Gun Series

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7/30/2021

# Base Panel Construction - ZCTA-Week Level

## Hospital Data - ZCTA-Week level

hosp\_zcta <- read\_csv("Data/Restricted MHA Data/minnepop\_1620\_agg\_zipfull\_updated.csv") %>%  
 arrange(zipcode, year, weekofyr) %>%  
 select(-c(`\_chk`, zippop\_tag)) %>%  
 filter(!(year==2016 & weekofyr==53)) %>%  
 mutate(across(-c(zipcode, year, weekofyr),   
 ~ifelse(is.na(.x),0,.x))) #fill NAs with 0

## 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",  
 "B06009\_002E", "B23025\_005E",  
 "B23025\_002E", "B11003\_015E",  
 "B19013\_001E"),  
 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,  
 no\_hs\_dip = B06009\_002E,  
 unemp = B23025\_005E,  
 total\_ilf = B23025\_002E,  
 female\_hh = B11003\_015E,  
 med\_hh\_inc = B19013\_001E) %>%  
 select(-ends\_with("M", ignore.case = F), -GEOID) %>%  
 mutate(zcta = str\_sub(NAME, 6)) %>%  
 select(-NAME) %>%  
 select(zcta, everything()) %>%  
 mutate(year = as.numeric(year)) %>%  
 mutate\_at(vars(-zcta, -year, -total\_pop, -med\_age,   
 -unemp, -total\_ilf, -med\_hh\_inc),   
 list(~(./total\_pop)\*100)) %>%  
 mutate(unemp\_rate = 100\*unemp/total\_ilf,  
 zcta = as.numeric(zcta))  
  
#LOCF imputation of 2020 until 2020 ACS release (12/9/2021)  
#acs\_2020 <- acs %>%  
 #complete(zcta, year = 2016:2020) %>%  
 #group\_by(zcta) %>%  
 #mutate\_at(vars(-zcta, -year),   
 # funs(if(sum(!is.na(.))<1) {.} else{na\_locf(., option = "locf")})) %>%  
 #filter(year==2020)  
  
#acs\_imp <- acs %>%   
 # rbind(acs\_2020) %>%  
 #mutate(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))

## | | | 0% | | | 1% | |= | 1% | |= | 2% | |== | 2% | |== | 3% | |== | 4% | |=== | 4% | |=== | 5% | |==== | 5% | |==== | 6% | |===== | 6% | |===== | 7% | |===== | 8% | |====== | 8% | |====== | 9% | |======= | 9% | |======= | 10% | |======= | 11% | |======== | 11% | |======== | 12% | |========= | 12% | |========= | 13% | |========= | 14% | |========== | 14% | |========== | 15% | |=========== | 15% | |=========== | 16% | |============ | 16% | |============ | 17% | |============ | 18% | |============= | 18% | |============= | 19% | |============== | 19% | |============== | 20% | |============== | 21% | |=============== | 21% | |=============== | 22% | |================ | 22% | |================ | 23% | |================ | 24% | |================= | 24% | |================= | 25% | |================== | 25% | |================== | 26% | |=================== | 26% | |=================== | 27% | |=================== | 28% | |==================== | 28% | |==================== | 29% | 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#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\rlarson21\Documents\Research\Gun-Violence-MN\Data\mpls\_city-shp\16cdbbfa-ad10-493c-afaf-52b61f2e76e42020329-1-180h9ap.whbo.shp'   
## 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 >= 2)  
  
#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),  
 assault\_undet\_incid\_c = (assault\_tot+undeter\_tot)/total\_pop\*100000)  
  
#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 <= 2021 & 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 <= 2021 & 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")) %>%  
 mutate(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)  
  
#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)),  
 stay\_at\_home = as.numeric(begin\_date >= as.Date("2020-03-28") & begin\_date <= as.Date("2020-05-28")),  
 state\_of\_emerg = 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),  
 months\_post = factor(case\_when(  
 weeks\_post <= 0 ~ "0 Months Post",  
 weeks\_post %in% c(1:4) ~ "1 Months Post",  
 weeks\_post %in% c(5:8) ~ "2 Months Post",  
 weeks\_post %in% c(9:12) ~ "3 Months Post",  
 weeks\_post %in% c(13:16) ~ "4 Months Post",  
 weeks\_post %in% c(17:20) ~ "5 Months Post",  
 weeks\_post %in% c(21:24) ~ "6 Months Post",  
 weeks\_post %in% c(25:31) ~ "7+ Months Post"),  
 levels = c("0 Months Post","1 Months Post","2 Months Post",  
 "3 Months Post","4 Months Post","5 Months Post",  
 "6 Months Post","7+ Months Post")),  
 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(uof\_rate, 1),  
 stops\_lag = dplyr::lag(stops\_rate, 1),  
 shoot\_lag = dplyr::lag(ois\_rate, 1))

# 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(assault\_tot = sum(assault\_tot, na.rm = T),  
 unintent\_tot = sum(unintent\_tot, na.rm = T),  
 suicide\_tot = sum(suicide\_tot, na.rm = T),  
 undeter\_tot = sum(undeter\_tot, na.rm = T),  
 legal\_tot = sum(legal\_tot, na.rm = T),  
 combined\_tot = sum(combined\_tot, na.rm = T),  
 total\_pop = sum(total\_pop, na.rm = T)) %>%  
 mutate(assault\_incid\_c = (assault\_tot/total\_pop)\*100000,  
 unintent\_incid\_c = (unintent\_tot/total\_pop)\*100000,  
 suicide\_incid\_c = (suicide\_tot/total\_pop)\*100000,  
 undeter\_incid\_c = (undeter\_tot/total\_pop)\*100000,  
 legal\_incid\_c = (legal\_tot/total\_pop)\*100000,  
 combined\_incid\_c = (combined\_tot/total\_pop)\*100000,  
 assault\_unintent\_incid\_c = (assault\_tot+unintent\_tot)/total\_pop\*100000) %>%  
 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  
series <- series %>%  
 mutate(begin\_date = ISOweek2date(paste(year, paste0("W", sprintf("%02d", weekofyr)), 1,sep = "-")),  
 end\_date = begin\_date+weeks(1)-days(1))

## Weather Data

# Minnesota DNR Daily Date  
 # https://www.dnr.state.mn.us/climate/historical/daily-data.html?sid=mspthr&sname=Minneapolis/St%20Paul%20Threaded%20Record&sdate=2010-01-01&edate=por  
 # 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 series  
series <- series %>% left\_join(weather, by = c("year","weekofyr"="week"))

## Sunset Data

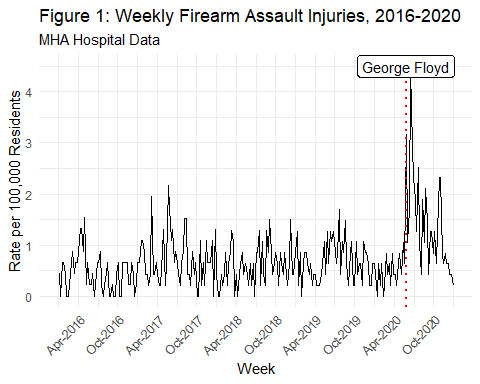
#setting lat-lon for MPLS  
mpls\_lonlat <- geocode("Minneapolis, MN", output = "latlon", source="google")  
  
#scrape sunset times for each begin date  
 #mutate to UTC-6 CST   
 #calculate hours of darkness before midnight  
sun\_series <- getSunlightTimes(date = seq(min(series$begin\_date),   
 max(series$begin\_date),   
 "days"),  
 lat = 44.97775 ,  
 lon = -93.26501,  
 keep = "sunset",  
 tz = "UTC") %>%  
 mutate(sunset = sunset-hours(6),  
 midnight = as.POSIXlt(date+days(1), format = '%Y-%m-%d %H:%M:%S'),  
 dark = as.numeric(midnight-sunset),   
 year = year(date),   
 week = isoweek(date)) %>%  
 group\_by(year, week) %>%  
 summarize(dark\_before\_12 = mean(dark, na.rm = T))  
  
  
#joining to series  
series <- series %>%  
 left\_join(sun\_series, by = c("year", "weekofyr"="week"))

## School Data

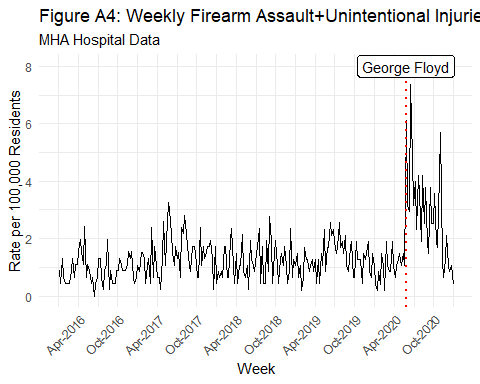
#created manually from online MPLS Public School Calendars: https://mpls.k12.mn.us/calendars  
school <- series %>%  
 select(year, weekofyr, begin\_date, end\_date) %>%  
 mutate(days\_in\_week = as.numeric((end\_date-begin\_date))+1,   
 days\_in\_school = NA\_integer\_)  
  
school[1,6] <- 5  
school[2,6] <- 4  
school[3,6] <- 3  
school[4,6] <- 5  
school[5,6] <- 5  
school[6,6] <- 4  
school[7,6] <- 4  
school[8,6] <- 5  
school[9,6] <- 5  
school[10,6] <- 4  
school[11,6] <- 4  
school[12,6] <- 5  
school[13,6] <- 0  
school[14,6] <- 5  
school[15,6] <- 5  
school[16,6] <- 5  
school[17,6] <- 5  
school[18,6] <- 5  
school[19,6] <- 5  
school[20,6] <- 5  
school[21,6] <- 5  
school[22,6] <- 4  
school[23,6] <- 2  
school[24,6] <- 0  
school[25,6] <- 0  
school[26,6] <- 0  
school[27,6] <- 0  
school[28,6] <- 0  
school[29,6] <- 0  
school[30,6] <- 0  
school[31,6] <- 0  
school[32,6] <- 0  
school[33,6] <- 0  
school[34,6] <- 0  
school[35,6] <- 5  
school[36,6] <- 4  
school[37,6] <- 5  
school[38,6] <- 5  
school[39,6] <- 5  
school[40,6] <- 5  
school[41,6] <- 5  
school[42,6] <- 2  
school[43,6] <- 5  
school[44,6] <- 3  
school[45,6] <- 5  
school[46,6] <- 5  
school[47,6] <- 2  
school[48,6] <- 5  
school[49,6] <- 5  
school[50,6] <- 5  
school[51,6] <- 0  
school[52,6] <- 0  
school[53,6] <- 4  
school[54,6] <- 5  
school[55,6] <- 4  
school[56,6] <- 4  
school[57,6] <- 4  
school[58,6] <- 5  
school[59,6] <- 4  
school[60,6] <- 4  
school[61,6] <- 5  
school[62,6] <- 5  
school[63,6] <- 5  
school[64,6] <- 5  
school[65,6] <- 3  
school[66,6] <- 0  
school[67,6] <- 5  
school[68,6] <- 5  
school[69,6] <- 5  
school[70,6] <- 5  
school[71,6] <- 5  
school[72,6] <- 5  
school[73,6] <- 5  
school[74,6] <- 4  
school[75,6] <- 5  
school[76,6] <- 3  
school[77,6] <- 0  
school[78,6] <- 0  
school[79,6] <- 0  
school[80,6] <- 0  
school[81,6] <- 0  
school[82,6] <- 0  
school[83,6] <- 0  
school[84,6] <- 0  
school[85,6] <- 0  
school[86,6] <- 0  
school[87,6] <- 5  
school[88,6] <- 4  
school[89,6] <- 5  
school[90,6] <- 5  
school[91,6] <- 5  
school[92,6] <- 5  
school[93,6] <- 5  
school[94,6] <- 2  
school[95,6] <- 5  
school[96,6] <- 3  
school[97,6] <- 5  
school[98,6] <- 5  
school[99,6] <- 2  
school[100,6] <- 5  
school[101,6] <- 5  
school[102,6] <- 5  
school[103,6] <- 5  
school[104,6] <- 0  
school[105,6] <- 0  
school[106,6] <- 0  
school[107,6] <- 5  
school[108,6] <- 4  
school[109,6] <- 3  
school[110,6] <- 5  
school[111,6] <- 5  
school[112,6] <- 4  
school[113,6] <- 4  
school[114,6] <- 5  
school[115,6] <- 5  
school[116,6] <- 5  
school[117,6] <- 5  
school[118,6] <- 4  
school[119,6] <- 0  
school[120,6] <- 5  
school[121,6] <- 5  
school[122,6] <- 5  
school[123,6] <- 5  
school[124,6] <- 5  
school[125,6] <- 5  
school[126,6] <- 5  
school[127,6] <- 4  
school[128,6] <- 5  
school[129,6] <- 0  
school[130,6] <- 0  
school[131,6] <- 0  
school[132,6] <- 0  
school[133,6] <- 0  
school[134,6] <- 0  
school[135,6] <- 0  
school[136,6] <- 0  
school[137,6] <- 0  
school[138,6] <- 0  
school[139,6] <- 0  
school[140,6] <- 5  
school[141,6] <- 4  
school[142,6] <- 5  
school[143,6] <- 5  
school[144,6] <- 5  
school[145,6] <- 5  
school[146,6] <- 5  
school[147,6] <- 2  
school[148,6] <- 5  
school[149,6] <- 3  
school[150,6] <- 5  
school[151,6] <- 5  
school[152,6] <- 2  
school[153,6] <- 5  
school[154,6] <- 5  
school[155,6] <- 5  
school[156,6] <- 5  
school[157,6] <- 0  
school[158,6] <- 0  
school[159,6] <- 5  
school[160,6] <- 5  
school[161,6] <- 2  
school[162,6] <- 5  
school[163,6] <- 5  
school[164,6] <- 4  
school[165,6] <- 4  
school[166,6] <- 5  
school[167,6] <- 5  
school[168,6] <- 5  
school[169,6] <- 5  
school[170,6] <- 4  
school[171,6] <- 0  
school[172,6] <- 5  
school[173,6] <- 5  
school[174,6] <- 5  
school[175,6] <- 5  
school[176,6] <- 5  
school[177,6] <- 5  
school[178,6] <- 5  
school[179,6] <- 4  
school[180,6] <- 5  
school[181,6] <- 0  
school[182,6] <- 0  
school[183,6] <- 0  
school[184,6] <- 0  
school[185,6] <- 0  
school[186,6] <- 0  
school[187,6] <- 0  
school[188,6] <- 0  
school[189,6] <- 0  
school[190,6] <- 0  
school[191,6] <- 0  
school[192,6] <- 0  
school[193,6] <- 4  
school[194,6] <- 5  
school[195,6] <- 5  
school[196,6] <- 5  
school[197,6] <- 5  
school[198,6] <- 5  
school[199,6] <- 2  
school[200,6] <- 5  
school[201,6] <- 4  
school[202,6] <- 5  
school[203,6] <- 5  
school[204,6] <- 5  
school[205,6] <- 2  
school[206,6] <- 5  
school[207,6] <- 5  
school[208,6] <- 5  
school[209,6] <- 0  
school[210,6] <- 0  
school[211,6] <- 5  
school[212,6] <- 4  
school[213,6] <- 4  
school[214,6] <- 5  
school[215,6] <- 5  
school[216,6] <- 5  
school[217,6] <- 3  
school[218,6] <- 5  
school[219,6] <- 5  
school[220,6] <- 5  
school[221,6] <- 5  
school[222,6] <- 4  
school[223,6] <- 0  
school[224,6] <- 5  
school[225,6] <- 5  
school[226,6] <- 5  
school[227,6] <- 5  
school[228,6] <- 5  
school[229,6] <- 5  
school[230,6] <- 5  
school[231,6] <- 4  
school[232,6] <- 5  
school[233,6] <- 0  
school[234,6] <- 0  
school[235,6] <- 0  
school[236,6] <- 0  
school[237,6] <- 0  
school[238,6] <- 0  
school[239,6] <- 0  
school[240,6] <- 0  
school[241,6] <- 0  
school[242,6] <- 0  
school[243,6] <- 0  
school[244,6] <- 0  
school[245,6] <- 4  
school[246,6] <- 5  
school[247,6] <- 5  
school[248,6] <- 5  
school[249,6] <- 5  
school[250,6] <- 5  
school[251,6] <- 3  
school[252,6] <- 4  
school[253,6] <- 5  
school[254,6] <- 4  
school[255,6] <- 5  
school[256,6] <- 5  
school[257,6] <- 2  
school[258,6] <- 5  
school[259,6] <- 5  
school[260,6] <- 5  
school[261,6] <- 0  
  
  
  
school <- school %>%  
 mutate(school = days\_in\_school/days\_in\_week) %>%  
 select(year, weekofyr, school)  
  
series <- series %>% left\_join(school, by = c("year", "weekofyr"))

