Mental Health Series

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12/28/2022

Base Panel Construction - ZCTA-Week Level

Hospital Data - ZCTA-Week level

```
hosp_zcta <- read_csv("Data/Restricted MHA Data/minnepop_1620_agg_zipfull_MH_102222.csv") %>%
  arrange(zipcode, year, weekofyr) %>%
  select(-c(`_chk`, zippop_tag)) %>%
  filter(!(year==2016 & weekofyr==53))
```

ZCTAs and ACS 5-Year Estimates

```
#adding in 5-year ACS data
census_api_key("ecda17575f4d914b502c70f2bae7a5f3d253792d")

year <- lst(2016, 2017, 2018, 2019, 2020)

acs <- map_dfr(
  year,
  ~ get_acs(geography = "zcta",
                variables = c("B01001_001E", "B03003_003E",
                              "B02001_003E", "B02001_002E",
                              "B02001_004E", "B02001_008E",
                              "B02001_005E", "B02001_006E",
                              "B02001_007E", "B11001_003E",
                              "B17001_002E", "B01002_001E",
                              "B09010_002E", "B06009_005E",
                              "B01001_002E", "B99233_005E",
           "B23025_005E",
           "B19057_002E",
           "B11003_015E",
           "B06009_002E",
           "B25003_002E",
           "B05002_013E",
          "B19013_001E",
          "B23025_002E",
          "B07001_017E"),
                output = "wide",
                survey = "acs5",
                year = .x),  .id = "year") %>%
  rename(total_pop = B01001_001E,
         white_pop = B02001_002E,
```

```
         black_pop = B02001_003E,
         na_pop = B02001_004E,
         asian_pop = B02001_005E,
         hpi_pop = B02001_006E,
         other_pop = B02001_007E,
         biracial_pop = B02001_008E,
         hisp_pop = B03003_003E,
         ssi_snap = B09010_002E, #snap, ssi, public cash transfers
         med_age = B01002_001E,
         mar_fam = B11001_003E,
         povlevel = B17001_002E,
         bach_degree = B06009_005E,
         male = B01001_002E,
         nowork_12 = B99233_005E,
         total_ilf = B23025_002E,
         unemp = B23025_005E,
         pub_assist = B19057_002E,
         female_hh = B11003_015E,
         no_hs_dip = B06009_002E,
         res_mob = B07001_017E,
         own_hh = B25003_002E,
         foreign = B05002_013E,
       med_hh_inc = B19013_001E) %>%
  select(-ends_with("M", ignore.case = F), -GEOID) %>%
  mutate(zcta = str_sub(NAME, 6),
          unemp_rate = 100*unemp/total_ilf,
         pov_rate = 100*povlevel/total_pop,
         pub_assist_rate = 100*pub_assist/total_pop,
         female_hh_rate = 100*female_hh/total_pop,
         no_hs_dip_rate = 100*no_hs_dip/total_pop,
         bach_degree_rate = 100*bach_degree/total_pop,
         res_mob_rate = 100-100*res_mob/total_pop,
         own_hh_rate = 100*own_hh/total_pop,
         foreign_rate = 100*foreign/total_pop) %>%
  select(-NAME) %>%
  select(zcta, everything()) %>%
  mutate(year = as.numeric(year),
         zcta = as.numeric(zcta))

#joining to hospital data
hosp_panel <- hosp_zcta %>%
  left_join(acs, by = c("zipcode"="zcta", "year"))

#SF geometries - get all ZCTAs
zcta <- get_acs(geography = "zcta",
                  variables = "B01001_001",
                  output = "wide",
                  year = 2020,
                  geometry = T,
                  survey = "acs5") %>%
  rename(zcta = GEOID,
         pop_2019 = B01001_001E) %>%
  select(-c(NAME, B01001_001M, pop_2019)) %>%
```

```
  mutate(zcta = as.numeric(zcta))
```

```
##   |                                                                      |
```

```
#minneapolis shapefile (source: openminneapolis.gov)
mpls <- st_read("Data/mpls_city-shp/16cdbbfa-ad10-493c-afaf-52b61f2e76e42020329-1-180h9ap.whbo.shp") %>%
   st_set_crs(st_crs(zcta))
```

```
## Reading layer `16cdbbfa-ad10-493c-afaf-52b61f2e76e42020329-1-180h9ap.whbo' from data source `C:\Users
##   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
```

```
#zctas that intersect MPLS
zcta_intersect <- zcta %>%
 st_filter(mpls, .predicate = st_intersects) %>%
  mutate(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 = round(intersection_area/zcta_area*100,2)) %>%
  filter(perc_intersection >= 5)

#filter hospital panel
panel <- hosp_panel %>%
  filter(zipcode %in% zcta_intersect$zcta) %>%
  mutate(zcta = zipcode)

#creating date bookends
panel <- panel %>%
  group_by(zipcode, year) %>%
  mutate(begin_date = ISOweek2date(paste(year, paste0("W", sprintf("%02d", weekofyr)), 1,sep = "-")),
         end_date = begin_date+weeks(1)-days(1))

#number of unique MPLS ZCTAs
n_zcta <- length(unique(panel$zcta))

#vector of intersecting ZCTAs for filtering downstream
zcta_universe <- unique(panel$zcta)
```

ZCTA-Week Level Police Data

```
#Minneapolis Police Department - Use of Force Dashboard
uof_spatial <- read_csv("Data/Police_Use_Of_Force.csv")  %>%
  mutate(date=ymd_hms(ResponseDate),
         year=isoyear(date),
         week=isoweek(date)) %>%
  select(OBJECTID, year, week, X, Y, Race) %>%
  st_as_sf(coords = c("X", "Y"), crs = "NAD83", remove=F) %>%
  mutate(intersection = as.integer(st_intersects(geometry, zcta)),
         zcta = ifelse(is.na(intersection), NA, zcta$zcta[intersection])) %>%
  st_drop_geometry() %>%
```

```
  filter(!is.na(zcta) & year >= 2016 & year <= 2021 & zcta %in% zcta_universe) %>%
  group_by(year, week, zcta, Race, .drop=F) %>%
  tally(name = "use_of_force") %>%
  filter(!is.na(Race) & Race!="not recorded") %>%
  ungroup() %>%
  complete(year, week, zcta=zcta_universe, Race, fill = list(use_of_force = 0)) %>%
  arrange(year, week, zcta, Race) %>%
  mutate(race = str_to_lower(Race)) %>%
  select(-Race) %>%
  pivot_wider(names_from = race,
              values_from = use_of_force,
              values_fill = 0,
              names_glue = "{race}_{.value}") %>%
  mutate(total_use_of_force = asian_use_of_force+black_use_of_force+`native american_use_of_force`+
           `other / mixed race_use_of_force`+`pacific islander_use_of_force`+unknown_use_of_force+
            white_use_of_force)

#MPD Stop Dashboard
stop_spatial <- read_csv("Data/Police_Stop_Data.csv") %>%
  mutate(date=ymd_hms(responseDate),
         year=isoyear(date),
         week=isoweek(date)) %>%
  select(OBJECTID, year, week, lat, long, race) %>%
  st_as_sf(coords = c("long", "lat"), crs = "NAD83", remove=F) %>%
  mutate(intersection = as.integer(st_intersects(geometry, zcta)),
         zcta = ifelse(is.na(intersection), NA, zcta$zcta[intersection])) %>%
  st_drop_geometry() %>%
  filter(!is.na(zcta) & year >= 2016 & year <= 2020 & zcta %in% zcta_universe) %>%
  group_by(year, week, zcta, race, .drop=F) %>%
  tally(name = "police_stops") %>%
   filter(!is.na(race) & race!="not recorded") %>%
  ungroup() %>%
  complete(year, week, zcta=zcta_universe, race, fill = list(police_stops = 0)) %>%
  mutate(race = str_to_lower(race)) %>%
  arrange(year, week, zcta, race) %>%
  pivot_wider(names_from = race,
              values_from = police_stops,
              values_fill = 0,
              names_glue = "{race}_{.value}") %>%
  mutate(total_police_stops = asian_police_stops+black_police_stops+
         `east african_police_stops`+latino_police_stops+`native american_police_stops`+
           other_police_stops+unknown_police_stops+white_police_stops)

#Officer Involved Shootings - MPD
ois_spatial <- read_csv("Data/Police_Officer_Involved_Shootings.csv") %>%
  mutate(date=ymd_hms(IncidentDate),
         year=isoyear(date),
         week=isoweek(date)) %>%
  select(OBJECTID, year, week, CenterLatitude, CenterLongitude, SubjectOfForceRace) %>%
  rename(race = SubjectOfForceRace,
         lat = CenterLatitude,
         long = CenterLongitude) %>%
  st_as_sf(coords = c("long", "lat"), crs = "NAD83", remove=F) %>%
```

```
  mutate(intersection = as.integer(st_intersects(geometry, zcta)),
         zcta = ifelse(is.na(intersection), NA, zcta$zcta[intersection])) %>%
  st_drop_geometry() %>%
  filter(!is.na(zcta) & year >= 2016 & year <= 2020 & zcta %in% zcta_universe) %>%
  group_by(year, week, zcta, race, .drop=F) %>%
  tally(name = "police_shootings") %>%
  filter(!is.na(race) & race!="not recorded") %>%
  ungroup() %>%
  complete(year=2016:2021, week=1:53, zcta=zcta_universe, race, fill = list(police_shootings = 0)) %>%
  mutate(race = str_to_lower(race)) %>%
  arrange(year, week, zcta, race) %>%
  pivot_wider(names_from = race,
              values_from = police_shootings,
              values_fill = 0,
              names_glue = "{race}_{.value}") %>%
  mutate(total_police_shootings = asian_police_shootings+black_police_shootings+
         hispanic_police_shootings+other_police_shootings+
           unknown_police_shootings+white_police_shootings)

panel <- panel %>%
  left_join(uof_spatial, by = c("year", "weekofyr"="week", "zcta"="zcta")) %>%
  left_join(stop_spatial, by = c("year", "weekofyr"="week", "zcta"="zcta")) %>%
  left_join(ois_spatial, by = c("year", "weekofyr"="week", "zcta"="zcta"))

#creating period indicators for panel
panel <- panel %>%
  mutate(post_floyd = as.numeric(begin_date >= as.Date("2020-05-25")),
         post_floyd_3 = as.numeric(begin_date >= as.Date("2020-05-25")+months(3)),
         t_post_floyd = ifelse(as.numeric(begin_date-as.Date("2020-05-25"))/7 >=0,
                               begin_date-as.numeric(as.Date("2020-05-25"))/7,
                               0),
         stay_at_home = as.numeric(begin_date >= as.Date("2020-03-28") &
         state_of_emerg = as.numeric(begin_date >= as.Date("2020-03-13")),
         period = factor(case_when(
           post_floyd==0 & post_floyd_3==0 ~ "Pre-Killing",
           post_floyd>=1 & post_floyd_3==0 ~ "0-3 Months Post-Killing",
           post_floyd>=1 & post_floyd_3>=1 ~ "3+ Months Post-Killing"),
           levels = c("Pre-Killing", "0-3 Months Post-Killing", "3+ Months Post-Killing"))) %>%
  group_by(zcta) %>%
  arrange(year, weekofyr) %>%
  mutate(t = row_number(),
         uof_lag = dplyr::lag(total_use_of_force, 1),
         stops_lag = dplyr::lag(total_police_stops, 1),
         shoot_lag = dplyr::lag(total_police_shootings, 1))
```

