Mental Health Series

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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.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_rate = total_use_of_force/total_pop*1000,
         stops_rate = total_police_stops/total_pop*1000,
         ois_rate = total_police_shootings/total_pop*1000) %>%
  group_by(zcta) %>%
  arrange(year, weekofyr) %>%
  mutate(t = row_number(),
         uof_lag = dplyr::lag(uof_rate, 1),
         stops_lag = dplyr::lag(stops_rate, 1),
         shoot_lag = dplyr::lag(ois_rate, 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"))
```

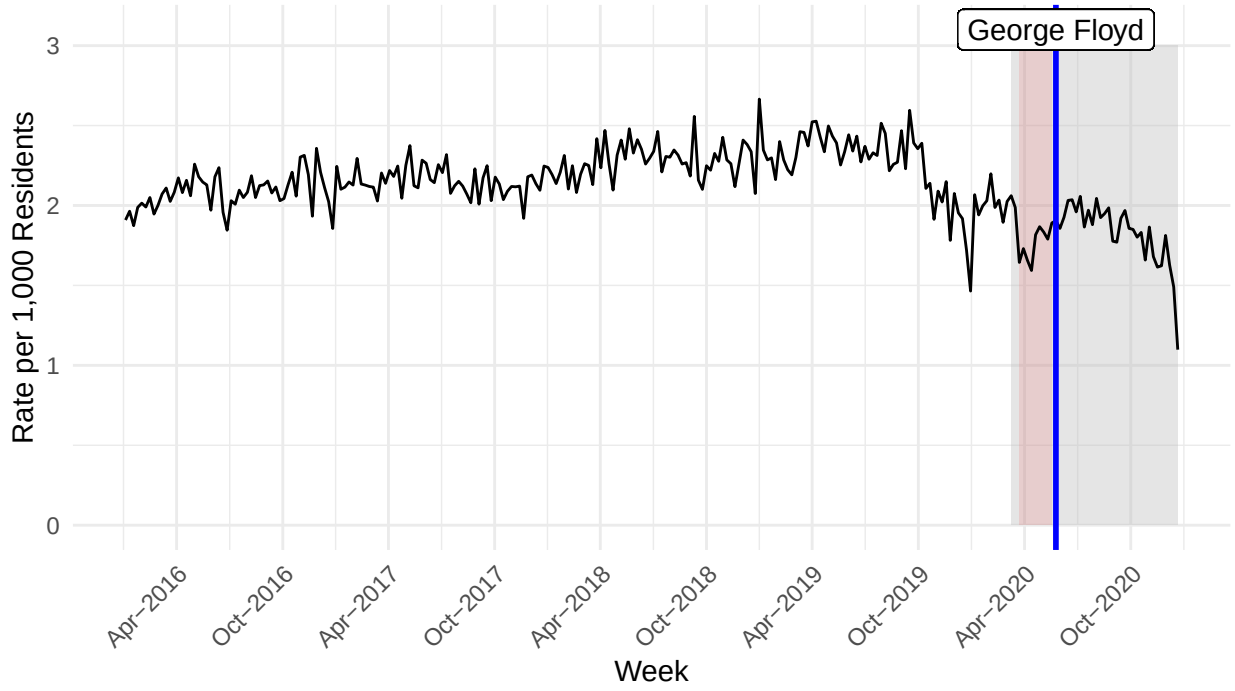
Time Series Vizualization

```
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("2020-12-27"))],
  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 Diagnoses, Minneapolis 2016-2020",
     subtitle = "MHA Hospital Data",
     x = "Week",
     y = "Rate per 1,000 Residents",
     fill = "MN COVID-19 Policy",
     caption = "The grey period represents the COVID-19 State of Emergency order,
     and the red represents the COVID-19 Stay at Home order.")+
theme_minimal()+
  theme(axis.text.x=element_text(angle=45, hjust=1))
```

Figure 1: Weekly Mental Health Diagnoses, Minneapolis 2016−2020

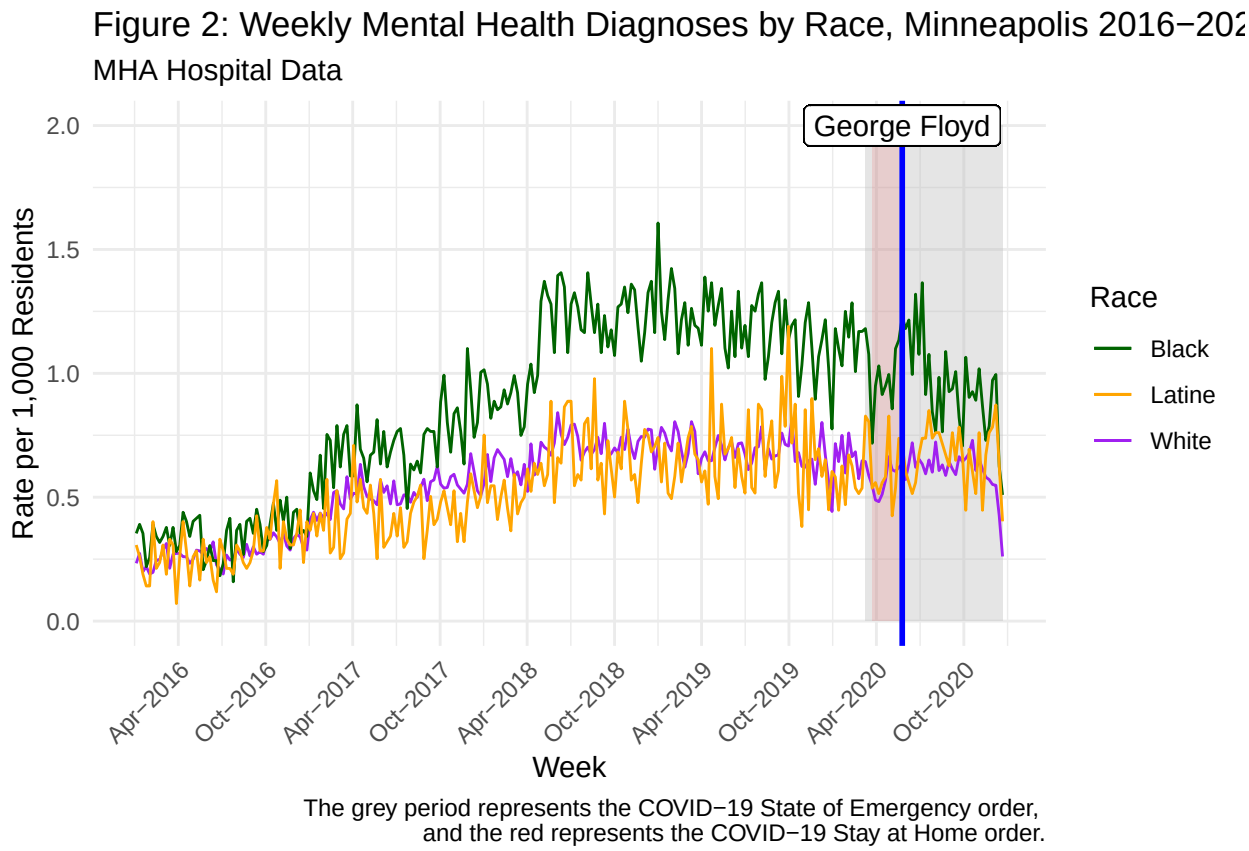
MHA Hospital Data



The grey period represents the COVID−19 State of Emergency order, and the red represents the COVID−19 Stay at Home order.

```
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("2020-12-27"))],
    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 = "Latine"))+
  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 Diagnoses by Race, Minneapolis 2016-2020",
```

```
      subtitle = "MHA Hospital Data",
      x = "Week",
      y = "Rate per 1,000 Residents",
      fill = "MN COVID-19 Policy",
      color = "Race",
      caption = "The grey period represents the COVID-19 State of Emergency order,
      and the red represents the COVID-19 Stay at Home order.")+
  theme_minimal()+
    theme(axis.text.x=element_text(angle=45, hjust=1)) +
   scale_color_manual(values = c("darkgreen", "orange", "purple"))
```



Time Series Analysis

$$y_t = \beta_0 + \beta_1 Time_t + \theta Event_t + \beta_2 TimePost_t + \phi \mathbf{X}_t + \rho_1 y_{t-1} + \rho_2 y_{t-2} + \rho_3 y_{t-3} + \epsilon_t$$

```
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))

mean(series$mh_incid_c[series$post_floyd==0 & series$weeks_post %in% c(-1, -2, -3, -4)])
```

```
## [1] 1.845131
```

```
mean(series$mh_incid_c[series$post_floyd==1 & series$weeks_post %in% c(0,1,2,3)])
```

```
## [1] 1.929959
```

```
mean(series$black_mh_incid_c[series$post_floyd==0 & series$weeks_post %in% c(-1, -2, -3, -4)])
```