# Time Series Vizualization

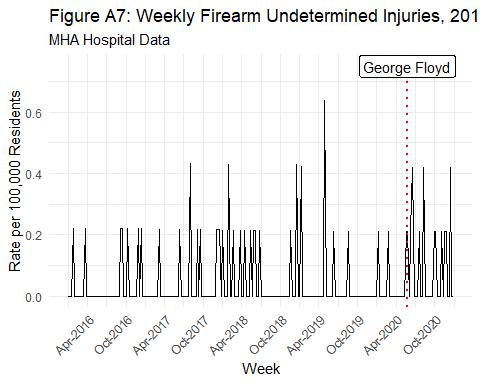
ggplot(series)+  
 geom\_line(aes(x=begin\_date, y=assault\_incid\_c))+   
 scale\_x\_date(date\_labels = "%b-%Y", date\_breaks = "6 months")+  
 geom\_vline(xintercept=series$begin\_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],   
 linetype="dotted", color="red", size=1)+  
 geom\_label(aes(x=series$begin\_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],  
 y=4.5),   
 label = "George Floyd", show.legend = FALSE)+  
 labs(title = "Figure 1: Weekly Firearm Assault Injuries, 2016-2020",  
 subtitle = "MHA Hospital Data",  
 x = "Week",  
 y = "Rate per 100,000 Residents")+  
 theme\_minimal()+  
 theme(axis.text.x=element\_text(angle=45, hjust=1))



ggplot(series)+  
 geom\_line(aes(x=begin\_date, y=assault\_unintent\_incid\_c))+   
 scale\_x\_date(date\_labels = "%b-%Y", date\_breaks = "6 months")+  
 geom\_vline(xintercept=series$begin\_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],   
 linetype="dotted", color="red", size=1)+  
 geom\_label(aes(x=series$begin\_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],  
 y=8),   
 label = "George Floyd", show.legend = FALSE)+  
 labs(title = "Figure A4: Weekly Firearm Assault+Unintentional Injuries, 2016-2020",  
 subtitle = "MHA Hospital Data",  
 x = "Week",  
 y = "Rate per 100,000 Residents")+  
 theme\_minimal()+  
 theme(axis.text.x=element\_text(angle=45, hjust=1))



ggplot(series)+  
 geom\_line(aes(x=begin\_date, y=undeter\_incid\_c))+   
 scale\_x\_date(date\_labels = "%b-%Y", date\_breaks = "6 months")+  
 geom\_vline(xintercept=series$begin\_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],   
 linetype="dotted", color="red", size=1)+  
 geom\_label(aes(x=series$begin\_date[series$year==2020 & series$weekofyr==isoweek(date("2020-05-25"))],  
 y=.75),   
 label = "George Floyd", show.legend = FALSE)+  
 labs(title = "Figure A7: Weekly Firearm Undetermined Injuries, 2016-2020",  
 subtitle = "MHA Hospital Data",  
 x = "Week",  
 y = "Rate per 100,000 Residents")+  
 theme\_minimal()+  
 theme(axis.text.x=element\_text(angle=45, hjust=1))



mean(series$assault\_incid\_c[series$post\_floyd==0])

## [1] NaN

4.4/.6

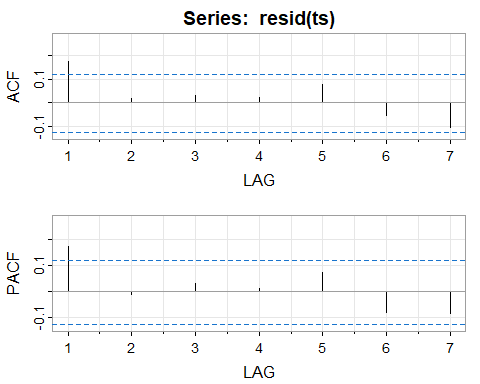
## [1] 7.333333

# Time Series Analysis

series <- series %>%  
 mutate(t = 1:length(assault\_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") & begin\_date <= as.Date("2020-05-28"))),  
 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),  
 months\_post = factor(case\_when(  
 weeks\_post <= 0 ~ "0 Months Post",  
 weeks\_post %in% c(1:4) ~ "1 Months Post",  
 weeks\_post %in% c(5:8) ~ "2 Months Post",  
 weeks\_post %in% c(9:12) ~ "3 Months Post",  
 weeks\_post %in% c(13:16) ~ "4 Months Post",  
 weeks\_post %in% c(17:20) ~ "5 Months Post",  
 weeks\_post %in% c(21:24) ~ "6 Months Post",  
 weeks\_post %in% c(25:31) ~ "7+ Months Post"),  
 levels = c("0 Months Post","1 Months Post","2 Months Post",  
 "3 Months Post","4 Months Post","5 Months Post",  
 "6 Months Post","7+ Months Post")))  
   
ts <- lm(assault\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school,   
 data = series)   
summary(ts)

##   
## Call:  
## lm(formula = assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school, data = series)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -1.35968 -0.32342 -0.04226 0.23651 2.26161   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.6730083 0.3947942 1.705 0.0895 .   
## t 0.0008298 0.0005033 1.649 0.1004   
## state\_of\_emerg1 -0.4221236 0.2884605 -1.463 0.1446   
## stay\_at\_home1 0.3270287 0.2967973 1.102 0.2716   
## post\_floyd1 1.9446701 0.3028230 6.422 6.73e-10 \*\*\*  
## t\_post\_floyd -0.0542385 0.0098753 -5.492 9.75e-08 \*\*\*  
## tmax\_f 0.0013252 0.0026799 0.494 0.6214   
## snow\_in -0.0505587 0.0859528 -0.588 0.5569   
## precip\_in -0.0890084 0.2808044 -0.317 0.7515   
## dark\_before\_12 -0.0385454 0.0462303 -0.834 0.4052   
## school 0.0004985 0.1047753 0.005 0.9962   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.4659 on 250 degrees of freedom  
## Multiple R-squared: 0.3724, Adjusted R-squared: 0.3473   
## F-statistic: 14.83 on 10 and 250 DF, p-value: < 2.2e-16

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

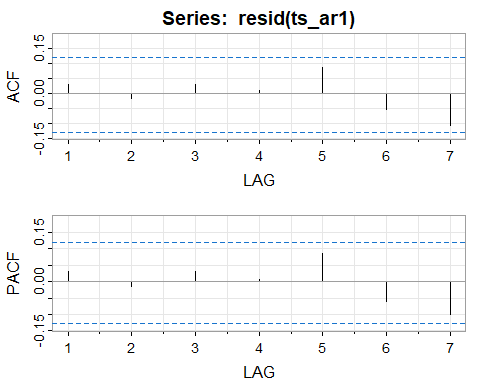


## [,1] [,2] [,3] [,4] [,5] [,6] [,7]  
## ACF 0.18 0.02 0.03 0.02 0.08 -0.05 -0.10  
## PACF 0.18 -0.01 0.03 0.01 0.07 -0.08 -0.08

ts\_ar1<- lm(assault\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 dplyr::lag(assault\_incid\_c, 1), data = series)  
summary(ts\_ar1)

##   
## Call:  
## lm(formula = assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + dplyr::lag(assault\_incid\_c, 1),   
## data = series)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -1.35773 -0.32834 -0.00796 0.23712 2.32335   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.5790022 0.3943385 1.468 0.143   
## t 0.0007124 0.0005068 1.406 0.161   
## state\_of\_emerg1 -0.4628323 0.2871631 -1.612 0.108   
## stay\_at\_home1 0.4029897 0.2966860 1.358 0.176   
## post\_floyd1 1.7814084 0.3090872 5.763 2.44e-08 \*\*\*  
## t\_post\_floyd -0.0475773 0.0102296 -4.651 5.38e-06 \*\*\*  
## tmax\_f 0.0010368 0.0026663 0.389 0.698   
## snow\_in -0.0485372 0.0853940 -0.568 0.570   
## precip\_in -0.0522940 0.2794156 -0.187 0.852   
## dark\_before\_12 -0.0337543 0.0459955 -0.734 0.464   
## school 0.0130985 0.1042370 0.126 0.900   
## dplyr::lag(assault\_incid\_c, 1) 0.1423092 0.0617438 2.305 0.022 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.4628 on 248 degrees of freedom  
## (1 observation deleted due to missingness)  
## Multiple R-squared: 0.385, Adjusted R-squared: 0.3578   
## F-statistic: 14.12 on 11 and 248 DF, p-value: < 2.2e-16

acf2(resid(ts\_ar1), max.lag = 7)

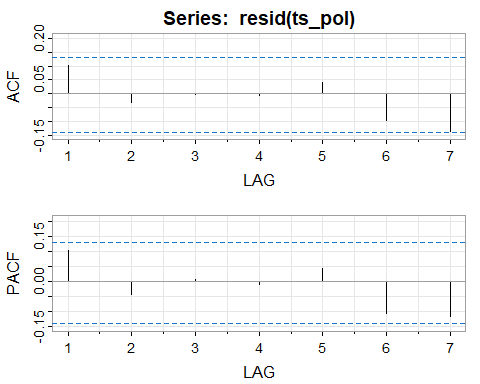


## [,1] [,2] [,3] [,4] [,5] [,6] [,7]  
## ACF 0.03 -0.02 0.03 0.01 0.09 -0.05 -0.11  
## PACF 0.03 -0.02 0.03 0.01 0.09 -0.06 -0.10

ts\_pol <- lm(assault\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag,  
 data = series)   
summary(ts\_pol)

##   
## Call:  
## lm(formula = assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag,   
## data = series)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -1.36308 -0.31473 -0.03944 0.24767 2.18171   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 9.947e-01 5.749e-01 1.730 0.0851 .   
## t -8.378e-04 9.741e-04 -0.860 0.3908   
## state\_of\_emerg1 -3.893e-01 2.969e-01 -1.311 0.1912   
## stay\_at\_home1 3.859e-01 3.040e-01 1.269 0.2058   
## post\_floyd1 1.839e+00 3.185e-01 5.774 2.87e-08 \*\*\*  
## t\_post\_floyd -5.015e-02 1.098e-02 -4.565 8.64e-06 \*\*\*  
## tmax\_f 3.010e-03 3.106e-03 0.969 0.3337   
## snow\_in -7.787e-02 9.228e-02 -0.844 0.3997   
## precip\_in 1.861e-01 3.130e-01 0.595 0.5528   
## dark\_before\_12 -2.323e-02 5.394e-02 -0.431 0.6671   
## school -3.614e-02 1.203e-01 -0.300 0.7642   
## uof\_lag 4.610e-02 7.035e-01 0.066 0.9478   
## stops\_lag -1.349e-01 1.234e-01 -1.093 0.2755   
## shoot\_lag -2.871e+01 2.053e+01 -1.399 0.1635   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.4743 on 203 degrees of freedom  
## (44 observations deleted due to missingness)  
## Multiple R-squared: 0.4043, Adjusted R-squared: 0.3662   
## F-statistic: 10.6 on 13 and 203 DF, p-value: < 2.2e-16

acf2(resid(ts\_pol), max.lag = 7)

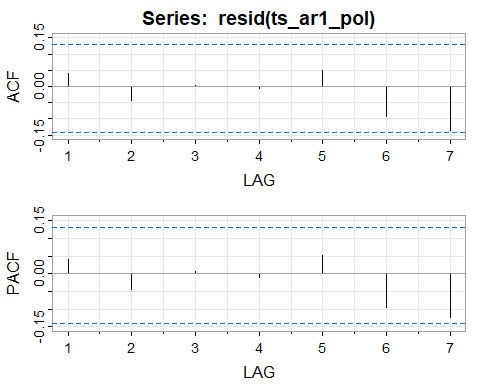


## [,1] [,2] [,3] [,4] [,5] [,6] [,7]  
## ACF 0.1 -0.03 0.00 -0.01 0.04 -0.10 -0.14  
## PACF 0.1 -0.04 0.01 -0.01 0.04 -0.11 -0.11

ts\_b <- lm(assault\_incid\_c~t+state\_of\_emerg+stay\_at\_home+  
 post\_floyd+months\_post+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school,  
 data = series)  
  
ts\_b\_pol <- lm(assault\_incid\_c~t+state\_of\_emerg+stay\_at\_home+  
 post\_floyd+months\_post+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag,  
 data = series)  
  
ts\_ar1\_pol<- lm(assault\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag+  
 dplyr::lag(assault\_incid\_c, 1), data = series)  
  
  
summary(ts\_ar1\_pol)

##   
## Call:  
## lm(formula = assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag +   
## dplyr::lag(assault\_incid\_c, 1), data = series)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -1.31636 -0.31029 -0.02695 0.22779 2.21257   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 9.310e-01 5.792e-01 1.607 0.110   
## t -7.609e-04 9.780e-04 -0.778 0.437   
## state\_of\_emerg1 -4.111e-01 2.979e-01 -1.380 0.169   
## stay\_at\_home1 4.162e-01 3.059e-01 1.361 0.175   
## post\_floyd1 1.775e+00 3.259e-01 5.448 1.48e-07 \*\*\*  
## t\_post\_floyd -4.716e-02 1.145e-02 -4.120 5.53e-05 \*\*\*  
## tmax\_f 2.663e-03 3.129e-03 0.851 0.396   
## snow\_in -7.622e-02 9.233e-02 -0.826 0.410   
## precip\_in 2.017e-01 3.135e-01 0.643 0.521   
## dark\_before\_12 -2.241e-02 5.396e-02 -0.415 0.678   
## school -2.888e-02 1.206e-01 -0.239 0.811   
## uof\_lag -1.511e-02 7.068e-01 -0.021 0.983   
## stops\_lag -1.213e-01 1.243e-01 -0.976 0.330   
## shoot\_lag -2.738e+01 2.058e+01 -1.330 0.185   
## dplyr::lag(assault\_incid\_c, 1) 6.459e-02 6.937e-02 0.931 0.353   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.4744 on 202 degrees of freedom  
## (44 observations deleted due to missingness)  
## Multiple R-squared: 0.4069, Adjusted R-squared: 0.3658   
## F-statistic: 9.898 on 14 and 202 DF, p-value: < 2.2e-16

acf2(resid(ts\_ar1\_pol), max.lag = 7)



## [,1] [,2] [,3] [,4] [,5] [,6] [,7]  
## ACF 0.04 -0.04 0.00 -0.01 0.05 -0.09 -0.14  
## PACF 0.04 -0.04 0.01 -0.01 0.05 -0.10 -0.12

ts\_ar1\_u <- lm(assault\_unintent\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 dplyr::lag(assault\_unintent\_incid\_c, 1),   
 data = series)  
  
ts\_ar1\_pol\_u <- lm(assault\_unintent\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag+  
 dplyr::lag(assault\_unintent\_incid\_c, 1),   
 data = series)  
  
ts\_ar1\_pol\_d <- lm(undeter\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag+  
 dplyr::lag(undeter\_incid\_c, 1), data = series)  
  
ts\_ar1\_d <- lm(undeter\_incid\_c~t+state\_of\_emerg+stay\_at\_home+post\_floyd+  
 t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 dplyr::lag(undeter\_incid\_c, 1), data = series)

# ZCTA-Week Level Analysis

## ZCTA-Level Maps

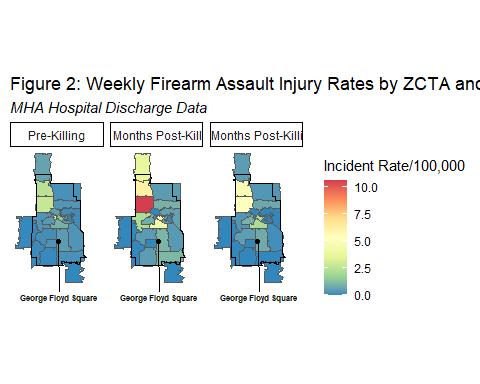
#aggregate to zip-level over years  
zip\_level <- panel %>%  
 group\_by(zcta, period) %>%  
 summarize(assault\_tot = mean(assault\_tot, na.rm = T),  
 unintent\_tot = mean(unintent\_tot, na.rm = T),  
 suicide\_tot = mean(suicide\_tot, na.rm = T),  
 undeter\_tot = mean(undeter\_tot, na.rm = T),  
 legal\_tot = mean(legal\_tot, na.rm = T),  
 combined\_tot = mean(combined\_tot, na.rm = T),  
 total\_pop = mean(total\_pop, na.rm = T)) %>%  
 mutate(assault\_incid\_c = (assault\_tot/total\_pop)\*100000,  
 unintent\_incid\_c = (unintent\_tot/total\_pop)\*100000,  
 suicide\_incid\_c = (suicide\_tot/total\_pop)\*100000,  
 undeter\_incid\_c = (undeter\_tot/total\_pop)\*100000,  
 legal\_incid\_c = (legal\_tot/total\_pop)\*100000,  
 combined\_incid\_c = (combined\_tot/total\_pop)\*100000,  
 assault\_unintent\_incid\_c = ((assault\_tot+unintent\_tot)/total\_pop)\*100000) %>%  
 ungroup() %>%  
 left\_join(zcta, by = "zcta")  
  
mean(zip\_level$assault\_incid\_c[zip\_level$period=="Pre-Killing"], na.rm = T)

## [1] 0.6761851

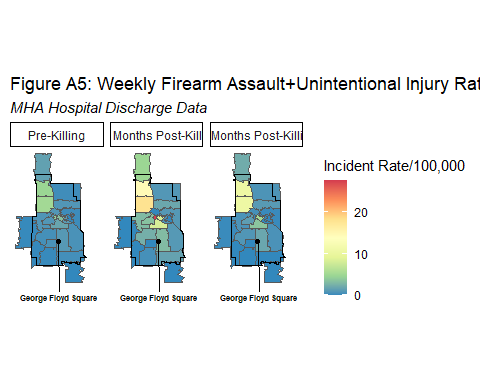
range(zip\_level$assault\_incid\_c[zip\_level$period=="Pre-Killing"], na.rm = T)

