Manejo de datos en R

Usos de tidyverse

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Paquetes que usaremos:

```
install.packages(c("tidyverse",
                   "here",
                   "readxl",
                   "tidylog",
                   "summarytools",
                   "knitr"))
```

Paquetes incluidos en tidyverse:

```
library(tidyverse)
tidyverse_packages()
```

```
##  [1] "broom"        "cli"          "crayon"       "dbplyr"       "dplyr"
##  [6] "dtplyr"       "forcats"      "googledrive"  "googlesheets4" "ggplot2"
## [11] "haven"        "hms"          "httr"         "jsonlite"     "lubridate"
## [16] "magrittr"     "modelr"       "pillar"       "purrr"        "readr"
## [21] "readxl"       "reprex"       "rlang"        "rstudioapi"   "rvest"
## [26] "stringr"      "tibble"       "tidyr"        "xml2"         "tidyverse"
```

```
library(readr)      #leer archivos
library(readxl)     #leer archivos excel
library(dplyr)      #manipular datos
library(tidyr)      #ordenar y trasformar datasets
library(stringr)    #manipular caracteres
library(forcats)    #manipular factores
library(lubridate)  #manipular fechas
```

Otros paquetes que utilizaremos:

```
library(here)            #refiere la ruta a la carpeta del proyecto
library(tidylog)         #informa sobre operaciones dplyr y tidyr
library(summarytools)    #resume de forma clara y rápida datos numéricos y categóricos
library(knitr)           #reportar datos en varios formatos
```

Leer datos

- Library *base*

`read.table`, `read.csv`, `readRDS`

Argumentos útiles: sep, dec, comment.char, na.strings, stringsAsFactors

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- Library *readr*

`read_delim`, `read_csv`, `read_csv2`, `read_table`

Más rapido, produce "tibbles", no convierte characteres a factors automaticamente, no usa los nombres de fila.

Argumentos útiles: delim, comment, na, col_types, skip_empty_rows, guess_max

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- Library $base$

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Argumentos útiles: delim, comment, na, col_types, skip_empty_rows, guess_max

- Library $readxl$

`read_excel`, `read_xls`, `read_xlsx`

Argumentos útiles: sheet, col_types, skip

Leer datos con `readr`

```
library(readr)
```

La función `read_delim()` lee varios tipos de archivo. El argumento delim, especifica el separador.

Además tiene funciones específicas como:

- `read_csv()` usa `','` como campo de separación, y `'.'` para el punto decimal.
- `read_csv2()` usa `';'` como campo de separación, y `','` para el punto decimal.

library(here)

La función `here()` permite hacer referencia siempre al directorio donde se encuentra el proyecto.

Allison Horst Illustration

library(here)

Ejemplo de uso.

Usando ruta absoluta:

```
data <- read_csv("C:/Usuarios/Elena/Documentos/Proyectos/Proyecto_peces/datos/medida_peces.csv")
```

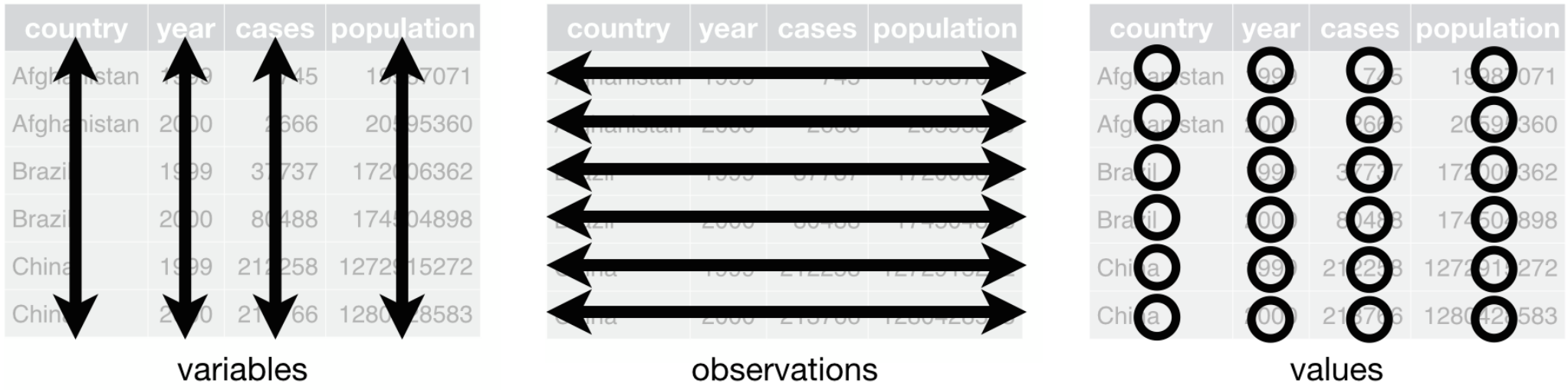
Usando ruta relativa al proyecto:

```
data <- read_csv(here("datos/medida_peces.csv"))
```

Formato tidy data:

Tres reglas para que los datos estén ordenado:

- Cada variable debe tener su propia columna
- Cada observación debe tener su propia fila
- Cada valor debe tener su propia celda



R for Data Science - tidy data

https://datacatalog.worldbank.org/search/dataset/0039597/What-a-Waste-Global-Database

What A Waste Global Database

Metadata last updated on - Jun 28, 2022

What a Waste is a global project to aggregate data on solid waste management from around the world. This database features the statistics collected through the effort, covering nearly all countries and over 330 cities. The metrics included cover all steps from the waste management value chain, including waste generation, composition, collection, and disposal, as well as information on user...

View More

Overview

City level codebook

CSV • **Last Updated:** Mar 4, 2019 • **Size:** 218.5 KB • Preview • API Service

Country level codebook

CSV • **Last Updated:** Mar 4, 2019 • **Size:** 1.3 MB • Preview • API Service

Country level dataset

CSV • **Last Updated:** Mar 4, 2019 • **Size:** 48.0 KB • Preview • API Service

Data Access and Licensing

Classification: Public

This dataset is classified as **Public** under the Access to Information Classification Policy. Users inside and outside the Bank can access this dataset.

License: Creative Commons Attribution 4.0

This dataset is licensed under Creative Commons Attribution 4.0

Topics

- Environment and Natural Resources,
- Urban Development

Collections

Leer dataset

```
library(readr)
library(here)

waste <- read_csv(here("data/country_level_data.csv"))
```

```
## Rows: 217 Columns: 28
## ── Column specification ────────────────────────────────────────────────────────
## Delimiter: ","
## chr  (5): iso3c, region_id, country_name, income_id, where_is_this_data_measured
## dbl (23): gdp, population_population_number_of_people, total_msw_total_msw_gener...
##
## ℹ Use `spec()` to retrieve the full column specification for this data.
## ℹ Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
#colnames(waste)
dplyr::glimpse(waste)
```

```
## Rows: 217
## Columns: 28
## $ iso3c                                                [3m [38;5;246m<chr> [39m [23m "ABW", "AF
## $ region_id                                            [3m [38;5;246m<chr> [39m [23m "LCN", "SA
## $ country_name                                         [3m [38;5;246m<chr> [39m [23m "Aruba", "
## $ income_id                                            [3m [38;5;246m<chr> [39m [23m "HIC", "LI
## $ gdp                                                  [3m [38;5;246m<dbl> [39m [23m 35563.3125
## $ population_population_number_of_people               [3m [38;5;246m<dbl> [39m [23m 103187, 34
## $ total_msw_total_msw_generated_tons_year              [3m [38;5;246m<dbl> [39m [23m 88132.02,
## $ composition_food_organic_waste_percent               [3m [38;5;246m<dbl> [39m [23m NA, NA, 51
## $ composition_glass_percent                            [3m [38;5;246m<dbl> [39m [23m NA, NA, 6.
## $ composition_metal_percent                            [3m [38;5;246m<dbl> [39m [23m NA, NA, 4.
## $ composition_other_percent                            [3m [38;5;246m<dbl> [39m [23m NA, NA, 11
## $ composition_paper_cardboard_percent                  [3m [38;5;246m<dbl> [39m [23m NA, NA, 11
## $ composition_plastic_percent                          [3m [38;5;246m<dbl> [39m [23m NA, NA, 13
## $ composition_rubber_leather_percent                   [3m [38;5;246m<dbl> [39m [23m NA, NA, NA
## $ composition_wood_percent                             [3m [38;5;246m<dbl> [39m [23m NA, NA, NA
## $ composition_yard_garden_green_waste_percent          [3m [38;5;246m<dbl> [39m [23m NA, NA, NA
## $ waste_treatment_anaerobic_digestion_percent          [3m [38;5;246m<dbl> [39m [23m NA, NA, NA
## $ waste_treatment_compost_percent                      [3m [38;5;246m<dbl> [39m [23m NA, NA, NA
## $ waste_treatment_controlled_landfill_percent          [3m [38;5;246m<dbl> [39m [23m NA, NA, NA
```