```
## [1] 1.021377
```

```
mean(series$black_mh_incid_c[series$post_floyd==1 & series$weeks_post %in% c(0,1,2,3)])
```

```
## [1] 1.154474
```

```
mean(series$white_mh_incid_c[series$post_floyd==0 & series$weeks_post %in% c(-1, -2, -3, -4)])
```

```
## [1] 0.6247813
```

```
mean(series$white_mh_incid_c[series$post_floyd==1 & series$weeks_post %in% c(0,1,2,3)])
```

```
## [1] 0.6404627
```

```
mean(series$latin_mh_incid_c[series$post_floyd==0 & series$weeks_post %in% c(-1, -2, -3, -4)])
```

```
## [1] 0.6318638
```

```
mean(series$latin_mh_incid_c[series$post_floyd==1 & series$weeks_post %in% c(0,1,2,3)])
```

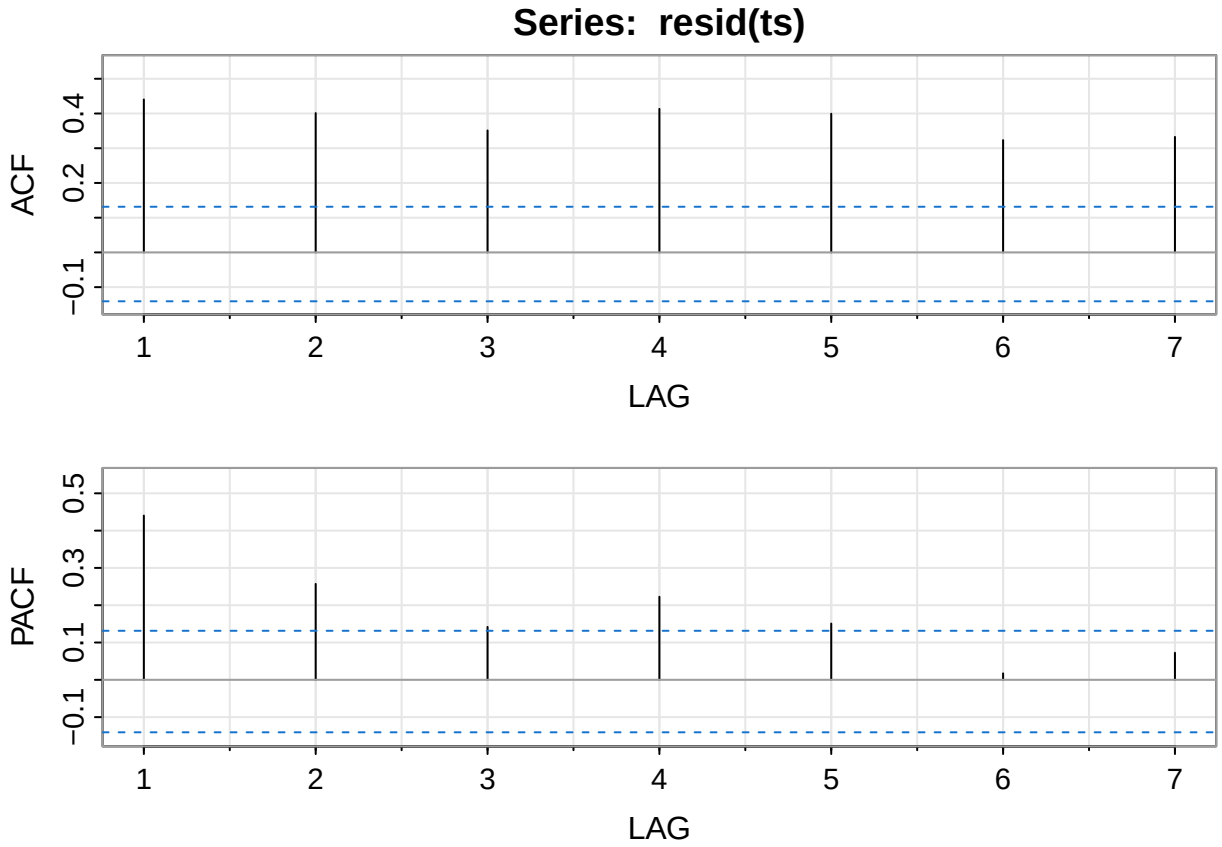
```
## [1] 0.5983135
```

```
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
```

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



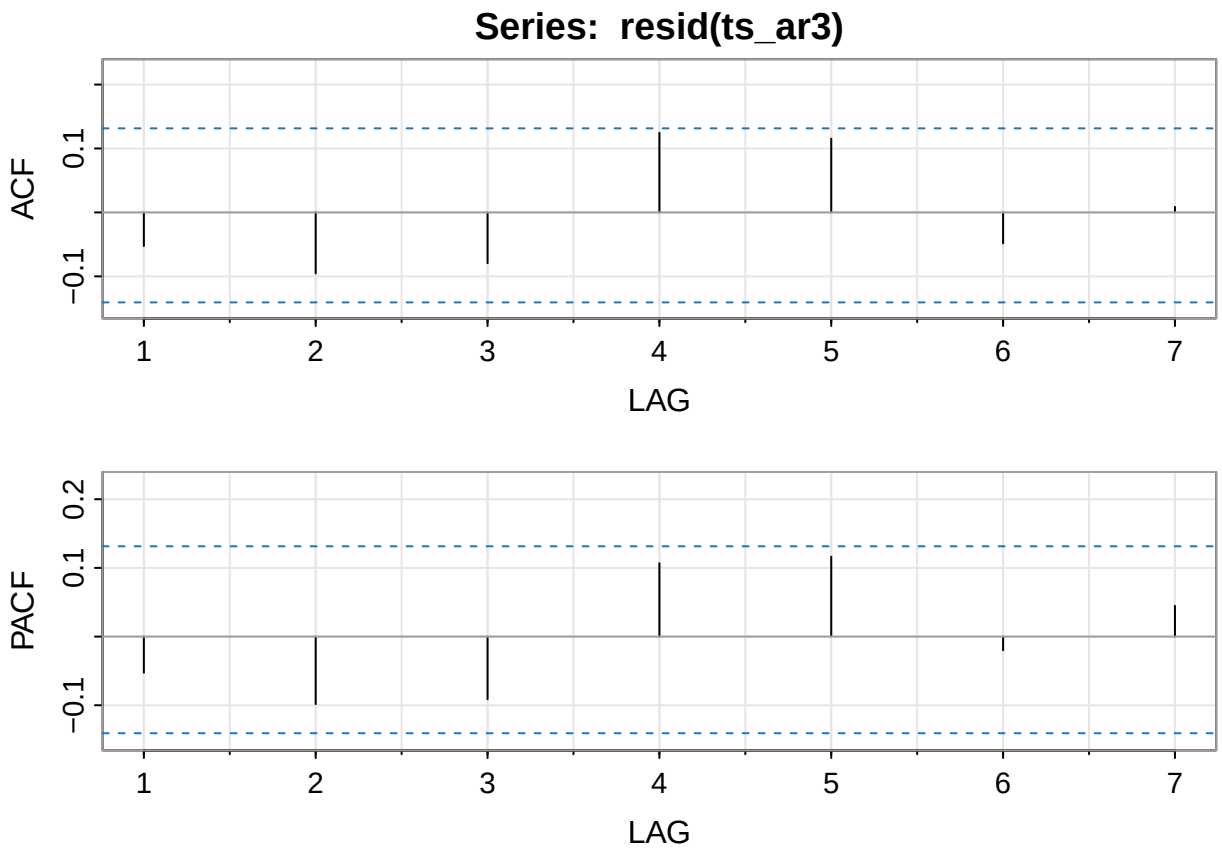

```
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7]
## ACF  0.44 0.40 0.35 0.41 0.40 0.32 0.33
## PACF 0.44 0.26 0.14 0.22 0.15 0.02 0.07
```

```
ts_ar3<- lm(mh_incid_c~t+post_floyd+t_post_floyd+
              state_of_emerg+stay_at_home+
                          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)
```

```r
summary(ts_ar3)
```

```
##
## Call:
## lm(formula = mh_incid_c ~ t + post_floyd + t_post_floyd + state_of_emerg +
##     stay_at_home + 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
## 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 **
## 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
## 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
```

```r
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
```

```
#race specific models

ts_ar3_white <- lm(white_mh_incid_c~t+post_floyd+t_post_floyd+
                     state_of_emerg+stay_at_home+
                          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 + post_floyd + t_post_floyd +
##     state_of_emerg + stay_at_home + 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 .
## post_floyd1                      0.0610518  0.0422839   1.444  0.15034
## t_post_floyd                    -0.0045808  0.0014591  -3.140  0.00195 **
## state_of_emerg1                 -0.0570246  0.0404216  -1.411  0.15987
## stay_at_home1                    0.0159212  0.0405788   0.392  0.69521
## 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
```