## [1] 0.000000 3.163689

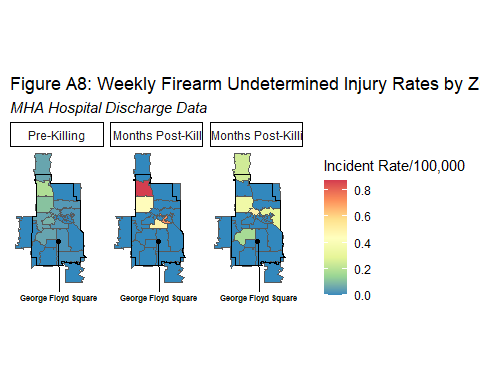
#george floyd square  
gfs <- geocode("George Floyd Square, Minneapolis", output = "latlon") %>%  
 st\_as\_sf(coords = c("lon", "lat"), crs = "NAD83", remove=F) %>%  
 mutate(name = "George Floyd Square")  
  
ggplot() +  
 geom\_sf(data = zip\_level, aes(geometry = geometry, fill = assault\_incid\_c)) +   
 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",  
 nudge\_x = .1, nudge\_y = -.1)+  
 facet\_wrap(~period)+  
 scale\_fill\_distiller(palette = "Spectral")+  
 labs(title = "Figure 2: Weekly Firearm Assault Injury Rates by ZCTA and Period",   
 subtitle = "MHA Hospital Discharge Data",  
 fill = "Incident Rate/100,000")+  
 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"))



ggplot() +  
 geom\_sf(data = zip\_level, aes(geometry = geometry, fill = assault\_unintent\_incid\_c)) +   
 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",  
 nudge\_x = .1, nudge\_y = -.1)+  
 facet\_wrap(~period)+  
 scale\_fill\_distiller(palette = "Spectral")+  
 labs(title = "Figure A5: Weekly Firearm Assault+Unintentional Injury Rates by ZCTA and Period",   
 subtitle = "MHA Hospital Discharge Data",  
 fill = "Incident Rate/100,000")+  
 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"))



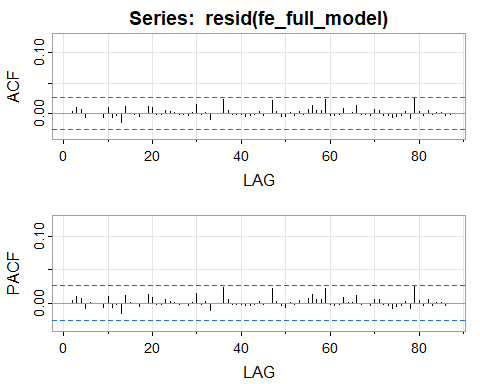
ggplot() +  
 geom\_sf(data = zip\_level, aes(geometry = geometry, fill = undeter\_incid\_c)) +   
 geom\_sf(data = mpls, aes(geometry = geometry), color = "black", alpha = 0)+  
 geom\_sf(data = gfs, aes(geometry = geometry), color = "black")+  
 geom\_text\_repel(data = gfs, aes(x=lon, y=lat, label = name),  
 size = 2,  
 fontface = "bold",  
 nudge\_x = .1, nudge\_y = -.1)+  
 facet\_wrap(~period)+  
 scale\_fill\_distiller(palette = "Spectral")+  
 labs(title = "Figure A8: Weekly Firearm Undetermined Injury Rates by ZCTA and Period",   
 subtitle = "MHA Hospital Discharge Data",  
 fill = "Incident Rate/100,000")+  
 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"))



## Panel Analysis

##   
## Call:  
## lm(formula = assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + as.factor(zcta), data = panel)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -4.392 -0.698 -0.260 0.050 264.010   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.528781 0.998838 0.529 0.59655   
## t 0.002728 0.001205 2.265 0.02357 \*   
## state\_of\_emerg -0.645033 0.690412 -0.934 0.35020   
## stay\_at\_home 0.242050 0.710366 0.341 0.73331   
## post\_floyd 1.329893 0.724788 1.835 0.06657 .   
## t\_post\_floyd -0.034941 0.023636 -1.478 0.13938   
## tmax\_f 0.003244 0.006414 0.506 0.61308   
## snow\_in -0.094086 0.205723 -0.457 0.64744   
## precip\_in -0.256354 0.672088 -0.381 0.70290   
## dark\_before\_12 -0.079221 0.110649 -0.716 0.47404   
## school -0.244403 0.250773 -0.975 0.32980   
## as.factor(zcta)55402 2.018846 0.468139 4.312 1.64e-05 \*\*\*  
## as.factor(zcta)55403 0.017175 0.468139 0.037 0.97073   
## as.factor(zcta)55404 0.773201 0.468139 1.652 0.09866 .   
## as.factor(zcta)55405 -0.034397 0.468139 -0.073 0.94143   
## as.factor(zcta)55406 -0.156014 0.468139 -0.333 0.73895   
## as.factor(zcta)55407 0.058258 0.468139 0.124 0.90097   
## as.factor(zcta)55408 -0.258652 0.468139 -0.553 0.58062   
## as.factor(zcta)55409 -0.236436 0.468139 -0.505 0.61354   
## as.factor(zcta)55410 -0.408970 0.468139 -0.874 0.38237   
## as.factor(zcta)55411 2.925887 0.468139 6.250 4.39e-10 \*\*\*  
## as.factor(zcta)55412 2.404515 0.468139 5.136 2.89e-07 \*\*\*  
## as.factor(zcta)55413 -0.059222 0.468139 -0.127 0.89934   
## as.factor(zcta)55414 -0.322758 0.468139 -0.689 0.49057   
## as.factor(zcta)55415 1.241611 0.468139 2.652 0.00802 \*\*   
## as.factor(zcta)55416 -0.441445 0.468139 -0.943 0.34573   
## as.factor(zcta)55417 -0.219008 0.468139 -0.468 0.63993   
## as.factor(zcta)55418 -0.226440 0.468139 -0.484 0.62862   
## as.factor(zcta)55419 -0.396449 0.468139 -0.847 0.39711   
## as.factor(zcta)55430 0.344431 0.468139 0.736 0.46191   
## as.factor(zcta)55450 -0.465239 0.468139 -0.994 0.32036   
## as.factor(zcta)55454 0.008653 0.468139 0.018 0.98525   
## as.factor(zcta)55455 -0.465239 0.468139 -0.994 0.32036   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 5.348 on 5970 degrees of freedom  
## Multiple R-squared: 0.03437, Adjusted R-squared: 0.0292   
## F-statistic: 6.641 on 32 and 5970 DF, p-value: < 2.2e-16

##   
## Call:  
## lm(formula = assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag +   
## as.factor(zcta), data = panel)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -5.718 -0.693 -0.254 0.067 262.095   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.5786927 1.0076415 0.574 0.565784   
## t 0.0020361 0.0012398 1.642 0.100594   
## state\_of\_emerg -0.5089950 0.6931282 -0.734 0.462768   
## stay\_at\_home 0.1448869 0.7126788 0.203 0.838908   
## post\_floyd 1.2563138 0.7275698 1.727 0.084269 .   
## t\_post\_floyd -0.0314801 0.0237464 -1.326 0.184996   
## tmax\_f 0.0038091 0.0064758 0.588 0.556417   
## snow\_in -0.1067510 0.2069464 -0.516 0.605986   
## precip\_in -0.2121920 0.6767740 -0.314 0.753886   
## dark\_before\_12 -0.0812793 0.1117160 -0.728 0.466916   
## school -0.2529043 0.2528311 -1.000 0.317212   
## uof\_lag -0.1503527 0.0285759 -5.262 1.48e-07 \*\*\*  
## stops\_lag 0.0290073 0.0087517 3.314 0.000924 \*\*\*  
## shoot\_lag -2.1208767 5.6098691 -0.378 0.705398   
## as.factor(zcta)55402 2.5840695 0.6598366 3.916 9.10e-05 \*\*\*  
## as.factor(zcta)55403 0.0056048 0.4708623 0.012 0.990503   
## as.factor(zcta)55404 0.7506650 0.4708060 1.594 0.110894   
## as.factor(zcta)55405 -0.0555793 0.4709667 -0.118 0.906063   
## as.factor(zcta)55406 -0.1637980 0.4711651 -0.348 0.728120   
## as.factor(zcta)55407 0.0429635 0.4710354 0.091 0.927328   
## as.factor(zcta)55408 -0.2952230 0.4709004 -0.627 0.530727   
## as.factor(zcta)55409 -0.2529969 0.4711038 -0.537 0.591267   
## as.factor(zcta)55410 -0.4093070 0.4712669 -0.869 0.385143   
## as.factor(zcta)55411 2.8757967 0.4706397 6.110 1.06e-09 \*\*\*  
## as.factor(zcta)55412 2.3718894 0.4708321 5.038 4.85e-07 \*\*\*  
## as.factor(zcta)55413 -0.1100124 0.4709180 -0.234 0.815294   
## as.factor(zcta)55414 -0.3364212 0.4710882 -0.714 0.475171   
## as.factor(zcta)55415 1.2405828 0.4705738 2.636 0.008403 \*\*   
## as.factor(zcta)55416 -0.4395512 0.4713632 -0.933 0.351111   
## as.factor(zcta)55417 -0.2200777 0.4712824 -0.467 0.640534   
## as.factor(zcta)55418 -0.2572163 0.4709933 -0.546 0.585008   
## as.factor(zcta)55419 -0.4082092 0.4711659 -0.866 0.386317   
## as.factor(zcta)55430 0.3488112 0.4712332 0.740 0.459202   
## as.factor(zcta)55450 -0.7555493 0.5026241 -1.503 0.132839   
## as.factor(zcta)55454 -0.0001772 0.4711057 0.000 0.999700   
## as.factor(zcta)55455 -0.4587530 0.4711117 -0.974 0.330212   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 5.363 on 5892 degrees of freedom  
## (75 observations deleted due to missingness)  
## Multiple R-squared: 0.04109, Adjusted R-squared: 0.03539   
## F-statistic: 7.213 on 35 and 5892 DF, p-value: < 2.2e-16



## [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13]  
## ACF 0 0 0.01 0.01 -0.01 0 0 0 -0.01 0.01 -0.01 0 -0.02  
## PACF 0 0 0.01 0.01 -0.01 0 0 0 -0.01 0.01 -0.01 0 -0.02  
## [,14] [,15] [,16] [,17] [,18] [,19] [,20] [,21] [,22] [,23] [,24] [,25]  
## ACF 0.01 0 0 0 0 0.01 0.01 0 0 0.01 0 0  
## PACF 0.01 0 0 0 0 0.01 0.01 0 0 0.01 0 0  
## [,26] [,27] [,28] [,29] [,30] [,31] [,32] [,33] [,34] [,35] [,36] [,37]  
## ACF 0 0 0 0 0.01 0 0 -0.01 0 0 0.02 0.01  
## PACF 0 0 0 0 0.01 0 0 -0.01 0 0 0.02 0.01  
## [,38] [,39] [,40] [,41] [,42] [,43] [,44] [,45] [,46] [,47] [,48] [,49]  
## ACF 0 0 0 0 0 0 0 0 0 0.02 0 0  
## PACF 0 0 0 0 0 0 0 0 0 0.02 0 0  
## [,50] [,51] [,52] [,53] [,54] [,55] [,56] [,57] [,58] [,59] [,60] [,61]  
## ACF 0.00 0 0 0 0 0.01 0.01 0 0 0.02 0 0  
## PACF -0.01 0 0 0 0 0.01 0.01 0 0 0.02 0 0  
## [,62] [,63] [,64] [,65] [,66] [,67] [,68] [,69] [,70] [,71] [,72] [,73]  
## ACF 0 0.01 0 0 0.01 0 0 0 0.01 0.01 0 0  
## PACF 0 0.01 0 0 0.01 0 0 0 0.01 0.01 0 0  
## [,74] [,75] [,76] [,77] [,78] [,79] [,80] [,81] [,82] [,83] [,84] [,85]  
## ACF -0.01 -0.01 0 0 -0.01 0.02 0 0 0.01 0 0 0  
## PACF -0.01 -0.01 0 0 -0.01 0.03 0 0 0.00 0 0 0  
## [,86] [,87]  
## ACF 0 0  
## PACF 0 0

##   
## Call:  
## lm(formula = assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + as.factor(zcta) + post\_floyd:as.factor(zcta) +   
## t\_post\_floyd:as.factor(zcta), data = panel)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -10.458 -0.635 -0.263 0.031 263.590   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 6.661e-01 1.004e+00 0.663 0.50716   
## t 2.728e-03 1.202e-03 2.269 0.02330 \*   
## state\_of\_emerg -6.450e-01 6.891e-01 -0.936 0.34926   
## stay\_at\_home 2.420e-01 7.090e-01 0.341 0.73281   
## post\_floyd -6.464e-01 1.973e+00 -0.328 0.74325   
## t\_post\_floyd 2.032e-02 1.027e-01 0.198 0.84318   
## tmax\_f 3.244e-03 6.402e-03 0.507 0.61238   
## snow\_in -9.409e-02 2.053e-01 -0.458 0.64679   
## precip\_in -2.564e-01 6.708e-01 -0.382 0.70234   
## dark\_before\_12 -7.922e-02 1.104e-01 -0.717 0.47317   
## school -2.444e-01 2.503e-01 -0.977 0.32885   
## as.factor(zcta)55402 2.301e+00 4.988e-01 4.613 4.05e-06 \*\*\*  
## as.factor(zcta)55403 -1.105e-01 4.988e-01 -0.222 0.82467   
## as.factor(zcta)55404 4.278e-01 4.988e-01 0.858 0.39115   
## as.factor(zcta)55405 -2.036e-01 4.988e-01 -0.408 0.68322   
## as.factor(zcta)55406 -2.168e-01 4.988e-01 -0.435 0.66377   
## as.factor(zcta)55407 -6.147e-02 4.988e-01 -0.123 0.90192   
## as.factor(zcta)55408 -3.636e-01 4.988e-01 -0.729 0.46605   
## as.factor(zcta)55409 -2.695e-01 4.988e-01 -0.540 0.58905   
## as.factor(zcta)55410 -4.661e-01 4.988e-01 -0.934 0.35009   
## as.factor(zcta)55411 2.256e+00 4.988e-01 4.524 6.19e-06 \*\*\*  
## as.factor(zcta)55412 1.964e+00 4.988e-01 3.938 8.30e-05 \*\*\*  
## as.factor(zcta)55413 -1.900e-01 4.988e-01 -0.381 0.70331   
## as.factor(zcta)55414 -4.043e-01 4.988e-01 -0.811 0.41763   
## as.factor(zcta)55415 8.710e-01 4.988e-01 1.746 0.08084 .   
## as.factor(zcta)55416 -5.031e-01 4.988e-01 -1.009 0.31317   
## as.factor(zcta)55417 -3.153e-01 4.988e-01 -0.632 0.52734   
## as.factor(zcta)55418 -3.157e-01 4.988e-01 -0.633 0.52678   
## as.factor(zcta)55419 -4.831e-01 4.988e-01 -0.968 0.33284   
## as.factor(zcta)55430 1.214e-01 4.988e-01 0.243 0.80771   
## as.factor(zcta)55450 -5.303e-01 4.988e-01 -1.063 0.28780   
## as.factor(zcta)55454 -3.370e-02 4.988e-01 -0.068 0.94613   
## as.factor(zcta)55455 -5.303e-01 4.988e-01 -1.063 0.28780   
## post\_floyd:as.factor(zcta)55402 -2.301e+00 2.655e+00 -0.867 0.38610   
## post\_floyd:as.factor(zcta)55403 2.798e-01 2.655e+00 0.105 0.91607   
## post\_floyd:as.factor(zcta)55404 4.714e+00 2.655e+00 1.776 0.07582 .   
## post\_floyd:as.factor(zcta)55405 2.556e+00 2.655e+00 0.963 0.33569   
## post\_floyd:as.factor(zcta)55406 8.601e-01 2.655e+00 0.324 0.74594   
## post\_floyd:as.factor(zcta)55407 9.488e-01 2.655e+00 0.357 0.72079   
## post\_floyd:as.factor(zcta)55408 9.903e-01 2.655e+00 0.373 0.70912   
## post\_floyd:as.factor(zcta)55409 2.695e-01 2.655e+00 0.102 0.91915   
## post\_floyd:as.factor(zcta)55410 4.661e-01 2.655e+00 0.176 0.86062   
## post\_floyd:as.factor(zcta)55411 1.170e+01 2.655e+00 4.408 1.06e-05 \*\*\*  
## post\_floyd:as.factor(zcta)55412 5.706e+00 2.655e+00 2.149 0.03165 \*   
## post\_floyd:as.factor(zcta)55413 1.584e+00 2.655e+00 0.597 0.55062   
## post\_floyd:as.factor(zcta)55414 1.227e+00 2.655e+00 0.462 0.64401   
## post\_floyd:as.factor(zcta)55415 5.501e+00 2.655e+00 2.072 0.03828 \*   
## post\_floyd:as.factor(zcta)55416 5.031e-01 2.655e+00 0.190 0.84968   
## post\_floyd:as.factor(zcta)55417 1.661e+00 2.655e+00 0.626 0.53145   
## post\_floyd:as.factor(zcta)55418 8.782e-01 2.655e+00 0.331 0.74080   
## post\_floyd:as.factor(zcta)55419 1.235e+00 2.655e+00 0.465 0.64184   
## post\_floyd:as.factor(zcta)55430 4.616e+00 2.655e+00 1.739 0.08209 .   
## post\_floyd:as.factor(zcta)55450 5.303e-01 2.655e+00 0.200 0.84169   
## post\_floyd:as.factor(zcta)55454 9.973e-01 2.655e+00 0.376 0.70717   
## post\_floyd:as.factor(zcta)55455 5.303e-01 2.655e+00 0.200 0.84169   
## t\_post\_floyd:as.factor(zcta)55402 -1.309e-16 1.445e-01 0.000 1.00000   
## t\_post\_floyd:as.factor(zcta)55403 4.914e-02 1.445e-01 0.340 0.73384   
## t\_post\_floyd:as.factor(zcta)55404 -1.224e-01 1.445e-01 -0.847 0.39722   
## t\_post\_floyd:as.factor(zcta)55405 -7.588e-02 1.445e-01 -0.525 0.59956   
## t\_post\_floyd:as.factor(zcta)55406 -2.348e-02 1.445e-01 -0.162 0.87093   
## t\_post\_floyd:as.factor(zcta)55407 1.789e-03 1.445e-01 0.012 0.99012   
## t\_post\_floyd:as.factor(zcta)55408 -8.664e-03 1.445e-01 -0.060 0.95220   
## t\_post\_floyd:as.factor(zcta)55409 -4.877e-16 1.445e-01 0.000 1.00000   
## t\_post\_floyd:as.factor(zcta)55410 -5.325e-16 1.445e-01 0.000 1.00000   
## t\_post\_floyd:as.factor(zcta)55411 -4.026e-01 1.445e-01 -2.786 0.00535 \*\*   
## t\_post\_floyd:as.factor(zcta)55412 -1.365e-01 1.445e-01 -0.945 0.34492   
## t\_post\_floyd:as.factor(zcta)55413 -3.342e-02 1.445e-01 -0.231 0.81715   
## t\_post\_floyd:as.factor(zcta)55414 -3.622e-02 1.445e-01 -0.251 0.80209   
## t\_post\_floyd:as.factor(zcta)55415 -1.599e-01 1.445e-01 -1.106 0.26866   
## t\_post\_floyd:as.factor(zcta)55416 -6.031e-16 1.445e-01 0.000 1.00000   
## t\_post\_floyd:as.factor(zcta)55417 -5.652e-02 1.445e-01 -0.391 0.69576   
## t\_post\_floyd:as.factor(zcta)55418 -9.677e-03 1.445e-01 -0.067 0.94662   
## t\_post\_floyd:as.factor(zcta)55419 -3.408e-02 1.445e-01 -0.236 0.81358   
## t\_post\_floyd:as.factor(zcta)55430 -1.805e-01 1.445e-01 -1.249 0.21179   
## t\_post\_floyd:as.factor(zcta)55450 -6.283e-16 1.445e-01 0.000 1.00000   
## t\_post\_floyd:as.factor(zcta)55454 -4.205e-02 1.445e-01 -0.291 0.77106   
## t\_post\_floyd:as.factor(zcta)55455 -5.201e-16 1.445e-01 0.000 1.00000   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 5.337 on 5926 degrees of freedom  
## Multiple R-squared: 0.04524, Adjusted R-squared: 0.033   
## F-statistic: 3.695 on 76 and 5926 DF, p-value: < 2.2e-16

