Individual Project (Yu)

Yu Sun

1/25/2021

Purpose

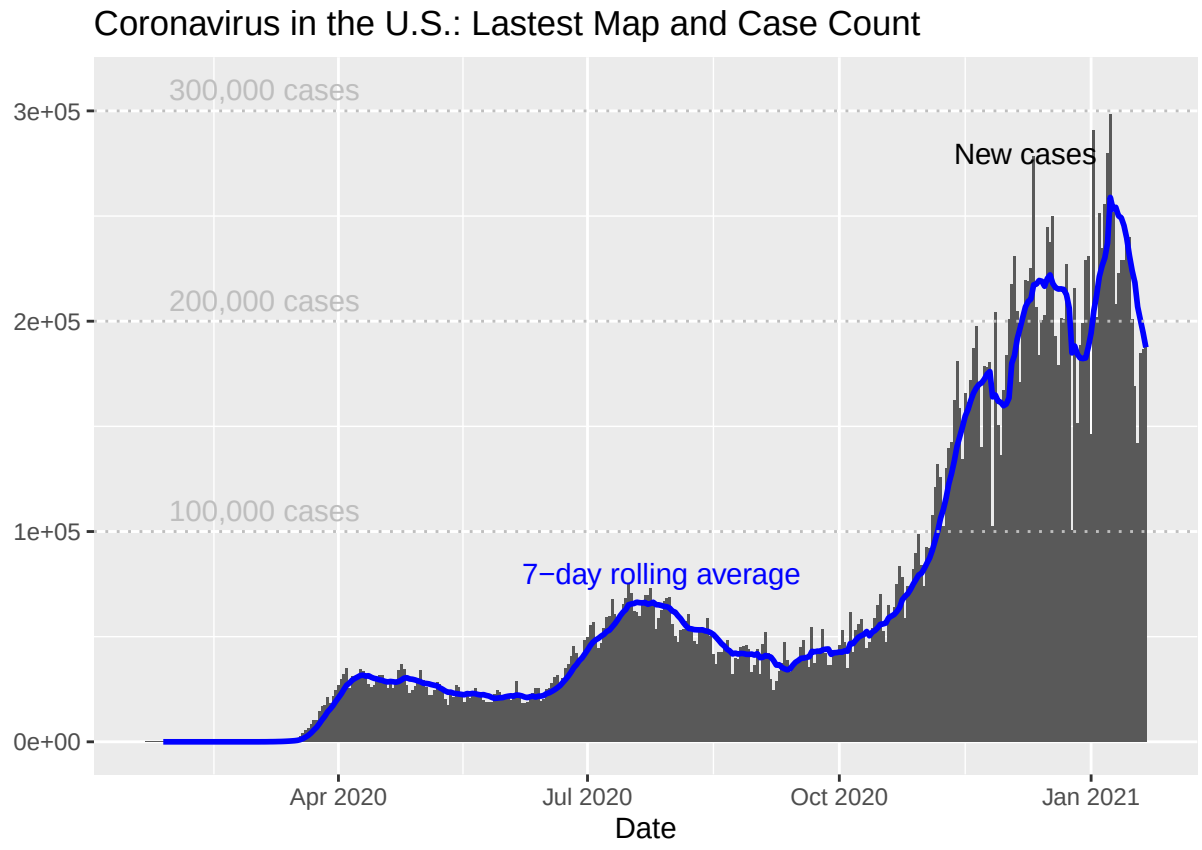
The purpose of this project is to reproduce one figure and two tables from the results of New York Times.

1. **Figure 1**: COVID-19 new cases and 7-day average in U.S. vs. date
2. **Table 1**: COVID-19 total cases, deaths and COVID-19 cases, deaths, and hospitalized data on 2021-01-17 with information about 14-day change in U.S.
3. **Table 2**: COVID-19 total cases and daily average in last 7 days from all U.S. states.