```
ts_ar3_black <- lm(black_mh_incid_c~t+post_floyd+t_post_floyd+
                     state_of_emerg+stay_at_home+
                          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 + post_floyd + t_post_floyd +
##     state_of_emerg + stay_at_home + 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 **
## post_floyd1                      0.2276755  0.0944241   2.411 0.016800 *
## t_post_floyd                    -0.0065160  0.0033862  -1.924 0.055731 .
## state_of_emerg1                 -0.2775568  0.0884554  -3.138 0.001958 **
## stay_at_home1                    0.1934573  0.0908775   2.129 0.034491 *
## 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+post_floyd+t_post_floyd+
                     state_of_emerg+stay_at_home+
                          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 + post_floyd + t_post_floyd +
##     state_of_emerg + stay_at_home + 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 ***
## post_floyd1                       0.0222977  0.0922099   0.242   0.8092
## t_post_floyd                     -0.0011048  0.0031700  -0.349   0.7278
## state_of_emerg1                  -0.0954767  0.0853309  -1.119   0.2645
## stay_at_home1                    -0.0255143  0.0884495  -0.288   0.7733
## 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+post_floyd+t_post_floyd+
                     state_of_emerg+stay_at_home+
                          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 + post_floyd + t_post_floyd +
##     state_of_emerg + stay_at_home + 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 ***
## post_floyd1                       -0.006802   0.542786  -0.013 0.990014
## t_post_floyd                      -0.027923   0.019385  -1.440 0.151310
## state_of_emerg1                   -1.077793   0.512862  -2.102 0.036841 *
## stay_at_home1                      0.615713   0.517523   1.190 0.235556
## 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+post_floyd+t_post_floyd+
                     state_of_emerg+stay_at_home+
```

```
                         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 + post_floyd + t_post_floyd +
##     state_of_emerg + stay_at_home + 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 ***
## post_floyd1                       0.0378355  0.0555700   0.681 0.496743
## t_post_floyd                     -0.0011296  0.0018702  -0.604 0.546511
## state_of_emerg1                  -0.1011590  0.0526152  -1.923 0.055941 .
## stay_at_home1                     0.0830573  0.0526202   1.578 0.116039
## 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 Diagnoses, Minneapolis 2016-2020",
          covariate.labels = c("T",
                               "Post-Killing", "T Post-Killing",
                               "COVID - State of Emerg.", "COVID - Stay at Home",
                               "MPD Use of Force t-1", "MPD Stops t-1",
                               "MPD OIS 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 Diagnoses/1,000",
          dep.var.labels.include = FALSE,
          column.labels = c("Overall", "White", "Black", "Latine"),
          model.numbers = TRUE,
          single.row = FALSE,
          align = T,
          omit.stat = c("adj.rsq", "f"),
          font.size="footnotesize", no.space = T, column.sep.width = "1pt",
          #star.cutoffs = c(.05, .01, .001), star.char = c("*","**","***"),
          report = "vcs",
          ci=TRUE,
          ci.level=0.95,
          ci.separator = "|",
          notes = "95\\% Confidence Intervals in parentheses",
          header = F,
          notes.append = F)
```

ZCTA-Week Level Analysis

Panel Analysis

```
panel <- panel %>%
  mutate(black_pop_center = scale(black_pop, center = T, scale = T),
         post_floyd = as.factor(post_floyd),
         stay_at_home = as.factor(stay_at_home),
         state_of_emerg = as.factor(state_of_emerg),
         mh_rate = mh_all_tot/total_pop*1000,
         blk_mh_rate = black_mh_all_tot/black_pop*1000,
         white_mh_rate = white_mh_all_tot/white_pop*1000,
         latin_mh_rate = latin_mh_all_tot/hisp_pop*1000)

#CFA: CD
library(lavaan)
```

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

```
cd_model_1  <- ' cd =~ unemp_rate + pov_rate +  female_hh_rate + no_hs_dip_rate + black_pop
                 black_pop ~~ unemp_rate'

cfa_cd <- cfa(cd_model_1, data = panel, std.lv = T)
```

```
## 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
```

```
modificationindices(cfa_cd)
```

```
##              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
```

Table 1: Interrupted Time Series Models of Mental Health Diagnoses, Minneapolis 2016-2020

	Mental Health Diagnoses/1,000			
	Overall	White	Black	Latine
	(1)	(2)	(3)	(4)
T	−0.0001	0.0003	0.001	0.002
	(-0.001|0.0004)	(-0.00001|0.001)	(0.0004|0.002)	(0.001|0.002)
Post-Killing	0.152	0.061	0.228	0.022
	(-0.015|0.319)	(-0.022|0.144)	(0.043|0.413)	(-0.158|0.203)
T Post-Killing	−0.010	−0.005	−0.007	−0.001
	(-0.015|-0.004)	(-0.007|-0.002)	(-0.013|0.0001)	(-0.007|0.005)
COVID - State of Emerg.	−0.198	−0.057	−0.278	−0.095
	(-0.357|-0.039)	(-0.136|0.022)	(-0.451|-0.104)	(-0.263|0.072)
COVID - Stay at Home	0.066	0.016	0.193	−0.026
	(-0.096|0.228)	(-0.064|0.095)	(0.015|0.372)	(-0.199|0.148)
MPD Use of Force t-1	0.412	0.241	0.112	−0.046
	(0.042|0.781)	(0.056|0.426)	(-0.297|0.521)	(-0.446|0.353)
MPD Stops t-1	−0.030	0.003	0.040	0.024
	(-0.091|0.031)	(-0.028|0.034)	(-0.028|0.108)	(-0.042|0.091)
MPD OIS t-1	−11.137	−3.609	0.917	−0.772
	(-21.857|-0.416)	(-8.956|1.739)	(-10.919|12.754)	(-12.339|10.795)
Mean Max. Temp.	0.002	0.0004	0.0002	0.001
	(0.0004|0.003)	(-0.0001|0.001)	(-0.001|0.001)	(-0.001|0.002)
Snow (in.)	0.011	0.012	−0.001	−0.017
	(-0.036|0.058)	(-0.011|0.035)	(-0.053|0.050)	(-0.067|0.034)
Precip. (in.)	−0.259	−0.077	−0.155	−0.014
	(-0.425|-0.094)	(-0.159|0.004)	(-0.335|0.026)	(-0.192|0.164)
AR(1) Overall	0.315			
	(0.180|0.451)			
AR(2) Overall	0.268			
	(0.132|0.404)			
AR(3) Overall	0.135			
	(0.001|0.269)			
AR(1) White		0.457		
		(0.321|0.594)		
AR(2) White		0.201		
		(0.053|0.349)		
AR(3) White		0.110		
		(-0.030|0.250)		
AR(1) Black			0.340	
			(0.205|0.475)	
AR(2) Black			0.175	
			(0.035|0.315)	
AR(3) Black			0.231	
			(0.095|0.366)	
AR(1) Latine				0.076
				(-0.063|0.215)
AR(2) Latine				0.122
				(-0.016|0.261)
AR(3) Latine				0.101
				(-0.038|0.239)
Constant	0.601	0.058	0.013	0.120
	(0.256|0.946)	(-0.027|0.142)	(-0.161|0.188)	(-0.054|0.295)
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

Note: 95% Confidence Intervals in parentheses

```
## 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
```

```
summary(cfa_cd, fit.measures=TRUE, standardized = T)
```

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

```
cd_predict <- as.vector(lavPredict(cfa_cd, newdata = as.data.frame(panel)))
panel$conc_dis <- cd_predict
```

$y_{ti} = \beta_{0i} + \beta_1 Time_t + \theta_i Event_t + \beta_2 TimePost_t + \phi \mathbf{X}_{ti} + \rho_1 y_{t-1} + \rho_2 y_{t-2} + \rho_3 y_{t-3} + \epsilon_{ti}$

$\beta_{0i} = \gamma_{00} + u_{0i}$

$\theta_i = \gamma_{10} + u_i$

```
#random effects specifications
library(lme4)
```

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

```
library(lmerTest)

#RE random coefficient model
re <- lmer(mh_rate~t+post_floyd+t_post_floyd+
                        state_of_emerg+stay_at_home+
                         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)+
                       (post_floyd|zcta), data = panel)
```

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

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