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

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + uof\_lag + stops\_lag + shoot\_lag + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 36813  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -1.114 -0.133 -0.055 0.003 48.937   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.8496 0.9217   
## Residual 28.7706 5.3638   
## Number of obs: 5928, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 8.338e-01 9.728e-01 4.007e+03 0.857 0.3915   
## t 1.975e-03 1.240e-03 5.897e+03 1.593 0.1112   
## state\_of\_emerg1 -5.055e-01 6.932e-01 5.891e+03 -0.729 0.4659   
## stay\_at\_home1 1.565e-01 7.127e-01 5.891e+03 0.220 0.8263   
## post\_floyd1 1.277e+00 7.276e-01 5.892e+03 1.755 0.0793 .   
## t\_post\_floyd -3.179e-02 2.375e-02 5.891e+03 -1.339 0.1807   
## tmax\_f 3.599e-03 6.475e-03 5.893e+03 0.556 0.5784   
## snow\_in -1.111e-01 2.069e-01 5.892e+03 -0.537 0.5913   
## precip\_in -2.170e-01 6.768e-01 5.891e+03 -0.321 0.7485   
## dark\_before\_12 -8.131e-02 1.117e-01 5.891e+03 -0.728 0.4668   
## school -2.598e-01 2.528e-01 5.892e+03 -1.027 0.3043   
## uof\_lag -1.303e-01 2.715e-02 1.922e+03 -4.800 1.71e-06 \*\*\*  
## stops\_lag 3.526e-02 8.278e-03 1.690e+03 4.259 2.16e-05 \*\*\*  
## shoot\_lag -1.953e+00 5.609e+00 5.897e+03 -0.348 0.7277   
## ---  
## 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: assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 37237  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -0.762 -0.135 -0.057 -0.001 49.406   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.8163 0.9035   
## Residual 28.5997 5.3479   
## Number of obs: 6003, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 7.941e-01 9.635e-01 4.188e+03 0.824 0.4099   
## t 2.728e-03 1.205e-03 5.970e+03 2.265 0.0236 \*  
## state\_of\_emerg1 -6.450e-01 6.904e-01 5.970e+03 -0.934 0.3502   
## stay\_at\_home1 2.420e-01 7.104e-01 5.970e+03 0.341 0.7333   
## post\_floyd1 1.330e+00 7.248e-01 5.970e+03 1.835 0.0666 .  
## t\_post\_floyd -3.494e-02 2.364e-02 5.970e+03 -1.478 0.1394   
## tmax\_f 3.244e-03 6.414e-03 5.970e+03 0.506 0.6131   
## snow\_in -9.409e-02 2.057e-01 5.970e+03 -0.457 0.6474   
## precip\_in -2.564e-01 6.721e-01 5.970e+03 -0.381 0.7029   
## dark\_before\_12 -7.922e-02 1.106e-01 5.970e+03 -0.716 0.4740   
## school -2.444e-01 2.508e-01 5.970e+03 -0.975 0.3298   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) t stt\_\_1 sty\_\_1 pst\_f1 t\_pst\_ tmax\_f snow\_n prcp\_n  
## t -0.104   
## stat\_f\_mrg1 -0.084 -0.203   
## stay\_at\_hm1 0.002 -0.009 -0.816   
## post\_floyd1 0.048 -0.027 -0.792 0.662   
## t\_post\_flyd 0.210 -0.010 -0.168 0.170 -0.345   
## tmax\_f -0.873 0.009 0.089 -0.019 -0.111 -0.090   
## snow\_in -0.330 -0.059 0.069 -0.037 -0.043 -0.072 0.478   
## precip\_in -0.005 -0.022 -0.034 0.042 0.030 0.059 -0.221 -0.221   
## dark\_bfr\_12 -0.914 -0.060 0.114 0.020 -0.018 -0.263 0.748 0.202 0.038  
## school -0.121 0.042 -0.025 -0.063 0.057 -0.040 0.145 0.097 0.024  
## dr\_\_12  
## t   
## stat\_f\_mrg1   
## stay\_at\_hm1   
## post\_floyd1   
## t\_post\_flyd   
## tmax\_f   
## snow\_in   
## precip\_in   
## dark\_bfr\_12   
## school -0.103

## 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: assault\_unintent\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 42081.3  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -1.181 -0.151 -0.058 0.020 45.334   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 3.815 1.953   
## Residual 69.972 8.365   
## Number of obs: 5928, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -1.913e-01 1.542e+00 2.403e+03 -0.124 0.90129   
## t 4.000e-03 1.933e-03 5.894e+03 2.069 0.03857 \*   
## state\_of\_emerg1 -4.217e-02 1.081e+00 5.891e+03 -0.039 0.96888   
## stay\_at\_home1 -8.173e-01 1.111e+00 5.891e+03 -0.735 0.46217   
## post\_floyd1 3.316e+00 1.135e+00 5.892e+03 2.922 0.00349 \*\*   
## t\_post\_floyd -1.479e-01 3.703e-02 5.891e+03 -3.995 6.56e-05 \*\*\*  
## tmax\_f 1.568e-02 1.010e-02 5.892e+03 1.553 0.12049   
## snow\_in -9.906e-02 3.227e-01 5.891e+03 -0.307 0.75891   
## precip\_in 2.690e-01 1.055e+00 5.891e+03 0.255 0.79888   
## dark\_before\_12 4.427e-02 1.742e-01 5.891e+03 0.254 0.79944   
## school -5.158e-02 3.943e-01 5.892e+03 -0.131 0.89592   
## uof\_lag -1.884e-01 4.320e-02 3.244e+03 -4.362 1.33e-05 \*\*\*  
## stops\_lag 1.420e-02 1.320e-02 2.974e+03 1.076 0.28203   
## shoot\_lag -3.259e+00 8.748e+00 5.894e+03 -0.373 0.70949   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## fit warnings:  
## Some predictor variables are on very different scales: consider rescaling

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: assault\_unintent\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 42081.3  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -1.181 -0.151 -0.058 0.020 45.334   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 3.815 1.953   
## Residual 69.972 8.365   
## Number of obs: 5928, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -1.913e-01 1.542e+00 2.403e+03 -0.124 0.90129   
## t 4.000e-03 1.933e-03 5.894e+03 2.069 0.03857 \*   
## state\_of\_emerg1 -4.217e-02 1.081e+00 5.891e+03 -0.039 0.96888   
## stay\_at\_home1 -8.173e-01 1.111e+00 5.891e+03 -0.735 0.46217   
## post\_floyd1 3.316e+00 1.135e+00 5.892e+03 2.922 0.00349 \*\*   
## t\_post\_floyd -1.479e-01 3.703e-02 5.891e+03 -3.995 6.56e-05 \*\*\*  
## tmax\_f 1.568e-02 1.010e-02 5.892e+03 1.553 0.12049   
## snow\_in -9.906e-02 3.227e-01 5.891e+03 -0.307 0.75891   
## precip\_in 2.690e-01 1.055e+00 5.891e+03 0.255 0.79888   
## dark\_before\_12 4.427e-02 1.742e-01 5.891e+03 0.254 0.79944   
## school -5.158e-02 3.943e-01 5.892e+03 -0.131 0.89592   
## uof\_lag -1.884e-01 4.320e-02 3.244e+03 -4.362 1.33e-05 \*\*\*  
## stops\_lag 1.420e-02 1.320e-02 2.974e+03 1.076 0.28203   
## shoot\_lag -3.259e+00 8.748e+00 5.894e+03 -0.373 0.70949   
## ---  
## 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: undeter\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + uof\_lag + stops\_lag + shoot\_lag + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 7336.8  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -0.5577 -0.1281 -0.0593 -0.0162 23.2781   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.002157 0.04645   
## Residual 0.197542 0.44446   
## Number of obs: 5928, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 9.609e-03 7.961e-02 5.508e+03 0.121 0.9039   
## t -5.642e-06 1.027e-04 5.903e+03 -0.055 0.9562   
## state\_of\_emerg1 -4.804e-02 5.744e-02 5.893e+03 -0.836 0.4030   
## stay\_at\_home1 3.869e-02 5.905e-02 5.893e+03 0.655 0.5124   
## post\_floyd1 1.383e-01 6.028e-02 5.895e+03 2.295 0.0218 \*  
## t\_post\_floyd -2.081e-03 1.968e-03 5.893e+03 -1.058 0.2903   
## tmax\_f -4.373e-05 5.365e-04 5.896e+03 -0.082 0.9350   
## snow\_in -1.041e-02 1.715e-02 5.894e+03 -0.607 0.5440   
## precip\_in -2.835e-02 5.608e-02 5.893e+03 -0.506 0.6132   
## dark\_before\_12 4.194e-03 9.257e-03 5.893e+03 0.453 0.6506   
## school 1.466e-02 2.095e-02 5.894e+03 0.700 0.4839   
## uof\_lag -3.591e-04 2.146e-03 9.104e+02 -0.167 0.8671   
## stops\_lag -8.683e-05 6.511e-04 7.687e+02 -0.133 0.8940   
## shoot\_lag -1.599e-01 4.646e-01 5.904e+03 -0.344 0.7307   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## fit warnings:  
## Some predictor variables are on very different scales: consider rescaling

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: undeter\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 7330.4  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -0.5595 -0.1276 -0.0581 -0.0152 23.4325   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.002113 0.04597   
## Residual 0.194994 0.44158   
## Number of obs: 6003, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 9.119e-03 7.861e-02 5.579e+03 0.116 0.9077   
## t 1.758e-06 9.946e-05 5.970e+03 0.018 0.9859   
## state\_of\_emerg1 -4.880e-02 5.701e-02 5.970e+03 -0.856 0.3921   
## stay\_at\_home1 3.887e-02 5.866e-02 5.970e+03 0.663 0.5075   
## post\_floyd1 1.378e-01 5.985e-02 5.970e+03 2.302 0.0214 \*  
## t\_post\_floyd -2.037e-03 1.952e-03 5.970e+03 -1.044 0.2966   
## tmax\_f -3.808e-05 5.296e-04 5.970e+03 -0.072 0.9427   
## snow\_in -1.033e-02 1.699e-02 5.970e+03 -0.608 0.5430   
## precip\_in -2.847e-02 5.550e-02 5.970e+03 -0.513 0.6080   
## dark\_before\_12 3.949e-03 9.136e-03 5.970e+03 0.432 0.6656   
## school 1.453e-02 2.071e-02 5.970e+03 0.702 0.4828   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) t stt\_\_1 sty\_\_1 pst\_f1 t\_pst\_ tmax\_f snow\_n prcp\_n  
## t -0.105   
## stat\_f\_mrg1 -0.085 -0.203   
## stay\_at\_hm1 0.002 -0.009 -0.816   
## post\_floyd1 0.049 -0.027 -0.792 0.662   
## t\_post\_flyd 0.212 -0.010 -0.168 0.170 -0.345   
## tmax\_f -0.884 0.009 0.089 -0.019 -0.111 -0.090   
## snow\_in -0.333 -0.059 0.069 -0.037 -0.043 -0.072 0.478   
## precip\_in -0.005 -0.022 -0.034 0.042 0.030 0.059 -0.221 -0.221   
## dark\_bfr\_12 -0.925 -0.060 0.114 0.020 -0.018 -0.263 0.748 0.202 0.038  
## school -0.123 0.042 -0.025 -0.063 0.057 -0.040 0.145 0.097 0.024  
## dr\_\_12  
## t   
## stat\_f\_mrg1   
## stay\_at\_hm1   
## post\_floyd1   
## t\_post\_flyd   
## tmax\_f   
## snow\_in   
## precip\_in   
## dark\_bfr\_12   
## school -0.103

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

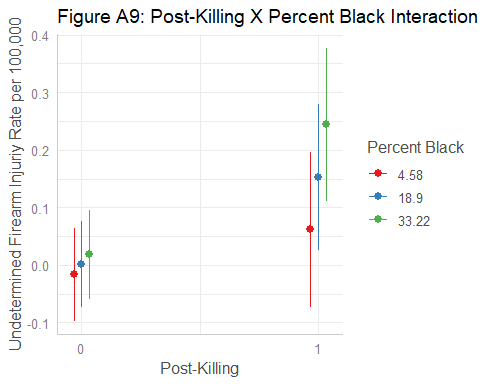
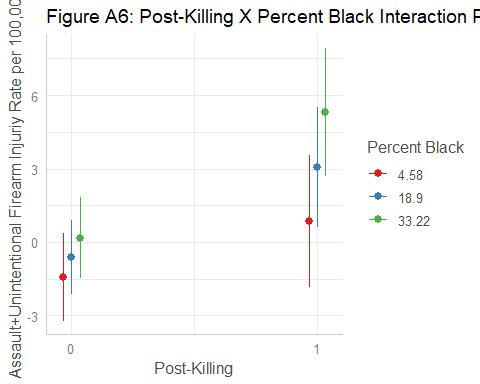
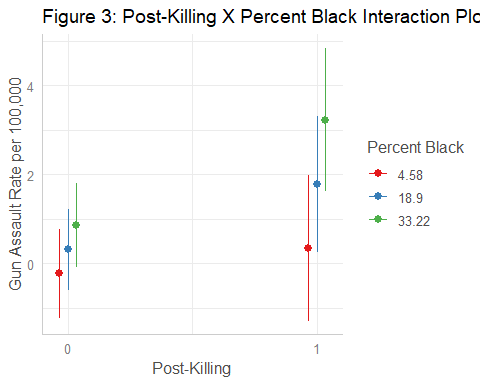
## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: assault\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + uof\_lag + stops\_lag + shoot\_lag + med\_hh\_inc + black\_pop +   
## post\_floyd:black\_pop + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 34344.1  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -1.471 -0.137 -0.062 -0.002 47.025   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.254 0.504   
## Residual 31.102 5.577   
## Number of obs: 5460, groups: zcta, 21  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -4.120e-01 1.211e+00 2.232e+02 -0.340 0.73393   
## t 9.744e-04 1.414e-03 1.354e+03 0.689 0.49074   
## state\_of\_emerg1 -4.385e-01 7.544e-01 5.425e+03 -0.581 0.56110   
## stay\_at\_home1 1.890e-01 7.755e-01 5.424e+03 0.244 0.80742   
## post\_floyd1 2.815e-01 8.450e-01 5.430e+03 0.333 0.73901   
## t\_post\_floyd -3.573e-02 2.582e-02 5.425e+03 -1.384 0.16649   
## tmax\_f 4.552e-03 7.013e-03 5.440e+03 0.649 0.51630   
## snow\_in -9.885e-02 2.245e-01 5.423e+03 -0.440 0.65979   
## precip\_in -2.404e-01 7.336e-01 5.424e+03 -0.328 0.74318   
## dark\_before\_12 -7.092e-02 1.210e-01 5.442e+03 -0.586 0.55780   
## school -2.927e-01 2.738e-01 5.425e+03 -1.069 0.28517   
## uof\_lag -1.228e-01 2.686e-02 9.139e+02 -4.571 5.52e-06 \*\*\*  
## stops\_lag 7.648e-02 1.077e-02 1.688e+02 7.099 3.34e-11 \*\*\*  
## shoot\_lag -1.668e+00 5.830e+00 5.435e+03 -0.286 0.77483   
## med\_hh\_inc 7.638e-06 7.044e-06 1.736e+01 1.084 0.29305   
## black\_pop 3.780e-02 1.226e-02 1.806e+01 3.084 0.00639 \*\*   
## post\_floyd1:black\_pop 6.295e-02 1.575e-02 5.442e+03 3.997 6.51e-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

