JHU\_COVID-19\_MD

Jonah Pool

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Constants

yd <- today() - ddays(1)  
td <- today()  
  
  
day <- yd  
MichiganRiots<- seq(ymd("2020-05-26"), ymd("2020-06-1"), by = 1)  
exclude = c("")  
# date for daily data release  
a <- as.character(ymd(day))  
b <- str\_split(a, "-")  
c1 <- as.character(b[[1]][2])  
c2 <- as.character(b[[1]][3])   
c3 <- as.character(b[[1]][1])  
d\_lookup\_str <- str\_c(c1, c2, c3, sep = "-")  
  
sinceMarch16 <- seq(date("2020-03-16"), day, by=1)  
  
last30 <- seq(td-30, td, by=1)  
last21 <- seq(td-21, td, by=1)  
last14 <- seq(td-14, td, by=1)  
last7 <- seq(td-7, td, by=1)  
  
  
  
bold.14.text <- element\_text(face = "bold", size = 12)  
  
red.fill.5 <- c("#bf080e","#bf080e","#bf080e","#bf080e","#bf080e")  
blue.fill.5 <- c("#0016bd","#0016bd","#0016bd","#0016bd","#0016bd")  
  
red.fill.10 <- c("#bf080e","#bf080e","#bf080e","#bf080e","#bf080e","#bf080e","#bf080e","#bf080e","#bf080e","#bf080e")  
blue.fill.10 <- c("#0016bd","#0016bd","#0016bd","#0016bd","#0016bd","#0016bd","#0016bd","#0016bd","#0016bd","#0016bd")  
  
x.limit.march15 <- seq(ymd("2020-03-15"), day, by=1)  
  
#annotation.moving.average <- annotate(geom = "text", x = xrange[1], y = yrange[2], label = paste(strwrap("Note: 5 Day Moving Average", 40), collapse = "\n"), hjust = 0, vjust = 1, size = 4)  
  
pq <- theme(text = bold.14.text) +  
 #theme(axis.ticks = element\_blank()) +  
 theme(panel.border = element\_rect(colour = "black", fill=NA, size=2))  
jhu\_caption <- labs(caption="Data Source: Johns Hopkins University CSSE")

Functions

ma <- function(arr, n=5){  
 res = arr  
 for(i in n:length(arr)){  
 res[i] = mean(arr[(i-n+1):i])  
 }  
 res  
}  
  
movingAverage <- function(x, n=7, centered=FALSE) {  
   
 if (centered) {  
 before <- floor ((n-1)/2)  
 after <- ceiling((n-1)/2)  
 } else {  
 before <- n-1  
 after <- 0  
 }  
  
 # Track the sum and count of number of non-NA items  
 s <- rep(0, length(x))  
 count <- rep(0, length(x))  
   
 # Add the centered data   
 new <- x  
 # Add to count list wherever there isn't a   
 count <- count + !is.na(new)  
 # Now replace NA\_s with 0\_s and add to total  
 new[is.na(new)] <- 0  
 s <- s + new  
   
 # Add the data from before  
 i <- 1  
 while (i <= before) {  
 # This is the vector with offset values to add  
 new <- c(rep(NA, i), x[1:(length(x)-i)])  
  
 count <- count + !is.na(new)  
 new[is.na(new)] <- 0  
 s <- s + new  
   
 i <- i+1  
 }  
  
 # Add the data from after  
 i <- 1  
 while (i <= after) {  
 # This is the vector with offset values to add  
 new <- c(x[(i+1):length(x)], rep(NA, i))  
   
 count <- count + !is.na(new)  
 new[is.na(new)] <- 0  
 s <- s + new  
   
 i <- i+1  
 }  
   
 # return sum divided by count  
 s/count  
}  
  
bar\_chart\_ts <- function(df, y, custom.fill = blue.fill.10, lab.title, y.lim = max(y)) {  
 plot <- ggplot(df, aes(x = date, y = y, fill = "")) +   
 geom\_col() +  
 scale\_fill\_manual(values = custom.fill) +  
 labs(y = "", title = lab.title, x = "Date") +  
 theme(legend.position = "none") +  
 ylim(0,y.lim) +  
 pq  
 plot  
}  
  
