

Effects of Wildfires on Covid

17 September, 2020

Independent Variable: Air Quality

[Github repo](#)

Option 1: Data on PM2.5 from AirNow Sensors.

- Missing in some counties
- Not yet corrected for outliers/faulty stations

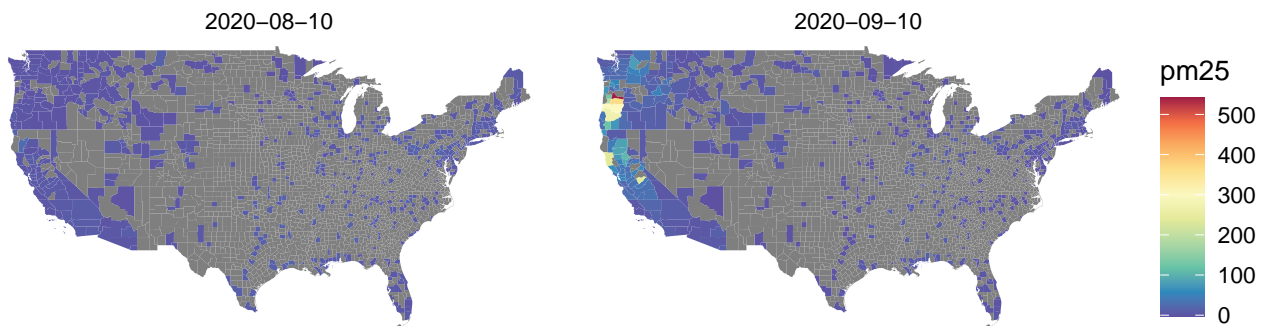


Figure 1: PM2.5 in counties with AirNow Sensors, in August and September 2020.

Option 2: Data on Aerosol Index from ESA Sentinel Satellite.

- More comprehensive
- “The main aerosol types that cause signals detected in the AI are desert dust, biomass burning and volcanic ash plumes.” [here](#)

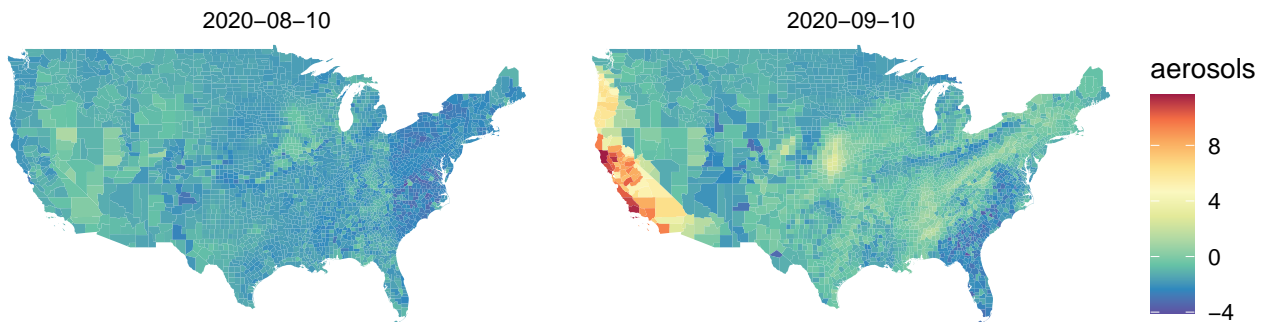


Figure 2: Aerosol Index, in August and September 2020.

