.007375      NA 0.8525507 65.84793
0.8495212
## 8           Bangladesh 4.633474  8.050836 0.6014683 61.72731
0.8147963
## 9           Belarus 5.718908  9.725568 0.9240726 65.31599
0.6227534
## 10          Belgium 6.904219 10.626178 0.8852088 71.34201
0.8694749
## 11          Benin 3.624664  7.598665 0.4343885 50.58654
0.7333836
## 12          Bhutan 5.082129  8.969653 0.8475744 60.61641
0.8301015
```

|           |                        |          |           |           |          |
|-----------|------------------------|----------|-----------|-----------|----------|
| ## 13     | Bolivia                | 5.834329 | 8.778191  | 0.8287058 | 59.73697 |
| 0.8836251 |                        |          |           |           |          |
| ## 14     | Bosnia and Herzegovina | 5.117178 | 9.178364  | 0.6557236 | 67.63831 |
| 0.6306980 |                        |          |           |           |          |
| ## 15     | Botswana               | 3.761965 | 9.654463  | 0.8156561 | 55.25417 |
| 0.8571689 |                        |          |           |           |          |
| ## 16     | Brazil                 | 6.546897 | 9.582796  | 0.9066931 | 64.59515 |
| 0.7989353 |                        |          |           |           |          |
| ## 17     | Burkina Faso           | 4.418930 | 7.357180  | 0.7053935 | 50.83040 |
| 0.6591027 |                        |          |           |           |          |
| ## 18     | Cambodia               | 4.162165 | 8.094646  | 0.7286103 | 58.16891 |
| 0.9563198 |                        |          |           |           |          |
| ## 19     | Cameroon               | 5.037965 | 7.986924  | 0.6463125 | 47.95748 |
| 0.7914286 |                        |          |           |           |          |
| ## 20     | Canada                 | 7.412773 | 10.664708 | 0.9390671 | 71.76053 |
| 0.9314690 |                        |          |           |           |          |
| ## 21     | Chad                   | 4.322675 | 7.695847  | 0.7512522 | 44.87283 |
| 0.4743609 |                        |          |           |           |          |
| ## 22     | Chile                  | 6.532750 | 10.009483 | 0.8271419 | 71.57857 |
| 0.7688814 |                        |          |           |           |          |
| ## 23     | China                  | 5.303878 | 9.501941  | 0.7937337 | 68.59845 |
| NA        |                        |          |           |           |          |
| ## 24     | Colombia               | 6.387572 | 9.471478  | 0.8899000 | 63.84050 |
| 0.7908980 |                        |          |           |           |          |
| ## 25     | Congo (Brazzaville)    | 4.690830 | 8.685216  | 0.6421362 | 53.51811 |
| 0.8501725 |                        |          |           |           |          |
| ## 26     | Congo (Kinshasa)       | 3.902742 | 6.613966  | 0.7672356 | 50.01415 |
| 0.5737638 |                        |          |           |           |          |
| ## 27     | Costa Rica             | 6.854004 | 9.580832  | 0.8782730 | 69.49661 |
| 0.9069257 |                        |          |           |           |          |
| ## 28     | Croatia                | 5.205438 | 9.919107  | 0.7683634 | 67.59174 |
| 0.6935230 |                        |          |           |           |          |
| ## 29     | Cyprus                 | 5.439161 | NA        | 0.7695561 | 72.48824 |
| 0.6280348 |                        |          |           |           |          |
| ## 30     | Czech Republic         | 6.608017 | 10.308098 | 0.9113626 | 69.60413 |
| 0.8084842 |                        |          |           |           |          |
| ## 31     | Denmark                | 7.514425 | 10.676427 | 0.9597013 | 70.70427 |
| 0.9414364 |                        |          |           |           |          |
| ## 32     | Dominican Republic     | 5.061862 | 9.488247  | 0.8931978 | 63.16206 |
| 0.8560253 |                        |          |           |           |          |
| ## 33     | Ecuador                | 5.964075 | 9.270621  | 0.8558892 | 66.94999 |
| 0.8008705 |                        |          |           |           |          |
| ## 34     | Egypt                  | 4.762538 | 9.234282  | 0.7297443 | 61.27411 |
| 0.6592615 |                        |          |           |           |          |
| ## 35     | El Salvador            | 6.018496 | 9.001607  | 0.7907554 | 63.90189 |
| 0.7333559 |                        |          |           |           |          |
| ## 36     | Estonia                | 5.628909 | 10.210577 | 0.9179296 | 66.66893 |