Weather Data

```
# Minnesota DNR Daily Date
 # https://www.dnr.state.mn.us/climate/historical/daily-data.html?sid=mspthr&sname=Minneapolis/St%20Pau
 # Station Name: Minneapolis/St Paul Threaded Record - Station ID: mspthr

weather <- read_csv("Data/dnr_weather.csv") %>%
```

```
  mutate(year=isoyear(Date),
         week=isoweek(Date),
         precip_in = as.numeric(ifelse(`Precipitation (inches)`=="T", .001, `Precipitation (inches)`)),
         snow_in = as.numeric(ifelse(`Snow (inches)`=="T", .001, `Snow (inches)`)),
         tmax_f = `Maximum Temperature degrees (F)`) %>%
  filter(year >= 2016 & year <= 2020) %>%
  select(year, week, precip_in, snow_in, tmax_f) %>%
  group_by(year, week) %>%
  summarize(precip_in = mean(precip_in, na.rm = T),
            snow_in = mean(snow_in, na.rm = T),
            tmax_f = mean(tmax_f, na.rm = T))

#join to panel
panel <- panel %>% left_join(weather, by = c("year","weekofyr"="week"))
```

Time Series Construction - Week Level

Aggregate Hospital Panel to Week-Level

```
#panel to week-level, aggregating over ZCTAs
hosp_series <- panel %>%
  group_by(year, weekofyr) %>%
  summarize(mh_all_tot = sum(mh_all_tot, na.rm = T),
            white_mh_all_tot =  sum(white_mh_all_tot, na.rm = T),
            indig_mh_all_tot =  sum(indig_mh_all_tot, na.rm = T),
            asian_mh_all_tot =  sum(asian_mh_all_tot, na.rm = T),
            black_mh_all_tot =  sum(black_mh_all_tot, na.rm = T),
            latin_mh_all_tot =  sum(latin_mh_all_tot, na.rm = T),
            total_pop = sum(total_pop, na.rm = T),
            white_pop = sum(white_pop, na.rm = T),
            na_pop = sum(na_pop, na.rm = T),
            hisp_pop = sum(hisp_pop, na.rm = T),
            asian_pop = sum(asian_pop, na.rm = T),
            black_pop = sum(black_pop, na.rm = T)) %>%
  mutate(mh_incid_c = (mh_all_tot/total_pop)*1000,
         white_mh_incid_c = (white_mh_all_tot/white_pop)*1000,
         indig_mh_incid_c = (indig_mh_all_tot/na_pop)*1000,
         asian_mh_incid_c = (asian_mh_all_tot/asian_pop)*1000,
         black_mh_incid_c = (black_mh_all_tot/black_pop)*1000,
         latin_mh_incid_c = (latin_mh_all_tot/hisp_pop)*1000) %>%
  ungroup() %>%
  mutate(week_id = row_number())
```

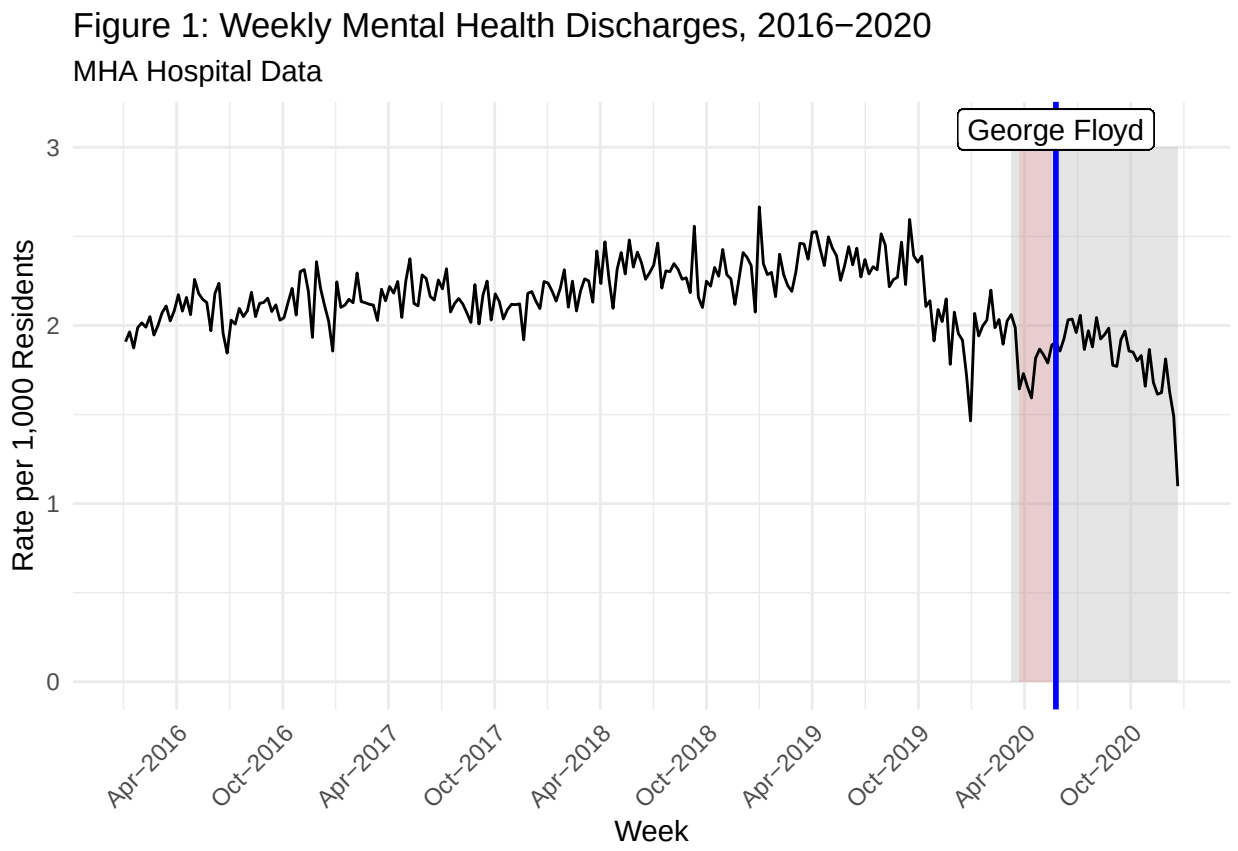
Police Data Week-Level

```
#Minneapolis Police Department - Use of Force Dashboard
uof <- read_csv("Data/Police_Use_Of_Force.csv") %>%
  mutate(date=ymd_hms(ResponseDate),
         year=isoyear(date),
         week=isoweek(date)) %>%
  group_by(year, week, .drop=F) %>%
  tally(name = "use_of_force") %>%
```

```
  arrange(year, week) %>%
  ungroup() %>%
  select(year, week, everything())

#merge onto series
series <- hosp_series %>%
  left_join(uof, by=c("year", "weekofyr"="week")) %>%
  mutate(use_of_force_rate = (use_of_force/total_pop)*1000)

#MPD Officer Involved Shootings
ois <- read_csv("Data/Police_Officer_Involved_Shootings.csv") %>%
  mutate(date=ymd_hms(IncidentDate),
         year=isoyear(date),
         week=isoweek(date)) %>%
  group_by(year, week, .drop=F) %>%
  tally(name = "off_inv_shooting") %>%
  arrange(year, week) %>%
  ungroup() %>%
  select(year, week, everything())

#merge onto series
series <- series %>%
  left_join(ois, by=c("year", "weekofyr"="week")) %>%
  mutate(off_inv_shooting = ifelse(is.na(off_inv_shooting), 0, off_inv_shooting),
         off_inv_shooting_rate = (off_inv_shooting/total_pop)*1000)


#Minneapolis Police Department - Police Stops Dashboard
stop <- read_csv("Data/Police_Stop_Data.csv") %>%
  mutate(date=ymd_hms(responseDate),
         year=isoyear(date),
         week=isoweek(date)) %>%
  group_by(year, week, .drop=F) %>%
  tally(name = "police_stops")

#merge onto series
series <- series %>%
  left_join(stop, by = c("year", "weekofyr"="week")) %>%
  mutate(police_stop_rate = (police_stops/total_pop)*1000)


#creating date variable
#removing week 53 of 2020

series <- series %>%
  mutate(begin_date = ISOweek2date(paste(year, paste0("W", sprintf("%02d", weekofyr)), 1,sep = "-")),
         end_date = begin_date+weeks(1)-days(1)) %>%
  filter(!(year==2020 & weekofyr== 53)) %>%
  left_join(weather, by = c("year","weekofyr"="week"))
```

