Final Project Coding Camp

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Introduction

I analyze Google Covid-19 Community Mobility Reports from 2020 to 2021. I focus on three counties in Illinois: to analyze some differences in Transit System Use during Covid-19 in Cook County, Lake County, and St. Clair County.

Cook County and Lake County are both near Chicago, and St. Clair County is in Southern Illinois near St. Louis, so they may have similarities in their proximity to a large city but have clear differences in how they respond to Covid-19 in terms of Transit Station Activity. The first plot shows how Cook County had the largest decrease in Transit Station Activity compared to its baseline. St. Clair had the smallest change in Transit Station Activity compared to baseline. Cook County Transit Activity has not reached pre-baseline levels at this time. Both St. Clair and Lake Counties have reached activity levels above 0% in 2021. Differences may occur due to transit system differences and differences in mode of transportation offered, and differences in number of people returning to offices or not, so it would be interesting to bring in population counts or covid-19 cases in addition to the mobility data. In the appendix, I also consider all types of mobility data for the entire state of Illinois, and compare Transit System Activity in Illinois and South Carolina.

Data can be found here: https://www.google.com/covid19/mobility/index.html?hl=en

Graph

```
library(tidyverse)
library(haven)
library(readr)
library(fs)
library(zoo)
library(lubridate)

setwd("C:/Users/keles/OneDrive/CAPP/Summer Prep/Math and Coding Camp Resources/Coding Camp Days/Final P

US_mobility2020 <- read_csv("Region_Mobility_Report_CSVs/2020_US_Region_Mobility_Report.csv")
US_mobility2021 <- read_csv("Region_Mobility_Report_CSVs/2021_US_Region_Mobility_Report.csv")

US_mobility <-
  US_mobility2020 %>% rbind(US_mobility2021)

US_mobility_clean <-
  US_mobility %>% rename(
    retailrec = retail_and_recreation_percent_change_from_baseline,
```

```r
      grocery =  grocery_and_pharmacy_percent_change_from_baseline,
      parks =  parks_percent_change_from_baseline,
      transit = transit_stations_percent_change_from_baseline,
      workplace = workplaces_percent_change_from_baseline,
      residential = residential_percent_change_from_baseline,
      state = sub_region_1, county = sub_region_2)

# Source for rolling average command:
  # https://www.storybench.org/how-to-calculate-a-rolling-average-in-r/

US_mobility_clean2 <-
  US_mobility_clean %>%
  arrange(state, county, date) %>%
  group_by(state, county) %>%
   mutate(retail_07da = rollmean(retailrec, k = 7, fill = NA),
         grocery_07da = rollmean(grocery, k = 7, fill = NA),
         parks_07da = rollmean(parks, k = 7, fill = NA),
         transit_07da = rollmean(transit, k = 7, fill = NA),
         workplace_07da = rollmean(workplace, k = 7, fill = NA),
         residential_07da = rollmean(residential, k = 7, fill = NA)
         ) %>%
  select(
    state,
    county,
    date,
    retailrec,
    grocery,
    parks,
    transit,
    workplace,
    residential,
    retail_07da,
    grocery_07da,
    parks_07da,
    transit_07da,
    workplace_07da,
    residential_07da)

ILFilter <-
  US_mobility_clean2 %>%
  filter(date <= "2021-09-17" & date >= "2020-02-01",
         state == "Illinois",
         county =="Cook County" |
           county=="St. Clair County" |
           county=="Lake County") %>%
  ungroup()

ILFilter %>%
  ggplot(aes(x = date, group = county, color = county, y = transit_07da)) +
  geom_line() +
  theme_minimal() +
  labs(x = "", y = "Transit Station Activity",
       title = "Transit Station Activity Compared to Baseline\nDuring Covid-19 in 3 IL Counties\n(seven-
```
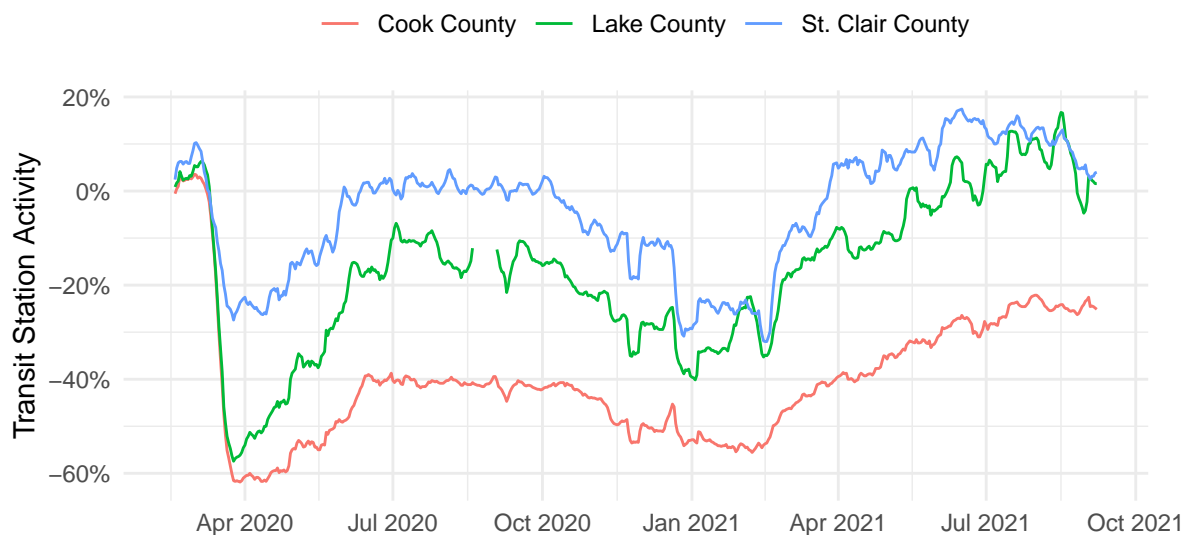
```
      subtitle = "Data source: Google Data") +
  scale_y_continuous(labels = function(x)
    paste0(x, "%")) +
  theme(legend.position = "top",
        legend.title=element_blank(),
        plot.margin = margin(0.5,0.5,1,1,"cm")) +
  scale_x_date(breaks = scales::breaks_pretty(10))
```

