# Journal (reproducible report)

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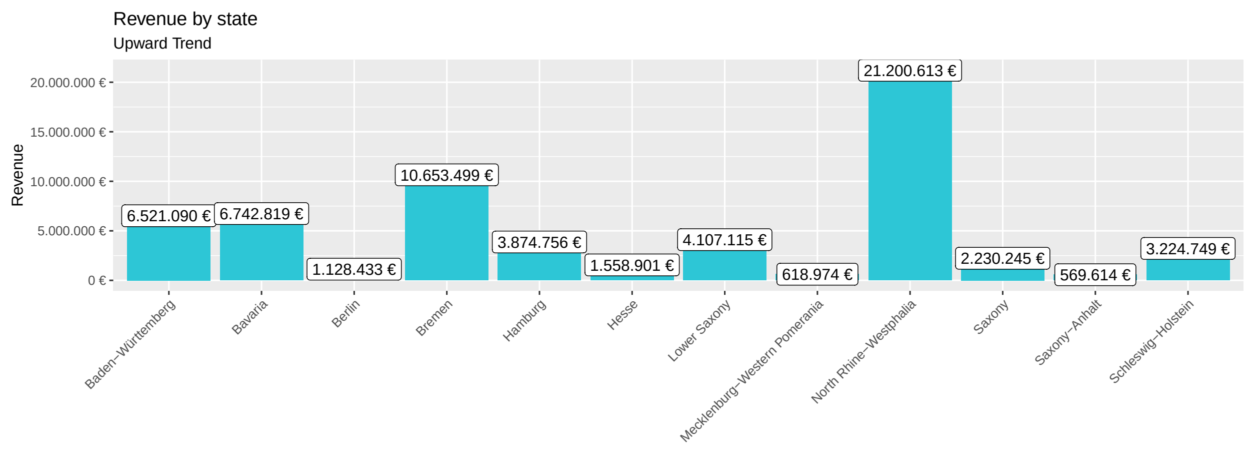
## Contents

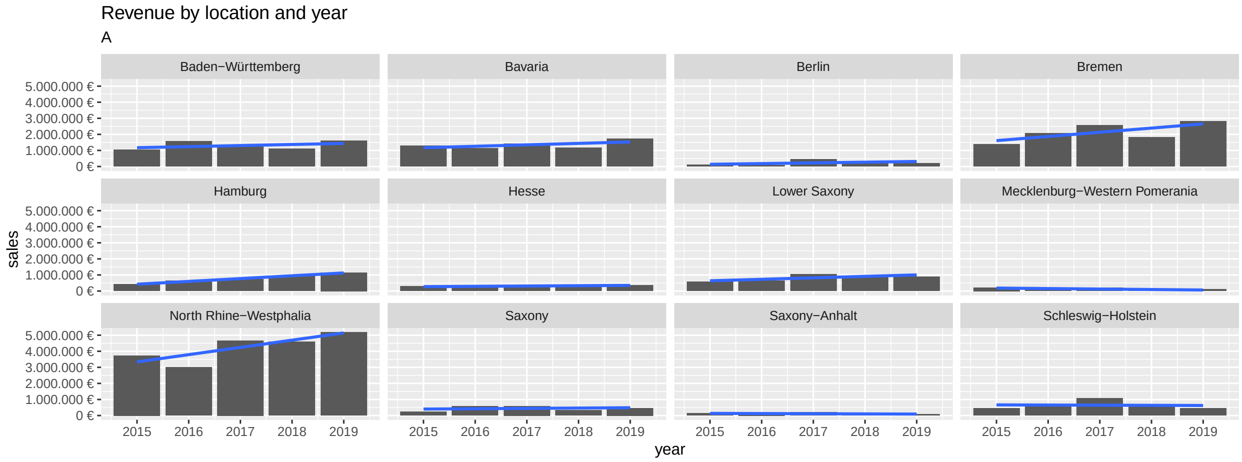
## Challenge 1

Last compiled: 2020-12-06

```r
# Challenge 01 ----

# 1.0 Load libraries ----
library(tidyverse)

#Excel Files
library(readxl)

# 2.0 Importing Files ----
bikes_tbl      <- read_xlsx("docs/00_data/01_bike_sales/01_raw_data/bikes.xlsx")
orderlines_tbl <- read_xlsx("docs/00_data/01_bike_sales/01_raw_data/orderlines.xlsx")
bikeshops_tbl  <- read_xlsx("docs/00_data/01_bike_sales/01_raw_data/bikeshops.xlsx")

# 3.0 Examining Data ----

#oderlines_tbl

#glimpse(orderlines_tbl)

#view(orderlines_tbl)

# 4.0 Joining Data ----

bike_orderlines_joined_tbl <- orderlines_tbl %>%
  left_join(bikes_tbl, by = c("product.id" = "bike.id")) %>%
  left_join(bikeshops_tbl, by = c("customer.id" = "bikeshop.id"))

# 5.0 Wrangling Data ----
bike_orderlines_wrangled_tbl <- bike_orderlines_joined_tbl %>%
  select(-...1) %>%
  rename(bikeshop = name) %>%
  set_names(names(.) %>% str_replace_all("\\.", "_")) %>%
  separate(col    = location,
           into   = c("city", "state"),
           sep    = ", ") %>%
  mutate(total_price = price * quantity)


# 6.0 Business Insights ----
# 6.1 Sales by location ----

# Step 1 - Manipulate

sales_by_location_tbl <- bike_orderlines_wrangled_tbl %>%
  select(state, total_price) %>%
  group_by(state) %>%
  summarize(sales = sum(total_price)) %>%
  mutate(sales_text = scales::dollar(sales, big.mark = ".",
                                     decimal.mark = ",",
                                     prefix = "",
                                     suffix = " €"))
# Step 2 - Visualize

sales_by_location_tbl %>%
  ggplot(aes(x = state, y = sales)) +
  geom_col(fill = "#2DC6D6") +
  geom_label(aes(label = sales_text)) +
  geom_smooth(method = "lm", se = FALSE) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))+
  scale_y_continuous(labels = scales::dollar_format(big.mark = ".",
                                                    decimal.mark = ",",
                                                    prefix = "",
                                                    suffix = " €")) +
  labs(
    title    = "Revenue by state",
    subtitle = "Upward Trend",
    x = "",
    y = "Revenue"
  )
```



```
# 6.2 Sales by location & year ----

# Step 1 - Manipulate
library(lubridate)

