Final Project

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Introduction

People's lifestyles changes in US and Japan under COVID-19 pandemic

This report tries to compare how people changed their lifestyles in 2021 under the COVID-19 pandemic, reflecting the vaccination rate. This report focuses on Illinois state in the US and Hokkaido prefecture in Japan. The reason is that these two regions have similar population and geographical characteristics. Due to the location accuracy and the understanding of categorized places varies from region to region, this report focuses on transitions in each region.

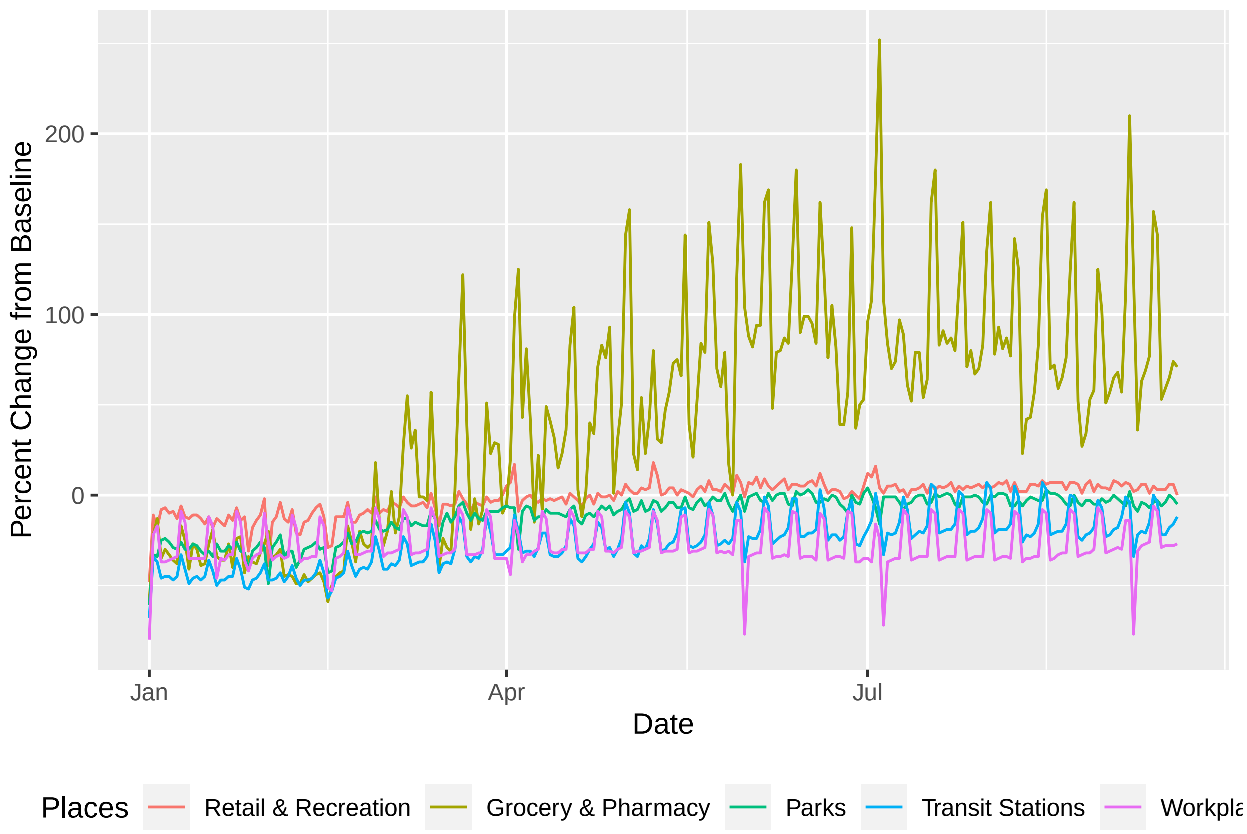
Graph

Importing the mobility data and getting the data of Illinois state in the US and Hokkaido prefecture in Japan. The data is from the following URL. https://www.google.com/covid19/mobility/index.html?hl=en

Making graph

1. US case

```
us_il_mr_pivoted <- us_il_mr %>%
  pivot_longer(cols=3:7)

ggplot(data = us_il_mr_pivoted,
       aes(x=date, y=value, color=name)) +
  geom_line() +
  scale_color_discrete(name = "Places", labels = c("Retail & Recreation",
                                                   "Grocery & Pharmacy",
                                                   "Parks",
                                                   "Transit Stations",
                                                   "Workplaces")) +
  xlab("Date") +
  ylab("Percent Change from Baseline") +
  theme(legend.position = "bottom")
```



