

Car Jacking MPLS

Ryan Larson

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Spatial Data

```
#Get Minneapolis ZCTA Geographies
zcta <- get_acs(geography = "zcta",
               variables = "B01001_001E",
               output = "wide",
               survey = "acs5",
               year = 2019,
               geometry = T)
```

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## |
```

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|
```

```
#Minneapolis Shapefile
```

```
mpls <- st_read("Data/mpls_city-shp/16cdbbfa-ad10-493c-afaf-52b61f2e76e42020329-1-180h9ap.whbo.shp") %>%
  st_transform(st_crs(zcta))
```

```
## Reading layer '16cdbbfa-ad10-493c-afaf-52b61f2e76e42020329-1-180h9ap.whbo' from data source 'C:\User
## using driver 'ESRI Shapefile'
## Simple feature collection with 1 feature and 4 fields
## Geometry type: POLYGON
## Dimension: XY
## Bounding box: xmin: -93.32911 ymin: 44.89059 xmax: -93.19433 ymax: 45.05125
## Geodetic CRS: WGS 84
```

```
#spatial filter to MPLS ZCTAs
```

```
#calculating area of intersection
```

```
#keeping ZCTAs with 2+ percent coverage
```

```
mpls_zcta <- zcta %>%
  st_filter(mpls, .predicate = st_intersects) %>%
  mutate(GEOID = as.numeric(GEOID),
         zcta_area = as.numeric(st_area(.)),
         zcta_area_sqkm = zcta_area*.000001,
         zcta_area_sqmi = zcta_area_sqkm*.386102,
         intersection_area = as.numeric(st_area(st_intersection(., mpls))),
         perc_intersection = intersection_area/zcta_area*100) %>%
  filter(perc_intersection >= 2)
```

Open Minneapolis Carjacking Data

```
#open minneapolis crime data 2019-4/7 (date of download)
cj_spatial <- read_csv("Car Theft/crime_data.csv") %>%
  filter(Offense=="Carjacking - Subset of Robbery") %>% #filter carjackings
  mutate(date=ymd_hms(Occurred_Date),
         year=isoyear(date),
         week=isoweek(date)) %>%
  select(OBJECTID, year, week, Latitude, Longitude) %>%
  st_as_sf(coords = c("Longitude", "Latitude"), crs = "NAD83", remove=F) %>%
  st_join(mpls_zcta) %>% #spatial join ZCTA
  rename(zcta = GEOID) %>%
  st_drop_geometry() %>%
  filter(!is.na(zcta)) %>%
  group_by(year, week, zcta, .drop=F) %>%
  tally(name = "car_jack") %>%
  ungroup() %>%
  complete(year, week, zcta=mpls_zcta$GEOID, fill = list(car_jack = 0)) %>%
  filter(!(year==2022 & week >= 14) & !(year==2021 & week==53)) %>% #removing unobserved/redundant comp
  arrange(zcta, year, week) %>%
  left_join(mpls_zcta, by = c("zcta" = "GEOID")) %>%
  mutate(car_jack_rate = car_jack/B01001_001E*1000) %>%
  st_as_sf()
```

MPLS Carjackings by Week

```
#aggregate to week over ZCTAs
cj_week <- cj_spatial %>%
  group_by(year, week) %>%
  summarize(car_jack = sum(car_jack, na.rm = T),
            total_pop = sum(B01001_001E, na.rm = T)) %>%
  mutate(car_jack_rate = (car_jack/total_pop)*1000,
         begin_date = ISOweek2date(paste(year, paste0("W", sprintf("%02d", week)), 1, sep = "-")),
         end_date = begin_date+weeks(1)-days(1))
```

'summarise()' has grouped output by 'year'. You can override using the
'.groups' argument.