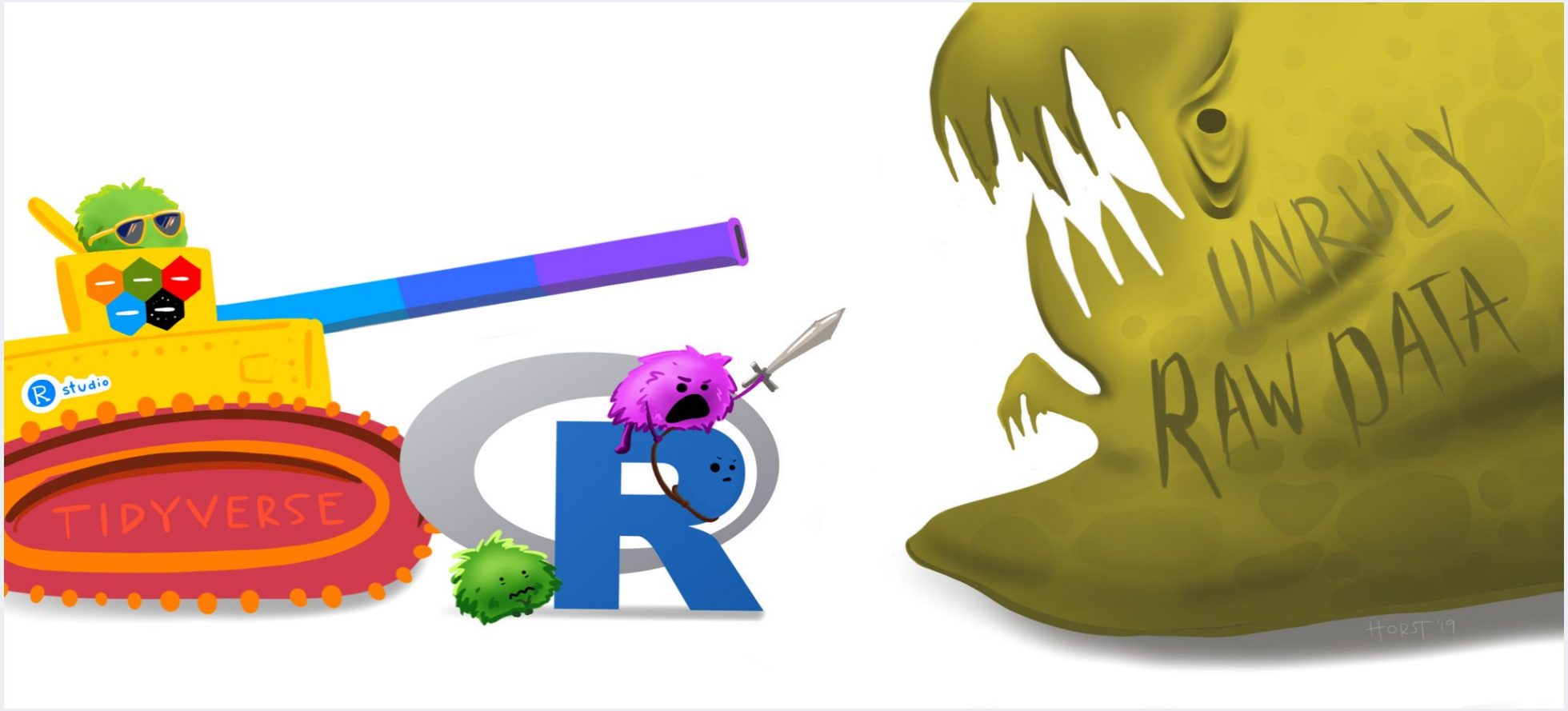
```
head(waste)
```

```
## # A tibble: 6 × 28
##   iso3c region_id country_name    income_id    gdp population_popu… total_msw_total…
##   <chr> <chr>     <chr>           <chr>      <dbl>            <dbl>            <dbl>
## 1 ABW   LCN       Aruba           HIC       35563.           103187           88132.
## 2 AFG   SAS       Afghanistan     LIC        2057.         34656032         5628525.
## 3 AGO   SSF       Angola          LMC        8037.         25096150         4213644.
## 4 ALB   ECS       Albania         UMC       13724.          2854191         1087447.
## 5 AND   ECS       Andorra         HIC       43712.            82431           43000
## 6 ARE   MEA       United Arab Em… HIC       67119.          9770529         5617682
## # … with 21 more variables: composition_food_organic_waste_percent <dbl>,
## #   composition_glass_percent <dbl>, composition_metal_percent <dbl>,
## #   composition_other_percent <dbl>, composition_paper_cardboard_percent <dbl>,
## #   composition_plastic_percent <dbl>, composition_rubber_leather_percent <dbl>,
## #   composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

```
tail(waste)
```

```
## # A tibble: 6 × 28
##   iso3c region_id country_name income_id    gdp population_populat… total_msw_total…
##   <chr> <chr>     <chr>        <chr>      <dbl>                <dbl>            <dbl>
## 1 WSM   EAS       Samoa        UMC        6211.               187665           27399.
## 2 XKX   ECS       Kosovo       LMC        9724.              1801800          319000 
## 3 YEM   MEA       Yemen, Rep.  LIC        8270.             27584212         4836820 
## 4 ZAF   SSF       South Africa UMC       12667.             51729344        18457232 
## 5 ZMB   SSF       Zambia       LMC        3201.             14264756         2608268 
## 6 ZWE   SSF       Zimbabwe     LIC        3191.             12500525         1449752 
## # … with 21 more variables: composition_food_organic_waste_percent <dbl>,
## #   composition_glass_percent <dbl>, composition_metal_percent <dbl>,
## #   composition_other_percent <dbl>, composition_paper_cardboard_percent <dbl>,
## #   composition_plastic_percent <dbl>, composition_rubber_leather_percent <dbl>,
## #   composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

Manejo de datos con tidyverse



Allison Horst Illustration

Manejo de datos con tidyverse

```
library(tidylog)
```

Da información de las operaciones que se realizan en el dataset.

El operador 'pipe'

`library(magrittr)`

Mecanismo para encadenar funciones.

```
data %>% function(...)
```

Ahora también implementado en R base como `|>`

```
data |> function(...)
```

Funciones de `dplyr`

- `arrange()` - Ordenar variable por casos
- `rename()` - Renombrar variables
- `relocate()` - Reordenar variables
- `select()` - Extraer variables

Ayudas de select:

Selecciona columnas que...

- contains() - *contienen ""*
- matches() - *coinciden con ""*
- starts_with() - *empiezan por ""*
- ends_with() - *acaban por ""*
- any_of() - *que estén en el set c("","")*

Ordernar datos por columnas:

```
waste %>%
  arrange(population_population_number_of_people)
```

```
## # A tibble: 217 × 28
##    iso3c region_id country_name   income_id    gdp population_popu… total_msw_total…
##    <chr> <chr>     <chr>          <chr>      <dbl>            <dbl>            <dbl>
##  1 TUV   EAS       Tuvalu         UMC        3793.            11097            3989.
##  2 NRU   EAS       Nauru          UMC       11167.            13049            6192.
##  3 VGB   LCN       British Virgi… HIC       24216.            20645           21099.
##  4 PLW   EAS       Palau          HIC       18275.            21503            9427.
##  5 MAF   LCN       St. Martin (F… HIC       30386.            30959           15480.
##  6 SMR   ECS       San Marino     HIC       58806.            33203           17175.
##  7 GIB   ECS       Gibraltar      HIC       43712.            33623           16954
##  8 TCA   LCN       Turks and Cai… HIC       28174.            34900              NA
##  9 LIE   ECS       Liechtenstein  HIC       45727.            36545           32382
## 10 SXM   LCN       Sint Maarten … HIC          NA             37685              NA
## # … with 207 more rows, and 21 more variables:
## #   composition_food_organic_waste_percent <dbl>, composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

Ordernar datos por columnas

descendiente:

```
waste %>%
  arrange(desc(population_population_number_of_people))
```

```
## # A tibble: 217 × 28
##    iso3c region_id country_name   income_id    gdp population_popu… total_msw_total…
##    <chr> <chr>     <chr>          <chr>      <dbl>             <dbl>            <dbl>
##  1 CHN   EAS       China          UMC       16092.        1400050048        395081376
##  2 IND   SAS       India          LMC        6497.        1352617344        189750000
##  3 USA   NAC       United States  HIC       61498.         326687488        265224528
##  4 IDN   EAS       Indonesia      LMC       10531.         261115456         65200000
##  5 BRA   LCN       Brazil         UMC       14596.         208494896         79069584
##  6 PAK   SAS       Pakistan       LMC        4571.         193203472         30760000
##  7 BGD   SAS       Bangladesh     LMC        3196.         155727056         14778497.
##  8 NGA   SSF       Nigeria        LMC        4690.         154402176         27614830.
##  9 RUS   ECS       Russian Feder… UMC       26013.         143201680         60000000
## 10 JPN   EAS       Japan          HIC       41310.         126529104         42720000
## # … with 207 more rows, and 21 more variables:
## #   composition_food_organic_waste_percent <dbl>, composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