Time Series Vizualization

```
ggplot(series)+
  scale_x_date(date_labels = "%b-%Y", date_breaks = "6 months")+
   annotate(geom="rect",
    xmin = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-03-13"))],
    xmax = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-12-25"))],
    ymin = 0,
    ymax = 3,
    fill = "grey",
    alpha = .4) +
  annotate(geom="rect",
    xmin = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-03-28"))],
    xmax = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-18"))],
    ymin = 0,
    ymax = 3,
    fill = "Red",
    alpha = .1) +
  scale_fill_manual(values=c("grey","red"), labels=c("Stay at Home", "State of Emergency")) +
  geom_line(aes(x=begin_date, y=mh_incid_c))+
  geom_vline(xintercept=series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25
             linetype="solid", color="blue", size=1) +
  geom_label(aes(x=series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],
                 y=3.1),
             label = "George Floyd", show.legend = FALSE)+
  labs(title = "Figure 1: Weekly Mental Health Discharges, 2016-2020",
       subtitle = "MHA Hospital Data",
       x = "Week",
       y = "Rate per 1,000 Residents",
       fill = "MN COVID-19 Policy")+
  theme_minimal()+
    theme(axis.text.x=element_text(angle=45, hjust=1))
```

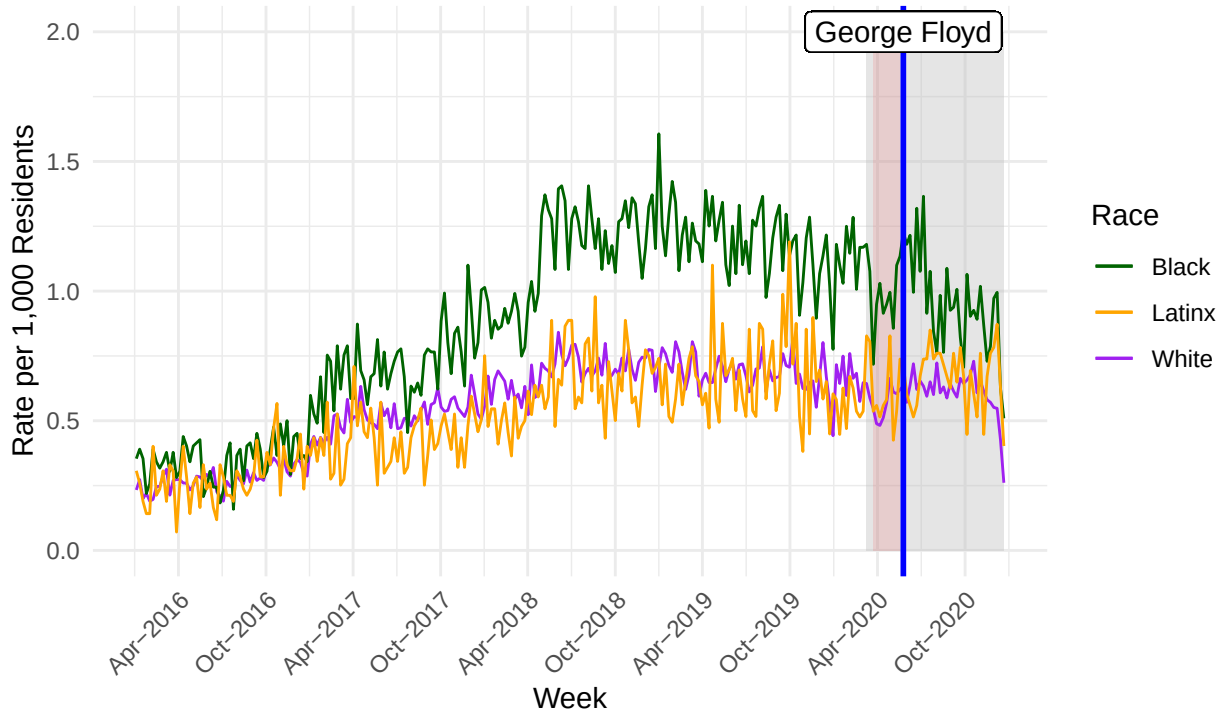



```
ggplot(series)+
  scale_x_date(date_labels = "%b-%Y", date_breaks = "6 months")+
   annotate(geom="rect",
    xmin = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-03-13"))],
    xmax = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-12-25"))],
    ymin = 0,
    ymax = 2,
    fill = "grey",
    alpha = .4) +
  annotate(geom="rect",
    xmin = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-03-28"))],
    xmax = series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-18"))],
    ymin = 0,
    ymax = 2,
    fill = "Red",
    alpha = .1) +
  scale_fill_manual(values=c("grey","red"), labels=c("Stay at Home", "State of Emergency")) +
  geom_line(aes(x=begin_date, y=white_mh_incid_c, color = "White"))+
  geom_line(aes(x=begin_date, y=black_mh_incid_c, color = "Black"))+
  geom_line(aes(x=begin_date, y=latin_mh_incid_c, color = "Latinx"))+
  geom_vline(xintercept=series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25
             linetype="solid", color="blue", size=1) +
  geom_label(aes(x=series$begin_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],
                 y=2),
             label = "George Floyd", show.legend = FALSE)+
  labs(title = "Figure 2: Weekly Mental Health Discharges by Patient Race, 2016-2020",
```

```
       subtitle = "MHA Hospital Data",
       x = "Week",
       y = "Rate per 1,000 Residents",
       fill = "MN COVID-19 Policy",
       color = "Race",
       caption = "")+
  theme_minimal()+
    theme(axis.text.x=element_text(angle=45, hjust=1)) +
   scale_color_manual(values = c("darkgreen", "orange", "purple"))
```