2. Japan case

```
jp_hokkaido_mr_pivoted <- jp_Hokkaido_mr %>%
  pivot_longer(cols=3:7)

ggplot(data = jp_hokkaido_mr_pivoted,
       aes(x=date, y=value, color=name)) +
  geom_line() +
  scale_color_discrete(name = "Places", labels = c("Retail & Recreation",
                                                   "Grocery & Pharmacy",
                                                   "Parks",
                                                   "Transit Stations",
                                                   "Workplaces")) +
  xlab("Date") +
  ylab("Percent Change from Baseline") +
  theme(legend.position = "bottom")
```

Analyse the relationship between mobility change and vaccination

Preparation: Calculating mean value

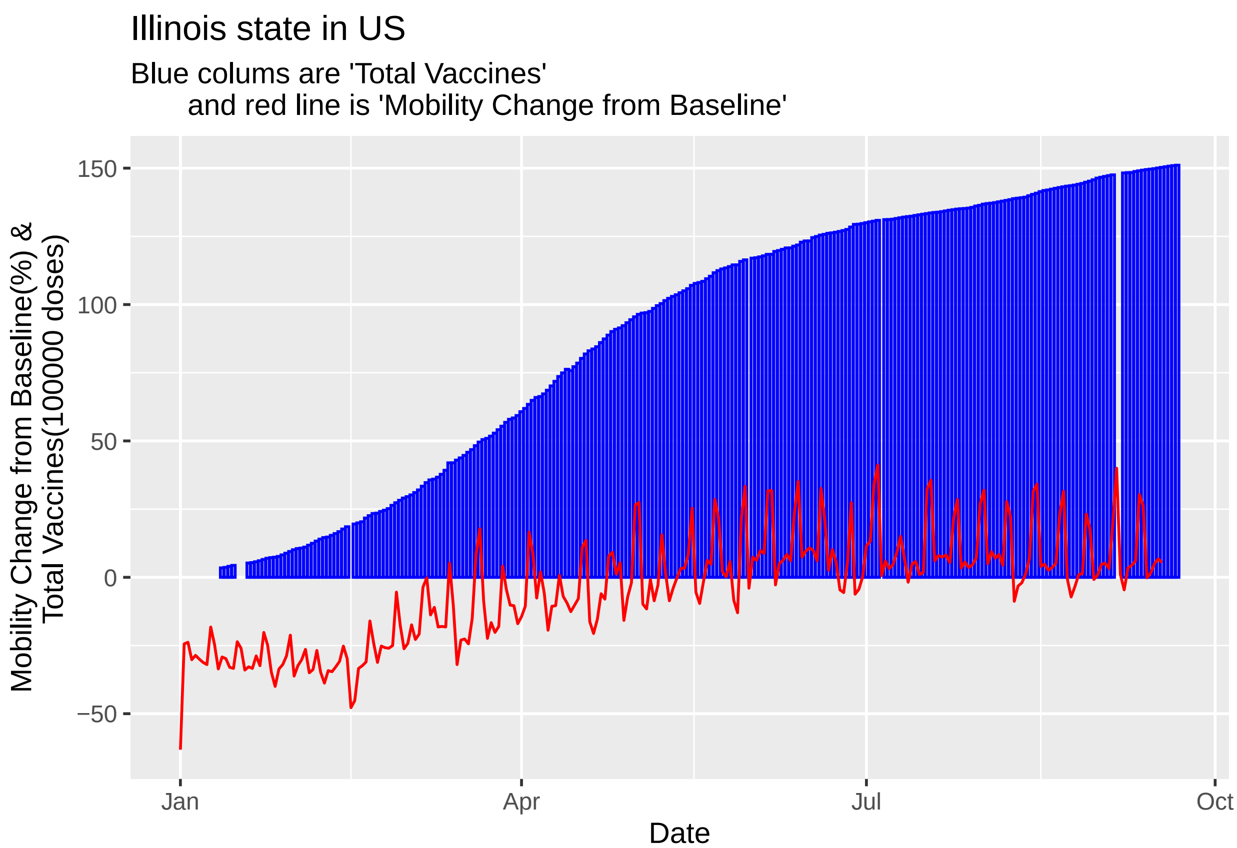
```
# places <- colnames(jp_Hokkaido_mr[3:7])
# print(places)

jp_hokkaido_mr_mean <- jp_Hokkaido_mr %>%
  rowwise() %>%
  mutate(mean_of_everywhere = mean(c(retail_and_recreation_percent_change_from_baseline,
                                    grocery_and_pharmacy_percent_change_from_baseline,
                                    parks_percent_change_from_baseline,
                                    transit_stations_percent_change_from_baseline,
                                    workplaces_percent_change_from_baseline)))

us_il_mr_mean <- us_il_mr %>%
  rowwise() %>%
  mutate(mean_of_everywhere = mean(c(retail_and_recreation_percent_change_from_baseline,
                                    grocery_and_pharmacy_percent_change_from_baseline,
                                    parks_percent_change_from_baseline,
                                    transit_stations_percent_change_from_baseline,
                                    workplaces_percent_change_from_baseline)))
```