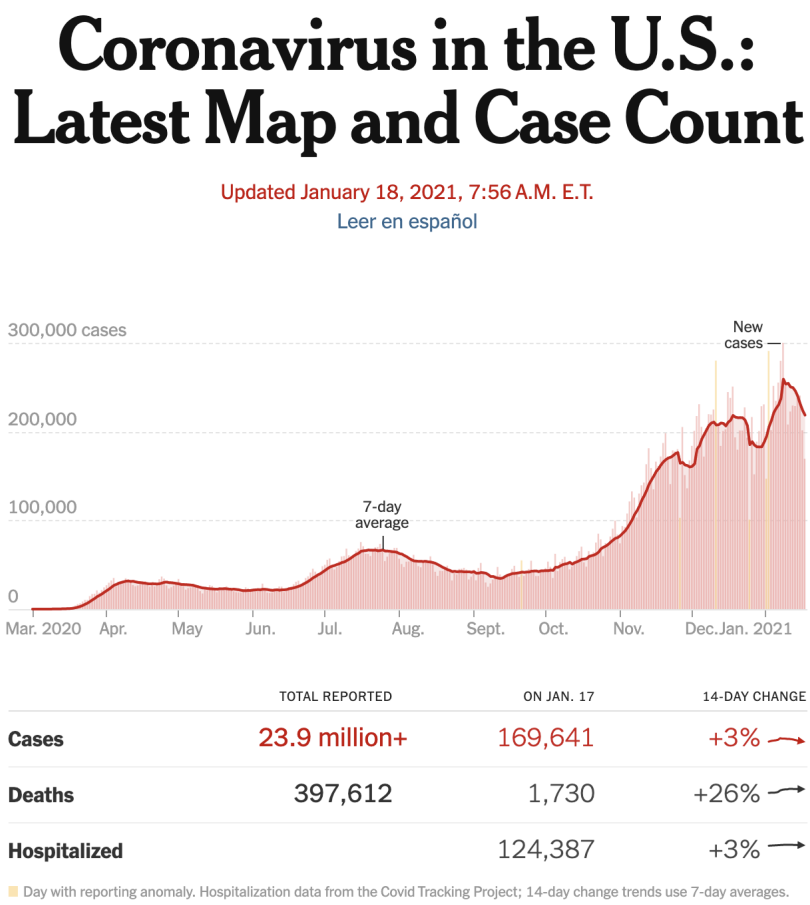
Figure 1:

```
#import the data file
us_data <- read.csv("us-counties.csv")

#change the class of date column from character into date
us_data$date <- ymd(us_data$date)

#merge all data from different counties together
us_full_data <- us_data %>%
  filter(!is.na(cases) & !is.na(deaths)) %>%
  group_by(date) %>%
  summarise(cases = sum(cases),deaths = sum(deaths))

#add the new columns of new cases and seven-day rolling average
new_us <- us_full_data %>%
  mutate(new_cases = cases - lag(cases)) %>%
  mutate(new_cases_7dayavg = rollmean(new_cases, k = 7, fill=NA, align = "right"))

#plot the figure with new cases as histogram and seven-day rolling average as curve
new_us %>% ggplot() +
  geom_bar(aes(date, new_cases),stat = "identity",width = 1) +
  geom_line(mapping = aes(x = date, y = new_us$new_cases_7dayavg),
            size = 1, color = "blue") +
  geom_hline(yintercept = 100000, linetype = "dotted", col="grey") +
  geom_hline(yintercept = 200000, linetype = "dotted", col="grey") +
  geom_hline(yintercept = 300000, linetype = "dotted", col="grey") +
  annotate(geom="text", x = as.Date("2020-07-28"), y=80000,
           label="7-day rolling average", color="blue") +
  annotate(geom="text", x = as.Date("2020-12-8"), y=280000,
           label="New cases", color="black") +
  annotate(geom="text", x = as.Date("2020-03-05"), y=110000,
```

```
          label="100,000 cases", color="grey") +
annotate(geom="text", x = as.Date("2020-03-05"), y=210000,
          label="200,000 cases", color="grey") +
annotate(geom="text", x = as.Date("2020-03-05"), y=310000,
          label="300,000 cases", color="grey") +
ggtitle("Coronavirus in the U.S.: Lastest Map and Case Count") +
xlab("Date") +
ylab("")
```



Comparasion: To better compare the results of this project to the orignal figure from New York Times, the original figure was provided below:



This figure is easy and clear to reproduce and the data set is well-labeled so that it was clear and convenient to regenerate the similar results.