Ordernar datos por orden jerárquico:

```
waste %>%
  arrange(region_id, country_name)
```

```
## # A tibble: 217 × 28
##    iso3c region_id country_name   income_id    gdp population_popu… total_msw_total…
##    <chr> <chr>     <chr>          <chr>      <dbl>             <dbl>            <dbl>
##  1 ASM   EAS       American Samoa UMC       11113.             55599           18989.
##  2 AUS   EAS       Australia      HIC       47784.          23789338        13345000
##  3 BRN   EAS       Brunei Daruss… HIC       60866.            423196          216253.
##  4 KHM   EAS       Cambodia       LMC        3364.          15270790         1089000
##  5 CHN   EAS       China          UMC       16092.        1400050048       395081376
##  6 FJI   EAS       Fiji           UMC       10788.            867086          189390.
##  7 PYF   EAS       French Polyne… HIC       60956.            273528          147000
##  8 GUM   EAS       Guam           HIC       59075.            159973          141500
##  9 HKG   EAS       Hong Kong SAR… HIC       57216.           7305700         5679816.
## 10 IDN   EAS       Indonesia      LMC       10531.         261115456        65200000
## # … with 207 more rows, and 21 more variables:
## #   composition_food_organic_waste_percent <dbl>, composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

Cambiar nombre columnas:

```
waste %>%
  rename(population = population_population_number_of_people,
         total_waste = total_msw_total_msw_generated_tons_year)
```

```
## rename: renamed 2 variables (population, total_waste)

## # A tibble: 217 × 28
##    iso3c region_id country_name         income_id    gdp population total_waste
##    <chr> <chr>     <chr>                <chr>      <dbl>      <dbl>       <dbl>
##  1 ABW   LCN       Aruba                HIC       35563.     103187      88132.
##  2 AFG   SAS       Afghanistan          LIC        2057.   34656032    5628525.
##  3 AGO   SSF       Angola               LMC        8037.   25096150    4213644.
##  4 ALB   ECS       Albania              UMC       13724.    2854191    1087447.
##  5 AND   ECS       Andorra              HIC       43712.      82431      43000
##  6 ARE   MEA       United Arab Emirates HIC       67119.    9770529    5617682
##  7 ARG   LCN       Argentina            HIC       23550.   42981516   17910550
##  8 ARM   ECS       Armenia              UMC       11020.    2906220     492800
##  9 ASM   EAS       American Samoa       UMC       11113.      55599      18989.
## 10 ATG   LCN       Antigua and Barbuda  HIC       17966.      96777      30585
## # … with 207 more rows, and 21 more variables:
## #   composition_food_organic_waste_percent <dbl>, composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

Organizar columnas:

```
waste %>%
  relocate(country_name, .before = iso3c)
```

```
## relocate: columns reordered (country_name, iso3c, region_id, income_id, gdp, …)

## # A tibble: 217 × 28
##    country_name   iso3c region_id income_id    gdp population_popu… total_msw_total…
##    <chr>          <chr> <chr>     <chr>      <dbl>            <dbl>            <dbl>
##  1 Aruba          ABW   LCN       HIC       35563.           103187           88132.
##  2 Afghanistan    AFG   SAS       LIC        2057.         34656032         5628525.
##  3 Angola         AGO   SSF       LMC        8037.         25096150         4213644.
##  4 Albania        ALB   ECS       UMC       13724.          2854191         1087447.
##  5 Andorra        AND   ECS       HIC       43712.            82431           43000
##  6 United Arab E… ARE   MEA       HIC       67119.          9770529         5617682
##  7 Argentina      ARG   LCN       HIC       23550.         42981516        17910550
##  8 Armenia        ARM   ECS       UMC       11020.          2906220          492800
##  9 American Samoa ASM   EAS       UMC       11113.            55599           18989.
## 10 Antigua and B… ATG   LCN       HIC       17966.            96777           30585
## # … with 207 more rows, and 21 more variables:
## #   composition_food_organic_waste_percent <dbl>, composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

(Des)seleccionar variables:

```
waste %>%
  select(-region_id)
```

```
## select: dropped one variable (region_id)

## # A tibble: 217 × 27
##    iso3c country_name         income_id    gdp population_populati… total_msw_total…
##    <chr> <chr>                <chr>      <dbl>                 <dbl>            <dbl>
##  1 ABW   Aruba                HIC       35563.                103187           88132.
##  2 AFG   Afghanistan          LIC        2057.              34656032         5628525.
##  3 AGO   Angola               LMC        8037.              25096150         4213644.
##  4 ALB   Albania              UMC       13724.               2854191         1087447.
##  5 AND   Andorra              HIC       43712.                 82431           43000
##  6 ARE   United Arab Emirates HIC       67119.               9770529         5617682
##  7 ARG   Argentina            HIC       23550.              42981516        17910550
##  8 ARM   Armenia              UMC       11020.               2906220          492800
##  9 ASM   American Samoa       UMC       11113.                 55599           18989.
## 10 ATG   Antigua and Barbuda  HIC       17966.                 96777           30585
## # … with 207 more rows, and 21 more variables:
## #   composition_food_organic_waste_percent <dbl>, composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>,
## #   waste_treatment_anaerobic_digestion_percent <dbl>, …
```

Seleccionar sólo variables de interés:

```
waste_select <- waste %>%
  select(iso3c,
         region_id,
         country = country_name,
         income_id,
         gdp,
         population = population_population_number_of_people,
         total_waste = total_msw_total_msw_generated_tons_year,
         starts_with("composition"))  %>%
  arrange(desc(total_waste))
```

```
## select: renamed 3 variables (country, population, total_waste) and dropped 12 variables
```

```
glimpse(waste_select)
```

```
## Rows: 217
## Columns: 16
## $ iso3c                                      <chr> "CHN", "USA", "IND", "BRA", "I…
## $ region_id                                  <chr> "EAS", "NAC", "SAS", "LCN", "E…
## $ country                                    <chr> "China", "United States", "Ind…
## $ income_id                                  <chr> "UMC", "HIC", "LMC", "UMC", "L…
## $ gdp                                        <dbl> 16092.301, 61498.371, 6496.808…
## $ population                                 <dbl> 1400050048, 326687488, 1352617…
## $ total_waste                                <dbl> 395081376, 265224528, 18975000…
## $ composition_food_organic_waste_percent     <dbl> 61.20000, 14.90000, NA, 51.400…
## $ composition_glass_percent                  <dbl> 2.100000, 4.400000, NA, 2.4000…
## $ composition_metal_percent                  <dbl> 1.10000, 9.00000, NA, 2.90000,…
## $ composition_other_percent                  <dbl> 13.10000, 3.20000, NA, 16.7000…
## $ composition_paper_cardboard_percent        <dbl> 9.600000, 26.600000, NA, 13.10…
## $ composition_plastic_percent                <dbl> 9.800000, 12.900000, NA, 13.50…
## $ composition_rubber_leather_percent         <dbl> 1.30, 9.50, NA, NA, NA, NA, NA…
## $ composition_wood_percent                   <dbl> 1.80, 6.20, NA, NA, NA, NA, NA…
## $ composition_yard_garden_green_waste_percent <dbl> NA, 13.30, NA, NA, NA, NA, NA,…
```

Tablas de resumen de datos:

```
library(summarytools)
dfSummary(waste_select$region_id)
```

```
## waste_select$region_id was converted to a data frame

## Data Frame Summary
## waste_select
## Dimensions: 217 x 1
## Duplicates: 210
##
## ------------------------------------------------------------------------------
## No   Variable      Stats / Values   Freqs (% of Valid)   Graph     Valid      Missing
## ---- ------------ ---------------- -------------------- --------- ---------- ---------
## 1    region_id     1. EAS           37 (17.1%)           III       217        0
##      [character]   2. ECS           58 (26.7%)           IIIII     (100.0%)   (0.0%)
##                    3. LCN           42 (19.4%)           III
##                    4. MEA           21 ( 9.7%)           I
##                    5. NAC            3 ( 1.4%)
##                    6. SAS            8 ( 3.7%)
##                    7. SSF           48 (22.1%)           IIII
## ------------------------------------------------------------------------------
```

```
waste_select %>%
  select(population, gdp) %>%
  dfSummary()
```

```
## select: dropped 14 variables (iso3c, region_id, country, income_id, total_waste, …)

## Data Frame Summary
## waste_select
## Dimensions: 217 x 2
## Duplicates: 0
##
## ------------------------------------------------------------------------------------------
## No   Variable     Stats / Values                      Freqs (% of Valid)    Graph         Valid      Mis
## ---- ------------ ----------------------------------- --------------------- ------------- ---------- ---
## 1    population   Mean (sd) : 33643890 (136583825)    217 distinct values   :             217        0
##      [numeric]    min < med < max:                                          :             (100.0%)   (0.
##                   11097 < 5737723 < 1400050048                              :
##                   IQR (CV) : 20456779 (4.1)                                 :
##                                                                             :
##
## 2    gdp          Mean (sd) : 22645.9 (22663.6)       213 distinct values   :             216        1
##      [numeric]    min < med < max:                                          :             (99.5%)    (0.
##                   822.6 < 13465.9 < 117335.6                                :
##                   IQR (CV) : 31111.8 (1)                                    : :
##                                                                             : : : : : .
## ------------------------------------------------------------------------------------------
```

Más funciones de `dplyr`

- `distinct()` - Extraer valores únicos
- `recode()` - Recodificar casos de una variable
- `group_by()` - Agrupar datos por casos
- `summarise()` - Resumir datos por casos
- `mutate()` - Crear nuevas variables
- `filter()` - Filtrar datos por casos
- `case_when()` - Filtrar datos por casos

Extraer valores únicos (niveles) de una(s) variable(s):