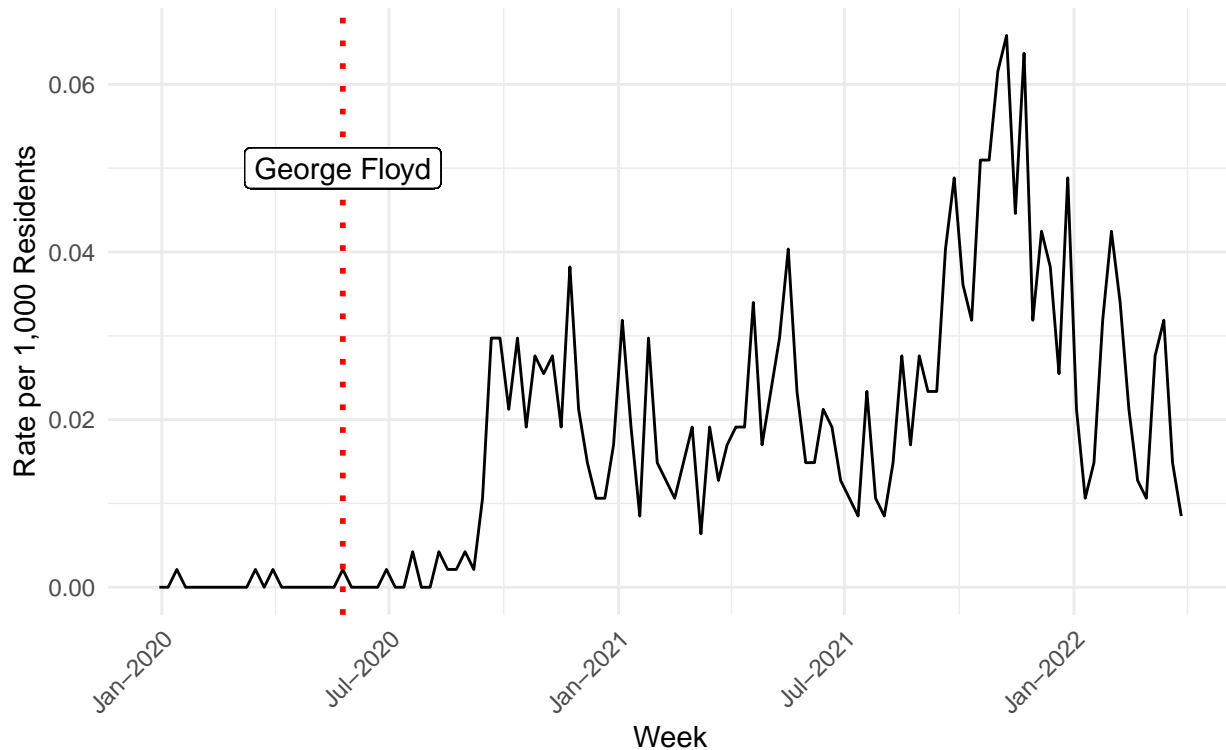
```
ggplot(cj_week)+
  geom_line(aes(x=begin_date, y=car_jack_rate))+
  scale_x_date(date_labels = "%b-%Y",
              limits = c(min(cj_week$begin_date), max(cj_week$begin_date)))+
  geom_vline(xintercept=cj_week$begin_date[cj_week$year==2020 & cj_week$week==isoweek(date("2020-05-25"))],
            linetype="dotted", color="red", size=1)+
  geom_label(aes(x=cj_week$begin_date[cj_week$year==2020 & cj_week$week==isoweek(date("2020-05-25"))],
                y=0.050),
            label = "George Floyd", show.legend = FALSE)+
  labs(title = "Figure X: Weekly Minneapolis Carjackings, 1/1/2019-4/7/2022",
       subtitle = "openminneapolis Crime Data",
```

```

x = "Week",
y = "Rate per 1,000 Residents")+
theme_minimal()+
  theme(axis.text.x=element_text(angle=45, hjust=1))

```

Figure X: Weekly Minneapolis Carjackings, 1/1/2019–4/7/2022
openminneapolis Crime Data



MPLS ZCTA Carjackings Map

```

#aggregate to ZCTA-Year level
cj_zip_year <- cj_spatial %>%
  group_by(zcta, year) %>%
  summarize(car_jack = sum(car_jack, na.rm = T),
            total_pop = sum(B01001_001E, na.rm = T)) %>%
  mutate(car_jack_rate = (car_jack/total_pop)*1000)

```

'summarise()' has grouped output by 'zcta'. You can override using the
'.groups' argument.

```

ggplot() +
  geom_sf(data = cj_zip_year, aes(geometry = geometry, fill = car_jack_rate)) +
  geom_sf(data = mpls, aes(geometry = geometry), color = "black", alpha = 0)+
  facet_wrap(~year)+
  scale_fill_distiller(palette = "Spectral")+

```

```
labs(title = "Figure X: Weekly Minneapolis Carjacking Rates",
      subtitle = "openminneapolis Crime Data",
      fill = "Rate/1,000 Residents")+
theme_void()
```

Figure X: Weekly Minneapolis Carjacking Rates

openminneapolis Crime Data