sales_by_location_year_tbl <- bike_orderlines_wrangled_tbl %>%


  select(state, total_price, order_date) %>%
  mutate(year = year(order_date)) %>%
  group_by(state, year) %>%
  summarise(sales = sum(total_price)) %>%
  ungroup() %>%

  mutate(sales_text = scales::dollar(sales, big.mark = ".",
                                     decimal.mark = ",",
                                     prefix = "",
                                     suffix = " €"))
# Step 2 - Visualize
sales_by_location_year_tbl %>%

  # Set up x, y, fill
  ggplot(aes(x = year, y = sales)) +

  # Geometries
  geom_col() + # Run up to here to get a stacked bar plot
  geom_smooth(method = "lm", se = FALSE) +

  # Facet
  facet_wrap(~ state) +

  # Formatting
  scale_y_continuous(labels = scales::dollar_format(big.mark = ".",
                                                    decimal.mark = ",",
                                                    prefix = "",
                                                    suffix = " €")) +
  labs(
    title = "Revenue by location and year",
    subtitle = "A"
  )
```



# Challange 2

Last compiled: 2020-12-06

```
#1. API

library(tidyverse)
library(httr)
library(jsonlite)
library(tibble)
library(keyring)


keyring::key_set("token")

resp <- GET("https://www.ncdc.noaa.gov/cdo-web/api/v2/stations?limit=1000", add_headers(token = key_get

stations_tbl <- resp %>%
  .$content  %>%
  rawToChar() %>%
  fromJSON() %>% .$results

head(stations_tbl,10)
```

```
##    elevation    mindate    maxdate latitude                                name datacoverage
## 1      139.0 1948-01-01 2014-01-01 31.57020                     ABBEVILLE, AL US       0.8813 COOP:010
## 2      249.3 1938-01-01 2015-11-01 34.25530                       ADDISON, AL US       0.5059 COOP:010
## 3      302.1 1940-05-01 1962-03-01 34.41667        ADDISON CENTRAL TOWER, AL US       0.9658 COOP:010
## 4      172.2 1995-04-01 2015-11-01 33.17833 ALABASTER SHELBY CO AIRPORT, AL US       0.8064 COOP:010
## 5      183.8 1949-01-01 1949-12-01 34.68910               BELLE MINA 2 N, AL US       1.0000 COOP:010
## 6       34.1 1935-05-01 1936-11-01 31.13333                         ALAGA, AL US       0.2624 COOP:010
## 7       53.3 1940-11-01 2014-12-01 32.23220                       ALBERTA, AL US       0.9888 COOP:010
## 8      348.1 1931-01-01 