```
waste_select %>%
  distinct(income_id)
```

```
## distinct: removed 213 rows (98%), 4 rows remaining
```

```
## # A tibble: 4 × 1
##   income_id
##   <chr>
## 1 UMC
## 2 HIC
## 3 LMC
## 4 LIC
```

Igual a:

```
base::unique(waste_select$income_id)
```

```
## [1] "UMC" "HIC" "LMC" "LIC"
```

LIC = Low income; LMC = Lower middle income; UMC = Upper middle income; HIC = High income

Recodificar niveles de una variable:

```
waste_select %>%
  distinct(region_id)
```

```
## distinct: removed 210 rows (97%), 7 rows remaining
```

```
## # A tibble: 7 × 1
##   region_id
##   <chr>
## 1 EAS
## 2 NAC
## 3 SAS
## 4 LCN
## 5 ECS
## 6 SSF
## 7 MEA
```

- LCN: Latin America & Caribbean
- SAS: South Asia
- SSF: Sub-Saharan Africa
- ECS: Europe & Central Asia
- MEA: Middle East & North Africa
- EAS: East Asia & Pacific
- NAC: North America

Recodificar niveles de una variable:

```
waste_regions <- waste_select %>%
  mutate(region_id = recode(region_id,
                            "LCN" = "Latin_America",
                            "SAS" = "South_Asia",
                            "SSF" = "Sub-Saharan_Africa",
                            "ECS" = "Europe_Central_Asia",
                            "MEA" = "Middle_East_North_Africa",
                            "EAS" = "East_Asia_Pacific",
                            "NAC" = "North_America"))
```

```
## mutate: changed 217 values (100%) of 'region_id' (0 new NA)
```

```
distinct(waste_regions, region_id)
```

```
## # A tibble: 7 × 1
##   region_id
##   <chr>
## 1 East_Asia_Pacific
## 2 North_America
## 3 South_Asia
## 4 Latin_America
## 5 Europe_Central_Asia
## 6 Sub-Saharan_Africa
## 7 Middle_East_North_Africa
```

Agrupar datos y resumir:

```
waste_regions %>%
  group_by(region_id) %>%
  summarise(total_waste = sum(total_waste, na.rm = TRUE))
```

```
## group_by: one grouping variable (region_id)

## summarise: now 7 rows and 2 columns, ungrouped

## # A tibble: 7 × 2
##   region_id                total_waste
##   <chr>                          <dbl>
## 1 East_Asia_Pacific          630827137.
## 2 Europe_Central_Asia        407170316.
## 3 Latin_America              224893129.
## 4 Middle_East_North_Africa   124442193.
## 5 North_America              290409562
## 6 South_Asia                 245640470.
## 7 Sub-Saharan_Africa         149000010.
```

Crear nueva variable - Ej: transformar basura a millones de toneladas

```
waste_regions %>%
  group_by(region_id) %>%
  summarise(total_waste = sum(total_waste, na.rm = TRUE)) %>%
  mutate(waste_mtons = total_waste/1000000)
```

```
## group_by: one grouping variable (region_id)

## summarise: now 7 rows and 2 columns, ungrouped

## mutate: new variable 'waste_mtons' (double) with 7 unique values and 0% NA

## # A tibble: 7 × 3
##   region_id                total_waste waste_mtons
##   <chr>                          <dbl>       <dbl>
## 1 East_Asia_Pacific         630827137.        631.
## 2 Europe_Central_Asia       407170316.        407.
## 3 Latin_America             224893129.        225.
## 4 Middle_East_North_Africa  124442193.        124.
## 5 North_America             290409562         290.
## 6 South_Asia                245640470.        246.
## 7 Sub-Saharan_Africa        149000010.        149.
```

Filtrar datos:

```
waste_regions %>%
  filter(region_id == "Latin_America")
```

```
## filter: removed 175 rows (81%), 42 rows remaining
```

```
## # A tibble: 42 × 16
##    iso3c region_id  country income_id    gdp population total_waste composition_foo…
##    <chr> <chr>      <chr>   <chr>      <dbl>      <dbl>       <dbl>             <dbl>
##  1 BRA   Latin_Ame… Brazil  UMC       14596.  208494896    79069584              51.4
##  2 MEX   Latin_Ame… Mexico  UMC       19332.  125890952    53100000              52.4
##  3 ARG   Latin_Ame… Argent… HIC       23550.   42981516    17910550              38.7
##  4 COL   Latin_Ame… Colomb… UMC       12523.   46406648    12150120              59.6
##  5 VEN   Latin_Ame… Venezu… UMC       14270.   29893080     9779093.             NA
##  6 PER   Latin_Ame… Peru    UMC       11877.   30973354     8356711.             50.4
##  7 CHL   Latin_Ame… Chile   HIC       20362.   16829442     6517000              53.3
##  8 ECU   Latin_Ame… Ecuador UMC       11896.   16144368     5297211.             58.7
##  9 PRI   Latin_Ame… Puerto… HIC       34311.    3473181     4170953              13.1
## 10 DOM   Latin_Ame… Domini… UMC       15328.   10528394     4063910              51
## # … with 32 more rows, and 8 more variables: composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>
```

Filtrar datos:

```
waste_regions %>%
  filter(region_id == "Europe_Central_Asia" & population <= 1000000)
```

```
## filter: removed 205 rows (94%), 12 rows remaining
```

```
## # A tibble: 12 × 16
##    iso3c region_id  country income_id    gdp population total_waste composition_foo…
##    <chr> <chr>      <chr>   <chr>      <dbl>      <dbl>       <dbl>             <dbl>
##  1 LUX   Europe_Ce… Luxemb… HIC       1.14e5     619896     490338.             30
##  2 MNE   Europe_Ce… Monten… UMC       2.08e4     622227     329780.             33.8
##  3 ISL   Europe_Ce… Iceland HIC       5.53e4     343400     225270.             10
##  4 CHI   Europe_Ce… Channe… HIC       4.67e4     164541     178933              NA
##  5 FRO   Europe_Ce… Faeroe… HIC       4.44e4      48842      61000              NA
##  6 IMN   Europe_Ce… Isle o… HIC       4.42e4      80759      50551              NA
##  7 GRL   Europe_Ce… Greenl… HIC       4.39e4      56905      50000              42.8
##  8 MCO   Europe_Ce… Monaco  HIC       4.37e4      37783      46000              NA
##  9 AND   Europe_Ce… Andorra HIC       4.37e4      82431      43000              31.2
## 10 LIE   Europe_Ce… Liecht… HIC       4.57e4      36545      32382              37.6
## 11 SMR   Europe_Ce… San Ma… HIC       5.88e4      33203      17175.              5.35
## 12 GIB   Europe_Ce… Gibral… HIC       4.37e4      33623      16954              24.6
## # … with 8 more variables: composition_glass_percent <dbl>,
## #   composition_metal_percent <dbl>, composition_other_percent <dbl>,
## #   composition_paper_cardboard_percent <dbl>, composition_plastic_percent <dbl>,
## #   composition_rubber_leather_percent <dbl>, composition_wood_percent <dbl>,
## #   composition_yard_garden_green_waste_percent <dbl>
```

Crear nuevo factor:

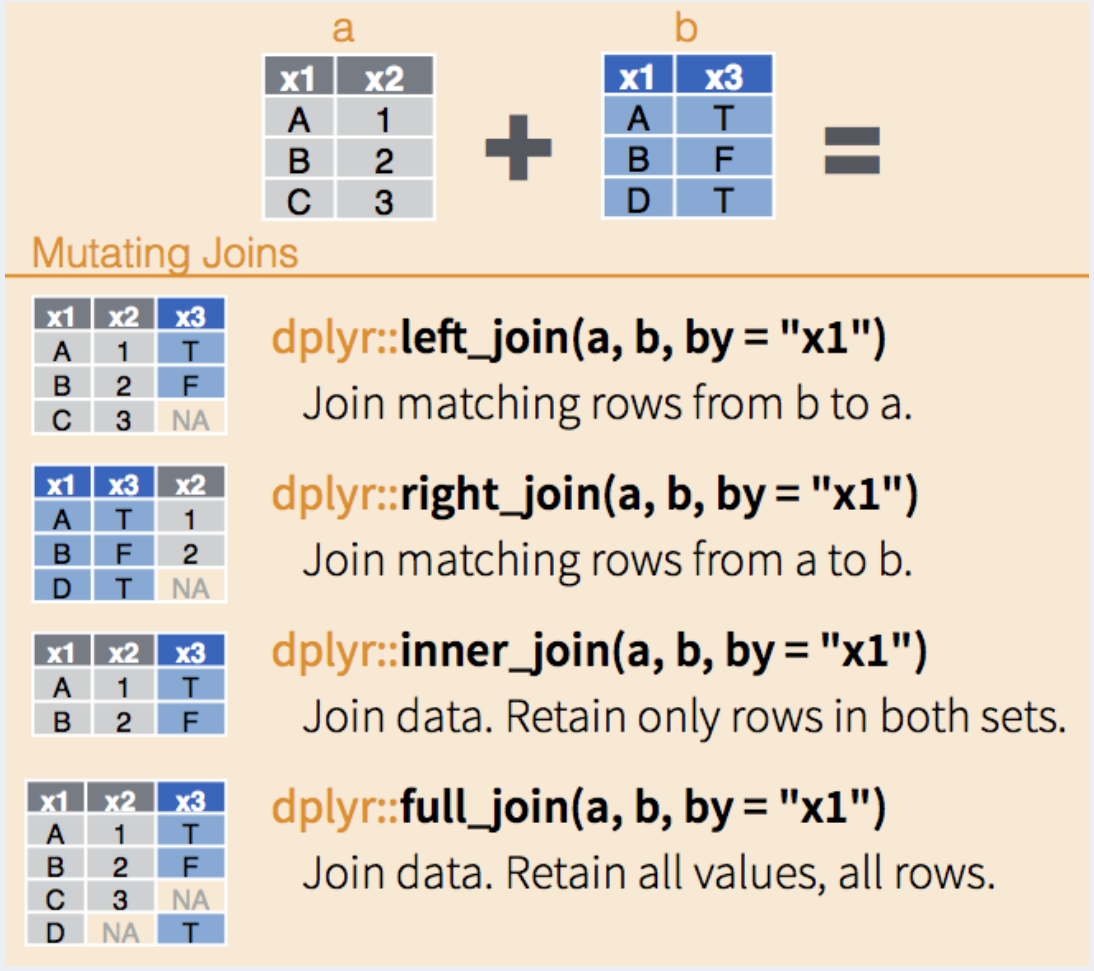
```
waste_regions %>%
  mutate(pop_size = case_when(
    population >= 1000000 ~ "big",
    population < 1000000 & population > 500000 ~ "medium",
    population <= 500000 ~ "small")) %>%
  relocate(pop_size, .before = population)
```