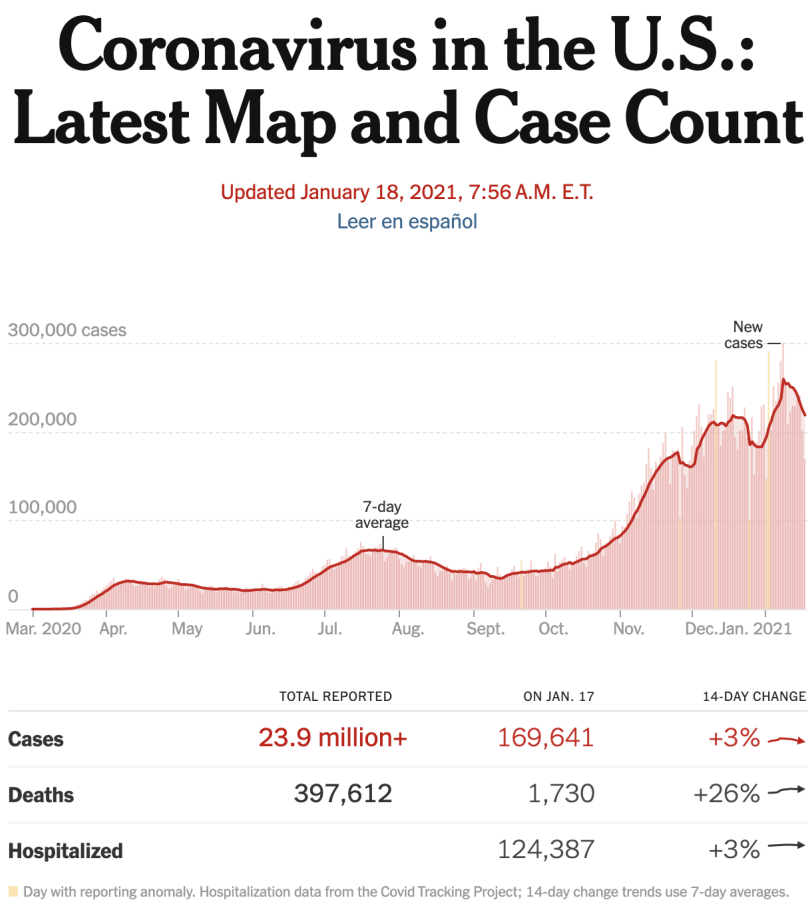
Table 1:

```
#data for cases
us_cases_data <- us_data %>%
  filter(!is.na(cases)) %>%
  group_by(date) %>%
  summarise(cases = sum(cases)) %>%
  mutate(new_cases = cases - lag(cases)) %>%
  mutate(new_cases_7dayavg = rollmean(new_cases, k = 7, fill=NA, align = "right")) %>%
  mutate("14-day change" = 100*(round((new_cases_7dayavg - lag(new_cases_7dayavg, n = 14))/lag(new_cases

#data for death
us_death_data <- us_data %>%
  filter(!is.na(deaths)) %>%
  group_by(date) %>%
  summarise(deaths = sum(deaths)) %>%
  mutate(deaths_increased = deaths - lag(deaths)) %>%
  mutate(new_deaths_7dayavg = rollmean(deaths_increased, k = 7, fill=NA, align = "right")) %>%
  mutate("14-day change" = 100*(round((new_deaths_7dayavg - lag(new_deaths_7dayavg, n = 14))/lag(new_dea

#data for hospitalization
```

```r
us_hospitalized <- read.csv("all-states-history.csv")
us_hospitalized_data <- us_hospitalized %>%
  filter(!is.na(hospitalizedCurrently)) %>%
  group_by(date) %>%
  summarise(hospitalizedCurrently = sum(hospitalizedCurrently)) %>%
  mutate(hospitalizedCurrently_7dayavg = rollmean(hospitalizedCurrently, k = 7, fill=NA, align = "right
  mutate("14-day change" = 100*(round((hospitalizedCurrently_7dayavg - lag(hospitalizedCurrently_7dayav

#Pick the data on January 17th, 2021
Jan_cases_data <- us_cases_data %>% filter(date == as.Date("2021-01-17")) %>%
  select(cases,new_cases,`14-day change`)
Jan_deaths_data <- us_death_data %>% filter(date == as.Date("2021-01-17")) %>%
  select(deaths,deaths_increased,`14-day change`)
Jan_hospitalized_data <- us_hospitalized_data %>% filter(date == as.Date("2021-01-17")) %>%
  select(hospitalizedCurrently,`14-day change`)

#Print table
table1 <-
  data.frame("Total Reported" = c(Jan_cases_data$cases, Jan_deaths_data$deaths, ""),
             "On Jan, 17" = c(Jan_cases_data$new_cases, Jan_deaths_data$deaths_increased, Jan_hospitali
             "14-Day Change" = c(Jan_cases_data$`14-day change`, Jan_deaths_data$`14-day change`, Jan_
rownames(table1) <- c("Cases", "Deaths", "Hospitalized")
kable(table1, booktabs = TRUE, digits = 2,
      col.names = c("Total Reported", "On Jan 17", "14-Day Change"))
```