1977-06-01 34.23333                   ALBERTVILLE, AL US       0.9535 COOP:010
## 9      195.1 1969-10-01 2015-11-01 32.94520              ALEXANDER CITY, AL US       0.9946 COOP:010
## 10     200.9 1942-11-01 1969-10-01 32.98333         ALEXANDER CITY 6 NE, AL US       0.9629 COOP:010
##    elevationUnit longitude
## 1         METERS -85.24820
## 2         METERS -87.18140
## 3         METERS -87.31667
## 4         METERS -86.78167
## 5         METERS -86.88190
## 6         METERS -85.06667
## 7         METERS -87.41040
## 8         METERS -86.16667
## 9         METERS -85.94800
## 10        METERS -85.86667
```

```
#2. Web scraping

# LIBRARIES ----

library(tidyverse) # Main Package - Loads dplyr, purrr, etc.
library(rvest)     # HTML Hacking & Web Scraping
library(xopen)     # Quickly opening URLs
library(jsonlite)  # converts JSON files to R objects
library(glue)      # concatenate strings
library(stringi)   # character string/text processing

url  <- "https://www.rosebikes.de/fahrr%C3%A4der/rennrad"
html <- url %>%
  read_html()


model_name <-  html %>%
  html_nodes(".catalog-category-bikes__title > span") %>%
  html_text() %>%
  stringr::str_extract("(?<=\n).*(?=\n)")

model_price_cent <-  html %>%
  html_nodes(".catalog-category-bikes__price-title") %>%
  html_text() %>%
  stringr::str_extract("(?<=ab\\s).*(?=\\s€)")%>%
  str_replace_all(c("\\." = "",","=""))%>%
  as.numeric()

model_price_EUR = model_price_cent /100

bikes_tbl <- tibble(model_name,model_price_EUR)
head(bikes_tbl,10)
```

```
## # A tibble: 9 x 2
##   model_name       model_price_EUR
##   <chr>                      <dbl>
## 1 PRO SL DISC                 1599
## 2 PRO SL                      1199
## 3 REVEAL FOUR DISC            2499
## 4 REVEAL FOUR                 2099
## 5 REVEAL SIX DISC             3499
## 6 X-LITE FOUR DISC            2699
## 7 X-LITE FOUR                 2199
## 8 X-LITE SIX DISC             3899
## 9 X-LITE SIX                  3499
```

## Challange 3

```r
# 1.0 Libraries----------------------------------------------------------------

library(vroom)
library(tidyverse)
library(data.table)
library(tictoc)
library(lubridate)
# 2.0 10 US Companies with most patents----------------------------------------

col_types <- list(
  id = col_character(),
  type = col_integer(),
  name_first = col_skip(),
  name_last = col_skip(),
  organization = col_character()