```
## mutate: new variable 'pop_size' (character) with 3 unique values and 0% NA

## relocate: columns reordered (iso3c, region_id, country, income_id, gdp, …)

## # A tibble: 217 × 17
##    iso3c region_id          country income_id    gdp pop_size population total_waste
##    <chr> <chr>              <chr>   <chr>      <dbl> <chr>         <dbl>       <dbl>
##  1 CHN   East_Asia_Pacific  China   UMC       16092. big      1400050048   395081376
##  2 USA   North_America      United… HIC       61498. big       326687488   265224528
##  3 IND   South_Asia         India   LMC        6497. big      1352617344   189750000
##  4 BRA   Latin_America      Brazil  UMC       14596. big       208494896    79069584
##  5 IDN   East_Asia_Pacific  Indone… LMC       10531. big       261115456    65200000
##  6 RUS   Europe_Central_As… Russia… UMC       26013. big       143201680    60000000
##  7 MEX   Latin_America      Mexico  UMC       19332. big       125890952    53100000
##  8 DEU   Europe_Central_As… Germany HIC       53785. big        83132800    50627876
##  9 JPN   East_Asia_Pacific  Japan   HIC       41310. big       126529104    42720000
## 10 FRA   Europe_Central_As… France  HIC       46110. big        67059888    36748820
## # … with 207 more rows, and 9 more variables:
## #   composition_food_organic_waste_percent <dbl>, composition_glass_percent <dbl>,
```

Funciones de `dplyr`

- `arrange()` - Ordenar variable por casos
- `rename()` - Renombrar variables
- `relocate()` - Reordenar variables
- `select()` - Extraer variables
- `distinct()` - Extraer valores únicos
- `recode()` - Recodificar casos de una variable
- `group_by()` - Agrupar datos por casos
- `summarise()` - Resumir datos por casos
- `mutate()` - Crear nuevas variables
- `filter()` - Filtrar datos por casos
- `case_when()` - Filtrar datos por casos

Combinar bases de datos con `join`:



Data Wrangling CheatSheet

Combinar bases de datos con `join`:

Vamos a darle a nuestro dataset información sobre el continente donde se encuentra cada pais y su localización.

Leer nuevo dataset con información sobre el continente:

```
world_data <- read_csv2(here("data/world_data.csv"))
```

```
## ℹ Using "','" as decimal and "'.'" as grouping mark. Use `read_delim()` for more control.

## Rows: 241 Columns: 16
## ── Column specification ────────────────────────────────────────────────────────
## Delimiter: ";"
## chr (12): name, name_long, sovereignt, type, abbrev, continent, formal_en, gdp_m...
## dbl  (4): pop_est, pop_year, lastcensus, gdp_year
##
## ℹ Use `spec()` to retrieve the full column specification for this data.
## ℹ Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
glimpse(world_data)
```

```
## Rows: 241
## Columns: 16
## $ name       <chr> "Aruba", "Afghanistan", "Angola", "Anguilla", "Albania", "Aland…
## $ name_long  <chr> "Aruba", "Afghanistan", "Angola", "Anguilla", "Albania", "Aland…
## $ sovereignt <chr> "Netherlands", "Afghanistan", "Angola", "United Kingdom", "Alba…
## $ type       <chr> "Country", "Sovereign country", "Sovereign country", "Dependenc…
## $ abbrev     <chr> "Aruba", "Afg.", "Ang.", "Ang.", "Alb.", "Aland", "And.", "U.A.…
## $ continent  <chr> "North America", "Asia", "Africa", "North America", "Europe", "…
## $ formal_en  <chr> "Aruba", "Islamic State of Afghanistan", "People's Republic of …
## $ pop_est    <dbl> 103065, 28400000, 12799293, 14436, 3639453, 27153, 83888, 47984…
## $ gdp_md_est <chr> "2258", "22270", "110300", "108.9", "21810", "1563", "3660", "1…
## $ pop_year   <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA,…
## $ lastcensus <dbl> 2010, 1979, 1970, NA, 2001, NA, 1989, 2010, 2010, 2001, 2010, N…
## $ gdp_year   <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA,…
## $ economy    <chr> "6. Developing region", "7. Least developed region", "7. Least …
## $ income_grp <chr> "2. High income: nonOECD", "5. Low income", "3. Upper middle in…
## $ iso_a3     <chr> "ABW", "AFG", "AGO", "AIA", "ALB", "ALA", "AND", "ARE", "ARG", …
## $ region_un  <chr> "Americas", "Asia", "Africa", "Americas", "Europe", "Europe", "…
```

Seleccionar variables de interés:

```
continent <- world_data %>%
  select(iso_a3,
         country_name = name_long,
         continent)
```

```
## select: renamed one variable (country_name) and dropped 13 variables
```

```
glimpse(continent)
```

```
## Rows: 241
## Columns: 3
## $ iso_a3       <chr> "ABW", "AFG", "AGO", "AIA", "ALB", "ALA", "AND", "ARE", "ARG"…
## $ country_name <chr> "Aruba", "Afghanistan", "Angola", "Anguilla", "Albania", "Ala…
## $ continent    <chr> "North America", "Asia", "Africa", "North America", "Europe",…
```

Combinar datasets:

Usando `full_join()`

```
waste_world <- waste_regions %>%
  rename(iso_a3 = iso3c) %>%
  full_join(continent, by = "iso_a3")
```

```
## rename: renamed one variable (iso_a3)

## full_join: added 2 columns (country_name, continent)

##            > rows only in x     5

##            > rows only in y    29

##            > matched rows     212

##            >                 =====

##            > rows total       246
```

Combinar datasets:

Usando `left_join()`

```
waste_world <- waste_regions %>%
  rename(iso_a3 = iso3c) %>%
  left_join(continent, by = "iso_a3")
```

```
## rename: renamed one variable (iso_a3)

## left_join: added 2 columns (country_name, continent)

##            > rows only in x     5

##            > rows only in y  ( 29)

##            > matched rows     212

##            >                 =====

##            > rows total       217
```

¿Qué paises se han quedado sin identificar?

```
waste_world %>%
  filter(is.na(continent)) %>%
  pull(country, iso_a3)
```

```
## filter: removed 212 rows (98%), 5 rows remaining
```

```
##                 TWN                 XKX                 CHI                 GIB
##                  NA           "Kosovo" "Channel Islands"        "Gibraltar"
##                 TUV
##           "Tuvalu"
```

Buscar los paises que faltan en el dataset de continente:

```
continent %>%
  filter(country_name %in%
           c("Channel Islands", "Gibraltar", "Tuvalu", "Kosovo", "Taiwan"))
```