Figure 2: Weekly Mental Health Discharges by Patient Race, 2016−2020

MHA Hospital Data



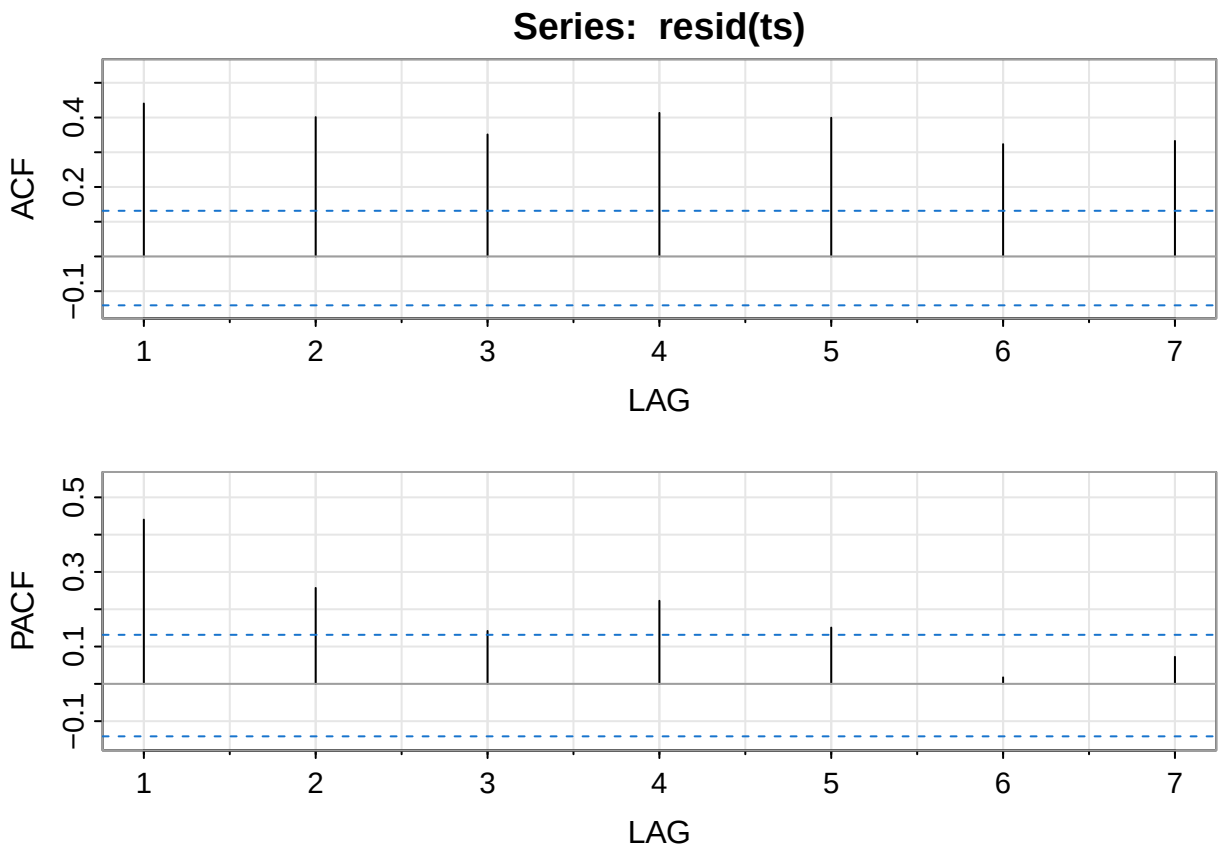
Time Series Analysis

```
series <- series %>%
  mutate(t = 1:length(mh_incid_c),
         post_floyd = as.factor(as.numeric(begin_date >= as.Date("2020-05-25"))),
         post_floyd_3 = as.factor(as.numeric(begin_date >= as.Date("2020-05-25")+months(3))),
         stay_at_home = as.factor(as.numeric(begin_date >= as.Date("2020-03-28") &
         state_of_emerg = as.factor(as.numeric(begin_date >= as.Date("2020-03-13"))),
         weeks_post = as.numeric(begin_date-as.Date("2020-05-25"))/7,
         t_post_floyd = ifelse(weeks_post >=0,
                               weeks_post,
                               0),
         uof_lag=lag(use_of_force_rate,1),
         stops_lag = lag(police_stop_rate,1),
         shoot_lag = lag(off_inv_shooting_rate,1))
```

```r
ts <- lm(mh_incid_c~t+state_of_emerg+stay_at_home+post_floyd+t_post_floyd+
           tmax_f+snow_in+precip_in+
           uof_lag+stops_lag+shoot_lag,
                       data = series)
summary(ts)
```

```
##
## Call:
## lm(formula = mh_incid_c ~ t + state_of_emerg + stay_at_home +
##     post_floyd + t_post_floyd + tmax_f + snow_in + precip_in +
##     uof_lag + stops_lag + shoot_lag, data = series)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.74151 -0.06959 -0.00027  0.08705  0.49370
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2.088e+00  9.561e-02  21.840  < 2e-16 ***
## t                1.090e-04  3.042e-04   0.358 0.720605
## state_of_emerg1 -3.895e-01  9.404e-02  -4.142 5.05e-05 ***
## stay_at_home1   -9.748e-02  9.707e-02  -1.004 0.316456
## post_floyd1      9.962e-02  1.018e-01   0.978 0.329139
## t_post_floyd    -1.377e-02  3.505e-03  -3.928 0.000117 ***
## tmax_f           3.226e-03  6.541e-04   4.931 1.69e-06 ***
## snow_in          2.271e-02  2.842e-02   0.799 0.425180
## precip_in       -1.316e-01  9.978e-02  -1.319 0.188612
## uof_lag          3.674e-01  2.248e-01   1.634 0.103788
## stops_lag       -4.011e-02  3.728e-02  -1.076 0.283296
## shoot_lag       -1.348e+01  6.536e+00  -2.062 0.040472 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1514 on 204 degrees of freedom
##   (44 observations deleted due to missingness)
## Multiple R-squared:  0.5965, Adjusted R-squared:  0.5747
## F-statistic: 27.42 on 11 and 204 DF,  p-value: < 2.2e-16
```

```r
acf2(resid(ts), max.lag = 7)
```