line\_chart\_ts <- function(df, y, custom.fill = blue.fill.10, lab.title, y.lim = max(y)) {  
 plot <- ggplot(df, aes(x = date, y = y, color = "", fill = "")) +   
 geom\_line(size = 1.2) +  
 scale\_fill\_manual(values = custom.fill) +  
 scale\_color\_manual(values = custom.fill)+  
 labs(y = "", title = lab.title, x = "Date") +  
 theme(legend.position = "none") +  
 ylim(0,y.lim) +  
 pq  
 plot  
}  
  
line\_chart\_ma\_ts <- function(df, y, custom.fill = blue.fill.10, lab.title, y.lim = max(y)) {  
 plot <- ggplot(df, aes(x = date, y = y, color = "", fill = "")) +   
 geom\_smooth(size = 1.2) +  
 scale\_fill\_manual(values = custom.fill) +  
 scale\_color\_manual(values = custom.fill)+  
 labs(y = "", title = lab.title, x = "Date") +  
 theme(legend.position = "none") +  
 ylim(0,y.lim) +  
 pq  
 plot  
}

Load Johns Hopkins Univ. CSSE Data

ts\_date\_count <- today() - ymd(20200122)  
  
daily\_fname <- str\_c("../COVID-19/csse\_covid\_19\_data/csse\_covid\_19\_daily\_reports\_us/", d\_lookup\_str, ".csv")  
csse\_today <- read\_csv(daily\_fname, col\_types = "ccTddddddddddddcdd")  
csse\_confirmed\_us\_ts <- read\_csv("../COVID-19/csse\_covid\_19\_data/csse\_covid\_19\_time\_series/time\_series\_covid19\_confirmed\_US.csv",  
 col\_types=str\_c('cccddcccddc',   
 str\_c(rep("i", times=ts\_date\_count), collapse=""))  
 )  
  
csse\_deaths\_us\_ts <- read\_csv("../COVID-19/csse\_covid\_19\_data/csse\_covid\_19\_time\_series/time\_series\_covid19\_deaths\_US.csv",   
 col\_types=str\_c('cccddcccddc',   
 str\_c(rep("i", times=ts\_date\_count+1), collapse=""))  
 )  
uid <- read\_csv("../COVID-19/csse\_covid\_19\_data/UID\_ISO\_FIPS\_LookUp\_Table.csv", col\_types = "cccddcccddci")  
daily\_updates\_ts <- read\_csv("daily\_updates\_ts\_us.csv", col\_types="ccDdTdcdddddddddddddd")

Filter US ID Values

us\_uid <- uid %>%   
 filter(code3 %in% c(16, 316, 580, 850, 630, 840)) %>%  
 select(UID, Province\_State, Combined\_Key, Population) %>%   
 arrange(UID)  
states <- c(us\_uid$Province\_State[1:4], us\_uid$Province\_State[6:57])  
states\_uid <-seq(84000001, 84000056, by = 1)  
uid\_states <- us\_uid %>%   
 filter(UID %in% c(16, 316, 580, 850, 630, seq(84000001, 84000056, by = 1)))

Maryland Data

md\_cases\_ts <- csse\_confirmed\_us\_ts %>%  
 select(-Lat, -Long\_, -FIPS) %>%  
 filter(Province\_State %in% us\_uid$Province\_State) %>%   
 filter(!(is.na(Admin2))) %>%   
 filter(Province\_State %in% c("Maryland")) %>%  
 group\_by(UID) %>%  
 pivot\_longer(`1/22/20`:last\_col(), names\_to = "date", values\_to = "cases") %>%   
 ungroup()  
  
  
  
md\_cases\_ts %<>%  
 select(-iso2, -iso3, -code3, -Province\_State) %>%   
 inner\_join(us\_uid, by = c("UID", "Combined\_Key")) %>%  
 mutate(date = mdy(date)) %>%  
 arrange(Admin2) %>%  
 group\_by(Admin2) %>%   
 mutate(cases\_per\_hundred\_thousand = round((cases / Population \* 100000), 1), cases\_delta=cases-lag(cases), cases\_relative = cases\_delta / lag(cases)) %>%   
 ungroup()  
  