Transit Station Activity Compared to Baseline During Covid–19 in 3 IL Counties (seven–day moving average)

Data source: Google Data


```
# source: 1. http://www.cookbook-r.com/Graphs/Titles_(ggplot2)/ and 2. https://stackoverflow.com/questi
```

Table

```
# source for date variables:
# https://www.geeksforgeeks.org/split-date-time-column-into-date-and-time-variables-in-r/

summary_table <-
  ILFilter %>% mutate(
  year = year(date),
  month = month(date),
  day = day(date)) %>%
  group_by(county, year, month) %>%
  summarize(avg_monthly_transit = mean(transit)) %>%
  filter(county == "Cook County")
```

```
summary_table %>%
  knitr::kable()
```

county	year	month	avg_monthly_transit
Cook County	2020	2	1.533333
Cook County	2020	3	-29.870968
Cook County	2020	4	-60.300000
Cook County	2020	5	-51.741935
Cook County	2020	6	-42.733333
Cook County	2020	7	-40.774194
Cook County	2020	8	-40.354839
Cook County	2020	9	-42.033333
Cook County	2020	10	-41.580645
Cook County	2020	11	-48.600000
Cook County	2020	12	-50.516129
Cook County	2021	1	-53.580645
Cook County	2021	2	-51.857143
Cook County	2021	3	-43.322581
Cook County	2021	4	-39.066667
Cook County	2021	5	-32.645161
Cook County	2021	6	-28.966667
Cook County	2021	7	-25.129032
Cook County	2021	8	-24.806452
Cook County	2021	9	-25.300000