	Total Reported	On Jan 17	14-Day Change
Cases	23983607	169641	3
Deaths	397612	1730	26
Hospitalized		124387	3

Comparasion: To better compare the results of this project to the original figure from New York Times, the original table was provided below:



This table is generated by two data sets and the illustration of the 14-day change is not very clear; more specifically, people did not know how to calculate this value based on the 7-day average. Moreover, the "hospitalized" row is actually the information of the patients that currently hospitalized, which made the reproduction of the results confusing. However, the data sets and labels were clear and easy to understand.

Table 2:

```
#merge the data from all counties from each state together on January 17th, 2021
us_state_data <- us_data %>%
  filter(!is.na(cases)) %>%
  group_by(state,date) %>%
  summarise(cases = sum(cases)) %>%
  mutate(new_cases = cases - lag(cases)) %>%
  mutate(new_cases_7dayavg = round(rollmean(new_cases, k = 7, fill=NA, align = "right"), digits = 0)) %
  filter(date == as.Date("2021-01-17"))
head(us_state_data)
```

```
## # A tibble: 6 x 5
## # Groups:   state [6]
##   state      date         cases new_cases new_cases_7dayavg
##   <chr>      <date>       <int>     <int>             <dbl>
## 1 Alabama    2021-01-17  422598      1917              2957
## 2 Alaska     2021-01-17   51630       283               242
## 3 Arizona    2021-01-17  673882      3648              7905
```

```
## 4 Arkansas   2021-01-17  271154       976             2297
## 5 California 2021-01-17 3006583     31617            39580
## 6 Colorado   2021-01-17  376921      1458             1986
```

Comparison: for better comparison with the original table, the same states were picked below:

```
us_state_data_comparison <- us_state_data %>%
  filter(state %in% c("Arizona", "California","South Carolina",
                      "Rhode Island", "Oklahoma", "Georgia",
                      "Utah", "Texas", "New York", "Massachusetts")) %>%
  select(state,cases, new_cases_7dayavg)
kable(us_state_data_comparison, booktabs = TRUE, col.names = c("State", "Total Cases", "Daily Avg.in Las
```

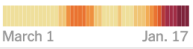
State	Total Cases	Daily Avg.in Last 7 Days
Arizona	673882	7905
California	3006583	39580
Georgia	791322	8457
Massachusetts	470140	5336
New York	1242818	15281
Oklahoma	354979	3374
Rhode Island	104443	976
South Carolina	388184	4808
Texas	2127334	22782
Utah	323837	2548

And the orginal table is provided below:

Cases and deaths by state and county

This table is sorted by places with the most cases per 100,000 residents in the last seven days. Charts are colored to reveal when outbreaks emerged.

Cases | Deaths | Search counties

	TOTAL CASES	PER 100,000	DAILY AVG. IN LAST 7 DAYS	▼ PER 100,000	WEEKLY CASES PER CAPITA (FEWER – MORE; March 1 – Jan. 17)
+ Arizona MAP »	673,882	9,258	7,905	109	
+ California MAP »	3,006,583	7,609	39,580	100	
+ South Carolina MAP »	388,184	7,539	4,808	93	
+ Rhode Island MAP »	104,443	9,859	976	92	
+ Oklahoma MAP »	354,979	8,971	3,374	85	
+ Georgia MAP »	791,322	7,453	8,457	80	
+ Utah MAP »	323,837	10,101	2,548	79	
+ Texas MAP »	2,127,334	7,337	22,782	79	
+ New York MAP »	1,242,818	6,389	15,281	79	
+ Massachusetts MAP »	470,140	6,821	5,336	77	

This table is easy and clear to reproduce and the data set is well-labeled so that it was clear and convenient to regenerate the similar results. However, we only reproduced part of the table, except the per 100,000 or per capita columns.