| 0.8146924 |                        |          |           |           |          |
| ## 37     | Ethiopia               | 4.573155 | 7.333114  | 0.6255968 | 55.63552 |
| 0.8026426 |                        |          |           |           |          |

|                    |             |          |           |              |          |
|--------------------|-------------|----------|-----------|--------------|----------|
| ## 38<br>0.9298619 | Finland     | 7.447926 | 10.553578 | 0.9478006    | 71.21165 |
| ## 39<br>0.8170362 | France      | 6.357625 | 10.530862 | 0.8957194    | 71.97216 |
| ## 40<br>0.6713007 | Gabon       | 4.661013 | 9.845919  | 0.7558620    | 55.68797 |
| ## 41<br>0.6399450 | Georgia     | 4.121941 | 8.902565  | 0.5173716    | 65.30637 |
| ## 42<br>0.8894289 | Germany     | 7.037138 | 10.694968 | 0.9259232    | 71.30358 |
| ## 43<br>0.8520162 | Ghana       | 3.985916 | 8.277353  | 0.6874486    | 53.54028 |
| ## 44<br>0.5317363 | Greece      | 5.622519 | 10.093509 | 0.8348247    | 70.67931 |
| ## 45<br>0.8686398 | Guatemala   | 6.464987 | 8.886600  | 0.8228375    | 61.96589 |
| ## 46<br>0.6659530 | Guinea      | 3.504694 | 7.037234  | 0.5788596    | 50.16096 |
| ## 47<br>0.3982955 | Haiti       | 3.569762 | 7.413352  | 0.5643197    | 52.95332 |
| ## 48<br>0.5340577 | Honduras    | 4.845437 | 8.470057  | 0.7723755    | 63.41061 |
| ## 49<br>0.5577214 | Hungary     | 5.344383 | 10.107333 | 0.8587338    | 66.59668 |
| ## 50<br>0.7772253 | India       | 4.342079 | 8.659320  | 0.6101333    | 59.07401 |
| ## 51<br>0.7794183 | Indonesia   | 5.042800 | 9.247716  | 0.8094781    | 60.31876 |
| ## 52<br>NA        | Iran        | 4.749956 | 9.717675  | 0.5724069    | 65.53881 |
| ## 53<br>0.5994599 | Iraq        | 4.493377 | 9.546689  | 0.6844348    | 60.94004 |
| ## 54<br>0.8922769 | Ireland     | 6.830125 | 10.839026 | 0.9529426    | 71.29931 |
| ## 55<br>0.7527840 | Israel      | 7.079411 | 10.363305 | 0.8641302    | 72.66603 |
| ## 56<br>0.5747657 | Italy       | 5.847684 | 10.394681 | 0.9089865    | 72.46586 |
| ## 57<br>0.7997455 | Ivory Coast | 4.445039 | 8.095674  | 0.7039917    | 45.04416 |
| ## 58<br>0.8316942 | Japan       | 5.879684 | 10.488579 | 0.9226572    | 74.82469 |
| ## 59<br>0.7665170 | Jordan      | 5.404593 | 9.352019  | 0.8304439    | 64.18116 |
| ## 60<br>0.7401328 | Kazakhstan  | 5.949995 | 10.042273 | 0.9313493    | 63.64412 |
| ## 61<br>0.7929903 | Kenya       | 4.357618 | 7.970297  | 0.7769231    | 54.14322 |
| ## 62<br>0.5610483 | Kosovo      | 5.077461 |           | NA 0.8052708 | 62.00486 |

|           |             |          |           |           |           |          |
|-----------|-------------|----------|-----------|-----------|-----------|----------|
| ## 63     | Kuwait      | 6.146032 |           | NA        | 0.8230178 | 65.09716 |
| 0.8216624 |             |          |           |           |           |          |
| ## 64     | Kyrgyzstan  | 4.905376 | 8.061284  | 0.8565845 | 62.41665  |          |
| 0.8131759 |             |          |           |           |           |          |
| ## 65     | Latvia      | 5.880598 | 10.037901 | 0.8793724 | 65.33850  |          |
| 0.6563932 |             |          |           |           |           |          |
| ## 66     | Lebanon     | 5.171971 | 9.728823  | 0.7417077 | 69.59850  |          |
| 0.5967498 |             |          |           |           |           |          |
| ## 67     | Liberia     | 2.701591 | 6.739805  | 0.6376660 | 51.28914  |          |
| 0.6714309 |             |          |           |           |           |          |
| ## 68     | Libya       | 5.615405 | 9.555550  | 0.8679877 | 61.16175  |          |
| 0.7745450 |             |          |           |           |           |          |
| ## 69     | Lithuania   | 5.711378 | 10.185368 | 0.9285235 | 65.67057  |          |
| 0.6414702 |             |          |           |           |           |          |
| ## 70     | Luxembourg  | 6.701571 | 11.429970 | 0.9336046 | 72.53326  |          |
| 0.9322564 |             |          |           |           |           |          |
| ## 71     | Macedonia   | 4.975590 | 9.446383  | 0.7663682 | 65.56458  |          |
| 0.6603189 |             |          |           |           |           |          |
| ## 72     | Madagascar  | 3.592514 | 7.228697  | 0.6467165 | 56.31346  |          |
| 0.5447536 |             |          |           |           |           |          |