Importing and arranging the vaccination rate data. This data is from the following website. US: https://github.com/owid/covid-19-data/tree/master/public/data/vaccinations Japan: https:

//cio.go.jp/c19vaccine_dashboard

1. US case

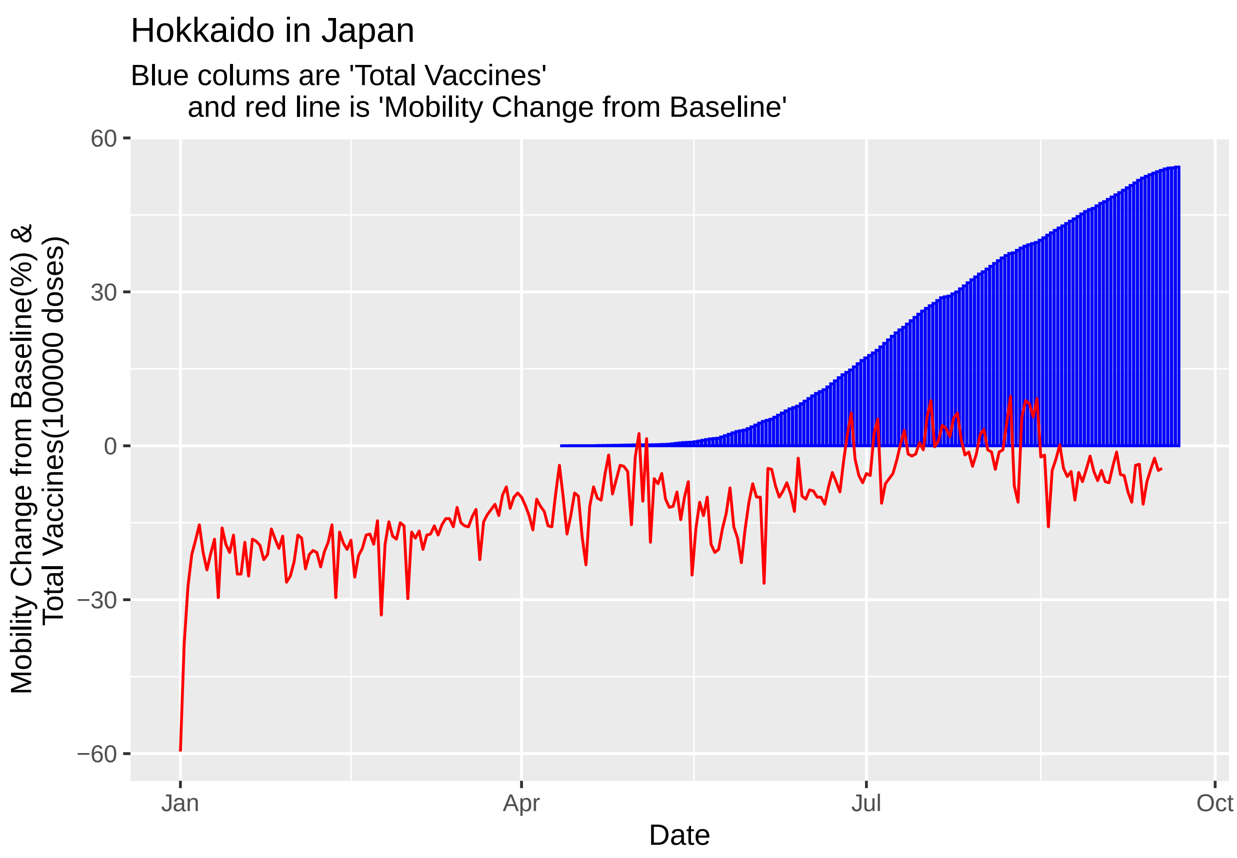
```
# Importing the vaccine data.
us_vaccine_data <- read_csv("../data/us_state_vaccinations.csv")

us_il_vaccine_data <- us_vaccine_data %>%
  filter(location == "Illinois") %>%
  select(date, total_vaccinations)

us_il_mr_and_vaccine <- us_il_mr_mean %>%
  full_join(us_il_vaccine_data, by="date") %>%
  select(date, mean_of_everywhere, total_vaccinations)

# Make graph.
ggplot(data = us_il_mr_and_vaccine,
       aes(x=date)) +
  geom_col(aes(y=total_vaccinations/100000),
           color = "blue",
           alpha=0.1) +
  geom_line(aes(y=mean_of_everywhere),
            color = "red") +
  labs(x="Date",
       y="Mobility Change from Baseline(%) &
       Total Vaccines(100000 doses)",
       title="Illinois state in US",
       subtitle="Blue colums are 'Total Vaccines'
       and red line is 'Mobility Change from Baseline'")
```