```
summary(re)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula:
## mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg + stay_at_home +
##     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) + (post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 19403.6
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -11.1733  -0.1857  -0.0051   0.1690  15.0711
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept) 16.203   4.025
##           post_floyd1  2.025   1.423    -1.00
##  Residual              2.152   1.467
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                            Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)              2.861e+00  8.643e-01  2.147e+01   3.310  0.00326 **
## t                        7.629e-04  3.574e-04  4.887e+03   2.134  0.03285 *
## post_floyd1             -1.844e-01  3.712e-01  4.190e+01  -0.497  0.62196
## t_post_floyd            -3.708e-02  6.749e-03  5.279e+03  -5.494 4.11e-08 ***
## state_of_emerg1         -1.377e-01  2.012e-01  5.259e+03  -0.684  0.49374
## stay_at_home1           -5.034e-01  2.094e-01  5.261e+03  -2.404  0.01625 *
## uof_lag                 -6.568e-02  1.013e-02  5.280e+03  -6.481 9.92e-11 ***
## stops_lag                7.832e-03  4.799e-03  5.266e+03   1.632  0.10271
## shoot_lag               -3.098e+00  2.505e+00  5.283e+03  -1.237  0.21618
## tmax_f                   3.528e-03  1.182e-03  5.255e+03   2.984  0.00286 **
## snow_in                  9.524e-02  5.722e-02  5.254e+03   1.664  0.09610 .
## precip_in                3.347e-02  1.957e-01  5.256e+03   0.171  0.86420
## conc_dis                -1.607e-01  1.354e-01  2.251e+01  -1.187  0.24754
## dplyr::lag(mh_rate, 1) -8.035e-04  1.365e-02  5.304e+03  -0.059  0.95306
## dplyr::lag(mh_rate, 2)  3.760e-03  1.141e-02  5.286e+03   0.330  0.74178
## dplyr::lag(mh_rate, 3)  1.302e-02  1.140e-02  5.285e+03   1.142  0.25363
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

```
re_blk <- lmer(blk_mh_rate~t+post_floyd+t_post_floyd+
                         state_of_emerg+stay_at_home+
                          uof_lag+stops_lag+shoot_lag+
                         tmax_f+snow_in+precip_in+
             conc_dis+
              dplyr::lag(blk_mh_rate, 1)+ dplyr::lag(blk_mh_rate, 2)+
               dplyr::lag(blk_mh_rate, 3)+
```

```
                        (post_floyd|zcta), data = panel)
```

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

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

```
summary(re_blk)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: blk_mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg +
##     stay_at_home + uof_lag + stops_lag + shoot_lag + tmax_f +
##     snow_in + precip_in + conc_dis + dplyr::lag(blk_mh_rate,
##     1) + dplyr::lag(blk_mh_rate, 2) + dplyr::lag(blk_mh_rate,
##     3) + (post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 29185.6
##
## Scaled residuals:
##    Min     1Q Median     3Q    Max
## -2.683 -0.146 -0.021  0.088 35.992
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept)  2.283   1.511
##           post_floyd1  1.560   1.249    -0.54
##  Residual             13.736   3.706
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                                Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)                   7.566e-01  3.823e-01  2.762e+01   1.979  0.05785
## t                             5.833e-03  9.135e-04  5.137e+03   6.386 1.86e-10
## post_floyd1                   2.918e+00  6.045e-01  1.942e+02   4.827 2.80e-06
## t_post_floyd                 -7.242e-02  1.707e-02  5.278e+03  -4.242 2.25e-05
## state_of_emerg1              -2.499e+00  5.085e-01  5.249e+03  -4.914 9.20e-07
## stay_at_home1                 2.277e+00  5.285e-01  5.249e+03   4.309 1.67e-05
## uof_lag                      -9.977e-02  2.496e-02  3.188e+03  -3.997 6.55e-05
## stops_lag                     2.345e-02  1.159e-02  1.385e+03   2.024  0.04318
## shoot_lag                    -1.463e+00  6.414e+00  5.267e+03  -0.228  0.81951
## tmax_f                       -1.128e-03  2.984e-03  5.247e+03  -0.378  0.70554
## snow_in                      -1.148e-01  1.445e-01  5.245e+03  -0.795  0.42687
## precip_in                    -3.439e-01  4.946e-01  5.246e+03  -0.695  0.48682
## conc_dis                     -8.981e-01  2.716e-01  2.228e+01  -3.306  0.00317
## dplyr::lag(blk_mh_rate, 1) -8.112e-03  1.382e-02  5.304e+03  -0.587  0.55717
## dplyr::lag(blk_mh_rate, 2)  1.881e-02  1.313e-02  5.300e+03   1.433  0.15205
## dplyr::lag(blk_mh_rate, 3)  6.405e-03  1.311e-02  5.298e+03   0.489  0.62515
##
## (Intercept)                  .
## t                            ***
## post_floyd1                  ***
```

```
## t_post_floyd               ***
## state_of_emerg1            ***
## stay_at_home1              ***
## uof_lag                    ***
## stops_lag                  *
## shoot_lag
## tmax_f
## snow_in
## precip_in
## conc_dis                   **
## dplyr::lag(blk_mh_rate, 1)
## dplyr::lag(blk_mh_rate, 2)
## dplyr::lag(blk_mh_rate, 3)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

```
re_white <- lmer(white_mh_rate~t+post_floyd+t_post_floyd+
                         state_of_emerg+stay_at_home+
                          uof_lag+stops_lag+shoot_lag+
                         tmax_f+snow_in+precip_in+
             conc_dis+
              dplyr::lag(white_mh_rate, 1)+ dplyr::lag(white_mh_rate, 2)+
               dplyr::lag(white_mh_rate, 3)+
                       (post_floyd|zcta), data = panel)
```

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

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

```
summary(re_white)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: white_mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg +
##     stay_at_home + uof_lag + stops_lag + shoot_lag + tmax_f +
##     snow_in + precip_in + conc_dis + dplyr::lag(white_mh_rate,
##     1) + dplyr::lag(white_mh_rate, 2) + dplyr::lag(white_mh_rate,
##     3) + (post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 11251.2
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.7728 -0.2817 -0.0224  0.2272 20.2499
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept) 0.65616  0.8100
##           post_floyd1 0.01114  0.1056   0.14
##  Residual             0.46525  0.6821
```

```
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)                    3.337e-01  1.770e-01  1.557e+01   1.886 0.078115
## t                              2.856e-03  1.828e-04  4.962e+03  15.624  < 2e-16
## post_floyd1                   -2.043e-03  1.021e-01  8.319e+02  -0.020 0.984035
## t_post_floyd                  -1.304e-02  3.125e-03  5.277e+03  -4.173 3.06e-05
## state_of_emerg1               -1.849e-01  9.365e-02  5.242e+03  -1.974 0.048396
## stay_at_home1                 -8.916e-02  9.725e-02  5.244e+03  -0.917 0.359277
## uof_lag                       -2.895e-02  4.692e-03  5.200e+03  -6.170 7.36e-10
## stops_lag                      8.300e-03  2.190e-03  3.531e+03   3.790 0.000153
## shoot_lag                     -1.567e+00  1.166e+00  5.272e+03  -1.345 0.178837
## tmax_f                         7.335e-04  5.497e-04  5.239e+03   1.334 0.182188
## snow_in                        1.233e-04  2.659e-02  5.238e+03   0.005 0.996302
## precip_in                     -6.869e-02  9.101e-02  5.241e+03  -0.755 0.450421
## conc_dis                      -5.141e-01  9.976e-02  1.109e+02  -5.153 1.12e-06
## dplyr::lag(white_mh_rate, 1) -4.573e-03  1.361e-02  5.289e+03  -0.336 0.736919
## dplyr::lag(white_mh_rate, 2)  4.465e-02  1.061e-02  5.252e+03   4.210 2.60e-05
## dplyr::lag(white_mh_rate, 3)  7.410e-03  1.061e-02  5.256e+03   0.698 0.484901
##
## (Intercept)                   .
## t                             ***
## post_floyd1
## t_post_floyd                  ***
## state_of_emerg1               *
## stay_at_home1
## uof_lag                       ***
## stops_lag                     ***
## shoot_lag
## tmax_f
## snow_in
## precip_in
## conc_dis                      ***
## dplyr::lag(white_mh_rate, 1)
## dplyr::lag(white_mh_rate, 2) ***
## dplyr::lag(white_mh_rate, 3)
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

```
re_latin <- lmer(latin_mh_rate~t+post_floyd+t_post_floyd+
                         state_of_emerg+stay_at_home+
                          uof_lag+stops_lag+shoot_lag+
                         tmax_f+snow_in+precip_in+
             conc_dis+
              dplyr::lag(latin_mh_rate, 1)+ dplyr::lag(latin_mh_rate, 2)+
               dplyr::lag(latin_mh_rate, 3)+
                       (post_floyd|zcta), data = panel)
```