| ## 73     | Malawi      | 3.867638 | 6.660712  | 0.4943816 | 54.48933  |          |
| 0.8013907 |             |          |           |           |           |          |
| ## 74     | Malaysia    | 6.322121 | 10.136704 | 0.8176163 | 64.74024  |          |
| 0.6745945 |             |          |           |           |           |          |
| ## 75     | Mali        | 4.582098 | 7.350600  | 0.8301892 | 49.19207  |          |
| 0.6337535 |             |          |           |           |           |          |
| ## 76     | Malta       | 6.613394 |           | NA        | 0.9187649 | 70.77766 |
| 0.9121780 |             |          |           |           |           |          |
| ## 77     | Mauritania  | 3.922664 | 8.231690  | 0.8749459 | 53.24210  |          |
| 0.4470866 |             |          |           |           |           |          |
| ## 78     | Mexico      | 6.236287 | 9.707403  | 0.7606143 | 67.78441  |          |
| 0.7194660 |             |          |           |           |           |          |
| ## 79     | Moldova     | 6.017472 | 8.447127  | 0.8399055 | 61.26768  |          |
| 0.5952414 |             |          |           |           |           |          |
| ## 80     | Mongolia    | 4.982720 | 9.346310  | 0.9055244 | 62.64931  |          |
| 0.6855108 |             |          |           |           |           |          |
| ## 81     | Montenegro  | 5.124921 | 9.616770  | 0.7396305 | 65.11017  |          |
| 0.5833173 |             |          |           |           |           |          |
| ## 82     | Morocco     | 5.160294 | 8.906810  | 0.6537850 | 63.91926  |          |
| 0.6934186 |             |          |           |           |           |          |
| ## 83     | Myanmar     | 4.223846 |           | NA        | 0.7520643 | 57.09218 |
| 0.8079711 |             |          |           |           |           |          |
| ## 84     | Nepal       | 4.812437 | 7.746914  | 0.7476119 | 60.75210  |          |
| 0.7634472 |             |          |           |           |           |          |
| ## 85     | Netherlands | 7.324437 | 10.748624 | 0.8790104 | 71.09193  |          |
| 0.9039788 |             |          |           |           |           |          |
| ## 86     | New Zealand | 7.418121 | 10.431994 | 0.9873435 | 71.92076  |          |
| 0.9417843 |             |          |           |           |           |          |
| ## 87     | Nicaragua   | 5.924113 | 8.480531  | 0.8269085 | 65.85806  |          |
| 0.8092592 |             |          |           |           |           |          |



|           |                         |          |           |           |          |
|-----------|-------------------------|----------|-----------|-----------|----------|
| ## 88     | Niger                   | 3.671454 | 6.803244  | 0.7130196 | 52.82997 |
| 0.7281283 |                         |          |           |           |          |
| ## 89     | Nigeria                 | 4.932915 | 8.644704  | 0.8116477 | 45.24734 |
| 0.6804703 |                         |          |           |           |          |
| ## 90     | North Cyprus            | 5.842550 | NA        | 0.7913827 | NA       |
| 0.7853528 |                         |          |           |           |          |
| ## 91     | Norway                  | 7.603434 | 11.068009 | 0.9468340 | 70.52483 |
| 0.9476205 |                         |          |           |           |          |
| ## 92     | Pakistan                | 4.823195 | 8.464853  | 0.5617201 | 57.25552 |
| 0.5865462 |                         |          |           |           |          |
| ## 93     | Palestinian Territories | 4.695239 | 8.365737  | 0.7661012 | 62.83750 |
| 0.5560409 |                         |          |           |           |          |
| ## 94     | Panama                  | 6.605550 | 9.942081  | 0.8826150 | 67.68180 |
| 0.8466692 |                         |          |           |           |          |
| ## 95     | Paraguay                | 5.559724 | 9.065535  | 0.9141991 | 63.34425 |
| 0.8061247 |                         |          |           |           |          |
| ## 96     | Peru                    | 5.577263 | 9.358279  | 0.7984183 | 65.03024 |
| 0.8022690 |                         |          |           |           |          |
| ## 97     | Philippines             | 5.547489 | 8.843670  | 0.8535886 | 59.46133 |
| 0.9115336 |                         |          |           |           |          |
| ## 98     | Poland                  | 6.007022 | 10.120240 | 0.8930904 | 66.95756 |
