TidyTuesday: CO-emissions from food

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Food consumption and CO-emission by country

```
library(tidyverse)
```

```
## -- Attaching packages ---------------------------------------------------------------------------
## v ggplot2 3.2.1     v purrr   0.3.3
## v tibble  2.1.3     v dplyr   0.8.4
## v tidyr   1.0.2     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.4.0
## -- Conflicts ------------------------------------------------------------------------------------
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(ggplot2)
theme_set(theme_bw()) #black/white better for maps in ggplot
library(cowplot)
```

```
##
## ************************************************************
## Note: As of version 1.0.0, cowplot does not change the
##   default ggplot2 theme anymore. To recover the previous
##   behavior, execute:
##   theme_set(theme_cowplot())
## ************************************************************
```

```
library(sf) #for spatial geoms
```

```
## Linking to GEOS 3.7.2, GDAL 2.4.2, PROJ 5.2.0
```

```
library(rnaturalearth) #for world map data
library(rnaturalearthdata) #for world map data
library(ggspatial)
library(ggrepel)
library(googleway)
library(rgeos)
```

```
## Loading required package: sp
## rgeos version: 0.5-2, (SVN revision 621)
##  GEOS runtime version: 3.7.2-CAPI-1.11.2
##  Linking to sp version: 1.3-1
##  Polygon checking: TRUE
```

```
library(gridExtra) #for multiple ggplots
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

```
library(grid)#for multiple ggplots

food_consumption <- readr::read_csv('https://raw.githubusercontent.com/rfordatascience/tidytuesday/maste
```

```
## Parsed with column specification:
## cols(
##   country = col_character(),
##   food_category = col_character(),
##   consumption = col_double(),
##   co2_emmission = col_double()
## )
```

```
food_consumption$country <- gsub("USA", "United States", food_consumption$country)  #name didn't match

food_consumption$food_category <- gsub("Milk - inc. cheese", "Milk/Cheese", food_consumption$food_catego
food_consumption$food_category <- gsub("Nuts inc. Peanut Butter", "Nuts", food_consumption$food_category
food_consumption$food_category <- gsub("Soybeans", "Soy", food_consumption$food_category)
food_consumption$food_category <- gsub("Wheat and Wheat Products", "Wheat", food_consumption$food_catego
food_consumption$food_category <- gsub("Lamb & Goat", "Lamb/Goat", food_consumption$food_category)

food_consumption$country <- as.factor(food_consumption$country)
food_consumption$food_category <- as.factor(food_consumption$food_category)

world <- ne_countries(scale = "medium", returnclass = "sf") #world map data
```

Add geom data by country

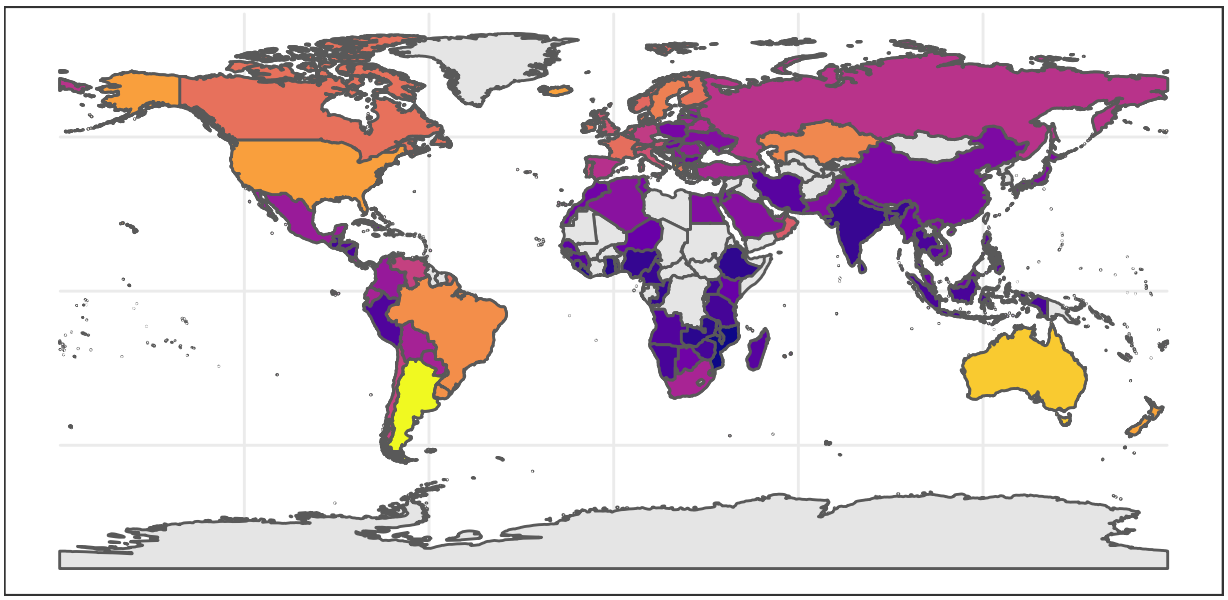
```
food <- world %>%
  select(country = name, continent, subregion, economy, income_grp, pop_est, gdp_md_est, geometry) %>%
  right_join(food_consumption, by="country")
```