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

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

```
## rescaling
summary(re_latin)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: latin_mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg +
##     stay_at_home + uof_lag + stops_lag + shoot_lag + tmax_f +
##     snow_in + precip_in + conc_dis + dplyr::lag(latin_mh_rate,
##     1) + dplyr::lag(latin_mh_rate, 2) + dplyr::lag(latin_mh_rate,
##     3) + (post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 37187.8
##
## Scaled residuals:
##    Min     1Q Median     3Q    Max
## -3.485 -0.087 -0.011  0.057 62.356
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept)  1.7293  1.3150
##           post_floyd1  0.2417  0.4916   -1.00
##  Residual             79.1054  8.8941
## Number of obs: 5150, groups:  zcta, 22
##
## Fixed effects:
##                                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)                   -5.447e-02  5.806e-01  2.009e+02  -0.094  0.92535
## t                              6.865e-03  2.225e-03  5.131e+03   3.085  0.00205
## post_floyd1                   -3.461e-01  1.301e+00  3.950e+03  -0.266  0.79014
## t_post_floyd                   2.703e-02  4.059e-02  5.114e+03   0.666  0.50536
## state_of_emerg1               -9.540e-01  1.221e+00  5.117e+03  -0.782  0.43453
## stay_at_home1                  6.546e-02  1.268e+00  5.113e+03   0.052  0.95882
## uof_lag                        8.599e-01  9.095e-02  4.459e+03   9.455  < 2e-16
## stops_lag                     -1.165e-02  2.992e-02  1.063e+02  -0.389  0.69776
## shoot_lag                     -8.866e+00  1.530e+01  5.119e+03  -0.579  0.56240
## tmax_f                        -5.511e-03  7.270e-03  5.119e+03  -0.758  0.44850
## snow_in                       -5.236e-01  3.498e-01  5.113e+03  -1.497  0.13455
## precip_in                      6.403e+00  1.214e+00  5.116e+03   5.274 1.39e-07
## conc_dis                      -4.226e-01  2.952e-01  1.986e+01  -1.432  0.16781
## dplyr::lag(latin_mh_rate, 1) -6.660e-03  1.381e-02  5.083e+03  -0.482  0.62978
## dplyr::lag(latin_mh_rate, 2) -1.148e-02  1.308e-02  5.094e+03  -0.878  0.38002
## dplyr::lag(latin_mh_rate, 3) -6.897e-03  1.307e-02  5.094e+03  -0.528  0.59781
##
## (Intercept)
## t                             **
## post_floyd1
## t_post_floyd
## state_of_emerg1
## stay_at_home1
## uof_lag                       ***
## stops_lag
## shoot_lag
## tmax_f
```

```
## snow_in
## precip_in                    ***
## conc_dis
## dplyr::lag(latin_mh_rate, 1)
## dplyr::lag(latin_mh_rate, 2)
## dplyr::lag(latin_mh_rate, 3)
## ---
## 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')
```

```
#extract random coefficients
re_pf_white <- as.data.frame(coef(re_white)$zcta) %>%
  select(post_floyd1) %>%
  mutate(zipcode = as.numeric(rownames(.))) %>%
  rename(post_floyd1_white = post_floyd1)

re_pf_blk <- as.data.frame(coef(re_blk)$zcta) %>%
  select(post_floyd1) %>%
  mutate(zipcode = as.numeric(rownames(.))) %>%
  rename(post_floyd1_blk = post_floyd1)

re_pf_latin <- as.data.frame(coef(re_latin)$zcta) %>%
  select(post_floyd1) %>%
  mutate(zipcode = as.numeric(rownames(.))) %>%
  rename(post_floyd1_latin = post_floyd1)


#aggregate to zip-level over years
zip_level <- panel %>%
  group_by(zcta) %>%
   summarize(mh_all_tot = sum(mh_all_tot, na.rm = T),
             total_pop = sum(total_pop, na.rm = T),
             conc_dis = mean(conc_dis, na.rm = T)) %>%
  mutate(mh_incid_c = (mh_all_tot/total_pop)*1000) %>%
  ungroup() %>%
  left_join(zcta, by = "zcta")

zip_level <- zip_level %>%
  left_join(re_pf_white, by = c("zcta" = "zipcode")) %>%
  left_join(re_pf_blk, by = c("zcta" = "zipcode")) %>%
  left_join(re_pf_latin, by = c("zcta" = "zipcode"))




#george floyd square
gfs <- geocode("George Floyd Square, Minneapolis", output = "latlon") %>%
  st_as_sf(coords = c("lon", "lat"), crs = "NAD83", remove=F) %>%
  mutate(name = "George Floyd Square")

re_coef_map_white <- ggplot() +
```

```
  geom_sf(data = zip_level, aes(geometry = geometry, fill = post_floyd1_white), color = "lightgrey") +
  geom_sf(data = mpls, aes(geometry = geometry), color = "black", alpha = 0)+
  geom_sf(data = gfs, aes(geometry = geometry), color = "black")+
  geom_text_repel(data = gfs, aes(x=lon, y=lat, label = name),
                  size = 2,
                 fontface = "bold")+
  scale_fill_distiller(palette = "Spectral")+
  labs(title = "Figure 3: RE Coefficients-White Residents",
       subtitle = "Rate per 1,000",
       fill = "Post-Killing Change")+
  theme(axis.text.x = element_blank(),
        axis.text.y = element_blank(),
  axis.line = element_blank(),
  axis.ticks = element_blank(),
  panel.border = element_blank(),
  panel.grid = element_blank(),
  axis.title = element_blank(),
  panel.background = element_blank(),
  panel.grid.major = element_line(colour="transparent"),
  plot.subtitle = element_text(face="italic"),
  strip.background = element_rect(fill = "white",
                 colour = "black"))+
  ggspatial::annotation_scale()+
  ggspatial::annotation_north_arrow(which_north = "true",
                                    location = "tr")

re_coef_map_blk <- ggplot() +
  geom_sf(data = zip_level, aes(geometry = geometry, fill = post_floyd1_blk), color = "lightgrey") +
  geom_sf(data = mpls, aes(geometry = geometry), color = "black", alpha = 0)+
  geom_sf(data = gfs, aes(geometry = geometry), color = "black")+
  geom_text_repel(data = gfs, aes(x=lon, y=lat, label = name),
                  size = 2,
                 fontface = "bold")+
  scale_fill_distiller(palette = "Spectral")+
  labs(title = "Figure 4: RE Coefficients-Black Residents",
       subtitle = "Rate per 1,000",
       fill = "Post-Killing Change")+
  theme(axis.text.x = element_blank(),
        axis.text.y = element_blank(),
  axis.line = element_blank(),
  axis.ticks = element_blank(),
  panel.border = element_blank(),
  panel.grid = element_blank(),
  axis.title = element_blank(),
  panel.background = element_blank(),
  panel.grid.major = element_line(colour="transparent"),
  plot.subtitle = element_text(face="italic"),
  strip.background = element_rect(fill = "white",
                 colour = "black"))+
  ggspatial::annotation_scale()+
  ggspatial::annotation_north_arrow(which_north = "true",
                                    location = "tr")
```

```
re_coef_map_latin <- ggplot() +
  geom_sf(data = zip_level, aes(geometry = geometry, fill = post_floyd1_latin), color = "lightgrey") +
  geom_sf(data = mpls, aes(geometry = geometry), color = "black", alpha = 0)+
  geom_sf(data = gfs, aes(geometry = geometry), color = "black")+
  geom_text_repel(data = gfs, aes(x=lon, y=lat, label = name),
                  size = 2,
                 fontface = "bold")+
  scale_fill_distiller(palette = "Spectral")+
  labs(title = "Figure 5: RE Coefficients-Latine Residents",
       subtitle = "Rate per 1,000",
       fill = "Post-Killing Change")+
  theme(axis.text.x = element_blank(),
        axis.text.y = element_blank(),
  axis.line = element_blank(),
  axis.ticks = element_blank(),
  panel.border = element_blank(),
  panel.grid = element_blank(),
  axis.title = element_blank(),
  panel.background = element_blank(),
  panel.grid.major = element_line(colour="transparent"),
  plot.subtitle = element_text(face="italic"),
  strip.background = element_rect(fill = "white",
                 colour = "black"))+
  ggspatial::annotation_scale()+
  ggspatial::annotation_north_arrow(which_north = "true",
                                    location = "tr")

cd_map <- ggplot() +
  geom_sf(data = zip_level, aes(geometry = geometry, fill = conc_dis), color="lightgrey") +
  geom_sf(data = mpls, aes(geometry = geometry), color = "black", alpha = 0)+
  geom_sf(data = gfs, aes(geometry = geometry), color = "black")+
  geom_text_repel(data = gfs, aes(x=lon, y=lat, label = name),
                  size = 2,
                 fontface = "bold")+
  scale_fill_distiller(palette = "Spectral")+
  labs(title = "Figure 6: Concentrated Disadvantage",
       subtitle = "Standard Deviation Units",
       fill = "Conc. Disad.")+
   theme(axis.text.x = element_blank(),
         axis.text.y = element_blank(),
  axis.line = element_blank(),
  axis.ticks = element_blank(),
  panel.border = element_blank(),
  panel.grid = element_blank(),
  axis.title = element_blank(),
  panel.background = element_blank(),
  panel.grid.major = element_line(colour="transparent"),
  plot.subtitle = element_text(face="italic"),
  strip.background = element_rect(fill = "white",
                 colour = "black"))+
  ggspatial::annotation_scale()+
  ggspatial::annotation_north_arrow(which_north = "true",
                                    location = "tr")
```

```
#RE random coefficient model - interaction
re_int <- lmer(mh_rate~t+post_floyd+t_post_floyd+
                         state_of_emerg+stay_at_home+
                          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)
```