| 0.7934622 |                         |          |           |           |          |
| ## 99     | Portugal                | 5.080866 | 10.195284 | 0.8662139 | 70.45056 |
| 0.8004403 |                         |          |           |           |          |
| ## 100    | Qatar                   | 6.374529 | NA        | NA        | 67.82797 |
| NA        |                         |          |           |           |          |
| ## 101    | Romania                 | 5.777491 | 9.896219  | 0.7869673 | 66.41331 |
| 0.7958477 |                         |          |           |           |          |
| ## 102    | Russia                  | 5.995539 | 10.012393 | 0.9243633 | 64.08343 |
| 0.6854547 |                         |          |           |           |          |
| ## 103    | Rwanda                  | 3.483109 | 7.416408  | 0.6781436 | 54.64949 |
| 0.9078923 |                         |          |           |           |          |
| ## 104    | Saudi Arabia            | 6.345492 | 10.815763 | 0.8197497 | 63.71784 |
| 0.8202072 |                         |          |           |           |          |
| ## 105    | Senegal                 | 4.617001 | 7.725880  | 0.7015345 | 57.57685 |
| 0.7195333 |                         |          |           |           |          |
| ## 106    | Serbia                  | 5.317685 | 9.462955  | 0.8162510 | 65.63837 |
| 0.5458920 |                         |          |           |           |          |
| ## 107    | Sierra Leone            | 4.908618 | 7.374071  | 0.6105937 | 43.74034 |
| 0.6242961 |                         |          |           |           |          |
| ## 108    | Singapore               | 6.619525 | NA        | 0.8664367 | 76.04466 |
| 0.8868909 |                         |          |           |           |          |
| ## 109    | Slovakia                | 6.162004 | 10.214083 | 0.9434537 | 67.49669 |
| 0.5871577 |                         |          |           |           |          |
| ## 110    | Slovenia                | 5.740642 | 10.269225 | 0.9011638 | 70.51219 |
| 0.8960073 |                         |          |           |           |          |
| ## 111    | Somalia                 | 5.353645 | NA        | 0.5992811 | 47.28276 |
| 0.9678693 |                         |          |           |           |          |
| ## 112    | South Africa            | 4.887326 | 9.428298  | 0.8980963 | 50.14693 |
| 0.8624494 |                         |          |           |           |          |

|           |                      |            |           |              |          |
|-----------|----------------------|------------|-----------|--------------|----------|
| ## 113    | South Korea          | 5.780211   | 10.446025 | 0.7683506    | 73.85837 |
| 0.6158488 |                      |            |           |              |          |
| ## 114    | Spain                | 6.380663   | 10.402864 | 0.9564719    | 73.37998 |
| 0.7320005 |                      |            |           |              |          |
| ## 115    | Sri Lanka            | 4.611607   | 9.319309  | 0.8625001    | 64.64014 |
| 0.9020748 |                      |            |           |              |          |
| ## 116    | Sweden               | 7.288922   | 10.712334 | 0.9294600    | 71.74087 |
| 0.9350721 |                      |            |           |              |          |
| ## 117    | Switzerland          | 7.572137   | 10.914726 | 0.9383337    | 72.86915 |
| 0.9278024 |                      |            |           |              |          |
| ## 118    | Syria                | 3.461913   |           | NA 0.4639129 | 64.83573 |
| 0.4482709 |                      |            |           |              |          |
| ## 119    | Taiwan               | 6.450088   |           | NA 0.8853889 | 70.75000 |
| 0.7008105 |                      |            |           |              |          |
| ## 120    | Tajikistan           | 5.124211   | 7.869648  | 0.8439325    | 61.64697 |
| 0.8465421 |                      |            |           |              |          |
| ## 121    | Tanzania             | 3.660597   | 7.831087  | 0.7902626    | 56.12052 |
| 0.7586847 |                      |            |           |              |          |
| ## 122    | Thailand             | 6.201763   | 9.637293  | 0.8663245    | 65.64534 |
| 0.8849165 |                      |            |           |              |          |
| ## 123    | Togo                 | 3.768302   | 7.241591  | 0.4785934    | 51.97361 |