2. Japan case

```
# Importing the vaccine data.
library(ndjson)
jp_vaccine_data <- stream_in("../data/prefecture.ndjson")
jp_hokkaido_vaccine_data <- jp_vaccine_data %>%
  filter(prefecture == "01") %>%
  group_by(date) %>%
  summarize(count_by_day = sum(count))

# Calculate cumulative vaccine doses.
len <- length(jp_hokkaido_vaccine_data$date)
cumulative <- rep(0,len)
cumulative[1] <- jp_hokkaido_vaccine_data$count_by_day[1]
for(i in 2:len){
  cumulative[i] = cumulative[i-1] + jp_hokkaido_vaccine_data$count_by_day[i]
}

library(lubridate)
jp_hokkaido_vaccine_data <- jp_hokkaido_vaccine_data %>%
  mutate(cumulative_count = cumulative) %>%
  mutate(date = date(date))

# Combine the vaccine data with the mobility data.
jp_hokkaido_mr_and_vaccine <- jp_hokkaido_mr_mean %>%
```

```r
  full_join(jp_hokkaido_vaccine_data, by="date") %>%
  select(date, mean_of_everywhere, cumulative_count)

# Make graph.
ggplot(data = jp_hokkaido_mr_and_vaccine,
       aes(x=date)) +
  geom_col(aes(y=cumulative_count/100000),
           color = "blue",
           alpha=0.1) +
  geom_line(aes(y=mean_of_everywhere),
            color = "red") +
  labs(x="Date",
       y="Mobility Change from Baseline(%) &
       Total Vaccines(100000 doses)",
       title="Hokkaido in Japan",
       subtitle="Blue colums are 'Total Vaccines'
       and red line is 'Mobility Change from Baseline'")
```



Table

```r
table_jp <- jp_hokkaido_mr_and_vaccine %>%
  filter(date == "2021-09-17")
```

```
colnames(table_jp)[3]= "total_vaccinations"
table_us <- us_il_mr_and_vaccine %>%
  filter(date == "2021-09-17")
table_jp_and_us <- table_jp %>%
  bind_rows(table_us) %>%
  select(mean_of_everywhere, total_vaccinations)
colnames(table_jp_and_us) <- c("Mobility Change(%)", "Total Vaccinations")
df <- tibble("Population(2019)" = c("5.28mil", "12.67mil"), #From Google
             "Total Vaccination / Population" = c(round(5368501 / 5280000, 2),
                                                  round(15029845 / 12670000,2)))
table_jp_and_us <- table_jp_and_us %>%
  bind_cols(df)
rownames(table_jp_and_us) <- c("Hokkaido in Japan", "Illinois in US")
table_jp_and_us %>%
  knitr::kable(caption = "Condition on Sep 17th 2021")
```

Table 1: Condition on Sep 17th 2021

	Mobility Change(%)	Total Vaccinations	Population(2019)	Total Vaccination / Population
Hokkaido in Japan	-4.4	5368501	5.28mil	1.02
Illinois in US	5.4	15029845	12.67mil	1.19

Conclusion

Comparing to Americans, Japanese seem not to go outside even though they take vaccines.