)

assignee_tbl <- vroom(
  file       = "docs/02_data_wrangling/assignee.tsv",
  delim      = "\t",
  col_types  = col_types,
  na         = c("", "NA", "NULL")
)

setDT(assignee_tbl)


col_types <- list(
  patent_id = col_character(),
  assignee_id = col_character(),
  location_id = col_skip()
)

patent_assignee_tbl <- vroom(
  file       = "docs/02_data_wrangling/patent_assignee.tsv",
  delim      = "\t",
  col_types  = col_types,
  na         = c("", "NA", "NULL")
)

setDT(patent_assignee_tbl)
```

```
combined_data_t1 <- merge(x = patent_assignee_tbl, y = assignee_tbl,
                       by.x    = "assignee_id",
                       by.y    = "id",
                       all.x = FALSE,
                       all.y = FALSE)


top_ten_US <- combined_data_t1[type == 2, .N , by = organization][order(-N)]
head(top_ten_US,10)

# 3.0 US company withe most patents granted in 2019

col_types <- list(
  id = col_character(),
  type = col_skip(),
  number = col_skip(),
  country = col_skip(),
  date = col_date("%Y-%m-%d"),
  abstract = col_skip(),
  title = col_skip(),
  kind = col_skip(),
  num_claims = col_skip(),
  filename = col_skip(),
  withdrawn = col_skip()
)

patent_tbl <- vroom(
  file       = "docs/02_data_wrangling/patent.tsv",
  delim      = "\t",
  col_types  = col_types,
  na         = c("", "NA", "NULL")
)
setDT(patent_tbl)

combined_data_t2 <- merge(x = combined_data_t1, y = patent_tbl,
                          by.x    = "patent_id",
                          by.y    = "id",
                          all.x = FALSE,
                          all.y = FALSE)

patents_granted <- combined_data_t2[lubridate::year(date) == "2019" & type == 2,.N, by=organization][or

head(patents_granted,10)

# 4.0   ------------------------------------------------------------

col_types <- list(
  uuid = col_skip(),
  patent_id = col_character(),
  mainclass_id = col_character(),
  subclass_id = col_skip(),
  sequence = col_skip()
)
```

```
uspc_tbl <- vroom(
  file       = "docs/02_data_wrangling/uspc.tsv",
  delim      = "\t",
  col_types  = col_types,
  na         = c("", "NA", "NULL")
)
setDT(uspc_tbl)

combined_data_t3 <- merge(x = combined_data_t1, y = uspc_tbl,
                          by    = "patent_id",
                          all.x = FALSE,
                          all.y = FALSE)

combined_data_t3[,":="(assignee_id = NULL)]