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

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

```
summary(re_int)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula:
## mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg + stay_at_home +
##     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: 19387.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -11.2182  -0.1877  -0.0094   0.1726  15.1222
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept) 16.891   4.110
##           post_floyd1  2.233   1.494    -1.00
##  Residual              2.145   1.464
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                          Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)             2.913e+00  8.823e-01  2.133e+01   3.302  0.00335 **
## t                       3.852e-04  3.674e-04  5.292e+03   1.048  0.29454
## post_floyd1            -1.938e-01  3.835e-01  3.920e+01  -0.505  0.61617
## t_post_floyd           -3.575e-02  6.743e-03  5.283e+03  -5.302 1.19e-07 ***
## state_of_emerg1        -1.461e-01  2.009e-01  5.282e+03  -0.727  0.46702
## stay_at_home1          -4.979e-01  2.091e-01  5.282e+03  -2.382  0.01726 *
## uof_lag                -6.323e-02  1.013e-02  5.291e+03  -6.243 4.64e-10 ***
## stops_lag               4.667e-03  4.844e-03  5.285e+03   0.963  0.33535
## shoot_lag              -2.904e+00  2.501e+00  5.282e+03  -1.161  0.24560
## tmax_f                  3.559e-03  1.180e-03  5.282e+03   3.015  0.00258 **
## snow_in                 9.467e-02  5.713e-02  5.282e+03   1.657  0.09757 .
```

```
## precip_in               4.809e-02  1.954e-01  5.282e+03   0.246  0.80559
## conc_dis               -1.097e+00  2.554e-01  2.151e+03  -4.296 1.81e-05 ***
## dplyr::lag(mh_rate, 1) -1.142e-04  1.363e-02  5.303e+03  -0.008  0.99331
## dplyr::lag(mh_rate, 2)  5.721e-03  1.140e-02  5.294e+03   0.502  0.61589
## dplyr::lag(mh_rate, 3)  1.133e-02  1.139e-02  5.295e+03   0.994  0.32005
## post_floyd1:conc_dis    5.118e-01  1.185e-01  4.007e+02   4.320 1.97e-05 ***
## ---
## 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')
```

```
re_int_blk <- lmer(blk_mh_rate~t+post_floyd+t_post_floyd+
                         state_of_emerg+stay_at_home+
                          uof_lag+stops_lag+shoot_lag+
                         tmax_f+snow_in+precip_in+conc_dis+
                   post_floyd:conc_dis+
                dplyr::lag(blk_mh_rate, 1)+ dplyr::lag(blk_mh_rate, 2)+
                 dplyr::lag(blk_mh_rate, 3)+
                        (1+post_floyd|zcta), data = panel)
```

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

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

```
summary(re_int_blk)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: blk_mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg +
##     stay_at_home + uof_lag + stops_lag + shoot_lag + tmax_f +
##     snow_in + precip_in + conc_dis + post_floyd:conc_dis + dplyr::lag(blk_mh_rate,
##     1) + dplyr::lag(blk_mh_rate, 2) + dplyr::lag(blk_mh_rate,
##     3) + (1 + post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 29186.1
##
## Scaled residuals:
##    Min     1Q Median     3Q    Max
## -2.682 -0.146 -0.021  0.088 35.962
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept)  2.325   1.525
##           post_floyd1  1.716   1.310    -0.55
##  Residual             13.735   3.706
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                              Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)                 7.578e-01  3.849e-01  2.590e+01   1.969  0.05974
```

```
## t                            5.831e-03  9.158e-04  4.987e+03   6.367 2.10e-10
## post_floyd1                  2.918e+00  6.104e-01  1.694e+02   4.780 3.79e-06
## t_post_floyd                -7.241e-02  1.708e-02  5.276e+03  -4.239 2.28e-05
## state_of_emerg1             -2.497e+00  5.084e-01  5.250e+03  -4.912 9.30e-07
## stay_at_home1                2.275e+00  5.285e-01  5.249e+03   4.305 1.70e-05
## uof_lag                     -1.000e-01  2.496e-02  3.179e+03  -4.008 6.27e-05
## stops_lag                    2.306e-02  1.162e-02  1.300e+03   1.985  0.04736
## shoot_lag                   -1.462e+00  6.414e+00  5.266e+03  -0.228  0.81965
## tmax_f                      -1.126e-03  2.984e-03  5.248e+03  -0.377  0.70586
## snow_in                     -1.147e-01  1.445e-01  5.246e+03  -0.794  0.42725
## precip_in                   -3.431e-01  4.946e-01  5.247e+03  -0.694  0.48782
## conc_dis                    -9.091e-01  3.129e-01  2.166e+01  -2.905  0.00829
## dplyr::lag(blk_mh_rate, 1) -8.100e-03  1.382e-02  5.303e+03  -0.586  0.55781
## dplyr::lag(blk_mh_rate, 2)  1.894e-02  1.314e-02  5.296e+03   1.442  0.14950
## dplyr::lag(blk_mh_rate, 3)  6.402e-03  1.311e-02  5.298e+03   0.488  0.62537
## post_floyd1:conc_dis         1.690e-02  3.237e-01  1.493e+01   0.052  0.95904
##
## (Intercept)                 .
## t                           ***
## post_floyd1                 ***
## t_post_floyd                ***
## state_of_emerg1             ***
## stay_at_home1               ***
## uof_lag                     ***
## stops_lag                   *
## shoot_lag
## tmax_f
## snow_in
## precip_in
## conc_dis                    **
## dplyr::lag(blk_mh_rate, 1)
## dplyr::lag(blk_mh_rate, 2)
## dplyr::lag(blk_mh_rate, 3)
## post_floyd1:conc_dis
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

```
re_int_white <- lmer(white_mh_rate~t+post_floyd+t_post_floyd+
                        state_of_emerg+stay_at_home+
                         uof_lag+stops_lag+shoot_lag+
                        tmax_f+snow_in+precip_in+conc_dis+
                  post_floyd:conc_dis+
              dplyr::lag(white_mh_rate, 1)+ dplyr::lag(white_mh_rate, 2)+
               dplyr::lag(white_mh_rate, 3)+
                      (1+post_floyd|zcta), data = panel)
```

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

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

```
summary(re_int_white)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: white_mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg +
##     stay_at_home + uof_lag + stops_lag + shoot_lag + tmax_f +
##     snow_in + precip_in + conc_dis + post_floyd:conc_dis + dplyr::lag(white_mh_rate,
##     1) + dplyr::lag(white_mh_rate, 2) + dplyr::lag(white_mh_rate,
##     3) + (1 + post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 11243.3
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.7514 -0.2846 -0.0216  0.2314 20.2106
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept) 0.74731  0.8645
##           post_floyd1 0.01761  0.1327   -0.98
##  Residual             0.46481  0.6818
## Number of obs: 5320, groups:  zcta, 22
##
## Fixed effects:
##                                 Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)                    3.416e-01  1.883e-01  1.579e+01   1.814  0.08872
## t                              2.839e-03  1.829e-04  4.990e+03  15.520  < 2e-16
## post_floyd1                   -1.721e-02  1.033e-01  3.747e+02  -0.167  0.86780
## t_post_floyd                  -1.246e-02  3.122e-03  5.274e+03  -3.990 6.68e-05
## state_of_emerg1               -1.855e-01  9.360e-02  5.252e+03  -1.982  0.04755
## stay_at_home1                 -9.028e-02  9.720e-02  5.254e+03  -0.929  0.35301
## uof_lag                       -2.975e-02  4.704e-03  5.248e+03  -6.324 2.76e-10
## stops_lag                      6.908e-03  2.214e-03  3.859e+03   3.120  0.00182
## shoot_lag                     -1.513e+00  1.164e+00  5.274e+03  -1.299  0.19385
## tmax_f                         7.382e-04  5.495e-04  5.249e+03   1.343  0.17919
## snow_in                        2.886e-04  2.658e-02  5.248e+03   0.011  0.99134
## precip_in                     -6.533e-02  9.096e-02  5.251e+03  -0.718  0.47264
## conc_dis                      -5.841e-01  1.013e-01  1.347e+02  -5.766 5.29e-08
## dplyr::lag(white_mh_rate, 1) -4.549e-03  1.361e-02  5.294e+03  -0.334  0.73810
## dplyr::lag(white_mh_rate, 2)  4.450e-02  1.061e-02  5.271e+03   4.193 2.80e-05
## dplyr::lag(white_mh_rate, 3)  7.023e-03  1.061e-02  5.270e+03   0.662  0.50819
## post_floyd1:conc_dis           1.873e-01  3.559e-02  2.302e+01   5.263 2.43e-05
##
## (Intercept)                   .
## t                             ***
## post_floyd1
## t_post_floyd                  ***
## state_of_emerg1               *
## stay_at_home1
## uof_lag                       ***
## stops_lag                     **
## shoot_lag
## tmax_f
```