## Warning: 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  
  
## 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: assault\_unintent\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag +   
## med\_hh\_inc + black\_pop + post\_floyd:black\_pop + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 39207.8  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -1.203 -0.150 -0.068 0.009 43.692   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 2.10 1.449   
## Residual 75.77 8.704   
## Number of obs: 5460, groups: zcta, 21  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) -1.599e+00 2.225e+00 6.872e+01 -0.719 0.474832   
## t 3.496e-03 2.355e-03 3.514e+02 1.484 0.138663   
## state\_of\_emerg1 3.915e-02 1.178e+00 5.420e+03 0.033 0.973481   
## stay\_at\_home1 -8.766e-01 1.210e+00 5.417e+03 -0.724 0.468997   
## post\_floyd1 1.812e+00 1.319e+00 5.427e+03 1.373 0.169778   
## t\_post\_floyd -1.630e-01 4.030e-02 5.420e+03 -4.043 5.34e-05 \*\*\*  
## tmax\_f 1.721e-02 1.096e-02 5.439e+03 1.570 0.116455   
## snow\_in -1.032e-01 3.505e-01 5.417e+03 -0.295 0.768366   
## precip\_in 2.819e-01 1.145e+00 5.419e+03 0.246 0.805529   
## dark\_before\_12 5.949e-02 1.892e-01 5.430e+03 0.314 0.753234   
## school -6.942e-02 4.275e-01 5.418e+03 -0.162 0.870985   
## uof\_lag -1.689e-01 4.416e-02 1.243e+03 -3.823 0.000138 \*\*\*  
## stops\_lag 4.167e-02 1.895e-02 3.129e+02 2.199 0.028632 \*   
## shoot\_lag -2.942e+00 9.103e+00 5.423e+03 -0.323 0.746605   
## med\_hh\_inc 4.628e-06 1.705e-05 1.561e+01 0.271 0.789597   
## black\_pop 5.525e-02 2.953e-02 1.572e+01 1.871 0.080126 .   
## post\_floyd1:black\_pop 1.002e-01 2.462e-02 5.442e+03 4.069 4.78e-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

## 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: undeter\_incid\_c ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + uof\_lag + stops\_lag + shoot\_lag + med\_hh\_inc + black\_pop +   
## post\_floyd:black\_pop + (1 | zcta)  
## Data: panel  
##   
## REML criterion at convergence: 7236.2  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -0.8875 -0.1175 -0.0614 -0.0213 22.3794   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.001376 0.0371   
## Residual 0.213833 0.4624   
## Number of obs: 5460, groups: zcta, 21  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 8.180e-03 9.848e-02 3.090e+02 0.083 0.934   
## t 1.296e-05 1.164e-04 1.782e+03 0.111 0.911   
## state\_of\_emerg1 -5.219e-02 6.255e-02 5.427e+03 -0.834 0.404   
## stay\_at\_home1 4.218e-02 6.430e-02 5.427e+03 0.656 0.512   
## post\_floyd1 5.446e-02 7.006e-02 5.432e+03 0.777 0.437   
## t\_post\_floyd -2.275e-03 2.141e-03 5.427e+03 -1.062 0.288   
## tmax\_f -6.160e-05 5.814e-04 5.440e+03 -0.106 0.916   
## snow\_in -1.150e-02 1.862e-02 5.426e+03 -0.618 0.537   
## precip\_in -3.110e-02 6.083e-02 5.426e+03 -0.511 0.609   
## dark\_before\_12 4.267e-03 1.003e-02 5.441e+03 0.425 0.671   
## school 1.602e-02 2.271e-02 5.428e+03 0.705 0.481   
## uof\_lag -4.853e-04 2.206e-03 1.006e+03 -0.220 0.826   
## stops\_lag -2.440e-04 8.723e-04 1.790e+02 -0.280 0.780   
## shoot\_lag -1.429e-01 4.834e-01 5.437e+03 -0.296 0.768   
## med\_hh\_inc -3.118e-07 5.427e-07 1.966e+01 -0.574 0.572   
## black\_pop 1.216e-03 9.460e-04 2.061e+01 1.285 0.213   
## post\_floyd1:black\_pop 5.149e-03 1.306e-03 5.442e+03 3.943 8.16e-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



class(re\_base\_nopol) <- "lmerMod"  
class(re\_base) <- "lmerMod"  
class(re\_int) <- "lmerMod"  
  
stargazer(ts\_ar1, ts\_ar1\_pol, re\_base\_nopol, re\_base, re\_int,  
 title = "Interrupted Time Series Models of Firearm Assault Injuries",  
 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 OIS t-1",   
 "AR(1)",  
 "Median HH Income",  
 "Percent Black",  
 "Post-Killing X Percent Black"),  
 header = F,  
 dep.var.caption = "Firearm Assault Injuries",  
 dep.var.labels = "Rate per 100,000",  
 model.names = FALSE,  
 column.labels = c("AR(1) TSR","AR(1) TSR",   
 "RE HLM","RE HLM", "RE HLM +Int."),  
 report = "vcs",  
 ci=TRUE,   
 ci.level=0.95,   
 ci.separator = "|",  
 notes = "95\\% Confidence Intervals in parentheses",  
 single.row = F,  
 font.size="scriptsize",   
 no.space = T,   
 column.sep.width = "0.1pt",  
 omit = c("tmax\_f", "snow\_in","precip\_in","dark\_before\_12","school"),  
 omit.stat = c("adj.rsq"),  
 #star.cutoffs = c(.05, .01, .001), star.char = c("\*","\*\*","\*\*\*"),  
 add.lines = list(c("SD(ZCTA)", "","", .904, .922, .504),  
 c("SD(Residual)", "","", 5.352, 5.364, 5.577)),  
 notes.label = "Models include controls for seasonality.",  
 notes.append = F,  
 type = "html",  
 out = "C:/Users/rlarson21/Documents/Research/Gun-Violence-MN/Gun Violence Submissions/SSTE Submission/SSTE R&R/table2.html")

Interrupted Time Series Models of Firearm Assault Injuries

Firearm Assault Injuries

Rate per 100,000

AR(1) TSR

AR(1) TSR

RE HLM

RE HLM

RE HLM +Int.

(1)

(2)

(3)

(4)

(5)

T

0.001

-0.001

0.003

0.002

0.001

(-0.0003|0.002)

(-0.003|0.001)

(0.0004|0.005)

(-0.0005|0.004)

(-0.002|0.004)

COVID - State of Emergency

-0.463

-0.411

-0.645

-0.506

-0.439

(-1.026|0.100)

(-0.995|0.173)

(-1.998|0.708)

(-1.864|0.853)

(-1.917|1.040)

COVID - Stay at Home

0.403

0.416

0.242

0.156

0.189

(-0.179|0.984)

(-0.183|1.016)

(-1.150|1.634)

(-1.240|1.553)

(-1.331|1.709)

Post-Killing

1.781

1.775

1.330

1.277

0.282

(1.176|2.387)

(1.137|2.414)

(-0.091|2.750)

(-0.149|2.703)

(-1.375|1.938)

T Post-Killing

-0.048

-0.047

-0.035

-0.032

-0.036

(-0.068|-0.028)

(-0.070|-0.025)

(-0.081|0.011)

(-0.078|0.015)

(-0.086|0.015)

MPD Use of Force t-1

-0.015

-0.130

-0.123

(-1.400|1.370)

(-0.184|-0.077)

(-0.175|-0.070)

MPD Stops t-1

-0.121

0.035

0.076

(-0.365|0.122)

(0.019|0.051)

(0.055|0.098)

MPD OIS t-1

-27.382

-1.953

-1.668

(-67.727|12.964)

(-12.946|9.040)

(-13.095|9.759)

AR(1)

0.142

0.065

(0.021|0.263)

(-0.071|0.201)

Median HH Income

0.00001

(-0.00001|0.00002)

Percent Black

0.038

(0.014|0.062)

Post-Killing X Percent Black

0.063

(0.032|0.094)

Constant

0.579

0.931

0.794

0.834

-0.412

(-0.194|1.352)

(-0.204|2.066)

(-1.094|2.683)

(-1.073|2.740)

(-2.785|1.961)

SD(ZCTA)

0.904

0.922

0.504

SD(Residual)

5.352

5.364

5.577

Observations

260

217

6,003

5,928

5,460

R2

0.385

0.407

Log Likelihood

-18,618.490

-18,406.520

-17,172.070

Akaike Inf. Crit.

37,262.990

36,845.050

34,382.150

Bayesian Inf. Crit.

37,350.090

36,952.040

34,507.650

Residual Std. Error

0.463 (df = 248)

0.474 (df = 202)

F Statistic

14.117\*\*\* (df = 11; 248)

9.898\*\*\* (df = 14; 202)

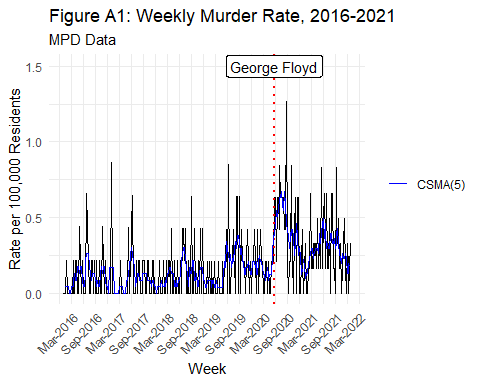
Models include controls for seasonality.

95% Confidence Intervals in parentheses

#maps of post\_floyd and post\_floyd\_3 coefficients by zip - colored divergently  
coef <- broom::tidy(fe\_int\_model$coefficients) %>%  
 filter(str\_detect(names, "post\_floyd")) %>%  
 mutate(period = ifelse(str\_detect(names, "post\_floyd\_3"), "3+ Months Post-Killing", "0-3 Months Post-Killing"),  
 main\_effect = ifelse(period=="3+ Months Post-Killing", round(0.3399083,2), round(-0.5604477,2)),  
 zcta = as.numeric(str\_sub(names, -5)),  
 zcta = as.numeric(ifelse(is.na(zcta), "55401", zcta)),  
 interaction\_effect = ifelse(zcta=="55401", 0, round(x,2)),  
 coef = main\_effect+interaction\_effect) %>%  
 select(zcta, period, coef, main\_effect, interaction\_effect) %>%  
 arrange(zcta, period)  
  
#creating period rows in other spatial layers  
coef\_zip\_level <- zip\_level %>%  
 filter(period!="Pre-Killing") %>%  
 left\_join(coef, by = c("zcta", "period"))  
coef\_gfs <- gfs  
coef\_gfs[2,] <- gfs[1,]  
coef\_gfs$period <- c("3+ Months Post-Killing", "0-3 Months Post-Killing")  
coef\_mpls <- mpls  
coef\_mpls[2,] <- mpls[1,]  
coef\_mpls$period <- c("3+ Months Post-Killing", "0-3 Months Post-Killing")  
  
  
ggplot() +  
 geom\_sf(data = coef\_zip\_level, aes(geometry = geometry, fill = coef)) +   
 geom\_sf(data = mpls, aes(geometry = geometry), color = "black", alpha = 0)+  
 geom\_sf(data = coef\_gfs, aes(geometry = geometry), color = "black")+  
 geom\_text\_repel(data = gfs, aes(x=lon, y=lat, label = name),  
 size = 2,  
 fontface = "bold",  
 nudge\_x = 1, nudge\_y = -1)+  
 scale\_fill\_gradient2(trans="reverse")+  
 facet\_wrap(~period)+  
 labs(title = "Figure 3: Treatment Effects by ZCTA",   
 fill = "Coef.")+  
 theme(axis.text = 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"))+  
 guides(fill = guide\_colorbar(reverse = TRUE))

# MPD Murders: Time Series

#pre-pims  
mpd\_2016 <- read\_csv("Data/Police\_Incidents\_2016.csv")   
mpd\_2017 <- read\_csv("Data/Police\_Incidents\_2017.csv")   
mpd\_2018a <- read\_csv("Data/Police\_Incidents\_2018.csv")  
  
#pims  
mpd\_2018b <- read\_csv("Data/Police\_Incidents\_2018\_PIMS.csv")   
mpd\_2019 <- read\_csv("Data/Police\_Incidents\_2019.csv")   
mpd\_2020 <- read\_csv("Data/Police\_Incidents\_2020.csv")   
mpd\_2021 <- read\_csv("Data/Police\_Incidents\_2021.csv")  
  
pre\_pims\_base <- mpd\_2016 %>%  
 rbind(mpd\_2017) %>%  
 rbind(mpd\_2018a) %>%  
 rename(reportedDate = ReportedDate,  
 centerLong = Long,  
 centerLat = Lat) %>%  
 select(FID, centerLong, centerLat, Offense, reportedDate) %>%  
 rename(OBJECTID = FID,   
 X = centerLong,   
 Y = centerLat,   
 offense = Offense)  
  
post\_pims\_base <- mpd\_2018b %>%  
 rbind(mpd\_2019) %>%  
 rbind(mpd\_2020) %>%  
 rbind(mpd\_2021) %>%  
 select(OBJECTID, X, Y, offense, reportedDate)  
  
mpd <- pre\_pims\_base %>%  
 rbind(post\_pims\_base)   
  
mpd\_series <- mpd %>%  
 mutate(date=ymd\_hms(reportedDate),  
 year=isoyear(date),  
 week=isoweek(date)) %>%  
 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(offense=="MURDR" & zcta %in% zcta\_universe) %>%  
 group\_by(year, week, .drop=F) %>%  
 tally(name = "murder") %>%  
 arrange(year, week) %>%  
 filter(year <= 2021 & year >= 2016) %>%  
 ungroup() %>%  
 complete(year, week = 1:52, fill = list(murder = 0)) %>%  
 select(year, week, murder)  
  
mpls\_pops\_year <- series %>%  
 group\_by(year) %>%  
 summarize(total\_pop = mean(total\_pop, na.rm = T)) %>%  
 add\_row(year = 2021, total\_pop = 603465)  
   
  
mpd\_series <- mpd\_series %>%  
 left\_join(mpls\_pops\_year, by = "year") %>%  
 mutate(murder\_rate = (murder/total\_pop)\*100000,  
 begin\_date = ISOweek2date(paste(year, paste0("W", sprintf("%02d", week)), 1,sep = "-")),  
 end\_date = begin\_date+weeks(1)-days(1))  
   
  
mpd\_series <- mpd\_series %>%   
 mutate(csma = forecast::ma(murder\_rate, order=5,centre=TRUE),  
 tsma = TTR::SMA(murder\_rate, n=5))  
  