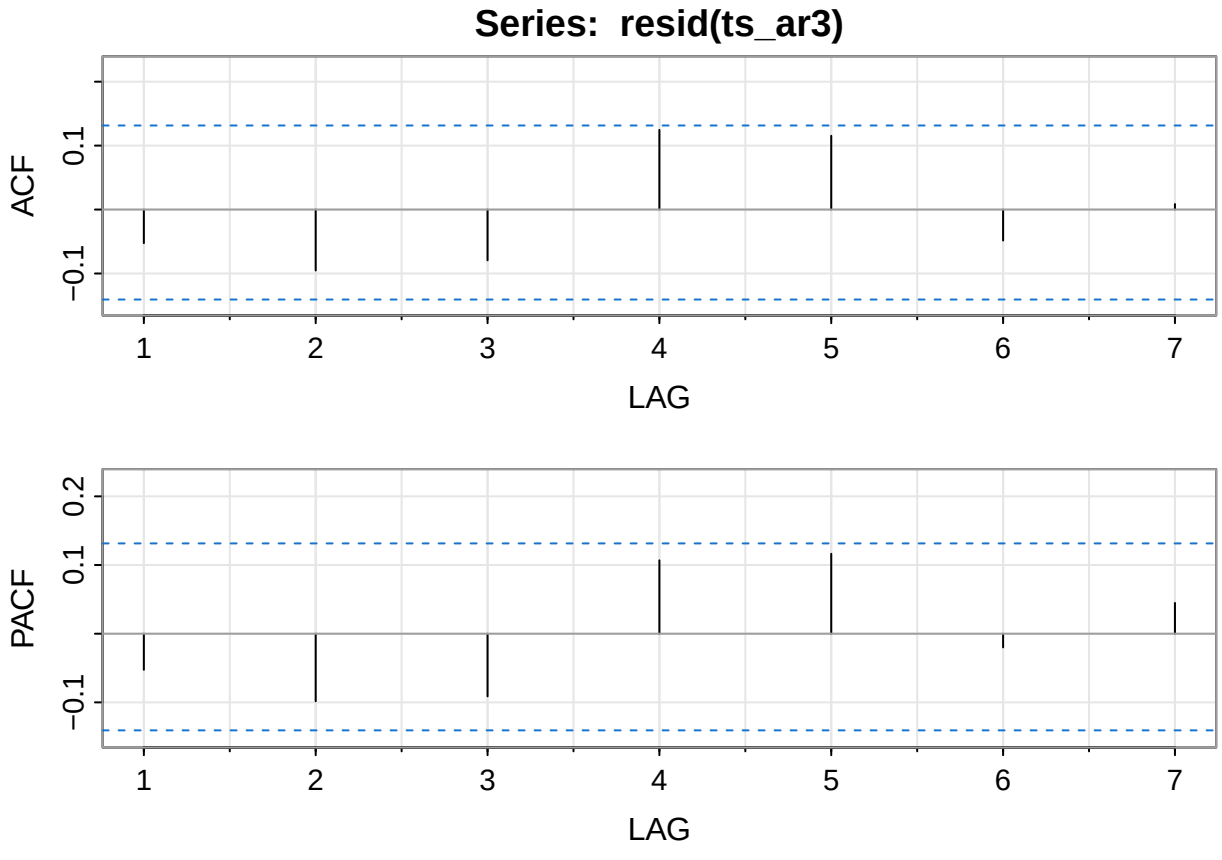

```
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7]
## ACF  0.44 0.40 0.35 0.41 0.40 0.32 0.33
## PACF 0.44 0.26 0.14 0.22 0.15 0.02 0.07
```

```
ts_ar3<- lm(mh_incid_c~t+state_of_emerg+stay_at_home+post_floyd+t_post_floyd+
                         uof_lag+stops_lag+shoot_lag+
                        tmax_f+snow_in+precip_in+
                        dplyr::lag(mh_incid_c, 1)+ dplyr::lag(mh_incid_c, 2)+
              dplyr::lag(mh_incid_c, 3),
            data = series)
summary(ts_ar3)
```

```
##
## Call:
## lm(formula = mh_incid_c ~ t + state_of_emerg + stay_at_home +
##     post_floyd + t_post_floyd + uof_lag + stops_lag + shoot_lag +
##     tmax_f + snow_in + precip_in + dplyr::lag(mh_incid_c, 1) +
##     dplyr::lag(mh_incid_c, 2) + dplyr::lag(mh_incid_c, 3), data = series)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.47466 -0.07480  0.00068  0.06902  0.45274
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 6.013e-01  1.760e-01   3.416 0.000770 ***
## t                          -8.503e-05  2.540e-04  -0.335 0.738164
```

```
## state_of_emerg1           -1.982e-01  8.105e-02  -2.445 0.015335 *
## stay_at_home1              6.603e-02  8.258e-02   0.800 0.424862
## post_floyd1                1.521e-01  8.520e-02   1.785 0.075803 .
## t_post_floyd              -9.658e-03  2.966e-03  -3.256 0.001325 **
## uof_lag                    4.116e-01  1.884e-01   2.185 0.030036 *
## stops_lag                 -3.021e-02  3.118e-02  -0.969 0.333756
## shoot_lag                 -1.114e+01  5.470e+00  -2.036 0.043053 *
## tmax_f                     1.522e-03  5.766e-04   2.640 0.008951 **
## snow_in                    1.109e-02  2.379e-02   0.466 0.641547
## precip_in                 -2.594e-01  8.433e-02  -3.076 0.002389 **
## dplyr::lag(mh_incid_c, 1)  3.154e-01  6.905e-02   4.567  8.6e-06 ***
## dplyr::lag(mh_incid_c, 2)  2.679e-01  6.944e-02   3.859 0.000154 ***
## dplyr::lag(mh_incid_c, 3)  1.350e-01  6.843e-02   1.973 0.049870 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.126 on 201 degrees of freedom
##   (44 observations deleted due to missingness)
## Multiple R-squared:  0.7247, Adjusted R-squared:  0.7055
## F-statistic:  37.8 on 14 and 201 DF,  p-value: < 2.2e-16
```

```
acf2(resid(ts_ar3), max.lag = 7)
```




```
##       [,1] [,2]  [,3] [,4] [,5]  [,6] [,7]
## ACF  -0.05 -0.1 -0.08 0.12 0.12 -0.05 0.01
## PACF -0.05 -0.1 -0.09 0.11 0.12 -0.02 0.04
```

```r
#race specific models

ts_ar3_white <- lm(white_mh_incid_c~t+state_of_emerg+stay_at_home+post_floyd+t_post_floyd+
                         uof_lag+stops_lag+shoot_lag+
                        tmax_f+snow_in+precip_in+
                        dplyr::lag(white_mh_incid_c, 1)+ dplyr::lag(white_mh_incid_c, 2)+
               dplyr::lag(white_mh_incid_c, 3),
             data = series)
summary(ts_ar3_white)
```

```
##
## Call:
## lm(formula = white_mh_incid_c ~ t + state_of_emerg + stay_at_home +
##     post_floyd + t_post_floyd + uof_lag + stops_lag + shoot_lag +
##     tmax_f + snow_in + precip_in + dplyr::lag(white_mh_incid_c,
##     1) + dplyr::lag(white_mh_incid_c, 2) + dplyr::lag(white_mh_incid_c,
##     3), data = series)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.205278 -0.034589 -0.002865  0.038491  0.161720
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       0.0576327  0.0429775   1.341  0.18144
## t                                 0.0003495  0.0001854   1.885  0.06085 .
## state_of_emerg1                  -0.0570246  0.0404216  -1.411  0.15987
## stay_at_home1                     0.0159212  0.0405788   0.392  0.69521
## post_floyd1                       0.0610518  0.0422839   1.444  0.15034
## t_post_floyd                     -0.0045808  0.0014591  -3.140  0.00195 **
## uof_lag                           0.2409374  0.0943712   2.553  0.01142 *
## stops_lag                         0.0032860  0.0157758   0.208  0.83521
## shoot_lag                        -3.6088769  2.7283081  -1.323  0.18742
## tmax_f                            0.0004023  0.0002739   1.469  0.14338
## snow_in                           0.0116618  0.0118124   0.987  0.32471
## precip_in                        -0.0772824  0.0415641  -1.859  0.06444 .
## dplyr::lag(white_mh_incid_c, 1)   0.4573811  0.0695599   6.575  4.1e-10 ***
## dplyr::lag(white_mh_incid_c, 2)   0.2006716  0.0754443   2.660  0.00845 **
## dplyr::lag(white_mh_incid_c, 3)   0.1099192  0.0712538   1.543  0.12449
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06272 on 201 degrees of freedom
##   (44 observations deleted due to missingness)
## Multiple R-squared:  0.7117, Adjusted R-squared:  0.6917
## F-statistic: 35.45 on 14 and 201 DF,  p-value: < 2.2e-16
```

```r
ts_ar3_black <- lm(black_mh_incid_c~t+state_of_emerg+stay_at_home+post_floyd+t_post_floyd+
                         uof_lag+stops_lag+shoot_lag+
                        tmax_f+snow_in+precip_in+
                        dplyr::lag(black_mh_incid_c, 1)+ dplyr::lag(black_mh_incid_c, 2)+
               dplyr::lag(black_mh_incid_c, 3),
             data = series)
summary(ts_ar3_black)
```

```
##
## Call:
## lm(formula = black_mh_incid_c ~ t + state_of_emerg + stay_at_home +
##     post_floyd + t_post_floyd + uof_lag + stops_lag + shoot_lag +
##     tmax_f + snow_in + precip_in + dplyr::lag(black_mh_incid_c,
##     1) + dplyr::lag(black_mh_incid_c, 2) + dplyr::lag(black_mh_incid_c,
##     3), data = series)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.36839 -0.09540  0.00568  0.08856  0.38696
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       0.0133141  0.0889231   0.150 0.881131
## t                                 0.0012456  0.0004332   2.875 0.004470 **
## state_of_emerg1                  -0.2775568  0.0884554  -3.138 0.001958 **
## stay_at_home1                     0.1934573  0.0908775   2.129 0.034491 *
## post_floyd1                       0.2276755  0.0944241   2.411 0.016800 *
## t_post_floyd                     -0.0065160  0.0033862  -1.924 0.055731 .
## uof_lag                           0.1122348  0.2087306   0.538 0.591378
## stops_lag                         0.0400787  0.0347849   1.152 0.250613
## shoot_lag                         0.9174678  6.0390611   0.152 0.879401
## tmax_f                            0.0002117  0.0006119   0.346 0.729732
## snow_in                          -0.0014666  0.0262880  -0.056 0.955563
## precip_in                        -0.1545481  0.0919805  -1.680 0.094467 .
## dplyr::lag(black_mh_incid_c, 1)   0.3398593  0.0687560   4.943 1.62e-06 ***
## dplyr::lag(black_mh_incid_c, 2)   0.1749467  0.0712258   2.456 0.014889 *
## dplyr::lag(black_mh_incid_c, 3)   0.2308650  0.0691262   3.340 0.000999 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1395 on 201 degrees of freedom
##   (44 observations deleted due to missingness)
## Multiple R-squared:  0.7486, Adjusted R-squared:  0.7311
## F-statistic: 42.75 on 14 and 201 DF,  p-value: < 2.2e-16
```

```
ts_ar3_latin <- lm(latin_mh_incid_c~t+state_of_emerg+stay_at_home+post_floyd+t_post_floyd+
                         uof_lag+stops_lag+shoot_lag+
                       tmax_f+snow_in+precip_in+
                       dplyr::lag(latin_mh_incid_c, 1)+ dplyr::lag(latin_mh_incid_c, 2)+
              dplyr::lag(latin_mh_incid_c, 3),
            data = series)
summary(ts_ar3_latin)
```

```