Dependent Variable: Covid Cases & Mortality

- Data from [USAfacts.com](https://datafairs.org/), was recommended by CDC.
- Comprehensive data at daily, county-level scale.
- In some cases, states are at the state level:

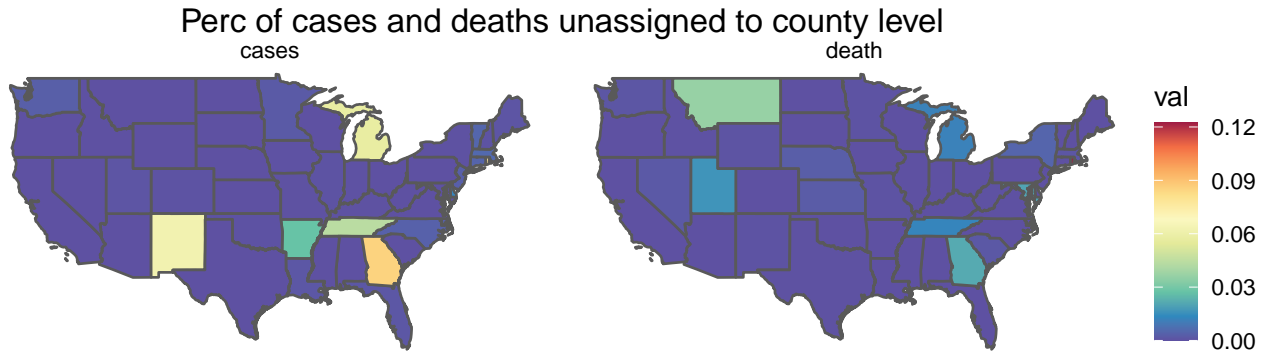


Figure 3: Percent of cases and deaths unassigned to a specific county since July.

So, we will model for CA, OR, WA, NV, and ID

Modeling

- Focus on past month
- Fixed effects at the county level
- Thin-Plate Spline temporal effect
- Day-of-week fixed effect

```
library(tidyverse)
library(lubridate)
library(mgcv)
library(broom)

setwd('/home/mattcoop/fires-covid/data/')

options(stringsAsFactors=F)

dat <- read.csv('moddat.csv') %>%
  filter(State %in% c("CA", "WA", "OR", "ID", "NV"),
         date >= ymd('2020-08-15'),
         date < ymd('2020-09-14')) %>%
  mutate(doy = factor(weekdays(ymd(date))),
         countyFIPS = factor(countyFIPS),
         date = as.numeric(ymd(date)))

death_pm25 <- gam(death_rate ~ pm25 + countyFIPS + s(date) + doy,
                  data = dat, method='REML')
case_pm25 <- gam(case_rate ~ pm25 + countyFIPS + s(date) + doy,
                 data = dat, method='REML')
death_aeros <- gam(death_rate ~ aerosols + countyFIPS + s(date) + doy,
                  data = dat, method='REML')
case_aeros <- gam(case_rate ~ aerosols + countyFIPS + s(date) + doy,
                  data = dat, method='REML')

extract.gam(death_pm25)

## # A tibble: 2 x 5
##   term          estimate  std.error statistic  p.value
##   <chr>          <dbl>    <dbl>    <dbl>    <dbl>
## 1 (Intercept)  0.000157    0.00000746    21.1  6.00e-93
## 2 pm25        -0.0000000500 0.0000000270    -1.85  6.43e- 2

extract.gam(case_pm25)

## # A tibble: 2 x 5
##   term          estimate  std.error statistic  p.value
##   <chr>          <dbl>    <dbl>    <dbl>    <dbl>
## 1 (Intercept)  0.0106    0.000171    62.3  0
## 2 pm25        -0.00000342 0.000000606    -5.64 0.0000000184

extract.gam(death_aeros)

## # A tibble: 2 x 5
##   term          estimate  std.error statistic  p.value
##   <chr>          <dbl>    <dbl>    <dbl>    <dbl>
## 1 (Intercept)  0.000159    0.00000672    23.7  8.13e-119
## 2 aerosols    -0.000000219 0.000000244    -0.899 3.69e- 1
```

```
extract.gam(case_aeros)
```

```
## # A tibble: 2 x 5
##   term          estimate std.error statistic    p.value
##   <chr>          <dbl>      <dbl>      <dbl>    <dbl>
## 1 (Intercept)  0.0107      0.000186      57.6    0
## 2 aerosols    -0.0000304  0.00000653     -4.65  0.00000342
```