| 0.7715772 |                      |            |           |              |          |
| ## 124    | Tunisia              | 5.131612   | 9.292294  | 0.6094700    | 63.35026 |
| 0.7113734 |                      |            |           |              |          |
| ## 125    | Turkey               | 5.514465   | 9.864202  | 0.8512246    | 65.69592 |
| 0.6531968 |                      |            |           |              |          |
| ## 126    | Turkmenistan         | 5.791460   | 9.669529  | 0.9601585    | 58.44135 |
| 0.7013584 |                      |            |           |              |          |
| ## 127    | Ukraine              | 3.964543   | 8.895362  | 0.9094397    | 63.52374 |
| 0.4305920 |                      |            |           |              |          |
| ## 128    | United Arab Emirates | 6.568398   |           | NA 0.8241367 | 68.35641 |
| 0.9150362 |                      |            |           |              |          |
| ## 129    | United Kingdom       | 6.515445   | 10.567661 | 0.9359857    | 71.05131 |
| 0.8329261 |                      |            |           |              |          |
| ## 130    | United States        | 6.863947   | 10.877965 | 0.9035711    | 70.03674 |
| 0.8487535 |                      |            |           |              |          |
| ## 131    | Uruguay              | 6.628080   | 9.917072  | 0.8914935    | 68.11640 |
| 0.9168797 |                      |            |           |              |          |
| ## 132    | Uzbekistan           | 5.972364   | 8.630272  | 0.9682252    | 60.53566 |
| 0.9799371 |                      |            |           |              |          |
| ## 133    | Venezuela            | 5.568800   |           | NA 0.9110869 | 64.58602 |
| 0.5121593 |                      |            |           |              |          |
| ## 134    | Vietnam              | 5.076315   | 8.637988  | 0.8486767    | 66.04872 |
| NA        |                      |            |           |              |          |
| ## 135    | Yemen                | 2.982674   | 7.843260  | 0.6686835    | 54.08096 |
| 0.6099808 |                      |            |           |              |          |
| ## 136    | Zimbabwe             | 3.703191   | 7.430315  | 0.7358003    | 50.36258 |
| 0.6671933 |                      |            |           |              |          |
| ##        | generosity           | corruption | world     | corruption_z | life_int |
| ## 1      | -0.082337685         | 0.88479304 | 2         | 0.756020306  | 68       |

|       |              |            |   |              |    |
|-------|--------------|------------|---|--------------|----|
| ## 2  | NA           | 0.85090619 | 4 | 0.586221555  | 67 |
| ## 3  | -0.186696529 | 0.90146220 | 2 | 0.839545377  | 65 |
| ## 4  | 0.315701962  | 0.35655439 | 1 | -1.890854923 | 73 |
| ## 5  | 0.089088559  | 0.55747962 | 1 | -0.884067531 | 71 |
| ## 6  | -0.222635135 | 0.61555255 | 2 | -0.593078249 | 62 |
| ## 7  | NA           | NA         | 4 | NA           | 66 |
| ## 8  | -0.059777591 | 0.72060090 | 3 | -0.066706514 | 62 |
| ## 9  | -0.100902960 | 0.66867816 | 2 | -0.326878712 | 65 |
| ## 10 | 0.052451991  | 0.46878463 | 1 | -1.328496522 | 71 |
| ## 11 | 0.001502594  | 0.85009819 | 3 | 0.582172864  | 51 |
| ## 12 | 0.285040438  | 0.63395578 | 3 | -0.500864136 | 61 |
| ## 13 | -0.023433717 | 0.86237395 | 4 | 0.643683682  | 60 |
| ## 14 | -0.046468392 | 0.95985365 | 2 | 1.132130720  | 68 |
| ## 15 | -0.126697809 | 0.86029297 | 4 | 0.633256413  | 55 |
| ## 16 | -0.027783971 | 0.77133906 | 4 | 0.187530027  | 65 |
| ## 17 | 0.020786475  | 0.69272399 | 3 | -0.206390940 | 51 |
| ## 18 | 0.212208703  | 0.82513022 | 3 | 0.457064453  | 58 |
| ## 19 | 0.058221977  | 0.86804903 | 4 | 0.672120115  | 48 |
| ## 20 | 0.237486422  | 0.42715225 | 1 | -1.537106258 | 72 |
| ## 21 | -0.041133381 | 0.88863939 | 3 | 0.775293414  | 45 |
| ## 22 | 0.026815979  | 0.81151134 | 4 | 0.388823532  | 72 |
| ## 23 | -0.262474209 | NA         | 4 | NA           | 69 |
| ## 24 | -0.107555106 | 0.84289932 | 4 | 0.546101080  | 64 |
| ## 25 | -0.143441707 | 0.84135950 | 3 | 0.538385382  | 54 |
| ## 26 | -0.014224946 | 0.86637801 | 3 | 0.663747056  | 50 |
| ## 27 | -0.058310181 | 0.76141941 | 4 | 0.137825107  | 69 |
| ## 28 | -0.100691713 | 0.84854555 | 2 | 0.574392953  | 68 |
| ## 29 | NA           | 0.89279515 | 4 | 0.796116895  | 72 |
| ## 30 | -0.152868271 | 0.88646746 | 2 | 0.764410387  | 70 |
| ## 31 | 0.213263184  | 0.19101639 | 1 | -2.720325510 | 71 |