#build in covariates to MPD series  
  
weather\_murder <- read\_csv("Data/dnr\_weather\_2.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 <= 2021) %>%  
 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))  
  
sun\_series\_murder <- getSunlightTimes(date = seq(min(mpd\_series$begin\_date),   
 max(mpd\_series$begin\_date),   
 "days"),  
 lat = 44.97775 ,  
 lon = -93.26501,  
 keep = "sunset",  
 tz = "UTC") %>%  
 mutate(sunset = sunset-hours(6),  
 midnight = as.POSIXlt(date+days(1), format = '%Y-%m-%d %H:%M:%S'),  
 dark = as.numeric(midnight-sunset),   
 year = year(date),   
 week = isoweek(date)) %>%  
 group\_by(year, week) %>%  
 summarize(dark\_before\_12 = mean(dark, na.rm = T))  
  
school\_murder <- mpd\_series %>%  
 select(year, week, begin\_date, end\_date) %>%  
 mutate(days\_in\_week = as.numeric((end\_date-begin\_date))+1,   
 days\_in\_school\_murder = NA\_integer\_)  
  
school\_murder[1,6] <- 5  
school\_murder[2,6] <- 4  
school\_murder[3,6] <- 3  
school\_murder[4,6] <- 5  
school\_murder[5,6] <- 5  
school\_murder[6,6] <- 4  
school\_murder[7,6] <- 4  
school\_murder[8,6] <- 5  
school\_murder[9,6] <- 5  
school\_murder[10,6] <- 4  
school\_murder[11,6] <- 4  
school\_murder[12,6] <- 5  
school\_murder[13,6] <- 0  
school\_murder[14,6] <- 5  
school\_murder[15,6] <- 5  
school\_murder[16,6] <- 5  
school\_murder[17,6] <- 5  
school\_murder[18,6] <- 5  
school\_murder[19,6] <- 5  
school\_murder[20,6] <- 5  
school\_murder[21,6] <- 5  
school\_murder[22,6] <- 4  
school\_murder[23,6] <- 2  
school\_murder[24,6] <- 0  
school\_murder[25,6] <- 0  
school\_murder[26,6] <- 0  
school\_murder[27,6] <- 0  
school\_murder[28,6] <- 0  
school\_murder[29,6] <- 0  
school\_murder[30,6] <- 0  
school\_murder[31,6] <- 0  
school\_murder[32,6] <- 0  
school\_murder[33,6] <- 0  
school\_murder[34,6] <- 0  
school\_murder[35,6] <- 5  
school\_murder[36,6] <- 4  
school\_murder[37,6] <- 5  
school\_murder[38,6] <- 5  
school\_murder[39,6] <- 5  
school\_murder[40,6] <- 5  
school\_murder[41,6] <- 5  
school\_murder[42,6] <- 2  
school\_murder[43,6] <- 5  
school\_murder[44,6] <- 3  
school\_murder[45,6] <- 5  
school\_murder[46,6] <- 5  
school\_murder[47,6] <- 2  
school\_murder[48,6] <- 5  
school\_murder[49,6] <- 5  
school\_murder[50,6] <- 5  
school\_murder[51,6] <- 0  
school\_murder[52,6] <- 0  
school\_murder[53,6] <- 4  
school\_murder[54,6] <- 5  
school\_murder[55,6] <- 4  
school\_murder[56,6] <- 4  
school\_murder[57,6] <- 4  
school\_murder[58,6] <- 5  
school\_murder[59,6] <- 4  
school\_murder[60,6] <- 4  
school\_murder[61,6] <- 5  
school\_murder[62,6] <- 5  
school\_murder[63,6] <- 5  
school\_murder[64,6] <- 5  
school\_murder[65,6] <- 3  
school\_murder[66,6] <- 0  
school\_murder[67,6] <- 5  
school\_murder[68,6] <- 5  
school\_murder[69,6] <- 5  
school\_murder[70,6] <- 5  
school\_murder[71,6] <- 5  
school\_murder[72,6] <- 5  
school\_murder[73,6] <- 5  
school\_murder[74,6] <- 4  
school\_murder[75,6] <- 5  
school\_murder[76,6] <- 3  
school\_murder[77,6] <- 0  
school\_murder[78,6] <- 0  
school\_murder[79,6] <- 0  
school\_murder[80,6] <- 0  
school\_murder[81,6] <- 0  
school\_murder[82,6] <- 0  
school\_murder[83,6] <- 0  
school\_murder[84,6] <- 0  
school\_murder[85,6] <- 0  
school\_murder[86,6] <- 0  
school\_murder[87,6] <- 5  
school\_murder[88,6] <- 4  
school\_murder[89,6] <- 5  
school\_murder[90,6] <- 5  
school\_murder[91,6] <- 5  
school\_murder[92,6] <- 5  
school\_murder[93,6] <- 5  
school\_murder[94,6] <- 2  
school\_murder[95,6] <- 5  
school\_murder[96,6] <- 3  
school\_murder[97,6] <- 5  
school\_murder[98,6] <- 5  
school\_murder[99,6] <- 2  
school\_murder[100,6] <- 5  
school\_murder[101,6] <- 5  
school\_murder[102,6] <- 5  
school\_murder[103,6] <- 5  
school\_murder[104,6] <- 0  
school\_murder[105,6] <- 0  
school\_murder[106,6] <- 0  
school\_murder[107,6] <- 5  
school\_murder[108,6] <- 4  
school\_murder[109,6] <- 3  
school\_murder[110,6] <- 5  
school\_murder[111,6] <- 5  
school\_murder[112,6] <- 4  
school\_murder[113,6] <- 4  
school\_murder[114,6] <- 5  
school\_murder[115,6] <- 5  
school\_murder[116,6] <- 5  
school\_murder[117,6] <- 5  
school\_murder[118,6] <- 4  
school\_murder[119,6] <- 0  
school\_murder[120,6] <- 5  
school\_murder[121,6] <- 5  
school\_murder[122,6] <- 5  
school\_murder[123,6] <- 5  
school\_murder[124,6] <- 5  
school\_murder[125,6] <- 5  
school\_murder[126,6] <- 5  
school\_murder[127,6] <- 4  
school\_murder[128,6] <- 5  
school\_murder[129,6] <- 0  
school\_murder[130,6] <- 0  
school\_murder[131,6] <- 0  
school\_murder[132,6] <- 0  
school\_murder[133,6] <- 0  
school\_murder[134,6] <- 0  
school\_murder[135,6] <- 0  
school\_murder[136,6] <- 0  
school\_murder[137,6] <- 0  
school\_murder[138,6] <- 0  
school\_murder[139,6] <- 0  
school\_murder[140,6] <- 5  
school\_murder[141,6] <- 4  
school\_murder[142,6] <- 5  
school\_murder[143,6] <- 5  
school\_murder[144,6] <- 5  
school\_murder[145,6] <- 5  
school\_murder[146,6] <- 5  
school\_murder[147,6] <- 2  
school\_murder[148,6] <- 5  
school\_murder[149,6] <- 3  
school\_murder[150,6] <- 5  
school\_murder[151,6] <- 5  
school\_murder[152,6] <- 2  
school\_murder[153,6] <- 5  
school\_murder[154,6] <- 5  
school\_murder[155,6] <- 5  
school\_murder[156,6] <- 5  
school\_murder[157,6] <- 0  
school\_murder[158,6] <- 0  
school\_murder[159,6] <- 5  
school\_murder[160,6] <- 5  
school\_murder[161,6] <- 2  
school\_murder[162,6] <- 5  
school\_murder[163,6] <- 5  
school\_murder[164,6] <- 4  
school\_murder[165,6] <- 4  
school\_murder[166,6] <- 5  
school\_murder[167,6] <- 5  
school\_murder[168,6] <- 5  
school\_murder[169,6] <- 5  
school\_murder[170,6] <- 4  
school\_murder[171,6] <- 0  
school\_murder[172,6] <- 5  
school\_murder[173,6] <- 5  
school\_murder[174,6] <- 5  
school\_murder[175,6] <- 5  
school\_murder[176,6] <- 5  
school\_murder[177,6] <- 5  
school\_murder[178,6] <- 5  
school\_murder[179,6] <- 4  
school\_murder[180,6] <- 5  
school\_murder[181,6] <- 0  
school\_murder[182,6] <- 0  
school\_murder[183,6] <- 0  
school\_murder[184,6] <- 0  
school\_murder[185,6] <- 0  
school\_murder[186,6] <- 0  
school\_murder[187,6] <- 0  
school\_murder[188,6] <- 0  
school\_murder[189,6] <- 0  
school\_murder[190,6] <- 0  
school\_murder[191,6] <- 0  
school\_murder[192,6] <- 0  
school\_murder[193,6] <- 4  
school\_murder[194,6] <- 5  
school\_murder[195,6] <- 5  
school\_murder[196,6] <- 5  
school\_murder[197,6] <- 5  
school\_murder[198,6] <- 5  
school\_murder[199,6] <- 2  
school\_murder[200,6] <- 5  
school\_murder[201,6] <- 4  
school\_murder[202,6] <- 5  
school\_murder[203,6] <- 5  
school\_murder[204,6] <- 5  
school\_murder[205,6] <- 2  
school\_murder[206,6] <- 5  
school\_murder[207,6] <- 5  
school\_murder[208,6] <- 5  
school\_murder[209,6] <- 0  
school\_murder[210,6] <- 0  
school\_murder[211,6] <- 5  
school\_murder[212,6] <- 4  
school\_murder[213,6] <- 4  
school\_murder[214,6] <- 5  
school\_murder[215,6] <- 5  
school\_murder[216,6] <- 5  
school\_murder[217,6] <- 3  
school\_murder[218,6] <- 5  
school\_murder[219,6] <- 5  
school\_murder[220,6] <- 5  
school\_murder[221,6] <- 5  
school\_murder[222,6] <- 4  
school\_murder[223,6] <- 0  
school\_murder[224,6] <- 5  
school\_murder[225,6] <- 5  
school\_murder[226,6] <- 5  
school\_murder[227,6] <- 5  
school\_murder[228,6] <- 5  
school\_murder[229,6] <- 5  
school\_murder[230,6] <- 5  
school\_murder[231,6] <- 4  
school\_murder[232,6] <- 5  
school\_murder[233,6] <- 0  
school\_murder[234,6] <- 0  
school\_murder[235,6] <- 0  
school\_murder[236,6] <- 0  
school\_murder[237,6] <- 0  
school\_murder[238,6] <- 0  
school\_murder[239,6] <- 0  
school\_murder[240,6] <- 0  
school\_murder[241,6] <- 0  
school\_murder[242,6] <- 0  
school\_murder[243,6] <- 0  
school\_murder[244,6] <- 0  
school\_murder[245,6] <- 4  
school\_murder[246,6] <- 5  
school\_murder[247,6] <- 5  
school\_murder[248,6] <- 5  
school\_murder[249,6] <- 5  
school\_murder[250,6] <- 5  
school\_murder[251,6] <- 3  
school\_murder[252,6] <- 4  
school\_murder[253,6] <- 5  
school\_murder[254,6] <- 4  
school\_murder[255,6] <- 5  
school\_murder[256,6] <- 5  
school\_murder[257,6] <- 2  
school\_murder[258,6] <- 5  
school\_murder[259,6] <- 5  
school\_murder[260,6] <- 5  
school\_murder[261,6] <- 5  
school\_murder[262,6] <- 5  
school\_murder[263,6] <- 4  
school\_murder[264,6] <- 4  
school\_murder[265,6] <- 4  
school\_murder[266,6] <- 5  
school\_murder[267,6] <- 5  
school\_murder[268,6] <- 3  
school\_murder[269,6] <- 5  
school\_murder[270,6] <- 5  
school\_murder[271,6] <- 5  
school\_murder[272,6] <- 5  
school\_murder[273,6] <- 4  
school\_murder[274,6] <- 0  
school\_murder[275,6] <- 5  
school\_murder[276,6] <- 5  
school\_murder[277,6] <- 5  
school\_murder[278,6] <- 5  
school\_murder[279,6] <- 5  
school\_murder[280,6] <- 5  
school\_murder[281,6] <- 5  
school\_murder[282,6] <- 4  
school\_murder[283,6] <- 0  
school\_murder[284,6] <- 0  
school\_murder[285,6] <- 0  
school\_murder[286,6] <- 0  
school\_murder[287,6] <- 0  
school\_murder[288,6] <- 0  
school\_murder[289,6] <- 0  
school\_murder[290,6] <- 0  
school\_murder[291,6] <- 0  
school\_murder[292,6] <- 0  
school\_murder[293,6] <- 0  
school\_murder[294,6] <- 0  
school\_murder[295,6] <- 0  
school\_murder[296,6] <- 3  
school\_murder[297,6] <- 5  
school\_murder[298,6] <- 5  
school\_murder[299,6] <- 5  
school\_murder[300,6] <- 5  
school\_murder[301,6] <- 5  
school\_murder[302,6] <- 3  
school\_murder[303,6] <- 5  
school\_murder[304,6] <- 4  
school\_murder[305,6] <- 5  
school\_murder[306,6] <- 5  
school\_murder[307,6] <- 2  
school\_murder[308,6] <- 5  
school\_murder[309,6] <- 5  
school\_murder[310,6] <- 5  
school\_murder[311,6] <- 0  
school\_murder[312,6] <- 0  
school\_murder[313,6] <- 0  
  
school\_murder <- school\_murder %>%  
 mutate(school = days\_in\_school\_murder/days\_in\_week) %>%  
 select(year, week, school)  
  
  
mpd\_series <- mpd\_series %>%  
 left\_join(uof, by=c("year", "week"="week")) %>%  
 left\_join(stop, by=c("year", "week"="week")) %>%  
 left\_join(ois, by=c("year", "week"="week")) %>%  
 left\_join(weather\_murder, by=c("year", "week"="week")) %>%  
 left\_join(sun\_series\_murder, by = c("year", "week"="week")) %>%  
 left\_join(school\_murder, by=c("year", "week"="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,  
 use\_of\_force\_rate = (use\_of\_force/total\_pop)\*1000,  
 police\_stop\_rate = (police\_stops/total\_pop)\*1000,  
 t = 1:length(murder\_rate),  
 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") & begin\_date <= as.Date("2020-05-28"))),  
 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))  
  
  
ggplot(mpd\_series)+  
 geom\_line(aes(x=begin\_date, y=murder\_rate))+   
 scale\_x\_date(date\_labels = "%b-%Y", date\_breaks = "6 months")+  
 geom\_vline(xintercept=mpd\_series$begin\_date[mpd\_series$year==2020 & mpd\_series$week==isoweek(date("2020-05-25"))],   
 linetype="dotted", color="red", size=1)+  
 geom\_label(aes(x=mpd\_series$begin\_date[mpd\_series$year==2020 & mpd\_series$week==isoweek(date("2020-05-25"))],  
 y=1.5),   
 label = "George Floyd", show.legend = FALSE)+  
 labs(title = "Figure A1: Weekly Murder Rate, 2016-2021",  
 subtitle = "MPD Data",  
 x = "Week",  
 y = "Rate per 100,000 Residents",   
 color = NULL)+  
 theme\_minimal()+  
 theme(axis.text.x=element\_text(angle=45, hjust=1)) +  
 geom\_line(aes(x=begin\_date, y=csma, color = "CSMA(5)"))+  
 #geom\_line(aes(x=begin\_date, y=tsma, color = "TSMA(5)"))+  
 #geom\_ma(aes(x = begin\_date, y = murder\_rate, color = "MA4"), ma\_fun = SMA, n = 4)  
 scale\_color\_manual(values = c("blue", "green"))



mean(mpd\_series$murder\_rate[mpd\_series$post\_floyd==0])

## [1] 0.124684

mean(mpd\_series$murder\_rate[mpd\_series$post\_floyd==1])

## [1] 0.3436705

t.test(murder\_rate~post\_floyd, data = mpd\_series, var.equal=F)

##   
## Welch Two Sample t-test  
##   
## data: murder\_rate by post\_floyd  
## t = -7.0569, df = 111.37, p-value = 1.535e-10  
## alternative hypothesis: true difference in means between group 0 and group 1 is not equal to 0  
## 95 percent confidence interval:  
## -0.2804754 -0.1574975  
## sample estimates:  
## mean in group 0 mean in group 1   
## 0.1246840 0.3436705

# murder time series models AR(1)  
ts\_ar1\_pol\_m<- lm(murder\_rate~t+  
 state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag+  
 dplyr::lag(murder\_rate, 1), data = mpd\_series)  
  
  
summary(ts\_ar1\_pol\_m)

##   
## Call:  
## lm(formula = murder\_rate ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag +   
## dplyr::lag(murder\_rate, 1), data = mpd\_series)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.44203 -0.13930 -0.03273 0.10442 0.86331   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.0375003 0.1995187 0.188 0.85106   
## t 0.0005974 0.0003924 1.523 0.12913   
## state\_of\_emerg1 -0.0436354 0.1214237 -0.359 0.71962   
## stay\_at\_home1 -0.0276275 0.1246543 -0.222 0.82478   
## post\_floyd1 0.2831971 0.1232375 2.298 0.02238 \*   
## t\_post\_floyd -0.0042185 0.0009803 -4.303 2.4e-05 \*\*\*  
## tmax\_f 0.0030664 0.0011011 2.785 0.00576 \*\*   
## snow\_in 0.0090765 0.0352209 0.258 0.79685   
## precip\_in -0.1058142 0.1163379 -0.910 0.36393   
## dark\_before\_12 -0.0069101 0.0183843 -0.376 0.70733   
## school 0.0016746 0.0447600 0.037 0.97019   
## uof\_lag 0.1588913 0.2575319 0.617 0.53780   
## stops\_lag -0.0541703 0.0476538 -1.137 0.25672   
## shoot\_lag 5.0560172 8.3311809 0.607 0.54447   
## dplyr::lag(murder\_rate, 1) -0.1388226 0.0625145 -2.221 0.02726 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1972 on 254 degrees of freedom  
## (44 observations deleted due to missingness)  
## Multiple R-squared: 0.3148, Adjusted R-squared: 0.277   
## F-statistic: 8.334 on 14 and 254 DF, p-value: 1.052e-14

ts\_ar1\_m<- lm(murder\_rate~t+  
 state\_of\_emerg+stay\_at\_home+post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 dplyr::lag(murder\_rate, 1), data = mpd\_series)  
  
  
summary(ts\_ar1\_pol\_m)