Appendix

```
# source for reshape: https://uc-r.github.io/tidyr
Reshaped <-
  US_mobility_clean2 %>%
  gather(location,
         mobile_value,
         retail_07da,
         grocery_07da,
         parks_07da,
         transit_07da,
         workplace_07da,
         residential_07da)

ILFilterreshape <-
  Reshaped %>%
    filter(state == "Illinois", county == "Cook County")

ILFilterreshape %>%
  ggplot(aes(x = date,
             color = location,
             y = mobile_value)) +
  geom_line() +
  labs(y = "Mobility Trends",
       x = "",
```
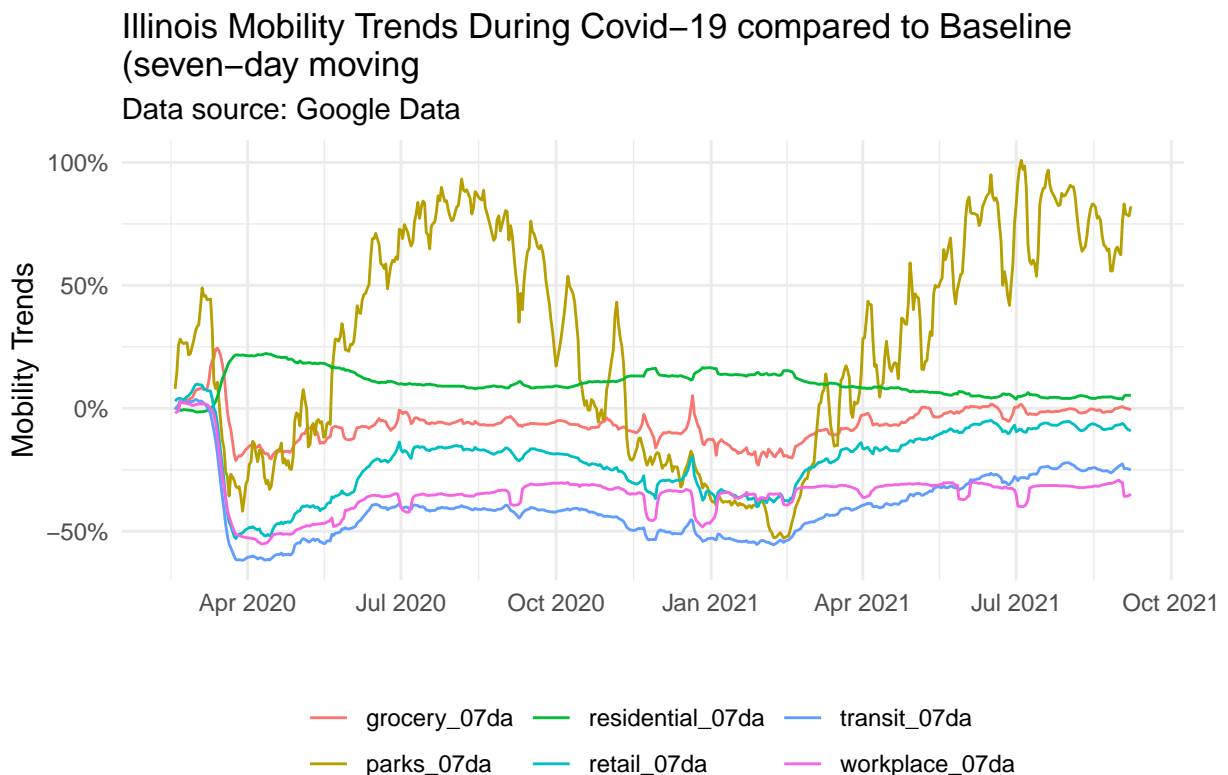
```
      title =
        "Illinois Mobility Trends During Covid-19 compared to Baseline\n(seven-day moving",
      subtitle = "Data source: Google Data") +
  theme_minimal() +
  scale_y_continuous(labels = function(x)
    paste0(x, "%")) +
  theme(legend.position = "bottom",
        legend.title = element_blank(),
        plot.margin = margin(0.5,0.5,0.5,0.5,"cm")) +
 scale_x_date(breaks = scales::breaks_pretty(10))
```

Illinois Mobility Trends During Covid−19 compared to Baseline (seven−day moving
Data source: Google Data


```
ILSAFilter <- US_mobility_clean2 %>%
      filter(state == "Illinois" & is.na(county) |
              state == "South Carolina" & is.na(county))

ILSAFilter %>%
  ggplot(aes(x = date,
            group = state,
            color = state,
            y = transit_07da)) +
  geom_line() +
  labs(y = "Transit Station Activity", x = "",
      title = "Illinois and South Carolina Transit Station\nActivity During Covid-19 compared to Baseli
      subtitle = "Data source: Google Data") +
  theme_minimal() +
```

```
  scale_y_continuous(labels = function(x)
    paste0(x, "%")) +
  theme(legend.position = "top",
        legend.title = element_blank(),
        plot.margin = margin(0.1,0.5,0.5,0.5,"cm")) +
scale_x_date(breaks = scales::breaks_pretty(10))
```

Illinois and South Carolina Transit Station
Activity During Covid–19 compared to Baseline
(seven–day moving average)
Data source: Google Data