| ## 32 | -0.068872340 | 0.75528818 | 4 | 0.107103002  | 63 |
| ## 33 | -0.118297137 | 0.66582751 | 4 | -0.341162630 | 67 |
| ## 34 | -0.098499060 | 0.68449807 | 4 | -0.247609007 | 61 |
| ## 35 | -0.166342810 | 0.80454427 | 4 | 0.353913251  | 64 |
| ## 36 | -0.173507467 | 0.56873447 | 2 | -0.827672234 | 67 |
| ## 37 | 0.125852734  | 0.56702733 | 3 | -0.836226282 | 56 |
| ## 38 | 0.100564413  | 0.22336966 | 4 | -2.558211170 | 71 |
| ## 39 | -0.150623634 | 0.64060205 | 1 | -0.467561271 | 72 |
| ## 40 | -0.224478483 | 0.86677748 | 4 | 0.665748708  | 56 |
| ## 41 | -0.175952777 | 0.50241679 | 2 | -1.159973960 | 65 |
| ## 42 | 0.164857537  | 0.41216829 | 1 | -1.612187191 | 71 |
| ## 43 | -0.030955523 | 0.94543612 | 3 | 1.059887994  | 54 |
| ## 44 | -0.278941423 | 0.82395965 | 1 | 0.451198986  | 71 |
| ## 45 | 0.050059937  | 0.82165492 | 4 | 0.439650531  | 62 |
| ## 46 | 0.054546587  | 0.76215202 | 3 | 0.141495992  | 50 |
| ## 47 | 0.312127113  | 0.77740395 | 3 | 0.217919724  | 53 |
| ## 48 | -0.095861293 | 0.84808272 | 4 | 0.572073824  | 63 |
| ## 49 | -0.208412573 | 0.90753031 | 2 | 0.869951203  | 67 |
| ## 50 | -0.016868994 | 0.77643496 | 4 | 0.213064336  | 59 |
| ## 51 | 0.457429528  | 0.94596726 | 4 | 1.062549392  | 60 |

|        |              |            |   |              |    |
|--------|--------------|------------|---|--------------|----|
| ## 52  | 0.141305760  | NA         | 4 | NA           | 66 |
| ## 53  | -0.016951477 | 0.76216716 | 4 | 0.141571855  | 61 |
| ## 54  | 0.232017383  | 0.40875691 | 1 | -1.629280796 | 71 |
| ## 55  | 0.099938810  | 0.78942990 | 1 | 0.278178840  | 73 |
| ## 56  | -0.070082054 | 0.91275305 | 1 | 0.896121071  | 72 |
| ## 57  | -0.035634797 | 0.74424964 | 4 | 0.051791557  | 45 |
| ## 58  | -0.169799194 | 0.65444309 | 1 | -0.398207226 | 75 |
| ## 59  | -0.069207847 | NA         | 4 | NA           | 64 |
| ## 60  | -0.051406134 | 0.71384430 | 2 | -0.100562211 | 64 |
| ## 61  | 0.238054082  | 0.85254985 | 4 | 0.594457525  | 54 |
| ## 62  | NA           | 0.85064709 | 4 | 0.584923263  | 62 |
| ## 63  | NA           | NA         | 4 | NA           | 65 |
| ## 64  | 0.226265088  | 0.85772502 | 2 | 0.620389056  | 62 |
| ## 65  | -0.085272886 | 0.80840039 | 2 | 0.373235344  | 65 |
| ## 66  | 0.054535788  | 0.88895327 | 4 | 0.776866185  | 70 |
| ## 67  | -0.009916847 | 0.90267265 | 3 | 0.845610652  | 51 |
| ## 68  | -0.076456018 | NA         | 4 | NA           | 61 |
| ## 69  | -0.262404770 | 0.92417407 | 2 | 0.953349040  | 66 |
| ## 70  | 0.036430217  | 0.37539047 | 1 | -1.796471909 | 73 |
| ## 71  | -0.048491806 | 0.82417899 | 2 | 0.452298071  | 66 |
| ## 72  | -0.029426256 | 0.86095339 | 3 | 0.636565617  | 56 |
| ## 73  | 0.085140154  | 0.83482540 | 3 | 0.505644603  | 54 |
| ## 74  | 0.201898143  | 0.83789223 | 4 | 0.521011776  | 65 |
| ## 75  | -0.042629778 | 0.80004674 | 3 | 0.331377234  | 49 |
| ## 76  | NA           | 0.66388631 | 4 | -0.350889530 | 71 |
| ## 77  | 0.073142350  | 0.71535844 | 3 | -0.092975239 | 53 |
| ## 78  | -0.156158805 | 0.70797193 | 4 | -0.129987217 | 68 |
| ## 79  | -0.038925178 | 0.94311881 | 2 | 1.048276523  | 61 |
| ## 80  | 0.157298073  | 0.90021819 | 4 | 0.833311956  | 63 |
| ## 81  | -0.145327449 | 0.78123259 | 2 | 0.237104126  | 65 |
| ## 82  | -0.248565361 | 0.86777443 | 4 | 0.670744167  | 64 |
| ## 83  | NA           | 0.63330519 | 3 | -0.504124059 | 57 |
| ## 84  | 0.242998511  | 0.82350838 | 3 | 0.448937797  | 61 |
| ## 85  | 0.247195244  | 0.41182211 | 1 | -1.613921835 | 71 |
| ## 86  | 0.320652515  | 0.18588871 | 1 | -2.746019081 | 72 |
| ## 87  | 0.081847742  | 0.72799838 | 4 | -0.029639579 | 66 |
| ## 88  | -0.009490362 | 0.70254970 | 3 | -0.157156716 | 53 |
| ## 89  | -0.045139253 | 0.92610925 | 4 | 0.963045776  | 45 |
| ## 90  | NA           | 0.65918028 | 4 | -0.374470275 | NA |
| ## 91  | 0.228181615  | 0.29881436 | 1 | -2.180176164 | 71 |
| ## 92  | 0.071716130  | 0.71664119 | 4 | -0.086547682 | 57 |
| ## 93  | -0.150193453 | 0.77430135 | 4 | 0.202373346  | 63 |
| ## 94  | -0.002205028 | 0.80994290 | 4 | 0.380964476  | 68 |
| ## 95  | 0.003749649  | 0.86288828 | 4 | 0.646260859  | 63 |
| ## 96  | -0.100029737 | 0.88373041 | 4 | 0.750695721  | 65 |
| ## 97  | -0.056648508 | 0.75519156 | 4 | 0.106618868  | 59 |
| ## 98  | -0.103777371 | 0.81009632 | 2 | 0.381733237  | 67 |
| ## 99  | -0.171841606 | 0.94105077 | 1 | 1.037914063  | 70 |
| ## 100 | NA           | NA         | 4 | NA           | 68 |
| ## 101 | -0.145152822 | 0.96165097 | 2 | 1.141136648  | 66 |