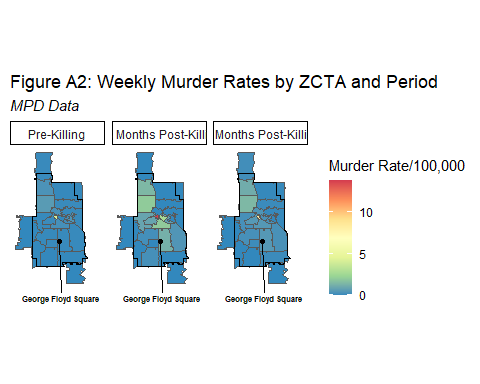
##   
## Call:  
## lm(formula = murder\_rate ~ t + state\_of\_emerg + stay\_at\_home +   
## post\_floyd + t\_post\_floyd + tmax\_f + snow\_in + precip\_in +   
## dark\_before\_12 + school + uof\_lag + stops\_lag + shoot\_lag +   
## dplyr::lag(murder\_rate, 1), data = mpd\_series)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -0.44203 -0.13930 -0.03273 0.10442 0.86331   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.0375003 0.1995187 0.188 0.85106   
## t 0.0005974 0.0003924 1.523 0.12913   
## state\_of\_emerg1 -0.0436354 0.1214237 -0.359 0.71962   
## stay\_at\_home1 -0.0276275 0.1246543 -0.222 0.82478   
## post\_floyd1 0.2831971 0.1232375 2.298 0.02238 \*   
## t\_post\_floyd -0.0042185 0.0009803 -4.303 2.4e-05 \*\*\*  
## tmax\_f 0.0030664 0.0011011 2.785 0.00576 \*\*   
## snow\_in 0.0090765 0.0352209 0.258 0.79685   
## precip\_in -0.1058142 0.1163379 -0.910 0.36393   
## dark\_before\_12 -0.0069101 0.0183843 -0.376 0.70733   
## school 0.0016746 0.0447600 0.037 0.97019   
## uof\_lag 0.1588913 0.2575319 0.617 0.53780   
## stops\_lag -0.0541703 0.0476538 -1.137 0.25672   
## shoot\_lag 5.0560172 8.3311809 0.607 0.54447   
## dplyr::lag(murder\_rate, 1) -0.1388226 0.0625145 -2.221 0.02726 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.1972 on 254 degrees of freedom  
## (44 observations deleted due to missingness)  
## Multiple R-squared: 0.3148, Adjusted R-squared: 0.277   
## F-statistic: 8.334 on 14 and 254 DF, p-value: 1.052e-14

# MPD Murders: Panel

# creation of mpd panel  
  
mpd\_panel <- mpd %>%  
 mutate(date=ymd\_hms(reportedDate),  
 year=isoyear(date),  
 week=isoweek(date)) %>%  
 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)) %>%  
 filter(offense=="MURDR" & zcta %in% zcta\_universe) %>%  
 group\_by(year, zcta, week, .drop=F) %>%  
 tally(name = "murder") %>%  
 arrange(year, week, zcta) %>%  
 filter(year <= 2021 & year >= 2016) %>%  
 ungroup() %>%  
 complete(year, zcta = zcta\_universe, week = 1:52, fill = list(murder = 0)) %>%  
 select(year, week, zcta, murder) %>%  
 mutate(begin\_date = ISOweek2date(paste(year,   
 paste0("W",   
 sprintf("%02d", week)),  
 1,sep = "-")),  
 end\_date = begin\_date+weeks(1)-days(1),  
 stay\_at\_home = as.numeric(begin\_date >= as.Date("2020-03-28") & begin\_date <= as.Date("2020-05-28")),  
 state\_of\_emerg = 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),  
 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)),  
 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"))) %>%  
 left\_join(acs, by = c("zcta", "year")) %>%  
 mutate(murder\_rate = murder/total\_pop\*100000) %>%  
 left\_join(weather\_murder, by = c("year","week")) %>%  
 left\_join(sun\_series\_murder, by = c("year","week")) %>%  
 left\_join(school\_murder, by = c("year","week")) %>%  
 left\_join(uof\_spatial, by = c("year", "week", "zcta")) %>%  
 left\_join(stop\_spatial, by = c("year", "week", "zcta")) %>%  
 left\_join(ois\_spatial, by = c("year", "week", "zcta")) %>%  
 mutate(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,  
 uof\_lag = dplyr::lag(uof\_rate, 1),  
 stops\_lag = dplyr::lag(stops\_rate, 1),  
 shoot\_lag = dplyr::lag(ois\_rate, 1),  
 t = row\_number())  
  
  
mpd\_zip\_level <- mpd\_panel %>%  
 group\_by(zcta, period) %>%  
 summarize(murder\_tot = mean(murder, na.rm = T),  
 total\_pop = mean(total\_pop, na.rm = T)) %>%  
 mutate(murder\_rate = (murder\_tot/total\_pop)\*100000) %>%  
 ungroup() %>%  
 left\_join(zcta, by = "zcta")

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

ggplot() +  
 geom\_sf(data = mpd\_zip\_level, aes(geometry = geometry, fill = murder\_rate)) +   
 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",  
 nudge\_x = .1, nudge\_y = -.1)+  
 facet\_wrap(~period)+  
 scale\_fill\_distiller(palette = "Spectral")+  
 labs(title = "Figure A2: Weekly Murder Rates by ZCTA and Period",   
 subtitle = "MPD Data",  
 fill = "Murder Rate/100,000")+  
 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"))



mpd\_panel <- mpd\_panel %>%  
 mutate(state\_of\_emerg = as.factor(state\_of\_emerg),  
 stay\_at\_home = as.factor(stay\_at\_home),  
 post\_floyd = as.factor(post\_floyd),  
 post\_floyd\_3 = as.factor(post\_floyd\_3))  
  
#RE base model  
re\_base\_m <- lmer(murder\_rate~t+state\_of\_emerg+stay\_at\_home+  
 post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag+  
 (1|zcta), data = mpd\_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\_base\_m)

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: murder\_rate ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + uof\_lag + stops\_lag + shoot\_lag + (1 | zcta)  
## Data: mpd\_panel  
##   
## REML criterion at convergence: 37566.2  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -0.944 -0.074 -0.025 0.015 33.225   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.5856 0.7653   
## Residual 32.7659 5.7241   
## Number of obs: 5926, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 3.065e-01 1.064e+00 4.566e+03 0.288 0.773317   
## t 1.067e-04 5.727e-05 5.572e+03 1.864 0.062426 .   
## state\_of\_emerg1 -3.317e-01 7.412e-01 5.885e+03 -0.448 0.654498   
## stay\_at\_home1 -3.308e-01 7.615e-01 5.874e+03 -0.434 0.664015   
## post\_floyd1 8.477e-01 7.781e-01 5.877e+03 1.089 0.276007   
## t\_post\_floyd -3.229e-02 2.663e-02 5.874e+03 -1.213 0.225310   
## tmax\_f 5.859e-03 7.024e-03 5.885e+03 0.834 0.404253   
## snow\_in -3.406e-02 2.213e-01 5.875e+03 -0.154 0.877652   
## precip\_in -7.428e-01 7.223e-01 5.873e+03 -1.028 0.303820   
## dark\_before\_12 -1.088e-01 1.198e-01 5.875e+03 -0.909 0.363561   
## school 1.284e-01 2.730e-01 5.877e+03 0.470 0.638130   
## uof\_lag -9.484e-02 2.835e-02 8.849e+02 -3.346 0.000855 \*\*\*  
## stops\_lag 1.991e-02 8.472e-03 8.345e+02 2.350 0.019029 \*   
## shoot\_lag 2.313e+00 5.985e+00 5.887e+03 0.387 0.699131   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

##   
## Correlation matrix not shown by default, as p = 14 > 12.  
## Use print(x, correlation=TRUE) or  
## vcov(x) if you need it

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

re\_base\_nopol\_m <- lmer(murder\_rate~t+state\_of\_emerg+stay\_at\_home+  
 post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 (1|zcta), data = mpd\_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\_base\_nopol\_m)

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: murder\_rate ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + (1 | zcta)  
## Data: mpd\_panel  
##   
## REML criterion at convergence: 37590.7  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -0.712 -0.076 -0.026 0.012 33.273   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.4733 0.688   
## Residual 32.8428 5.731   
## Number of obs: 5929, groups: zcta, 23  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 2.369e-01 1.062e+00 5.315e+03 0.223 0.8235   
## t 1.280e-04 5.689e-05 5.612e+03 2.251 0.0245 \*  
## state\_of\_emerg1 -4.280e-01 7.416e-01 5.904e+03 -0.577 0.5638   
## stay\_at\_home1 -2.623e-01 7.621e-01 5.896e+03 -0.344 0.7308   
## post\_floyd1 8.870e-01 7.786e-01 5.896e+03 1.139 0.2547   
## t\_post\_floyd -3.328e-02 2.659e-02 5.896e+03 -1.252 0.2107   
## tmax\_f 5.708e-03 7.025e-03 5.899e+03 0.812 0.4166   
## snow\_in -2.804e-02 2.214e-01 5.897e+03 -0.127 0.8992   
## precip\_in -7.552e-01 7.230e-01 5.896e+03 -1.045 0.2963   
## dark\_before\_12 -1.024e-01 1.199e-01 5.897e+03 -0.854 0.3930   
## school 1.244e-01 2.730e-01 5.896e+03 0.456 0.6487   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Correlation of Fixed Effects:  
## (Intr) t stt\_\_1 sty\_\_1 pst\_f1 t\_pst\_ tmax\_f snow\_n prcp\_n  
## t -0.246   
## stat\_f\_mrg1 -0.056 -0.209   
## stay\_at\_hm1 0.006 -0.001 -0.817   
## post\_floyd1 0.043 -0.025 -0.786 0.656   
## t\_post\_flyd 0.225 0.012 -0.177 0.176 -0.349   
## tmax\_f -0.886 0.139 0.065 -0.025 -0.105 -0.119   
## snow\_in -0.321 -0.057 0.072 -0.041 -0.039 -0.089 0.469   
## precip\_in -0.007 0.004 -0.040 0.043 0.027 0.065 -0.218 -0.224   
## dark\_bfr\_12 -0.925 0.088 0.086 0.016 -0.016 -0.273 0.754 0.197 0.036  
## school -0.138 0.035 -0.017 -0.069 0.067 -0.082 0.164 0.107 0.020  
## dr\_\_12  
## t   
## stat\_f\_mrg1   
## stay\_at\_hm1   
## post\_floyd1   
## t\_post\_flyd   
## tmax\_f   
## snow\_in   
## precip\_in   
## dark\_bfr\_12   
## school -0.084  
## fit warnings:  
## Some predictor variables are on very different scales: consider rescaling

re\_int\_m <- lmer(murder\_rate~t+state\_of\_emerg+stay\_at\_home+  
 post\_floyd+t\_post\_floyd+  
 tmax\_f+snow\_in+precip\_in+dark\_before\_12+school+  
 uof\_lag+stops\_lag+shoot\_lag+  
 med\_hh\_inc+  
 black\_pop+  
 post\_floyd:black\_pop+  
 (1|zcta), data = mpd\_panel)

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

## boundary (singular) fit: see help('isSingular')

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

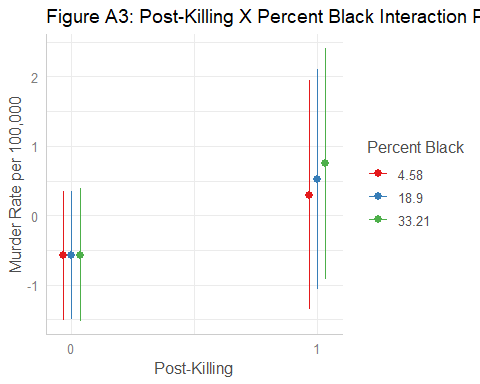
summary(re\_int\_m)

## Linear mixed model fit by REML. t-tests use Satterthwaite's method [  
## lmerModLmerTest]  
## Formula: murder\_rate ~ t + state\_of\_emerg + stay\_at\_home + post\_floyd +   
## t\_post\_floyd + tmax\_f + snow\_in + precip\_in + dark\_before\_12 +   
## school + uof\_lag + stops\_lag + shoot\_lag + med\_hh\_inc + black\_pop +   
## post\_floyd:black\_pop + (1 | zcta)  
## Data: mpd\_panel  
##   
## REML criterion at convergence: 34801.3  
##   
## Scaled residuals:   
## Min 1Q Median 3Q Max   
## -1.272 -0.076 -0.026 0.012 33.094   
##   
## Random effects:  
## Groups Name Variance Std.Dev.  
## zcta (Intercept) 0.00 0.00   
## Residual 33.99 5.83   
## Number of obs: 5458, groups: zcta, 21  
##   
## Fixed effects:  
## Estimate Std. Error df t value Pr(>|t|)   
## (Intercept) 4.613e-01 1.163e+00 5.441e+03 0.397 0.6917   
## t 1.028e-04 6.101e-05 5.441e+03 1.684 0.0922 .   
## state\_of\_emerg1 -2.644e-01 7.894e-01 5.441e+03 -0.335 0.7377   
## stay\_at\_home1 -3.333e-01 8.117e-01 5.441e+03 -0.411 0.6813   
## post\_floyd1 8.087e-01 8.863e-01 5.441e+03 0.912 0.3616   
## t\_post\_floyd -3.959e-02 2.836e-02 5.441e+03 -1.396 0.1628   
## tmax\_f 4.631e-03 7.442e-03 5.441e+03 0.622 0.5338   
## snow\_in -2.778e-02 2.352e-01 5.441e+03 -0.118 0.9060   
## precip\_in -8.566e-01 7.670e-01 5.441e+03 -1.117 0.2641   
## dark\_before\_12 -1.319e-01 1.269e-01 5.441e+03 -1.040 0.2985   
## school 1.999e-01 2.896e-01 5.441e+03 0.690 0.4902   
## uof\_lag -3.625e-02 2.632e-02 5.441e+03 -1.377 0.1686   
## stops\_lag 7.362e-02 9.324e-03 5.441e+03 7.895 3.48e-15 \*\*\*  
## shoot\_lag 2.586e+00 6.090e+00 5.441e+03 0.425 0.6712   
## med\_hh\_inc -2.748e-06 4.308e-06 5.441e+03 -0.638 0.5235   
## black\_pop 4.716e-04 7.637e-03 5.441e+03 0.062 0.9508   
## post\_floyd1:black\_pop 1.518e-02 1.667e-02 5.441e+03 0.911 0.3625   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

##   
## Correlation matrix not shown by default, as p = 17 > 12.  
## Use print(x, correlation=TRUE) or  
## vcov(x) if you need it

## fit warnings:  
## Some predictor variables are on very different scales: consider rescaling  
## optimizer (nloptwrap) convergence code: 0 (OK)  
## boundary (singular) fit: see help('isSingular')

plot\_model(re\_int\_m,   
 terms = c("post\_floyd", "black\_pop", "t[245.5]", "t\_post\_floyd[15.5]"),  
 type = "pred",   
 ci.lvl = 0.95,  
 mdrt.values = "meansd",  
 title = "Figure A3: Post-Killing X Percent Black Interaction Plot",  
 axis.title = c("Post-Killing","Murder Rate per 100,000"))+  
 theme\_sjplot()+  
 ggplot2::labs(colour = "Percent Black")



# Appendix Tables

class(re\_base\_nopol\_m) <- "lmerMod"  
class(re\_base\_m) <- "lmerMod"  
class(re\_int\_m) <- "lmerMod"  
  
stargazer(ts\_ar1\_m, ts\_ar1\_pol\_m, re\_base\_nopol\_m, re\_base\_m, re\_int\_m,  
 title = "Interrupted Time Series Models of the Murder Rate",  
 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 OIS t-1",   
 "AR(1)",  
 "Median HH Income",  
 "Percent Black",  
 "Post-Killing X Percent Black"),  
 header = F,  
 dep.var.caption = "Murder Rate",  
 dep.var.labels = "Rate per 100,000",  
 model.names = FALSE,  
 column.labels = c("AR(1) TSR","AR(1) TSR",   
 "RE HLM","RE HLM", "RE HLM +Int."),  
 report = "vcs",  
 ci=TRUE,   
 ci.level=0.95,   
 ci.separator = "|",  
 notes = "95\\% Confidence Intervals in parentheses",  
 single.row = F,  
 font.size="scriptsize",   
 no.space = T,   
 column.sep.width = "0.01pt",  
 omit = c("tmax\_f", "snow\_in","precip\_in","dark\_before\_12","school"),  
 omit.stat = c("adj.rsq"),  
 #star.cutoffs = c(.05, .01, .001), star.char = c("\*","\*\*","\*\*\*"),  
 add.lines = list(c("SD(ZCTA)", "","", .904, .922, .504),  
 c("SD(Residual)", "","", 5.352, 5.364, 5.577)),  
 notes.label = "Models include controls for seasonality.",  
 notes.append = F,  
 type = "html",  
 out = "C:/Users/rlarson21/Documents/Research/Gun-Violence-MN/Gun Violence Submissions/SSTE Submission/SSTE R&R/tableA1.html")

Interrupted Time Series Models of the Murder Rate

Murder Rate

Rate per 100,000

AR(1) TSR

AR(1) TSR

RE HLM

RE HLM

RE HLM +Int.