```
## Warning: Column `country` joining character vector and factor, coercing into
## character vector
```

Plot countries by CO-emissions from food products

```
a <- food %>%
  group_by(country) %>%
  summarize(sum_emmision = sum(co2_emmission)) %>%
  ggplot() +
  geom_sf(data=world) +
  geom_sf(aes(fill=sum_emmision), show.legend=FALSE)+
  scale_fill_viridis_c(option="plasma")+
  labs(
    title="CO-emissions due to food products globally",
    fill="Per capita\nCO-emmissions"
  )
```

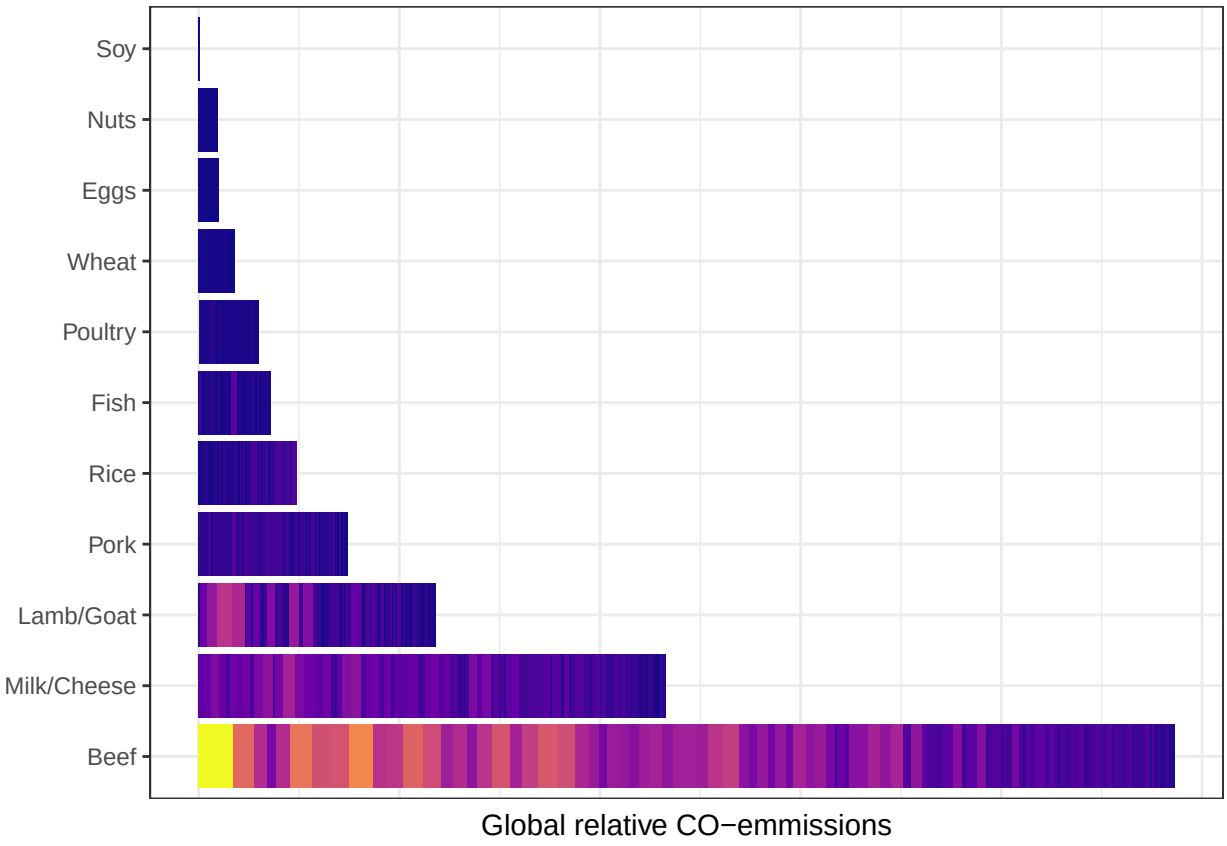
```
a
```



Create bar chart of world CO-emissions by food type