```

## 102 -0.179458767 0.91341829 2 0.899454462 64
## 103 0.035836529 0.09460447 3 -3.203422163 55
## 104 -0.070376605 NA 4 NA 64
## 105 -0.092522651 0.76549017 3 0.158222689 58
## 106 -0.062717922 0.85935801 2 0.628571566 66
## 107 0.050585665 0.82482803 3 0.455550227 44
## 108 NA 0.09894388 4 -3.181678426 76
## 109 -0.142087966 0.92754513 2 0.970240601 67
## 110 -0.000629284 0.89219791 2 0.793124276 71
## 111 NA 0.41023576 3 -1.621870633 47
## 112 -0.138439283 0.85269475 4 0.595183578 50
## 113 -0.048341293 0.84072161 1 0.535189075 74
## 114 -0.084349990 0.82166493 1 0.439700703 73
## 115 0.310886711 0.85947096 4 0.629137531 65
## 116 0.197725981 0.23196414 1 -2.515146309 72
## 117 0.097075745 0.20953351 1 -2.627540722 73
## 118 NA 0.68523693 4 -0.243906764 65
## 119 NA 0.85719484 4 0.617732438 71
## 120 0.025703574 0.74168962 2 0.038963920 62
## 121 0.142459080 0.90642261 3 0.864400823 56
## 122 0.305076480 0.91365111 4 0.900621046 66
## 123 -0.063052811 0.73326176 3 -0.003266024 52
## 124 -0.240898952 0.81482500 4 0.405427475 63
## 125 NA 0.80607623 1 0.361589525 66
## 126 0.063167505 NA 2 NA 58
## 127 -0.012190276 0.95247275 2 1.095146813 64
## 128 NA NA 4 NA 68
## 129 0.288037807 0.45613372 1 -1.391887135 71
## 130 0.201775953 0.69754261 1 -0.182246014 70
## 131 -0.048586730 0.67347568 4 -0.302839513 68
## 132 0.373070538 0.47091693 2 -1.317812101 61
## 133 NA 0.81309682 4 0.396768001 65
## 134 0.087306730 NA 4 NA 66
## 135 -0.139901683 0.82909757 3 0.476943852 54
## 136 -0.081429422 0.81045735 4 0.383542250 50

```

- Change existing variables

When we imported our data, the world variable was automatically categorized as an integer.

```
class(world_happiness$world)
```

```
## [1] "integer"
```

However, this variable refers to discrete categories, and we want to change it to be a factor. We can do this using `mutate()`.

```

# Note that I am re-saving the dataframe here to preserve this change
world_happiness <- world_happiness %>%
  mutate(world = as.factor(world))

```

Now check the type again...

```
class(world_happiness$world)
## [1] "factor"
```

---

## Summarizing data

- The next dplyr verb we'll cover is `summarize()`, which is used to summarize across rows of a data set. Like all tidyverse functions, `summarize()` requires data as its first argument, and then you enter your summary functions separated by commas. Summary functions take vectors as inputs and return single values as outputs.
- The resulting data set will have just the summary variables you created. In other words, you are going from your raw data frame to a smaller summary data frame that only contains the summary variables you specify within `summarize()`.

Let's use `summarize()` to get the mean of `gdp` across all observations in the data set.

```
world_happiness %>%
  summarize(mean_gdp = mean(gdp, na.rm = TRUE))
##   mean_gdp
## 1 9.221787
```

- Of course, we typically want to calculate more than just a mean. We can add other summary variables, separating them by commas.