```
## snow_in
## precip_in
## conc_dis                      ***
## dplyr::lag(white_mh_rate, 1)
## dplyr::lag(white_mh_rate, 2) ***
## dplyr::lag(white_mh_rate, 3)
## post_floyd1:conc_dis          ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## fit warnings:
## Some predictor variables are on very different scales: consider rescaling
```

```
re_int_latin <- lmer(latin_mh_rate~t+post_floyd+t_post_floyd+
                        state_of_emerg+stay_at_home+
                         uof_lag+stops_lag+shoot_lag+
                        tmax_f+snow_in+precip_in+conc_dis+
                   post_floyd:conc_dis+
              dplyr::lag(latin_mh_rate, 1)+ dplyr::lag(latin_mh_rate, 2)+
               dplyr::lag(latin_mh_rate, 3)+
                      (1+post_floyd|zcta), data = panel)
```

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

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

```
summary(re_int_latin)
```

```
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [
## lmerModLmerTest]
## Formula: latin_mh_rate ~ t + post_floyd + t_post_floyd + state_of_emerg +
##     stay_at_home + uof_lag + stops_lag + shoot_lag + tmax_f +
##     snow_in + precip_in + conc_dis + post_floyd:conc_dis + dplyr::lag(latin_mh_rate,
##     1) + dplyr::lag(latin_mh_rate, 2) + dplyr::lag(latin_mh_rate,
##     3) + (1 + post_floyd | zcta)
##    Data: panel
##
## REML criterion at convergence: 37187.4
##
## Scaled residuals:
##    Min     1Q Median     3Q    Max
## -3.489 -0.087 -0.011  0.058 62.350
##
## Random effects:
##  Groups   Name        Variance Std.Dev. Corr
##  zcta     (Intercept)  1.7787  1.3337
##           post_floyd1  0.2819  0.5309   -1.00
##  Residual             79.1087  8.8943
## Number of obs: 5150, groups:  zcta, 22
##
## Fixed effects:
##                               Estimate Std. Error         df t value Pr(>|t|)
## (Intercept)                 -4.432e-02  5.828e-01  1.865e+02  -0.076  0.93947
## t                            6.835e-03  2.226e-03  5.121e+03   3.071  0.00215
```

```
## post_floyd1                  -3.713e-01  1.302e+00  3.786e+03  -0.285  0.77547
## t_post_floyd                  2.808e-02  4.062e-02  5.113e+03   0.691  0.48939
## state_of_emerg1              -9.579e-01  1.221e+00  5.115e+03  -0.785  0.43267
## stay_at_home1                 6.965e-02  1.268e+00  5.112e+03   0.055  0.95619
## uof_lag                       8.614e-01  9.096e-02  4.468e+03   9.470  < 2e-16
## stops_lag                    -1.328e-02  3.017e-02  9.929e+01  -0.440  0.66091
## shoot_lag                    -8.710e+00  1.531e+01  5.117e+03  -0.569  0.56939
## tmax_f                       -5.506e-03  7.270e-03  5.118e+03  -0.757  0.44885
## snow_in                      -5.238e-01  3.498e-01  5.112e+03  -1.497  0.13442
## precip_in                     6.408e+00  1.214e+00  5.115e+03   5.278 1.36e-07
## conc_dis                     -5.118e-01  3.278e-01  1.929e+01  -1.561  0.13473
## dplyr::lag(latin_mh_rate, 1) -6.713e-03  1.382e-02  5.083e+03  -0.486  0.62710
## dplyr::lag(latin_mh_rate, 2) -1.154e-02  1.308e-02  5.094e+03  -0.883  0.37744
## dplyr::lag(latin_mh_rate, 3) -6.913e-03  1.307e-02  5.093e+03  -0.529  0.59700
## post_floyd1:conc_dis          2.579e-01  4.052e-01  1.141e+02   0.636  0.52575
##
## (Intercept)
## t                            **
## post_floyd1
## t_post_floyd
## state_of_emerg1
## stay_at_home1
## uof_lag                      ***
## stops_lag
## shoot_lag
## tmax_f
## snow_in
## precip_in                    ***
## conc_dis
## dplyr::lag(latin_mh_rate, 1)
## dplyr::lag(latin_mh_rate, 2)
## dplyr::lag(latin_mh_rate, 3)
## post_floyd1:conc_dis
## ---
## 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')
```

```
#specifying varcov objects from model estimates
var_re_white <- VarCorr(re_white)
var_re_int_white <- VarCorr(re_int_white)
var_re_black <- VarCorr(re_blk)
var_re_int_black <- VarCorr(re_int_blk)
var_re_latin <- VarCorr(re_latin)
var_re_int_latin <- VarCorr(re_int_latin)
class(re_white) <- "lmerMod"
class(re_blk) <- "lmerMod"
class(re_latin) <- "lmerMod"
class(re_int_blk) <- "lmerMod"
class(re_int_white) <- "lmerMod"
class(re_int_blk) <- "lmerMod"
class(re_int_latin) <- "lmerMod"
```

```
library(patchwork)

(re_coef_map_white+re_coef_map_blk)/(re_coef_map_latin+cd_map)
```

Figure 3: RE Coefficients−White F

Rate per 1,000

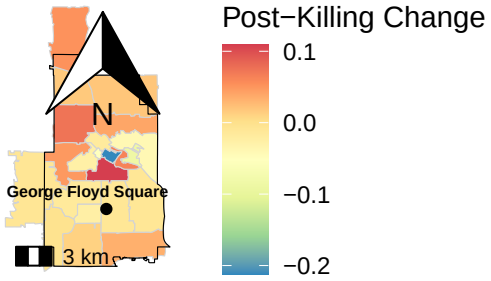


Figure 4: RE Coefficients−Black Reside

Rate per 1,000

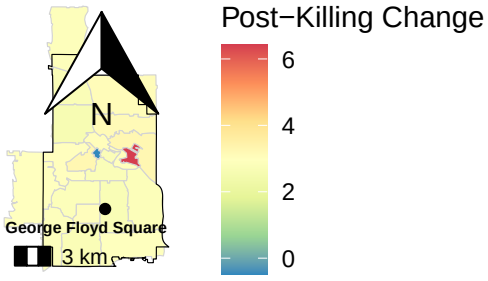


Figure 5: RE Coefficients−Latine F

Rate per 1,000

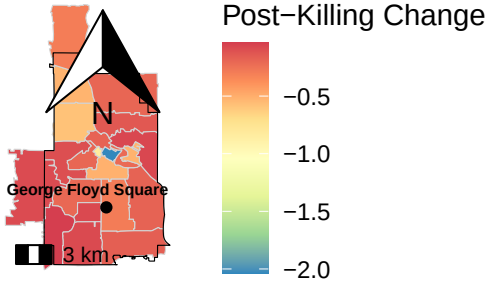
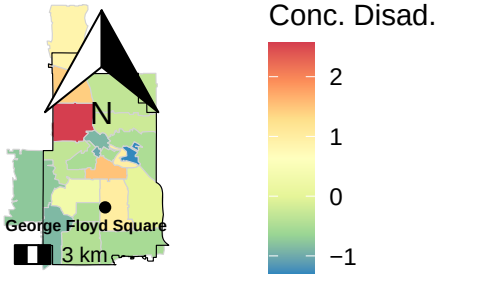


Figure 6: Concentrated Disadvantage

Standard Deviation Units