```
b <- ggplot(data=food_consumption)+
  geom_col(aes(x=reorder(food_category, -co2_emmission), y=co2_emmission, fill=co2_emmission), show.leg
  coord_flip()+
  scale_fill_viridis_c(option="plasma")+
  theme(
    axis.title.y = element_blank(),
    axis.ticks.x = element_blank(),
    axis.text.x = element_blank()
  )+
  ylab("Global relative CO-emmissions")

b
```

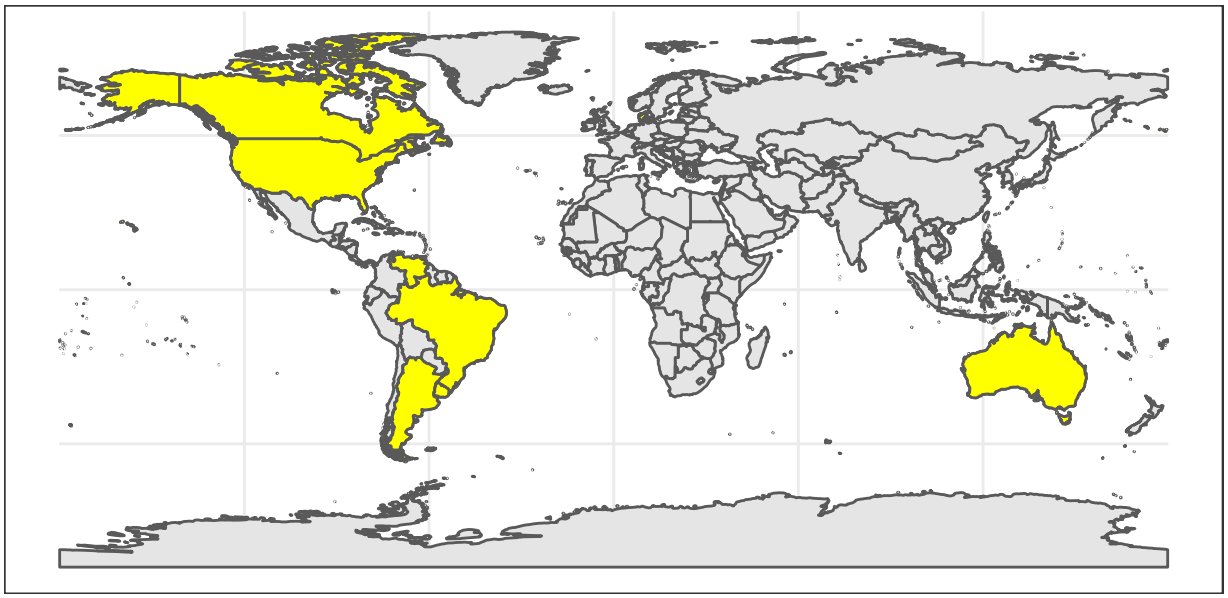


Create map of top beef eating countries