```
world_happiness %>%
  summarize(mean_gdp = mean(gdp, na.rm = TRUE),
           sd_gdp = sd(gdp, na.rm = TRUE),
           n = n())
##   mean_gdp  sd_gdp  n
## 1 9.221787 1.155729 136
```

---

## Grouping data

- The `group_by()` function creates groups based on one or more variables in the data. This affects all kinds of things that you then do with the data, such as mutating and/or summarizing. `group_by()` requires data as its first argument, and then you name the variable(s) to group by.

```
world_happiness %>%
  group_by(world)
## # A tibble: 136 x 9
## # Groups:   world [4]
```

```
##   country    happiness    gdp support    life freedom generosity corruption
world
##   <chr>      <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
<fct>
##  1 Albania      4.61  9.25  0.639  68.4  0.704  -0.0823  0.885
2
##  2 Argentina    6.70 NA    0.926  67.3  0.881  NA      0.851
4
##  3 Armenia      4.35  8.97  0.723  65.3  0.551  -0.187  0.901
2
##  4 Australia    7.31 10.7  0.952  72.6  0.922  0.316  0.357
1
##  5 Austria      7.08 10.7  0.928  70.8  0.900  0.0891  0.557
1
##  6 Azerbaijan   5.15  9.73  0.786  62.0  0.764  -0.223  0.616
2
##  7 Bahrain      6.01 NA    0.853  65.8  0.850  NA      NA
4
##  8 Bangladesh   4.63  8.05  0.601  61.7  0.815  -0.0598 0.721
3
##  9 Belarus      5.72  9.73  0.924  65.3  0.623  -0.101  0.669
2
## 10 Belgium      6.90 10.6  0.885  71.3  0.869  0.0525  0.469
1
## # ... with 126 more rows
```

At first glance, it doesn't appear that anything has happened. However, under the hood it has indeed grouped the data frame by the world variable. Copy and paste this code into the console—what do you notice?

### Combining `group_by()` and `summarize()`

- `group_by()` and `summarize()` can be combined to get group-level statistics. This is a great way to make tables of descriptive stats in R or to create aggregated data sets for some purposes.
- To use these together, you just run `group_by()` followed by `summarize()` in a pipeline.

```
world_happiness %>%
  group_by(world) %>%
  summarize(mean_gdp = mean(gdp, na.rm = TRUE),
            sd_gdp = sd(gdp, na.rm = TRUE),
            n = n())

## `summarise()` ungrouping output (override with `.groups` argument)

## # A tibble: 4 x 4
##   world mean_gdp sd_gdp    n
##   <fct> <dbl> <dbl> <int>
## 1 1      10.6  0.322  24
## 2 2      9.53  0.695  27
```

```
## 3 3          7.57  0.599   27
## 4 4          9.22  0.685   58
```

---

## Minihacks

For the minihacks today, we will be working with the `diamonds` data set, which is built into R. This data set contains the prices and various other attributes of about 54,000 different diamonds. Take a peek at the data set with the following functions:

```
head(diamonds) # first few rows
str(diamonds) # structure of the data frame
```

Here are what the variables refer to:

| variable | meaning   |
|----------|---|
| price    | price in US dollars   |
| carat    | weight of the diamond   |
| cut      | quality of the cut (Fair, Good, Very Good, Premium, Ideal)  |
| color    | diamond colour, from D (best) to J (worst)  |
| clarity  | a measurement of how clear the diamond is (I1 (worst), SI2, SI1, VS2, VS1, VVS2, VVS1, IF (best)) |
| x        | length in mm  |
| y        | width in mm   |
| z        | depth in mm   |
| depth    | total depth percentage  |
| table    | width of top of diamond relative to widest point  |

### Minihack 1: Make code more legible

1. Take a look at the following chunk of code. See if you can understand what this code is trying to do.

```
arrange(select(filter(diamonds, carat > 3 & carat < 4, cut == "Premium",
color == "G" | color == "H" | color == "I" | color == "J"), carat, color,
price), color, desc(price))
```

2. Re-write this code using pipes (`%>%`) so it is easier to read. Make sure you get the same result that you get when you run the above code. For an extra challenge, try making the filtering step a little more concise.

```
# your code here
```

### Minihack 2: Translating into `{dplyr}` verbs

Answer the questions below using functions from `{dplyr}`.



1. On average, which cut of diamond is the most expensive?

```
# your code here
```

2. Which is more expensive on average: a diamond that is the worst color and best clarity, or a diamond that is the best color and worst clarity?

```
# your code here
```

### Minihack 3: Summarizing data

1. Calculate the summary statistics listed below for the carat variable for each color of diamond. Give your summary variables the names indicated in parentheses.

- mean (mean)
- standard deviation (sd)
- number of observations (n)
- standard error of the mean (sem)
- 95% confidence interval (lower and upper bounds) around the mean (calculated using a  $t$  distribution). (ci\_lower and ci\_upper)
  - Hint: Refer to [this slide from class](#) for an example

\*\*\*In your final summary output only include color, mean, ci\_lower and ci\_upper

```
# your code here
```