##
## Call:
## lm(formula = latin_mh_incid_c ~ t + state_of_emerg + stay_at_home +
##     post_floyd + t_post_floyd + uof_lag + stops_lag + shoot_lag +
##     tmax_f + snow_in + precip_in + dplyr::lag(latin_mh_incid_c,
##     1) + dplyr::lag(latin_mh_incid_c, 2) + dplyr::lag(latin_mh_incid_c,
##     3), data = series)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -0.32579 -0.08927 -0.00465  0.07260  0.46798
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      0.1204987  0.0889065   1.355   0.1768
## t                                0.0015655  0.0003621   4.323 2.42e-05 ***
## state_of_emerg1                 -0.0954767  0.0853309  -1.119   0.2645
## stay_at_home1                   -0.0255143  0.0884495  -0.288   0.7733
## post_floyd1                      0.0222977  0.0922099   0.242   0.8092
## t_post_floyd                    -0.0011048  0.0031700  -0.349   0.7278
## uof_lag                         -0.0464674  0.2038473  -0.228   0.8199
## stops_lag                        0.0243096  0.0338002   0.719   0.4728
## shoot_lag                       -0.7723934  5.9016926  -0.131   0.8960
## tmax_f                           0.0006489  0.0005994   1.083   0.2803
## snow_in                         -0.0166781  0.0258966  -0.644   0.5203
## precip_in                       -0.0139046  0.0906698  -0.153   0.8783
## dplyr::lag(latin_mh_incid_c, 1)  0.0758069  0.0708497   1.070   0.2859
## dplyr::lag(latin_mh_incid_c, 2)  0.1223659  0.0705450   1.735   0.0843 .
## dplyr::lag(latin_mh_incid_c, 3)  0.1008496  0.0707014   1.426   0.1553
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1366 on 201 degrees of freedom
##   (44 observations deleted due to missingness)
## Multiple R-squared:  0.3949, Adjusted R-squared:  0.3527
## F-statistic: 9.369 on 14 and 201 DF,  p-value: 8.675e-16
```

```
ts_ar3_indig <- lm(indig_mh_incid_c~t+state_of_emerg+stay_at_home+post_floyd+t_post_floyd+
                         uof_lag+stops_lag+shoot_lag+
                        tmax_f+snow_in+precip_in+
                        dplyr::lag(indig_mh_incid_c, 1)+ dplyr::lag(indig_mh_incid_c, 2)+
               dplyr::lag(indig_mh_incid_c, 3),
             data = series)
summary(ts_ar3_indig)
```

```
##
## Call:
## lm(formula = indig_mh_incid_c ~ t + state_of_emerg + stay_at_home +
##     post_floyd + t_post_floyd + uof_lag + stops_lag + shoot_lag +
##     tmax_f + snow_in + precip_in + dplyr::lag(indig_mh_incid_c,
##     1) + dplyr::lag(indig_mh_incid_c, 2) + dplyr::lag(indig_mh_incid_c,
##     3), data = series)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.94513 -0.47980 -0.03261  0.41043  2.16181
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                       0.089262   0.511650   0.174 0.861681
## t                                 0.011113   0.002409   4.613 7.07e-06 ***
## state_of_emerg1                  -1.077793   0.512862  -2.102 0.036841 *
## stay_at_home1                     0.615713   0.517523   1.190 0.235556
## post_floyd1                      -0.006802   0.542786  -0.013 0.990014
## t_post_floyd                     -0.027923   0.019385  -1.440 0.151310
```

```
## uof_lag                           1.091052   1.211417   0.901 0.368857
## stops_lag                         0.129736   0.205540   0.631 0.528629
## shoot_lag                       -20.886282  34.962687  -0.597 0.550921
## tmax_f                            0.012841   0.003692   3.478 0.000619 ***
## snow_in                          -0.096711   0.151970  -0.636 0.525252
## precip_in                        -0.297486   0.534188  -0.557 0.578220
## dplyr::lag(indig_mh_incid_c, 1)   0.089007   0.070456   1.263 0.207945
## dplyr::lag(indig_mh_incid_c, 2)   0.002713   0.071394   0.038 0.969725
## dplyr::lag(indig_mh_incid_c, 3)   0.102463   0.070031   1.463 0.145002
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8053 on 201 degrees of freedom
##   (44 observations deleted due to missingness)
## Multiple R-squared:  0.4718, Adjusted R-squared:  0.435
## F-statistic: 12.82 on 14 and 201 DF,  p-value: < 2.2e-16
```

```
ts_ar3_asian <- lm(asian_mh_incid_c~t+state_of_emerg+stay_at_home+post_floyd+t_post_floyd+
                         uof_lag+stops_lag+shoot_lag+
                        tmax_f+snow_in+precip_in+
                        dplyr::lag(asian_mh_incid_c, 1)+ dplyr::lag(asian_mh_incid_c, 2)+
               dplyr::lag(asian_mh_incid_c, 3),
             data = series)
summary(ts_ar3_asian)
```

```
##
## Call:
## lm(formula = asian_mh_incid_c ~ t + state_of_emerg + stay_at_home +
##     post_floyd + t_post_floyd + uof_lag + stops_lag + shoot_lag +
##     tmax_f + snow_in + precip_in + dplyr::lag(asian_mh_incid_c,
##     1) + dplyr::lag(asian_mh_incid_c, 2) + dplyr::lag(asian_mh_incid_c,
##     3), data = series)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.178990 -0.056598 -0.002371  0.053889  0.249423
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                      0.0890906  0.0509010   1.750 0.081597 .
## t                                0.0006954  0.0001904   3.652 0.000332 ***
## state_of_emerg1                 -0.1011590  0.0526152  -1.923 0.055941 .
## stay_at_home1                    0.0830573  0.0526202   1.578 0.116039
## post_floyd1                      0.0378355  0.0555700   0.681 0.496743
## t_post_floyd                    -0.0011296  0.0018702  -0.604 0.546511
## uof_lag                          0.0070316  0.1193611   0.059 0.953082
## stops_lag                       -0.0060339  0.0198558  -0.304 0.761529
## shoot_lag                       -3.9888752  3.4669359  -1.151 0.251285
## tmax_f                           0.0003517  0.0003468   1.014 0.311636
## snow_in                         -0.0011596  0.0151291  -0.077 0.938978
## precip_in                       -0.0309055  0.0528961  -0.584 0.559695
## dplyr::lag(asian_mh_incid_c, 1)  0.0300318  0.0713681   0.421 0.674350
## dplyr::lag(asian_mh_incid_c, 2)  0.0269563  0.0709769   0.380 0.704502
## dplyr::lag(asian_mh_incid_c, 3) -0.0796674  0.0714802  -1.115 0.266379
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.08022 on 201 degrees of freedom
##   (44 observations deleted due to missingness)
## Multiple R-squared:  0.1816, Adjusted R-squared:  0.1246
## F-statistic: 3.185 on 14 and 201 DF,  p-value: 0.0001512
```

```
stargazer(ts_ar3, ts_ar3_white, ts_ar3_black, ts_ar3_latin,
          title = "Interrupted Time Series Models of Mental Health Discharges",
          covariate.labels = c("T","COVID - State of Emergency", "COVID - Stay at Home",
                               "Post-Killing", "T Post-Killing",
                               "MPD Use of Force t-1", "MPD Stops t-1",
                               "MPD Officer Involved Shootings t-1",
                               "Mean Max. Temp.", "Snow (in.)", "Precip. (in.)",
                               "AR(1) Overall", "AR(2) Overall", "AR(3) Overall",
                               "AR(1) White", "AR(2) White", "AR(3) White",
                               "AR(1) Black", "AR(2) Black", "AR(3) Black",
                               "AR(1) Latine", "AR(2) Latine", "AR(3) Latine"),
          dep.var.caption = "Mental Health Discharges",
          dep.var.labels.include = FALSE,
          column.labels = c("Overall", "White", "Black", "Latine"),
          model.numbers = TRUE,
          single.row = FALSE,
          align = T,
          omit.stat = "adj.rsq",
          font.size="footnotesize", no.space = T, column.sep.width = "1pt",
          star.cutoffs = c(.05, .01, .001), star.char = c("*","**","***"))
```