```
c <- food[which(food$food_category == "Beef"),] %>%
  group_by(country) %>%
  filter(consumption > 25) %>%
  ggplot()+
    geom_sf(data=world) +
    geom_sf(aes(fill=consumption), show.legend=FALSE)+
  scale_fill_gradient(low="yellow", high="yellow")+
  labs(
    title="Hotspots of beef consumption"
  )

c
```

Hotspots of beef consumption

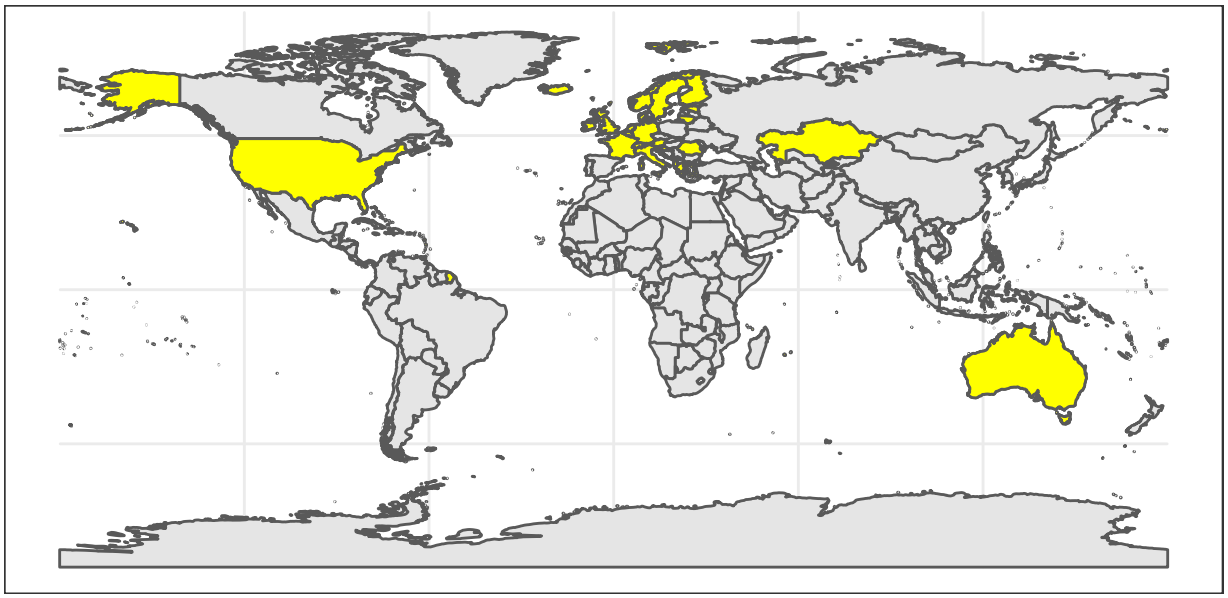


Create map of top mik/cheese eating countries

```
d <- food[which(food$food_category == "Milk/Cheese"),] %>%
  group_by(country) %>%
  filter(consumption > 220) %>%
  ggplot()+
    geom_sf(data=world) +
    geom_sf(aes(fill=consumption), show.legend=FALSE)+
  scale_fill_gradient(low="yellow", high="yellow")+
  labs(
    title="Hotspots of milk/cheese consumption"
  )

d
```

Hotspots of milk/cheese consumption



Create dashboard

```
lay <- rbind(c(1,1,1,1,2,2,2),
             c(1,1,1,1,2,2,2),
             c(1,1,1,1,2,2,2),
             c(3,3,3,4,4,4,4),
             c(3,3,3,4,4,4,4))

all_graphs <- arrangeGrob(
  a, b, c, d,
  layout_matrix = lay,
  top=textGrob("Cows & Global Warming",gp=gpar(fontsize=20))
)

all_graphs
```

```
## TableGrob (6 x 7) "arrange": 5 grobs
##   z     cells    name                grob
## 1 1 (2-4,1-4) arrange      gtable[layout]
## 2 2 (2-4,5-7) arrange      gtable[layout]
## 3 3 (5-6,1-3) arrange      gtable[layout]
## 4 4 (5-6,4-7) arrange      gtable[layout]
## 5 5 (1-1,1-7) arrange text[GRID.text.244]
```

```
#ggsave("Cows_GlobalWarming.png", all_graphs)
```