# 4.1 Most innovative tech sector?
#

tic()
most_inno_tech <- combined_data_t3[, unique(patent_id), by=mainclass_id][, .N , by =mainclass_id][order

head(most_inno_tech$mainclass_id,1)
toc()

# 4.2 Top 5 USPTO tech main classes

tic()
top10_ww <- combined_data_t1[type == 2 | type == 3, .N , by = organization][order(-N)][1:10]
toc()

tic()
most_inno_tech_top10 <- combined_data_t3[organization %in% top10_ww$organization , unique(patent_id), by
head(most_inno_tech$mainclass_id,5)
toc()
```

```
read_rds("docs/top_ten_US")
```

```
##                                     organization      N
##  1: International Business Machines Corporation 139091
##  2:                     General Electric Company  47121
##  3:                            Intel Corporation  42156
##  4:   Hewlett-Packard Development Company, L.P.  35572
##  5:                        Microsoft Corporation  30085
##  6:                      Micron Technology, Inc.  28000
##  7:                        QUALCOMM Incorporated  24702
##  8:               Texas Instruments Incorporated  24181
##  9:                            Xerox Corporation  23173
## 10:                                   Apple Inc.  21820
```

```
read_rds("docs/patents_granted")
```

```
##                                     organization    N
##  1: International Business Machines Corporation 9265
##  2:                           Intel Corporation 3526
##  3:         Microsoft Technology Licensing, LLC 3106
##  4:                                  Apple Inc. 2817
##  5:               Ford Global Technologies, LLC 2624
##  6:                   Amazon Technologies, Inc. 2533
##  7:                       QUALCOMM Incorporated 2359
##  8:                                 Google Inc. 2290
##  9:                    General Electric Company 1860
## 10:   Hewlett-Packard Development Company, L.P. 1589
```

```
read_rds("docs/most_inno_tech")
```

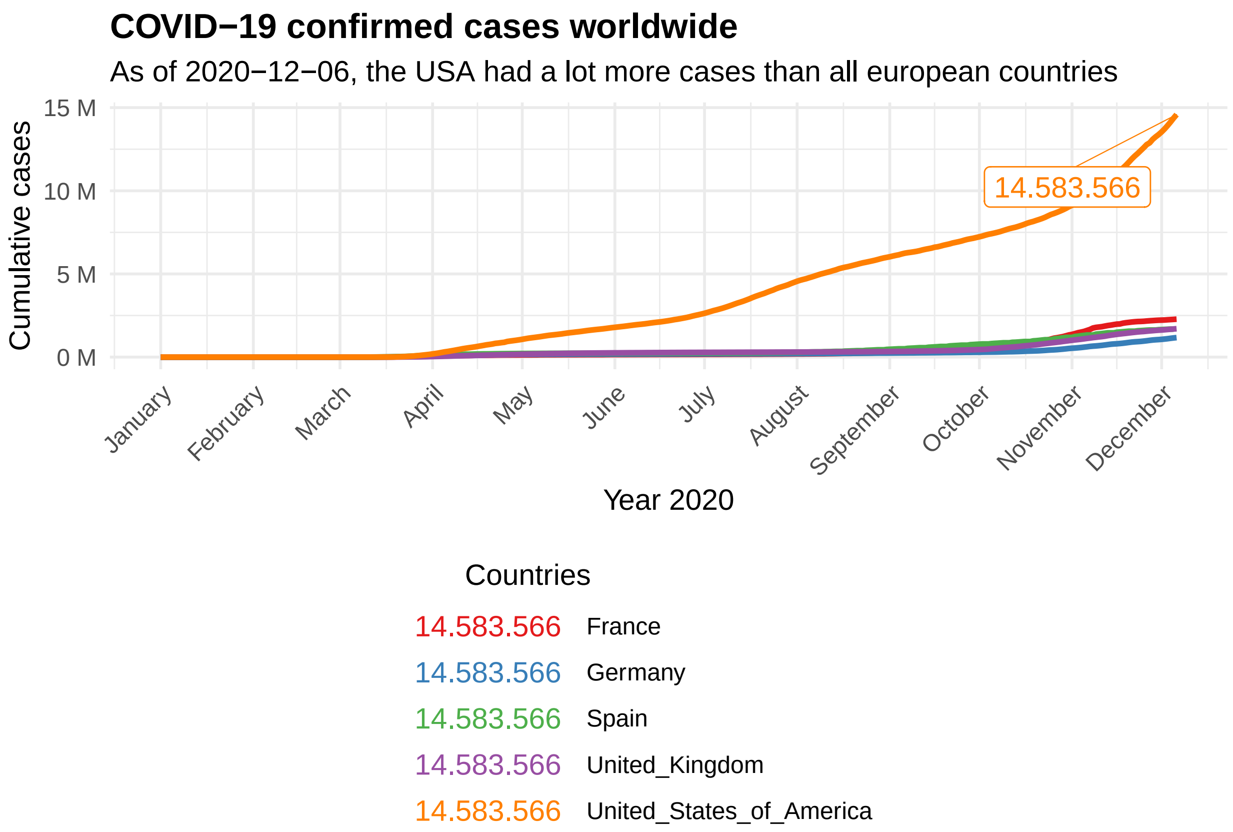
```
## [1] "257"
```

```
read_rds("docs/most_inno_main_class")
```

```
## [1] "257" "438" "370" "709" "365"
```

# Challange 4

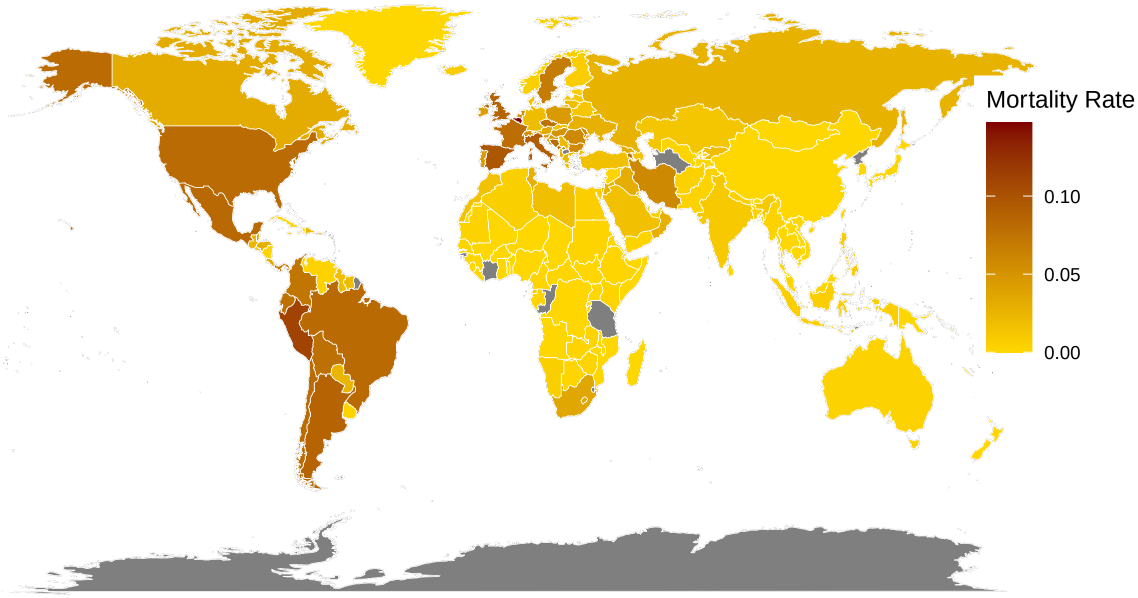
```
# 1.0 Libraries

library(tidyverse)
library(lubridate)
library(ggrepel)
library(maps)
library(ggthemes)
library(viridis)