% Table created by stargazer v.5.2.3 by Marek Hlavac, Social Policy Institute. E-mail: marek.hlavac at gmail.com % Date and time: Fri, Apr 07, 2023 - 6:01:06 PM % Requires LaTeX packages: dcolumn

ZCTA-Week Level Analysis

Panel Analysis

```
## Warning: package 'lavaan' was built under R version 4.2.3
```

```
## Warning in lav_data_full(data = data, group = group, cluster = cluster, :
## lavaan WARNING: some observed variances are (at least) a factor 1000 times
## larger than others; use varTable(fit) to investigate
```

```
## Warning in lav_data_full(data = data, group = group, cluster = cluster, : lavaan WARNING: some obser
##   lavaan NOTE: use varTable(fit) to investigate
```

```
##                lhs op            rhs      mi    epc sepc.lv sepc.all sepc.nox
## 13     unemp_rate ~~       pov_rate   6.692  1.221   1.221    0.035    0.035
## 14     unemp_rate ~~ female_hh_rate  98.234 -0.805  -0.805   -0.196   -0.196
## 15     unemp_rate ~~ no_hs_dip_rate  77.525  1.305   1.305    0.148    0.148
## 16       pov_rate ~~ female_hh_rate 667.761 -4.369  -4.369   -0.422   -0.422
## 17       pov_rate ~~ no_hs_dip_rate 592.734  8.179   8.179    0.369    0.369
## 19 female_hh_rate ~~ no_hs_dip_rate  13.188  0.339   0.339    0.128    0.128
```

```
## lavaan 0.6.15 ended normally after 47 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
```

Table 1: Interrupted Time Series Models of Mental Health Discharges

	Mental Health Discharges			
	Overall	White	Black	Latine
	(1)	(2)	(3)	(4)
T	−0.0001	0.0003	0.001**	0.002***
	(0.0003)	(0.0002)	(0.0004)	(0.0004)
COVID - State of Emergency	−0.198*	−0.057	−0.278**	−0.095
	(0.081)	(0.040)	(0.088)	(0.085)
COVID - Stay at Home	0.066	0.016	0.193*	−0.026
	(0.083)	(0.041)	(0.091)	(0.088)
Post-Killing	0.152	0.061	0.228*	0.022
	(0.085)	(0.042)	(0.094)	(0.092)
T Post-Killing	−0.010**	−0.005**	−0.007	−0.001
	(0.003)	(0.001)	(0.003)	(0.003)
MPD Use of Force t-1	0.412*	0.241*	0.112	−0.046
	(0.188)	(0.094)	(0.209)	(0.204)
MPD Stops t-1	−0.030	0.003	0.040	0.024
	(0.031)	(0.016)	(0.035)	(0.034)
MPD Officer Involved Shootings t-1	−11.137*	−3.609	0.917	−0.772
	(5.470)	(2.728)	(6.039)	(5.902)
Mean Max. Temp.	0.002**	0.0004	0.0002	0.001
	(0.001)	(0.0003)	(0.001)	(0.001)
Snow (in.)	0.011	0.012	−0.001	−0.017
	(0.024)	(0.012)	(0.026)	(0.026)
Precip. (in.)	−0.259**	−0.077	−0.155	−0.014
	(0.084)	(0.042)	(0.092)	(0.091)
AR(1) Overall	0.315***			
	(0.069)			
AR(2) Overall	0.268***			
	(0.069)			
AR(3) Overall	0.135*			
	(0.068)			
AR(1) White		0.457***		
		(0.070)		
AR(2) White		0.201**		
		(0.075)		
AR(3) White		0.110		
		(0.071)		
AR(1) Black			0.340***	
			(0.069)	
AR(2) Black			0.175*	
			(0.071)	
AR(3) Black			0.231***	
			(0.069)	
AR(1) Latine				0.076
				(0.071)
AR(2) Latine				0.122
				(0.071)
AR(3) Latine				0.101
				(0.071)
Constant	0.601***	0.058	0.013	0.120
	(0.176)	(0.043)	(0.089)	(0.089)
Observations	216	216	216	216
R^2	0.725	0.712	0.749	0.395
Residual Std. Error (df = 201)	0.126	0.063	0.140	0.137
F Statistic (df = 14; 201)	37.797***	35.448***	42.751***	9.369***
Note:				*p<0.05; **p<0.01; ***p<0.001

```
##   Number of model parameters                        11
##
##   Number of observations                          5742
##
## Model Test User Model:
##
##   Test statistic                              1186.074
##   Degrees of freedom                                 4
##   P-value (Chi-square)                           0.000
##
## Model Test Baseline Model:
##
##   Test statistic                             15500.990
##   Degrees of freedom                                10
##   P-value                                        0.000
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    0.924
##   Tucker-Lewis Index (TLI)                       0.809
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)            -115690.433
##   Loglikelihood unrestricted model (H1)    -115097.396
##
##   Akaike (AIC)                              231402.865
##   Bayesian (BIC)                            231476.076
##   Sample-size adjusted Bayesian (SABIC)     231441.122
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.227
##   90 Percent confidence interval - lower         0.216
##   90 Percent confidence interval - upper         0.238
##   P-value H_0: RMSEA <= 0.050                    0.000
##   P-value H_0: RMSEA >= 0.080                    1.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.049
##
## Parameter Estimates:
##
##   Standard errors                             Standard
##   Information                                 Expected
##   Information saturated (h1) model          Structured
##
## Latent Variables:
##                    Estimate     Std.Err   z-value  P(>|z|)   Std.lv     Std.all
##   cd =~
##     unemp_rate          1.834     0.056   32.752    0.000       1.834    0.444
##     pov_rate            5.673     0.139   40.859    0.000       5.673    0.520
##     female_hh_rate      1.925     0.024   80.082    0.000       1.925    0.866
```

```
##     no_hs_dip_rate       3.434     0.046   74.115    0.000       3.434    0.822
##     black_pop         3606.213    40.331   89.416    0.000    3606.213    0.930
##
## Covariances:
##                    Estimate     Std.Err   z-value  P(>|z|)   Std.lv     Std.all
##  .unemp_rate ~~
##    .black_pop          422.838   109.450    3.863    0.000     422.838    0.080
##
## Variances:
##                    Estimate     Std.Err   z-value  P(>|z|)   Std.lv     Std.all
##    .unemp_rate          13.712     0.268   51.234    0.000      13.712    0.803
##    .pov_rate            86.768     1.673   51.873    0.000      86.768    0.729
##    .female_hh_rate       1.233     0.034   36.717    0.000       1.233    0.250
##    .no_hs_dip_rate       5.657     0.132   42.766    0.000       5.657    0.324
##    .black_pop      2047184.631 92832.942   22.052    0.000 2047184.631    0.136
##     cd                   1.000                                   1.000    1.000

## Warning: package 'lme4' was built under R version 4.2.3

## Warning: Some predictor variables are on very different scales: consider
## rescaling

## Warning: Some predictor variables are on very different scales: consider
## rescaling

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula:
## mh_rate ~ t + state_of_emerg + stay_at_home + post_floyd + t_post_floyd +
##     uof_lag + stops_lag + shoot_lag + tmax_f + snow_in + precip_in +
##     conc_dis + dplyr::lag(mh_rate, 1) + dplyr::lag(mh_rate, 2) +
##     dplyr::lag(mh_rate, 3) + (1 + post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 19467.1
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -10.7712  -0.1859  -0.0061   0.1722  14.4836
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept) 15.647   3.956
##           post_floyd1  2.036   1.427    -1.00
##  Residual              2.171   1.473
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                          Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)             2.844e+00  8.497e-01  2.160e+01   3.347  0.00297 **
## t                       9.017e-04  3.754e-04  4.642e+03   2.402  0.01633 *
## state_of_emerg1        -1.627e-01  2.025e-01  5.251e+03  -0.804  0.42172
## stay_at_home1          -4.903e-01  2.105e-01  5.253e+03  -2.330  0.01986 *
## post_floyd1             8.261e+01  1.543e+01  5.283e+03   5.355 8.94e-08 ***
## t_post_floyd           -5.247e-03  9.726e-04  5.280e+03  -5.395 7.15e-08 ***
```

```
## uof_lag                -8.334e-03  7.339e-03  5.072e+03  -1.136  0.25621
## stops_lag               3.004e-04  1.015e-03  5.270e+03   0.296  0.76720
## shoot_lag              -1.040e-01  1.536e-01  5.273e+03  -0.677  0.49832
## tmax_f                  3.351e-03  1.188e-03  5.246e+03   2.820  0.00482 **
## snow_in                 9.422e-02  5.750e-02  5.245e+03   1.639  0.10135
## precip_in               2.141e-02  1.966e-01  5.246e+03   0.109  0.91329
## conc_dis               -2.671e-01  1.434e-01  1.902e+01  -1.863  0.07801 .
## dplyr::lag(mh_rate, 1) -4.467e-04  1.372e-02  5.303e+03  -0.033  0.97402
## dplyr::lag(mh_rate, 2)  5.058e-03  1.148e-02  5.295e+03   0.441  0.65940
## dplyr::lag(mh_rate, 3)  1.256e-02  1.148e-02  5.295e+03   1.095  0.27372
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling

## Warning: Some predictor variables are on very different scales: consider
## rescaling

## Warning: Some predictor variables are on very different scales: consider
## rescaling

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula:
## mh_rate ~ t + state_of_emerg + stay_at_home + post_floyd + t_post_floyd +
##     uof_lag + stops_lag + shoot_lag + tmax_f + snow_in + precip_in +
##     conc_dis + post_floyd:conc_dis + dplyr::lag(mh_rate, 1) +
##     dplyr::lag(mh_rate, 2) + dplyr::lag(mh_rate, 3) + (1 + post_floyd |
##     zcta)
##    Data: panel
##
## REML criterion at convergence: 19443.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -10.8669  -0.1897  -0.0079   0.1725  14.6442
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept) 16.634   4.079
##           post_floyd1  2.291   1.514    -1.00
##  Residual              2.162   1.470
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                          Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)             2.902e+00  8.757e-01  2.137e+01   3.314  0.00325 **
## t                       4.497e-04  3.852e-04  5.299e+03   1.167  0.24310
## state_of_emerg1        -1.673e-01  2.021e-01  5.282e+03  -0.828  0.40762
## stay_at_home1          -4.848e-01  2.100e-01  5.282e+03  -2.308  0.02102 *
## post_floyd1             7.876e+01  1.540e+01  5.254e+03   5.114 3.27e-07 ***
## t_post_floyd           -5.004e-03  9.710e-04  5.251e+03  -5.154 2.65e-07 ***
## uof_lag                -9.502e-03  7.317e-03  5.283e+03  -1.299  0.19414
## stops_lag               1.644e-04  1.012e-03  5.286e+03   0.162  0.87104
## shoot_lag              -9.523e-02  1.532e-01  5.282e+03  -0.622  0.53428
```

```
## tmax_f                  3.395e-03  1.186e-03  5.282e+03   2.863  0.00421 **
## snow_in                 9.375e-02  5.738e-02  5.282e+03   1.634  0.10234
## precip_in               3.747e-02  1.962e-01  5.282e+03   0.191  0.84855
## conc_dis               -1.311e+00  2.521e-01  2.152e+03  -5.198 2.21e-07 ***
## dplyr::lag(mh_rate, 1)  3.896e-04  1.369e-02  5.302e+03   0.028  0.97729
## dplyr::lag(mh_rate, 2)  7.019e-03  1.146e-02  5.297e+03   0.613  0.54018
## dplyr::lag(mh_rate, 3)  1.071e-02  1.146e-02  5.298e+03   0.935  0.35009
## post_floyd1:conc_dis    6.137e-01  1.189e-01  4.012e+02   5.160 3.89e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see help('isSingular')
```