```
stargazer(re_white, re_blk, re_latin, re_int_white, re_int_blk, re_int_latin,
          title = "Interrupted Time Series RE Models of Mental Health Diagnoses, Minneapolis 2016-2020"
          covariate.labels = c("T",
                               "Post-Killing", "T Post-Killing",
                               "COVID - State of Emerg.", "COVID - Stay at Home",
                               "MPD Use of Force t-1", "MPD Stops t-1",
                               "MPD OIS t-1",
                               "Mean Max. Temp.", "Snow (in.)", "Precip. (in.)",
                               "Conc. Disad.",
                               "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",
                               "Post-KillingXConc.Disad."),
          dep.var.caption = "Mental Health Diagnoses/1,000",
          dep.var.labels.include = FALSE,
          column.labels = c("White", "Black", "Latine",
                            "White w/ Int.","Black w/ Int.", "Latine 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("*","**","***"),
          report = "vcs",
          ci=TRUE,
          ci.level=0.95,
          ci.separator = "|",
          notes = "95\\% Confidence Intervals in parentheses",
          header = F,
          notes.append = F,
          add.lines = list(c("Resid. Var.", round(attr(VarCorr(re_white), "sc")^2,2),
                             round(attr(VarCorr(re_int_white), "sc")^2,2),
                             round(attr(VarCorr(re_blk), "sc")^2,2),
                             round(attr(VarCorr(re_int_blk), "sc")^2,2),
                              round(attr(VarCorr(re_latin), "sc")^2,2),
                             round(attr(VarCorr(re_int_latin), "sc")^2,2)),
                                      c("ZCTA Var.",
                                        round(var_re_white$zcta[1,1],2),
                                        round(var_re_int_white$zcta[1,1],2),
                                        round(var_re_black$zcta[1,1],2),
                                        round(var_re_int_black$zcta[1,1],2),
                                        round(var_re_latin$zcta[1,1],2),
                                        round(var_re_int_latin$zcta[1,1],2)),
                             c("Post-Floyd Var.",
                                        round(var_re_white$zcta[2,2],2),
                                        round(var_re_int_white$zcta[2,2],2),
                                        round(var_re_black$zcta[2,2],2),
                                        round(var_re_int_black$zcta[2,2],2),
                                        round(var_re_latin$zcta[2,2],2),
                                        round(var_re_int_latin$zcta[2,2],2))))
```

```
results_table<-standardizedSolution(cfa_cd) %>%
  filter(row_number() %in% c(1:6)) %>%
  dplyr::select(LHS=lhs, Specification=op, RHS=rhs, 'Std(Beta)'=est.std, SE=se,
                'P-Value'=pvalue) %>%
  mutate(LHS = case_when(
    LHS=="cd"~"Conc. Dis.",
    LHS=="unemp_rate"~"Unemp. Rate"),
         RHS = case_when(
           RHS=="unemp_rate"~"Unemp. Rate",
           RHS=="pov_rate"~"Poverty Rate",
           RHS=="female_hh_rate"~"Female-HH Rate",
           RHS=="no_hs_dip_rate"~"No HS Diploma Rate",
           RHS=="black_pop"~"Black Pop"
         ),
    Specification = case_when(
      Specification=="=~"~"FL",
      Specification=="~~"~"Cov."),
     `P-Value` = round(`P-Value`, 2))
```

Table 2: Interrupted Time Series RE Models of Mental Health Diagnoses, Minneapolis 2016-2020

	Mental Health Diagnoses/1,000					
	White	Black	Latine	White w/ Int.	Black w/ Int.	Latine w/ Interaction
	(1)	(2)	(3)	(4)	(5)	(6)
T	0.003	0.006	0.007	0.003	0.006	0.007
	(0.002|0.003)	(0.004|0.008)	(0.003|0.011)	(0.002|0.003)	(0.004|0.008)	(0.002|0.011)
Post-Killing	−0.002	2.918	−0.346	−0.017	2.918	−0.371
	(-0.202|0.198)	(1.733|4.103)	(-2.895|2.203)	(-0.220|0.185)	(1.721|4.114)	(-2.923|2.180)
T Post-Killing	−0.013	−0.072	0.027	−0.012	−0.072	0.028
	(-0.019|-0.007)	(-0.106|-0.039)	(-0.053|0.107)	(-0.019|-0.006)	(-0.106|-0.039)	(-0.052|0.108)
COVID - State of Emerg.	−0.185	−2.499	−0.954	−0.186	−2.497	−0.958
	(-0.368|-0.001)	(-3.495|-1.502)	(-3.346|1.438)	(-0.369|-0.002)	(-3.494|-1.501)	(-3.350|1.435)
COVID - Stay at Home	−0.089	2.277	0.065	−0.090	2.275	0.070
	(-0.280|0.101)	(1.241|3.313)	(-2.419|2.550)	(-0.281|0.100)	(1.239|3.311)	(-2.415|2.555)
MPD Use of Force t-1	−0.029	−0.100	0.860	−0.030	−0.100	0.861
	(-0.038|-0.020)	(-0.149|-0.051)	(0.682|1.038)	(-0.039|-0.021)	(-0.149|-0.051)	(0.683|1.040)
MPD Stops t-1	0.008	0.023	−0.012	0.007	0.023	−0.013
	(0.004|0.013)	(0.001|0.046)	(-0.070|0.047)	(0.003|0.011)	(0.0003|0.046)	(-0.072|0.046)
MPD OIS t-1	−1.567	−1.463	−8.866	−1.513	−1.462	−8.710
	(-3.852|0.717)	(-14.034|11.107)	(-38.862|21.130)	(-3.795|0.769)	(-14.034|11.109)	(-38.713|21.293)
Mean Max. Temp.	0.001	−0.001	−0.006	0.001	−0.001	−0.006
	(-0.0003|0.002)	(-0.007|0.005)	(-0.020|0.009)	(-0.0003|0.002)	(-0.007|0.005)	(-0.020|0.009)
Snow (in.)	0.0001	−0.115	−0.524	0.0003	−0.115	−0.524
	(-0.052|0.052)	(-0.398|0.168)	(-1.209|0.162)	(-0.052|0.052)	(-0.398|0.168)	(-1.209|0.162)
Precip. (in.)	−0.069	−0.344	6.403	−0.065	−0.343	6.408
	(-0.247|0.110)	(-1.313|0.625)	(4.024|8.783)	(-0.244|0.113)	(-1.312|0.626)	(4.028|8.787)
Conc. Disad.	−0.514	−0.898	−0.423	−0.584	−0.909	−0.512
	(-0.710|-0.319)	(-1.430|-0.366)	(-1.001|0.156)	(-0.783|-0.386)	(-1.522|-0.296)	(-1.154|0.131)
AR(1)-White	−0.005			−0.005		
	(-0.031|0.022)			(-0.031|0.022)		
AR(2)-White	0.045			0.045		
	(0.024|0.065)			(0.024|0.065)		
AR(3)-White	0.007			0.007		
	(-0.013|0.028)			(-0.014|0.028)		
AR(1)-Black		−0.008			−0.008	
		(-0.035|0.019)			(-0.035|0.019)	
AR(2)-Black		0.019			0.019	
		(-0.007|0.045)			(-0.007|0.045)	
AR(3)-Black		0.006			0.006	
		(-0.019|0.032)			(-0.019|0.032)	
AR(1)-Latine			−0.007			−0.007
			(-0.034|0.020)			(-0.034|0.020)
AR(2)-Latine			−0.011			−0.012
			(-0.037|0.014)			(-0.037|0.014)
AR(3)-Latine			−0.007			−0.007
			(-0.033|0.019)			(-0.033|0.019)
Post-KillingXConc.Disad.				0.187	0.017	0.258
				(0.118|0.257)	(-0.618|0.651)	(-0.536|1.052)
Constant	0.334	0.757	−0.054	0.342	0.758	−0.044
	(-0.013|0.681)	(0.007|1.506)	(-1.192|1.083)	(-0.027|0.711)	(0.003|1.512)	(-1.187|1.098)
Resid. Var.	0.47	0.46	13.74	13.73	79.11	79.11
ZCTA Var.	0.66	0.75	2.28	2.32	1.73	1.78
Post-Floyd Var.	0.01	0.02	1.56	1.72	0.24	0.28
Observations	5,320	5,320	5,150	5,320	5,320	5,150
Log Likelihood	-5,625.625	-14,592.800	-18,593.900	-5,621.670	-14,593.030	-18,593.690
Akaike Inf. Crit.	11,291.250	29,225.600	37,227.810	11,285.340	29,228.050	37,229.380
Bayesian Inf. Crit.	11,422.830	29,357.190	37,358.740	11,423.500	29,366.220	37,366.860

Note: 95% Confidence Intervals in parentheses

```
stargazer(results_table, summary = FALSE, header = F,
          type="latex", style="aer", align = T,
          title="CFA Measurement Model of Concentrated Disadvantage",
          notes="$LR\\chi^2$ vs. saturated (4) = 1186, p < .05,  CFI = .926, SRMR = .049")
```

Table 3: CFA Measurement Model of Concentrated Disadvantage

	LHS	Specification	RHS	Std(Beta)	SE	P-Value
1	Conc. Dis.	FL	Unemp. Rate	0.444	0.012	0
2	Conc. Dis.	FL	Poverty Rate	0.520	0.010	0
3	Conc. Dis.	FL	Female-HH Rate	0.866	0.004	0
4	Conc. Dis.	FL	No HS Diploma Rate	0.822	0.005	0
5	Conc. Dis.	FL	Black Pop	0.930	0.004	0
6	Unemp. Rate	Cov.	Black Pop	0.080	0.020	0

$LR\chi^2$ vs. saturated (4) = 1186, p < .05, CFI = .926, SRMR = .049