```
## filter: removed 239 rows (99%), 2 rows remaining
```

```
## # A tibble: 2 × 3
##   iso_a3 country_name continent
##   <chr>  <chr>        <chr>
## 1 <NA>   Kosovo       Europe
## 2 <NA>   Taiwan       Asia
```

library(stringr)

Allison Horst Illustration

Utilidades de `library(stringr)`

- `str_length()` - Longitud de una cadena
- `str_detect()` - Detecta un determinado patrón
- `str_extract()` - Extrae un determinado patrón
- `str_c()` - Encadena caracteres (similar a `paste0()`)
- `str_sub()` - Extrae sub-caracteres de una cadena
- `str_replace()` - Reemplaza caracter(es) por otro(s)
- `str_to_lower()`, `str_to_upper()`, `str_to_title()` - transformar en mayúsculas o minúsculas

Usando `library(stringr)`

Alternativa para buscar los paises que faltan en el dataset de continente:

```
continent %>%
  filter(str_detect(country_name, "Kosovo|Gibraltar|Tuvalu|Channel Islands|Taiwan"))
```

```
## filter: removed 239 rows (99%), 2 rows remaining
```

```
## # A tibble: 2 × 3
##   iso_a3 country_name continent
##   <chr>  <chr>        <chr>
## 1 <NA>   Kosovo       Europe
## 2 <NA>   Taiwan       Asia
```

Otro ejemplo - buscar Islas:

```
continent %>%
  filter(str_detect(country_name, "Island"))
```

```
## filter: removed 224 rows (93%), 17 rows remaining
```

```
## # A tibble: 17 × 3
##    iso_a3 country_name                          continent
##    <chr>  <chr>                                 <chr>
##  1 ALA    Aland Islands                         Europe
##  2 <NA>   Ashmore and Cartier Islands           Oceania
##  3 COK    Cook Islands                          Oceania
##  4 CYM    Cayman Islands                        North America
##  5 <NA>   Falkland Islands                      <NA>
##  6 FRO    Faeroe Islands                        Europe
##  7 HMD    Heard I. and McDonald Islands         Seven seas (open ocean)
##  8 MHL    Marshall Islands                      Oceania
##  9 MNP    Northern Mariana Islands              Oceania
## 10 NFK    Norfolk Island                        Oceania
## 11 PCN    Pitcairn Islands                      Oceania
## 12 SGS    South Georgia and South Sandwich Islands Seven seas (open ocean)
## 13 SLB    Solomon Islands                       Oceania
## 14 TCA    Turks and Caicos Islands              North America
## 15 VGB    British Virgin Islands                North America
## 16 VIR    United States Virgin Islands          North America
```

Corregir un dato:

```
continent_corrected <- continent %>%
  mutate(iso_a3 = ifelse(country_name == "Kosovo", "XKX", iso_a3)) %>%
  mutate(iso_a3 = ifelse(country_name == "Taiwan", "TWN", iso_a3))
```

```
## mutate: changed one value (<1%) of 'iso_a3' (1 fewer NA)
## mutate: changed one value (<1%) of 'iso_a3' (1 fewer NA)
```

Volver a combinar dataset:

```
waste_world <- waste_regions %>%
  rename(iso_a3 = iso3c) %>%
  left_join(continent_corrected, by = "iso_a3")
```

```
## rename: renamed one variable (iso_a3)

## left_join: added 2 columns (country_name, continent)

##            > rows only in x     3

##            > rows only in y  ( 27)

##            > matched rows     214

##            >                 =====

##            > rows total       217
```

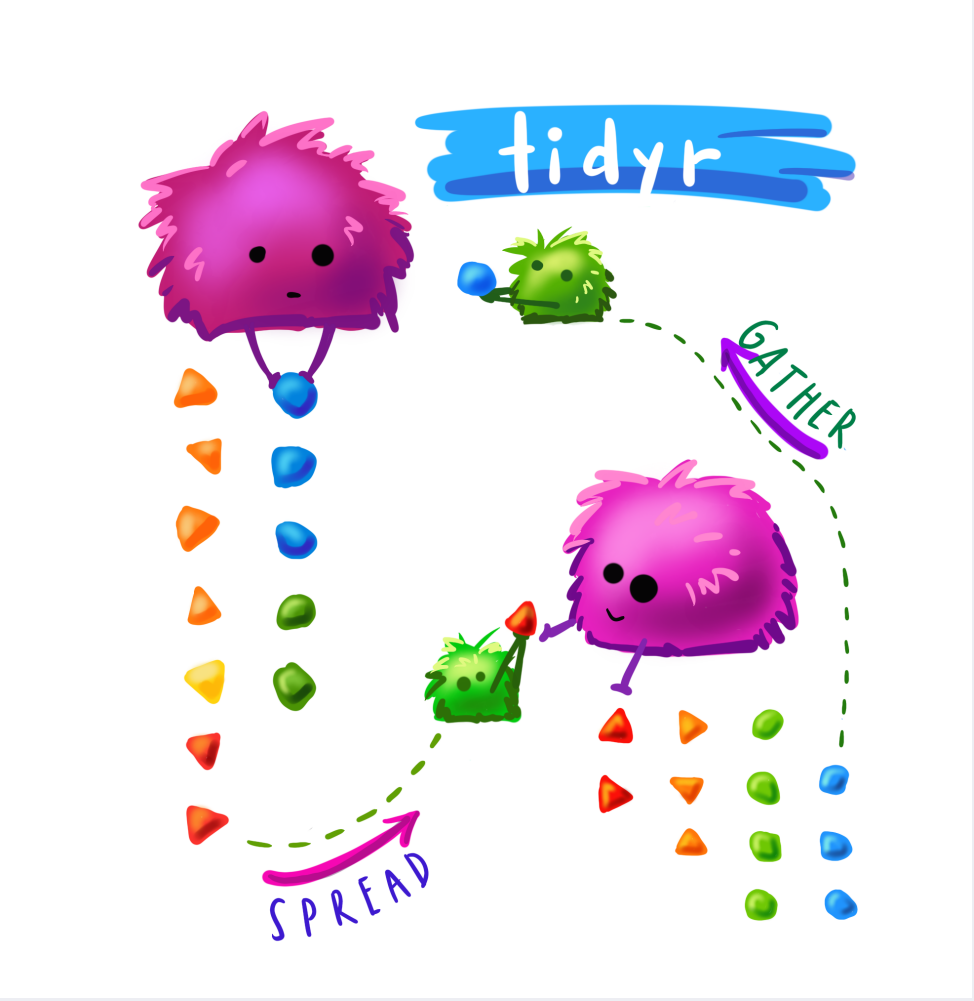
```
glimpse(waste_world)
```

```
## Rows: 217
## Columns: 18
## $ iso_a3                                          <chr> "CHN", "USA", "IND", "BRA", "I…
## $ region_id                                       <chr> "East_Asia_Pacific", "North_Am…
## $ country                                         <chr> "China", "United States", "Ind…
## $ income_id                                       <chr> "UMC", "HIC", "LMC", "UMC", "L…
## $ gdp                                             <dbl> 16092.301, 61498.371, 6496.808…
## $ population                                      <dbl> 1400050048, 326687488, 1352617…
## $ total_waste                                     <dbl> 395081376, 265224528, 18975000…
## $ composition_food_organic_waste_percent          <dbl> 61.20000, 14.90000, NA, 51.400…
## $ composition_glass_percent                       <dbl> 2.100000, 4.400000, NA, 2.4000…
## $ composition_metal_percent                       <dbl> 1.10000, 9.00000, NA, 2.90000,…
## $ composition_other_percent                       <dbl> 13.10000, 3.20000, NA, 16.7000…
## $ composition_paper_cardboard_percent             <dbl> 9.600000, 26.600000, NA, 13.10…
## $ composition_plastic_percent                     <dbl> 9.800000, 12.900000, NA, 13.50…
## $ composition_rubber_leather_percent              <dbl> 1.30, 9.50, NA, NA, NA, NA, NA…
## $ composition_wood_percent                        <dbl> 1.80, 6.20, NA, NA, NA, NA, NA…
## $ composition_yard_garden_green_waste_percent     <dbl> NA, 13.30, NA, NA, NA, NA, NA,…
## $ country_name                                    <chr> "China", "United States", "Ind…
## $ continent                                       <chr> "Asia", "North America", "Asia…
```

Guardar dataset para el próximo día:

```
write_csv(waste_world, here("data/waste_world.csv"))
```

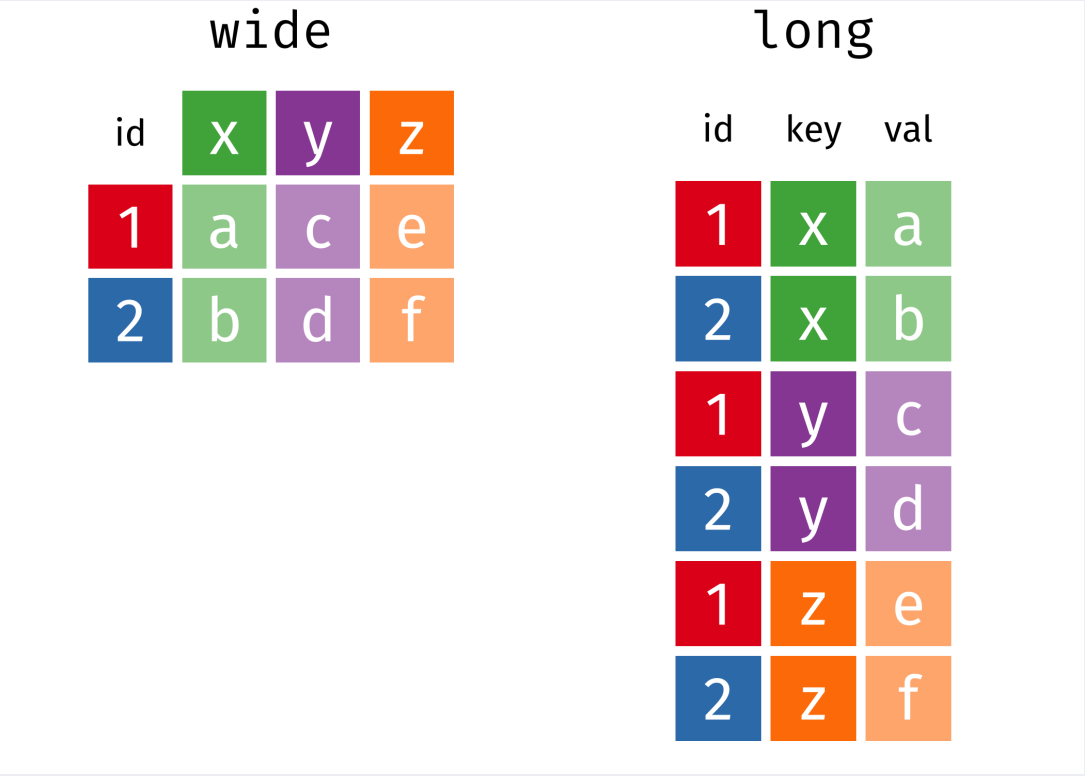
library(tidyr)



Allison Horst Illustration

Reestructurar dataset con `library(tidyr)`

- `pivot_wider()` o `spread()`
- `pivot_longer()` o `gather()`



Fuente: Garrick Aden-Buie's - Tidyexplained Verbs

Reestructurar el dataset con `library(tidyr)`

```
glimpse(waste_world)
```

```
## Rows: 217
## Columns: 18
## $ iso_a3                                      <chr> "CHN", "USA", "IND", "BRA", "I…
## $ region_id                                   <chr> "East_Asia_Pacific", "North_Am…
## $ country                                     <chr> "China", "United States", "Ind…
## $ income_id                                   <chr> "UMC", "HIC", "LMC", "UMC", "L…
## $ gdp                                         <dbl> 16092.301, 61498.371, 6496.808…
## $ population                                  <dbl> 1400050048, 326687488, 1352617…
## $ total_waste                                 <dbl> 395081376, 265224528, 18975000…
## $ composition_food_organic_waste_percent      <dbl> 61.20000, 14.90000, NA, 51.400…
## $ composition_glass_percent                   <dbl> 2.100000, 4.400000, NA, 2.4000…
## $ composition_metal_percent                   <dbl> 1.10000, 9.00000, NA, 2.90000,…
## $ composition_other_percent                   <dbl> 13.10000, 3.20000, NA, 16.7000…
## $ composition_paper_cardboard_percent         <dbl> 9.600000, 26.600000, NA, 13.10…
## $ composition_plastic_percent                 <dbl> 9.800000, 12.900000, NA, 13.50…
## $ composition_rubber_leather_percent          <dbl> 1.30, 9.50, NA, NA, NA, NA, NA…
## $ composition_wood_percent                    <dbl> 1.80, 6.20, NA, NA, NA, NA, NA…
## $ composition_yard_garden_green_waste_percent <dbl> NA, 13.30, NA, NA, NA, NA, NA,…
## $ country_name                                <chr> "China", "United States", "Ind…
## $ continent                                   <chr> "Asia", "North America", "Asia…
```

Reestructurar el dataset con `library(tidyr)`

```
composition <- waste_world %>%
  pivot_longer(cols = starts_with("composition"), names_to = "composition", values_to = "percent")
```

```
## pivot_longer: reorganized (composition_food_organic_waste_percent, composition_glass_percent, compositi
```

```
composition %>%
  select(country, composition, percent)
```

```
## select: dropped 8 variables (iso_a3, region_id, income_id, gdp, population, …)

## # A tibble: 1,953 × 3
##    country       composition                                  percent
##    <chr>         <chr>                                          <dbl>
##  1 China         composition_food_organic_waste_percent          61.2
##  2 China         composition_glass_percent                        2.1
##  3 China         composition_metal_percent                        1.1
##  4 China         composition_other_percent                       13.1
##  5 China         composition_paper_cardboard_percent              9.6
##  6 China         composition_plastic_percent                      9.8
##  7 China         composition_rubber_leather_percent               1.3
##  8 China         composition_wood_percent                         1.8
##  9 China         composition_yard_garden_green_waste_percent     NA
## 10 United States composition_food_organic_waste_percent          14.9
## # … with 1,943 more rows
```

Simplificar variables con `library(stringr)`:

```
composition_fix <- composition %>%
  mutate(composition=str_remove(composition, "composition_")) %>%
  mutate(composition=str_remove(composition, "_percent"))
```

```
## mutate: changed 1,953 values (100%) of 'composition' (0 new NA)
## mutate: changed 1,953 values (100%) of 'composition' (0 new NA)
```

```
distinct(composition_fix, composition)
```

```
## distinct: removed 1,944 rows (>99%), 9 rows remaining
```

```
## # A tibble: 9 × 1
##   composition
##   <chr>
## 1 food_organic_waste
## 2 glass
## 3 metal
## 4 other
## 5 paper_cardboard
## 6 plastic
## 7 rubber_leather
## 8 wood
## 9 yard_garden_green_waste
```

```
glimpse(composition_fix)
```

```
## Rows: 1,953
## Columns: 11
## $ iso_a3       <chr> "CHN", "CHN", "CHN", "CHN", "CHN", "CHN", "CHN", "CHN", "CHN"…
## $ region_id    <chr> "East_Asia_Pacific", "East_Asia_Pacific", "East_Asia_Pacific"…
## $ country      <chr> "China", "China", "China", "China", "China", "China", "China"…
## $ income_id    <chr> "UMC", "UMC", "UMC", "UMC", "UMC", "UMC", "UMC", "UMC", "UMC"…
## $ gdp          <dbl> 16092.301, 16092.301, 16092.301, 16092.301, 16092.301, 16092.…
## $ population   <dbl> 1400050048, 1400050048, 1400050048, 1400050048, 1400050048, 1…
## $ total_waste  <dbl> 395081376, 395081376, 395081376, 395081376, 395081376, 395081…
## $ country_name <chr> "China", "China", "China", "China", "China", "China", "China"…
## $ continent    <chr> "Asia", "Asia", "Asia", "Asia", "Asia", "Asia", "Asia", "Asia…
## $ composition  <chr> "food_organic_waste", "glass", "metal", "other", "paper_cardb…
## $ percent      <dbl> 61.2, 2.1, 1.1, 13.1, 9.6, 9.8, 1.3, 1.8, NA, 14.9, 4.4, 9.0,…
```

Comprobar datos: asegurar que los porcentajes suman 100%

```
composition %>%
  group_by(country) %>%
  summarise(per_sum = sum(percent, na.rm = TRUE))
```

```
## group_by: one grouping variable (country)

## summarise: now 217 rows and 2 columns, ungrouped

## # A tibble: 217 × 2
##    country             per_sum
##    <chr>                 <dbl>
##  1 Afghanistan             0
##  2 Albania               100.
##  3 Algeria               100
##  4 American Samoa        100
##  5 Andorra               100
##  6 Angola                 99.8
##  7 Antigua and Barbuda   100
##  8 Argentina             100.
##  9 Armenia               100
## 10 Aruba                   0
## # … with 207 more rows
```

Comprobar datos: Lista de paises cuyos porcentajes no suman 100%

```
composition %>%
  group_by(country) %>%
  summarise(per_sum = sum(percent, na.rm = TRUE)) %>%
  filter(per_sum < 99.9 | per_sum > 100.1)  %>% # arrange(per_sum) %>%
  pull(per_sum, country)
```

```
##             Afghanistan                  Angola                   Aruba
##                    0.00                   99.80                    0.00
##                Barbados                 Belgium                Botswana
##                  100.10                   99.86                  100.10
##              Cabo Verde                  Canada Central African Republic
##                    0.00                  101.00                    0.00
##        Channel Islands        Congo, Dem. Rep.             Congo, Rep.
##                    0.00                    0.00                    0.00
##          Côte d'Ivoire                 Curacao                Djibouti
##                    0.00                    0.00                    0.00
##       Equatorial Guinea                 Eritrea                Eswatini
##                    0.00                    0.00                    0.00
##          Faeroe Islands                   Gabon               Gibraltar
##                    0.00                    0.00                   97.25
##          Guinea-Bissau                   India               Indonesia
##                    0.00                    0.00                   99.90
##      Iran, Islamic Rep.                    Iraq             Isle of Man
##                  100.30                   99.74                    0.00
##              Kazakhstan             Korea, Rep.                  Kuwait
##                   97.50                  100.40                  101.00
```

Crear dataset solo para los paises con información completa:

```
composition_complete <- composition %>%
  group_by(country) %>%
  mutate(per_sum = sum(percent, na.rm = TRUE)) %>%
  filter(per_sum >= 99.9) %>%
  filter(per_sum <= 100.1)
```

```
## group_by: one grouping variable (country)

## mutate (grouped): new variable 'per_sum' (double) with 42 unique values and 0% NA

## filter (grouped): removed 477 rows (24%), 1,476 rows remaining

## filter (grouped): removed 135 rows (9%), 1,341 rows remaining
```

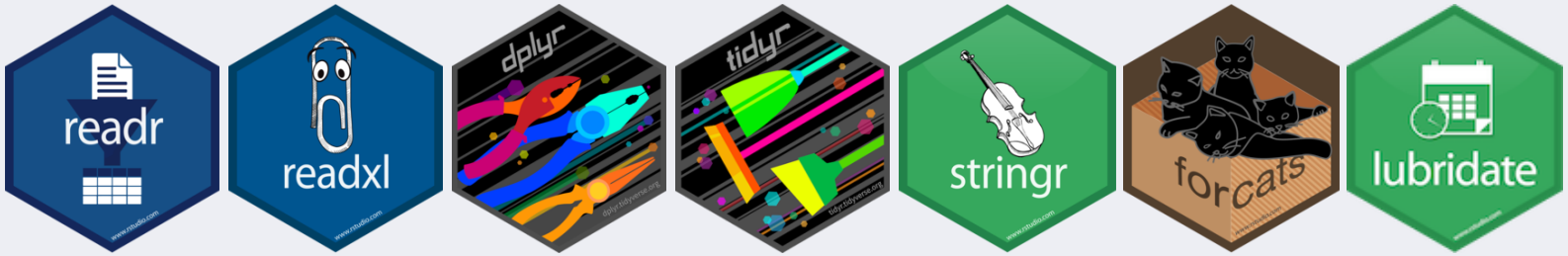
Atención, en este caso para filtrar el dataset usamos `mutate()` y no `summarise()`, ya que queremos toda la información desagregada.

```
glimpse(composition_complete)
```

```
## Rows: 1,341
## Columns: 12
## Groups: country [149]
## $ iso_a3       <chr> "CHN", "CHN", "CHN", "CHN", "CHN", "CHN", "CHN", "CHN", "CHN"…
## $ region_id    <chr> "East_Asia_Pacific", "East_Asia_Pacific", "East_Asia_Pacific"…
## $ country      <chr> "China", "China", "China", "China", "China", "China", "China"…
## $ income_id    <chr> "UMC", "UMC", "UMC", "UMC", "UMC", "UMC", "UMC", "UMC", "UMC"…
## $ gdp          <dbl> 16092.30, 16092.30, 16092.30, 16092.30, 16092.30, 16092.30, 1…
## $ population   <dbl> 1400050048, 1400050048, 1400050048, 1400050048, 1400050048, 1…
## $ total_waste  <dbl> 395081376, 395081376, 395081376, 395081376, 395081376, 395081…
## $ country_name <chr> "China", "China", "China", "China", "China", "China", "China"…
## $ continent    <chr> "Asia", "Asia", "Asia", "Asia", "Asia", "Asia", "Asia", "Asia…
## $ composition  <chr> "composition_food_organic_waste_percent", "composition_glass_…
## $ percent      <dbl> 61.20, 2.10, 1.10, 13.10, 9.60, 9.80, 1.30, 1.80, NA, 14.90, …
## $ per_sum      <dbl> 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 1…
```

Recursos

- Tidyverse packages
- R for Data Science Book - Wrangle Chapter
- RStudio CheatSheets
    - Data import with readr, readxl, and googlesheets4
    - Data Transformation with dplyr
    - Data tidying with tidyr
    - String manipulation with stringr
    - Factors with forcats
    - Dates and times with lubridate



Ejercicio 1:

Calcular composición de basura en España:

Ejercicio 1:

Calcular composición de basura en España:

```
composition_complete %>%
  filter(country == "Spain") %>%
  select(composition, percent)
```

```
## # A tibble: 9 × 3
## # Groups:   country [1]
##   country composition                                 percent
##   <chr>   <chr>                                         <dbl>
## 1 Spain   composition_food_organic_waste_percent            49
## 2 Spain   composition_glass_percent                         8
## 3 Spain   composition_metal_percent                         3
## 4 Spain   composition_other_percent                        14
## 5 Spain   composition_paper_cardboard_percent              15
## 6 Spain   composition_plastic_percent                      9
## 7 Spain   composition_rubber_leather_percent               NA
## 8 Spain   composition_wood_percent                         2
## 9 Spain   composition_yard_garden_green_waste_percent      NA
```

Ejercicio 2:

Usando el dataset waste_world - calcular la población media por regiones en millones de habitantes.

Ejercicio 2:

Usando el dataset waste_world - calcular la población media por regiones en millones de habitantes.

```
waste_world %>%
  group_by(region_id) %>%
  summarise(pop = mean(population, na.rm = TRUE)) %>%
  mutate(pop = pop / 1000000)
```

```
## # A tibble: 7 × 2
##   region_id                 pop
##   <chr>                   <dbl>
## 1 East_Asia_Pacific        61.6
## 2 Europe_Central_Asia      15.7
## 3 Latin_America            15.0
## 4 Middle_East_North_Africa 20.2
## 5 North_America           121.
## 6 South_Asia              223.
## 7 Sub-Saharan_Africa       18.9
```

Ejercicio 3:

Crear una variable basada en el nivel de basura per cápita y contar el numero de paises en cada grupo.

Ejemplo:

- high_waste = >0.6 toneladas de basura por persona al año
- medium_waste = 0.2 a 0.6 toneladas de basura por persona al año
- low_waste = <0.2 toneladas de basura por persona al año

Ejercicio 3:

Crear una variable basada en el nivel de basura per cápita y contar el número de paises en cada grupo.

- high_waste = >0.6 toneladas de basura por persona al año
- medium_waste = 0.2 a 0.6 toneladas de basura por persona al año
- low_waste = <0.2 toneladas de basura por persona al año

```
waste_world %>%
  select(country, population, total_waste) %>%
  mutate(waste_per_pers = total_waste / population) %>%
  mutate(waste_levels = case_when(
              waste_per_pers >= 0.6 ~ "high_waste",
              waste_per_pers <= 0.2 ~ "low_waste",
              waste_per_pers < 0.6 & waste_per_pers > 0.2 ~ "medium_waste")) %>%
  group_by(waste_levels) %>%
  summarise(n_countries = n())
```

```
## # A tibble: 4 × 2
##   waste_levels n_countries
##   <chr>              <int>
## 1 high_waste            34
## 2 low_waste             65
## 3 medium_waste         116
## 4 <NA>                   2
```

Ejercicio 4:

Usando la nueva categoria de niveles de basura, contar paises por region y crear una tabla como esta:

region_id	high_waste	low_waste	medium_waste
East_Asia_Pacific	6	10	21
Europe_Central_Asia	14	5	39
Latin_America	8	4	28
Middle_East_North_Africa	3	3	15
North_America	3	0	0
South_Asia	0	7	1
Sub-Saharan_Africa	0	36	12

Ejercicio 4:

Usando la nueva categoria de niveles de basura, contar paises por region y crear una tabla como esta:

```
waste_world %>%
  select(region_id, country, population, total_waste) %>%
  mutate(waste_per_pers = total_waste/population) %>%
  filter(!is.na(waste_per_pers)) %>%
  mutate(waste_levels = case_when(
              waste_per_pers >= 0.6 ~ "high_waste",
              waste_per_pers <= 0.2 ~ "low_waste",
              waste_per_pers < 0.6 & waste_per_pers > 0.2 ~ "medium_waste")) %>%
  group_by(region_id, waste_levels) %>%
  summarise(n_countries=n()) %>%
  pivot_wider(names_from=waste_levels, values_from=n_countries) %>%
  replace(is.na(.), 0) %>%
  kable()
```

Ejercicio 5:

Usando el dataset waste_world - calcular el residuo de basura plástica en millones de toneladas (composition_plastic_percent * total_waste) por continente y ordenarlo de mayor a menor.

Ejercicio 5:

Usando el dataset waste_world - calcular el residuo de basura plástica en millones de toneladas (composition_plastic_percent * total_waste) por continente y ordenarlo de mayor a menor.

```
waste_world %>%
  select(continent,
         total_waste,
         plastic_per=composition_plastic_percent) %>%
  mutate(plastic_waste=total_waste*plastic_per) %>%
  group_by(continent) %>%
  summarise(plastic = sum(plastic_waste, na.rm=T)/1000000) %>%
  arrange(desc(plastic))
```

```
## # A tibble: 8 × 2
##   continent                 plastic
##   <chr>                       <dbl>
## 1 Asia                      8565.
## 2 North America             4387.
## 3 Europe                    4261.
## 4 South America             1735.
## 5 Africa                    1266.
## 6 Oceania                    152.
## 7 Seven seas (open ocean)      6.54
## 8 <NA>                         0.335
```