# 2.0 Map the time course of the cumulative Covid-19 cases!

# 2.1 Import Data

covid_data_tbl  <- read_csv("https://opendata.ecdc.europa.eu/covid19/casedistribution/csv")

# 2.2 Data wrangling

cum_c19_cases_tbl <- covid_data_tbl %>%

          mutate(date := lubridate::dmy(dateRep)) %>%
          select(date, countriesAndTerritories, cases) %>%
          filter(countriesAndTerritories %in% c("Germany",
                                                "France",
                                                "Spain",
                                                "United_Kingdom",
                                                "United_States_of_America")
                                                , year(date) == "2020") %>%
          group_by(countriesAndTerritories) %>%
          arrange(date, .by_group = TRUE) %>%
          mutate(cum_cases = cumsum(cases)) %>%
          ungroup()

# 2.3. Data visualization
cum_c19_cases_tbl %>%
  ggplot(aes(date, cum_cases, color = countriesAndTerritories)) +
  geom_line(aes(color = countriesAndTerritories),size = 1,) +
  scale_color_brewer(palette = "Set1") +
  geom_label_repel(
    data = cum_c19_cases_tbl %>%
      filter(date %in% max(date),
             countriesAndTerritories == "United_States_of_America"),
    label = scales::dollar(max(cum_c19_cases_tbl$cum_cases),
                           big.mark     = ".",
                           decimal.mark = ",",
                           prefix       = ""),
    segment.size       = 0.2,
    min.segment.length = 1,
    box.padding        = 1.5
  ) +

  scale_y_continuous(labels = scales::dollar_format(scale = 1e-6,
                                                    prefix = "",
                                                    suffix = " M")) +
  scale_x_date(date_labels = "%B", date_breaks = "1 month") +


  labs(
    title = "COVID-19 confirmed cases worldwide",
    subtitle = str_glue("As of {Sys.Date()}, the USA had a lot more cases than all european countries"),
    x = "Year 2020",
    y = "Cumulative cases",
    color = "Countries"
  ) +

  theme_minimal() +
  theme(
    axis.text.x = element_text(angle = 45, hjust = 1),
    legend.position = "bottom",
    plot.title = element_text(face = "bold"),
    legend.margin = margin(0.2, 0.2, 0.2, 0.2, "cm"),
    legend.direction = "vertical",
    legend.spacing.x = unit(1, "cm"),
    legend.text.align = 0
  )
```



```r
# 3.0 Mortality rate ----------------------------------------------------------

# 3.1 Import Data

covid_data_tbl  <- read_csv("https://opendata.ecdc.europa.eu/covid19/casedistribution/csv")

world <- map_data("world")

# 3.2 Data wrangling

covid_deaths_tbl <- covid_data_tbl %>%
  mutate(date := lubridate::dmy(dateRep)) %>%
  select(date, countriesAndTerritories, deaths, popData2019) %>%
  filter( year(date) == "2020") %>%

  group_by(countriesAndTerritories) %>%
  arrange(date, .by_group = TRUE) %>%
  mutate(total_deaths = cumsum(deaths)) %>%
  ungroup() %>%

  filter(date == as.Date(date("2020-12-01"))) %>%
  mutate(mortality_pct := 100 * total_deaths / popData2019) %>%
  select(date, countriesAndTerritories, mortality_pct) %>%
  mutate(across(countriesAndTerritories, str_replace_all, "_", " ")) %>%
  mutate(countriesAndTerritories = case_when(
    countriesAndTerritories == "United Kingdom" ~ "UK",
    countriesAndTerritories == "United States of America" ~ "USA",
    countriesAndTerritories == "Czechia" ~ "Czech Republic",
    TRUE ~ countriesAndTerritories
  ))


covid_mortality_tbl <- covid_deaths_tbl %>%
  full_join(world %>% select(region,long,lat), by = c("countriesAndTerritories" = "region"))


# 3.3. Data visualization

covid_mortality_tbl %>% ggplot()+
  geom_map(map = world,
           aes(long, lat, map_id = countriesAndTerritories),
           color="#2b2b2b", fill=NA, size=0.15) +
  geom_map(map = world,
           aes(fill=mortality_pct,
               map_id = countriesAndTerritories),
           color="white", size=0.15) +

   scale_fill_continuous(
       name = "Mortality Rate",
       low   = "#FFD700",
       high  = "#800000")+

  labs(title = "Confirmed COVID-19 deaths relative to the size of the population",
       subtitle = "More than X-Million confirmed COVID-19 deaths worldwide",
       caption = "Date: 2020-12-01") +

  theme_map() +

  theme(
        plot.margin=margin(20,20,20,20),
        legend.position = c(0.9, 0.4))
```

Confirmed COVID−19 deaths relative to the size of the population

More than X−Million confirmed COVID−19 deaths worldwide



Date: 2020−12−01