(1)

(2)

(3)

(4)

(5)

T

0.001

0.001

0.0001

0.0001

0.0001

(0.0002|0.001)

(-0.0002|0.001)

(0.00002|0.0002)

(-0.00001|0.0002)

(-0.00002|0.0002)

COVID - State of Emergency

-0.025

-0.044

-0.428

-0.332

-0.264

(-0.255|0.205)

(-0.282|0.194)

(-1.881|1.025)

(-1.785|1.121)

(-1.812|1.283)

COVID - Stay at Home

-0.038

-0.028

-0.262

-0.331

-0.333

(-0.275|0.199)

(-0.272|0.217)

(-1.756|1.231)

(-1.823|1.162)

(-1.924|1.257)

Post-Killing

0.309

0.283

0.887

0.848

0.809

(0.078|0.541)

(0.042|0.525)

(-0.639|2.413)

(-0.677|2.373)

(-0.928|2.546)

T Post-Killing

-0.004

-0.004

-0.033

-0.032

-0.040

(-0.006|-0.002)

(-0.006|-0.002)

(-0.085|0.019)

(-0.084|0.020)

(-0.095|0.016)

MPD Use of Force t-1

0.159

-0.095

-0.036

(-0.346|0.664)

(-0.150|-0.039)

(-0.088|0.015)

MPD Stops t-1

-0.054

0.020

0.074

(-0.148|0.039)

(0.003|0.037)

(0.055|0.092)

MPD OIS t-1

5.056

2.313

2.586

(-11.273|21.385)

(-9.418|14.045)

(-9.350|14.521)

AR(1)

-0.107

-0.139

(-0.220|0.006)

(-0.261|-0.016)

Median HH Income

-0.00000

(-0.00001|0.00001)

Percent Black

0.0005

(-0.014|0.015)

Post-Killing X Percent Black

0.015

(-0.017|0.048)

Constant

-0.028

0.038

0.237

0.306

0.461

(-0.303|0.247)

(-0.354|0.429)

(-1.845|2.319)

(-1.779|2.392)

(-1.819|2.741)

SD(ZCTA)

0.904

0.922

0.504

SD(Residual)

5.352

5.364

5.577

Observations

312

269

5,929

5,926

5,458

R2

0.297

0.315

Log Likelihood

-18,795.350

-18,783.110

-17,400.650

Akaike Inf. Crit.

37,616.700

37,598.210

34,839.310

Bayesian Inf. Crit.

37,703.640

37,705.210

34,964.800

Residual Std. Error

0.192 (df = 300)

0.197 (df = 254)

F Statistic

11.538\*\*\* (df = 11; 300)

8.334\*\*\* (df = 14; 254)

Models include controls for seasonality.

95% Confidence Intervals in parentheses

class(re\_base\_u) <- "lmerMod"  
class(re\_base\_u\_nopol) <- "lmerMod"  
class(re\_int\_u) <- "lmerMod"  
  
stargazer(ts\_ar1\_u, ts\_ar1\_pol\_u, re\_base\_u\_nopol,re\_base\_u, re\_int\_u,  
 title = "Interrupted Time Series Models of Firearm Assault+Unintentional Injuries",  
 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 OIS t-1",   
 "AR(1)",  
 "Median HH Income",  
 "Percent Black",  
 "Post-Killing X Percent Black"),  
 header = F,  
 dep.var.caption = "Firearm Assault+Unintentional Injuries",  
 dep.var.labels = "Rate per 100,000",  
 model.names = FALSE,  
 column.labels = c("AR(1) TSR","AR(1) TSR",   
 "RE HLM","RE HLM", "RE HLM +Int."),  
 report = "vcs",  
 ci=TRUE,   
 ci.level=0.95,   
 ci.separator = "|",  
 notes = "95\\% Confidence Intervals in parentheses",  
 single.row = F,  
 font.size="scriptsize",   
 no.space = T,   
 column.sep.width = "0.01pt",  
 omit = c("tmax\_f", "snow\_in","precip\_in","dark\_before\_12","school"),  
 omit.stat = c("adj.rsq"),  
 #star.cutoffs = c(.05, .01, .001), star.char = c("\*","\*\*","\*\*\*"),  
 add.lines = list(c("SD(ZCTA)", "","", 1.779, 1.916, 1.449),  
 c("SD(Residual)", "","", 8.493, 8.494, 8.704)),  
 notes.label = "Models include controls for seasonality.",  
 notes.append = F,  
 type = "html",  
 out = "C:/Users/rlarson21/Documents/Research/Gun-Violence-MN/Gun Violence Submissions/SSTE Submission/SSTE R&R/tableA2.html")

Interrupted Time Series Models of Firearm Assault+Unintentional Injuries

Firearm Assault+Unintentional Injuries

Rate per 100,000

AR(1) TSR

AR(1) TSR

RE HLM

RE HLM

RE HLM +Int.

(1)

(2)

(3)

(4)

(5)

T

0.002

-0.002

0.005

0.004

0.003

(0.0001|0.003)

(-0.005|0.001)

(0.001|0.008)

(0.0002|0.008)

(-0.001|0.008)

COVID - State of Emergency

-0.608

-0.464

-0.176

-0.042

0.039

(-1.486|0.270)

(-1.380|0.452)

(-2.293|1.941)

(-2.161|2.077)

(-2.269|2.347)

COVID - Stay at Home

0.445

0.451

-0.699

-0.817

-0.877

(-0.464|1.354)

(-0.490|1.393)

(-2.877|1.478)

(-2.996|1.361)

(-3.249|1.496)

Post-Killing

3.394

3.341

3.428

3.316

1.812

(2.443|4.345)

(2.337|4.344)

(1.206|5.650)

(1.092|5.540)

(-0.774|4.397)

T Post-Killing

-0.097

-0.092

-0.152

-0.148

-0.163

(-0.128|-0.065)

(-0.127|-0.057)

(-0.224|-0.079)

(-0.221|-0.075)

(-0.242|-0.084)

MPD Use of Force t-1

-0.083

-0.188

-0.169

(-2.252|2.086)

(-0.273|-0.104)

(-0.255|-0.082)

MPD Stops t-1

-0.265

0.014

0.042

(-0.649|0.118)

(-0.012|0.040)

(0.005|0.079)

MPD OIS t-1

-10.263

-3.259

-2.942

(-73.259|52.733)

(-20.405|13.886)

(-20.784|14.900)

AR(1)

0.045

-0.038

(-0.075|0.165)

(-0.173|0.096)

Median HH Income

0.00000

(-0.00003|0.00004)

Percent Black

0.055

(-0.003|0.113)

Post-Killing X Percent Black

0.100

(0.052|0.148)

Constant

0.411

1.290

-0.258

-0.191

-1.599

(-0.787|1.609)

(-0.483|3.063)

(-3.262|2.745)

(-3.214|2.831)

(-5.960|2.762)

SD(ZCTA)

1.779

1.916

1.449

SD(Residual)

8.493

8.494

8.704

Observations

260

217

5,951

5,928

5,460

R2

0.491

0.513

Log Likelihood

-21,118.790

-21,040.630

-19,603.880

Akaike Inf. Crit.

42,263.570

42,113.260

39,245.770

Bayesian Inf. Crit.

42,350.560

42,220.260

39,371.270

Residual Std. Error

0.721 (df = 248)

0.742 (df = 202)

F Statistic

21.786\*\*\* (df = 11; 248)

15.216\*\*\* (df = 14; 202)

Models include controls for seasonality.

95% Confidence Intervals in parentheses

class(re\_base\_d\_nopol) <- "lmerMod"  
class(re\_base\_d) <- "lmerMod"  
class(re\_int\_d) <- "lmerMod"  
  
stargazer(ts\_ar1\_d, ts\_ar1\_pol\_d, re\_base\_d\_nopol, re\_base\_d, re\_int\_d,  
 title = "Interrupted Time Series Models of Firearm Undetermined Injuries",  
 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 OIS t-1",   
 "AR(1)",  
 "Median HH Income",  
 "Percent Black",  
 "Post-Killing X Percent Black"),  
 header = F,  
 dep.var.caption = "Firearm Undetermined Injuries",  
 dep.var.labels = "Rate per 100,000",  
 model.names = FALSE,  
 column.labels = c("AR(1) TSR","AR(1) TSR",   
 "RE HLM","RE HLM", "RE HLM +Int."),  
 report = "vcs",  
 ci=TRUE,   
 ci.level=0.95,   
 ci.separator = "|",  
 notes = "95\\% Confidence Intervals in parentheses",  
 single.row = F,  
 font.size="scriptsize",   
 no.space = T,   
 column.sep.width = "0.1pt",  
 omit = c("tmax\_f", "snow\_in","precip\_in","dark\_before\_12","school"),  
 omit.stat = c("adj.rsq"),  
 #star.cutoffs = c(.05, .01, .001), star.char = c("\*","\*\*","\*\*\*"),  
 add.lines = list(c("SD(ZCTA)", "","", .046, .046, .037),  
 c("SD(Residual)", "","", .442, .444, .462)),  
 notes.label = "Models include controls for seasonality.",  
 notes.append = F,  
 type = "html",  
 out = "C:/Users/rlarson21/Documents/Research/Gun-Violence-MN/Gun Violence Submissions/SSTE Submission/SSTE R&R/tableA3.html")

Interrupted Time Series Models of Firearm Undetermined Injuries

Firearm Undetermined Injuries

Rate per 100,000

AR(1) TSR

AR(1) TSR

RE HLM

RE HLM

RE HLM +Int.

(1)

(2)

(3)

(4)

(5)

T

0.00002

-0.0001

0.00000

-0.00001

0.00001

(-0.0002|0.0002)

(-0.001|0.0003)

(-0.0002|0.0002)

(-0.0002|0.0002)

(-0.0002|0.0002)

COVID - State of Emergency

-0.065

-0.065

-0.049

-0.048

-0.052

(-0.192|0.062)

(-0.200|0.071)

(-0.161|0.063)

(-0.161|0.065)

(-0.175|0.070)

COVID - Stay at Home

0.050

0.054

0.039

0.039

0.042

(-0.080|0.181)

(-0.084|0.193)

(-0.076|0.154)

(-0.077|0.154)

(-0.084|0.168)

Post-Killing

0.164

0.170

0.138

0.138

0.054

(0.029|0.299)

(0.023|0.316)

(0.020|0.255)

(0.020|0.257)

(-0.083|0.192)

T Post-Killing

-0.002

-0.002

-0.002

-0.002

-0.002

(-0.006|0.002)

(-0.007|0.003)

(-0.006|0.002)

(-0.006|0.002)

(-0.006|0.002)

MPD Use of Force t-1

0.099

-0.0004

-0.0005

(-0.221|0.420)

(-0.005|0.004)

(-0.005|0.004)

MPD Stops t-1

-0.007

-0.0001

-0.0002

(-0.064|0.049)

(-0.001|0.001)

(-0.002|0.001)

MPD OIS t-1

-3.299

-0.160

-0.143

(-12.654|6.055)

(-1.071|0.751)

(-1.090|0.805)

AR(1)

-0.058

-0.085

(-0.183|0.067)

(-0.224|0.053)

Median HH Income

-0.00000

(-0.00000|0.00000)

Percent Black

0.001

(-0.001|0.003)

Post-Killing X Percent Black

0.005

(0.003|0.008)

Constant

0.075

0.194

0.009

0.010

0.008

(-0.098|0.249)

(-0.071|0.459)

(-0.145|0.163)

(-0.146|0.166)

(-0.185|0.201)

SD(ZCTA)

0.046

0.046

0.037

SD(Residual)

0.442

0.444

0.462

Observations

260

217

6,003

5,928

5,460

R2

0.057

0.068

Log Likelihood

-3,665.197

-3,668.384

-3,618.112

Akaike Inf. Crit.

7,356.394

7,368.768

7,274.223

Bayesian Inf. Crit.

7,443.494

7,475.767

7,399.722

Residual Std. Error

0.104 (df = 248)

0.110 (df = 202)

F Statistic

1.373 (df = 11; 248)

1.051 (df = 14; 202)

Models include controls for seasonality.

95% Confidence Intervals in parentheses

class(re\_base\_b\_nopol) <- "lmerMod"  
class(re\_base\_b) <- "lmerMod"  
class(re\_int\_b) <- "lmerMod"  
  
stargazer(ts\_b, ts\_b\_pol, re\_base\_b\_nopol, re\_base\_b, re\_int\_b,  
 title = "Interrupted Time Series Models of Firearm Assault Injuries",  
 covariate.labels = c("T","COVID - State of Emergency",   
 "COVID - Stay at Home",  
 "Post-Killing",   
 "1 Month Post","2 Months Post","3 Months Post",  
 "4 Months Post","5 Months Post","6 Months Post",  
 "7+ Months Post",  
 "MPD Use of Force t-1", "MPD Stops t-1",  
 "MPD OIS t-1",   
 "AR(1)",  
 "Median HH Income",  
 "Percent Black",  
 "Post-Killing X Percent Black"),  
 header = F,  
 dep.var.caption = "Firearm Assault Injuries",  
 dep.var.labels = "Rate per 100,000",  
 model.names = FALSE,  
 column.labels = c("AR(1) TSR","AR(1) TSR",   
 "RE HLM","RE HLM", "RE HLM +Int."),  
 report = "vcs",  
 ci=TRUE,   
 ci.level=0.95,   
 ci.separator = "|",  
 notes = "95\\% Confidence Intervals in parentheses",  
 single.row = F,  
 font.size="scriptsize",   
 no.space = T,   
 column.sep.width = "0.1pt",  
 omit = c("tmax\_f", "snow\_in","precip\_in","dark\_before\_12","school"),  
 omit.stat = c("adj.rsq"),  
 #star.cutoffs = c(.05, .01, .001), star.char = c("\*","\*\*","\*\*\*"),  
 add.lines = list(c("SD(ZCTA)", "","", .817, .922, .504),  
 c("SD(Residual)", "","", 5.353, 5.364, 5.578)),  
 notes.label = "Models include controls for seasonality.",  
 notes.append = F,  
 type = "html",  
 out = "C:/Users/rlarson21/Documents/Research/Gun-Violence-MN/Gun Violence Submissions/SSTE Submission/SSTE R&R/tableA4.html")

Interrupted Time Series Models of Firearm Assault Injuries

Firearm Assault Injuries

Rate per 100,000

AR(1) TSR

AR(1) TSR

RE HLM

RE HLM

RE HLM +Int.

(1)

(2)

(3)

(4)

(5)

T

0.001

-0.001

0.003

0.002

0.001

(-0.0001|0.002)

(-0.003|0.001)

(0.0004|0.005)

(-0.0004|0.004)

(-0.002|0.004)

COVID - State of Emergency

-0.148

-0.063

-0.519

-0.352

-0.313

(-0.786|0.490)

(-0.706|0.580)

(-2.111|1.074)

(-1.951|1.246)

(-2.052|1.427)

COVID - Stay at Home

-0.016

-0.032

0.081

-0.037

0.028

(-0.712|0.681)

(-0.732|0.669)

(-1.657|1.819)

(-1.781|1.707)

(-1.869|1.926)

Post-Killing

2.545

2.556

1.611

1.617

0.563

(1.614|3.477)

(1.619|3.493)

(-0.714|3.936)

(-0.715|3.950)

(-2.040|3.166)

1 Month Post

-0.699

-0.853

-0.012

-0.067

0.052

(-1.906|0.509)

(-2.080|0.374)

(-3.026|3.001)

(-3.090|2.956)

(-3.237|3.342)

2 Months Post

-1.241

-1.538

-0.901

-1.059

-0.972

(-2.454|-0.028)

(-2.785|-0.292)

(-3.928|2.125)

(-4.096|1.977)

(-4.276|2.331)

3 Months Post

-2.128

-2.355

-1.248

-1.331

-1.337

(-3.345|-0.911)

(-3.596|-1.114)

(-4.284|1.789)

(-4.377|1.716)

(-4.652|1.977)

4 Months Post

-1.871

-2.021

-1.176

-1.145

-1.156

(-3.085|-0.656)

(-3.252|-0.790)

(-4.207|1.855)

(-4.185|1.896)

(-4.464|2.153)

5 Months Post

-2.121

-2.111

-1.373

-1.353

-1.401

(-3.334|-0.907)

(-3.339|-0.884)

(-4.401|1.655)

(-4.390|1.684)

(-4.706|1.903)

6 Months Post

-1.330

-1.337

-0.250

-0.304

-0.179

(-2.548|-0.111)

(-2.566|-0.108)

(-3.291|2.791)

(-3.355|2.746)

(-3.498|3.140)

7+ Months Post

-2.489

-2.485

-1.528

-1.524

-1.566

(-3.672|-1.307)

(-3.674|-1.295)

(-4.478|1.423)

(-4.484|1.435)

(-4.786|1.654)

MPD Use of Force t-1

-0.732

-0.130

-0.123

(-2.145|0.680)

(-0.184|-0.077)

(-0.175|-0.070)

MPD Stops t-1

-0.182

0.035

0.077

(-0.415|0.050)

(0.019|0.051)

(0.055|0.098)

MPD OIS t-1

-30.131

-2.053

-1.773

(-68.210|7.948)

(-13.048|8.942)

(-13.202|9.657)

AR(1)

0.00001

(-0.00001|0.00002)

Median HH Income

0.038

(0.014|0.062)

Percent Black

0.063

(0.032|0.094)

Post-Killing X Percent Black

0.722

1.263

0.871

0.924

-0.320

(-0.029|1.474)

(0.178|2.348)

(-1.040|2.782)

(-1.006|2.854)

(-2.715|2.076)

SD(ZCTA)

0.817

0.922

0.504

SD(Residual)

5.353

5.364

5.578

Observations

261

217

6,003

5,928

5,460

R2

0.436

0.485

Log Likelihood

-18,608.870

-18,396.930

-17,161.870

Akaike Inf. Crit.

37,255.730

36,837.860

34,373.740

Bayesian Inf. Crit.

37,383.030

36,984.990

34,538.870

Residual Std. Error

0.447 (df = 244)

0.448 (df = 197)

F Statistic

11.808\*\*\* (df = 16; 244)

9.761\*\*\* (df = 19; 197)

Models include controls for seasonality.

95% Confidence Intervals in parentheses