Figure 3: RE Coefficients

Rate per 1,000

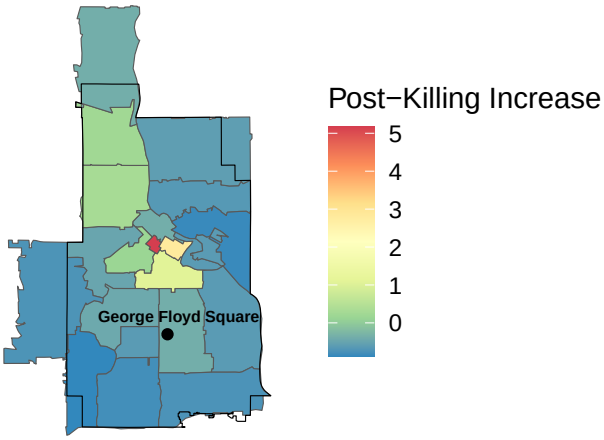
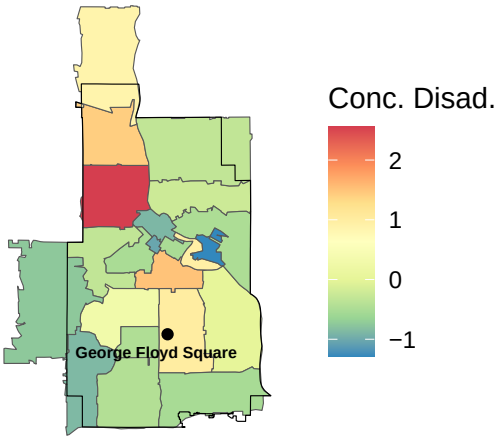


Figure 5: Concentrated Disadvantag

Standard Deviation Units




```
stargazer(re, re_int,
          title = "Interrupted Time Series Random Coefficient Models of Mental Health",
          covariate.labels = c("T","COVID - State of Emergency", "COVID - Stay at Home",
                               "Post-Killing", "T Post-Killing",
                               "MPD Use of Force t-1", "MPD Stops t-1",
                               "MPD Officer Involved Shootings t-1",
                               "Mean Max. Temp.", "Snow (in.)", "Precip. (in.)",
                               "Conc. Disad.",
                               "AR(1)", "AR(2)", "AR(3)", "Post-Floyd X Conc.Disad."),
          dep.var.caption = "Mental Health Discharges",
          dep.var.labels.include = FALSE,
```

```
          column.labels = c("RE", "RE w/ Interaction"),
          model.numbers = TRUE,
          single.row = FALSE,
          align = T,
          omit.stat = "adj.rsq",
          font.size="footnotesize", no.space = T, column.sep.width = "1pt",
          star.cutoffs = c(.05, .01, .001), star.char = c("*","**","***"),
          add.lines = list(c("Resid. Var.", round(attr(VarCorr(re), "sc")^2,2),
                             round(attr(VarCorr(re_int), "sc")^2,2)),
                                    c("ZCTA Var.",
                                      round(var_re$zcta[1,1],2),
                                      round(var_re_int$zcta[1,1],2)),
                             c("Post-Floyd Var.",
                                      round(var_re$zcta[2,2],2),
                                      round(var_re_int$zcta[2,2],2))))
```

% Table created by stargazer v.5.2.3 by Marek Hlavac, Social Policy Institute. E-mail: marek.hlavac at gmail.com % Date and time: Fri, Apr 07, 2023 - 6:01:08 PM % Requires LaTeX packages: dcolumn

Table 2: Interrupted Time Series Random Coefficient Models of Mental Health

	Mental Health Discharges	
	RE	RE w/ Interaction
	(1)	(2)
T	0.001*	0.0004
	(0.0004)	(0.0004)
COVID - State of Emergency	−0.163	−0.167
	(0.202)	(0.202)
COVID - Stay at Home	−0.490*	−0.485*
	(0.210)	(0.210)
Post-Killing	82.610***	78.762***
	(15.428)	(15.402)
T Post-Killing	−0.005***	−0.005***
	(0.001)	(0.001)
MPD Use of Force t-1	−0.008	−0.010
	(0.007)	(0.007)
MPD Stops t-1	0.0003	0.0002
	(0.001)	(0.001)
MPD Officer Involved Shootings t-1	−0.104	−0.095
	(0.154)	(0.153)
Mean Max. Temp.	0.003**	0.003**
	(0.001)	(0.001)
Snow (in.)	0.094	0.094
	(0.057)	(0.057)
Precip. (in.)	0.021	0.037
	(0.197)	(0.196)
Conc. Disad.	−0.267	−1.311***
	(0.143)	(0.252)
AR(1)	−0.0004	0.0004
	(0.014)	(0.014)
AR(2)	0.005	0.007
	(0.011)	(0.011)
AR(3)	0.013	0.011
	(0.011)	(0.011)
Post-Floyd X Conc.Disad.		0.614***
		(0.119)
Constant	2.844***	2.902***
	(0.850)	(0.876)
Resid. Var.	2.17	2.16
ZCTA Var.	15.65	16.63
Post-Floyd Var.	2.04	2.29
Observations	5,320	5,320
Log Likelihood	-9,733.530	-9,721.851
Akaike Inf. Crit.	19,507.060	19,485.700
Bayesian Inf. Crit.	19,638.640	19,623.870
Note:	*p<0.05; **p<0.01; ***p<0.001	