md\_cases\_ts %<>%  
 mutate(cases\_delta = case\_when(  
 is.na(cases\_delta) ~ as.double(cases),  
 TRUE ~ as.double(cases) - as.double(lag(cases))  
 ), cases\_delta\_per\_hundred\_thousand = round((100000 \* cases\_delta / Population), 2), cases\_delta\_ma = movingAverage(cases\_delta), cases\_delta\_ma\_per\_hundred\_thousand = movingAverage(cases\_delta\_per\_hundred\_thousand),  
 cases\_relative = case\_when(  
 is.na(cases\_relative) ~ 0,  
 cases\_relative == Inf ~ 1,  
 TRUE ~ cases\_delta / lag(cases)), cases\_perc = round((100 \* cases\_relative), 3), cases\_perc\_ma = movingAverage(cases\_perc)) %>%  
 ungroup() %>%   
 filter(!(date %in% exclude)) %>%   
 rename(state = Province\_State) %>%   
 rename(County = Admin2) %>%   
 filter(date %in% sinceMarch16)  
  
top5counties <- md\_cases\_ts %>%   
 filter(date == day) %>%   
 top\_n(5, cases)  
  
md\_deaths\_ts <- csse\_deaths\_us\_ts %>%  
 select(-Lat, -Long\_, -FIPS) %>%  
 filter(Province\_State %in% us\_uid$Province\_State) %>%   
 #filter(!(is.na(Admin2))) %>%   
 filter(Province\_State %in% c("Maryland")) %>%  
 group\_by(UID) %>%  
 pivot\_longer(`1/22/20`:last\_col(), names\_to = "date", values\_to = "deaths") %>%   
 ungroup()  
   
  
md\_deaths\_ts %<>%   
 select(-iso2, -iso3, -code3, -Province\_State) %>%   
 group\_by(date) %>%   
 inner\_join(us\_uid, by = c("UID", "Combined\_Key", "Population")) %>%  
 ungroup() %>%   
 mutate(date = mdy(date)) %>%  
 arrange(Admin2) %>%  
 group\_by(Admin2) %>%   
 mutate(deaths\_per\_hundred\_thousand = round((100000 \* deaths / Population), 2), deaths\_delta = deaths - lag(deaths), deaths\_relative = deaths\_delta / lag(deaths)) %>%   
 ungroup()  
  
md\_deaths\_ts %<>%  
 mutate(deaths\_delta = case\_when(  
 is.na(deaths\_delta) ~ as.double(deaths),  
 #deaths\_delta < 0 ~ 0,  
 TRUE ~ as.double(deaths) - as.double(lag(deaths))  
 ), deaths\_delta\_per\_hundred\_thousand = round((100000 \* deaths\_delta / Population), 2), deaths\_delta\_ma = movingAverage(deaths\_delta), deaths\_delta\_ma\_per\_hundred\_thousand = movingAverage(deaths\_delta\_per\_hundred\_thousand),  
 deaths\_relative = case\_when(  
 is.na(deaths\_relative) ~ 0,  
 deaths\_relative == Inf ~ 1,  
 TRUE ~ deaths\_delta / lag(deaths)), deaths\_perc = round((100 \* deaths\_relative), 3), deaths\_perc\_ma = movingAverage(deaths\_perc)) %>%   
 ungroup() %>%   
 filter(!(date %in% exclude)) %>%   
 rename(state = Province\_State) %>%   
 rename(County = Admin2) %>%   
 filter(date %in% sinceMarch16)  
   
md\_combined\_ts <- md\_cases\_ts %>%   
 full\_join(md\_deaths\_ts) %>%   
 filter(date %in% sinceMarch16)

## Joining, by = c("UID", "County", "Country\_Region", "Combined\_Key", "date", "state", "Population")

md\_combined\_ts[is.na(md\_combined\_ts)] <- as.double(0)  
md\_combined\_ts[md\_combined\_ts == Inf]<- as.double(100)

two\_week\_sum <- md\_combined\_ts %>%   
 group\_by(County) %>%  
 arrange(date) %>%   
 mutate(week\_num = week(date)) %>%   
 ungroup() %>%   
 group\_by(week\_num, County) %>%   
 filter(date == max(date)) %>%   
 ungroup() %>%   
 group\_by(week\_num) %>%   
 summarize(date=date, week\_num=week\_num, County = County, Combined\_Key = Combined\_Key, cases = cases, deaths = deaths) %>%   
 #select(date, week\_num, County, Combined\_Key, cases, deaths) %>%   
 ungroup() %>%   
 filter((week\_num %% 2) == (max(week\_num) %% 2)) %>%   
 group\_by(County) %>%   
 mutate(cases\_delta\_tw = cases - lag(cases),   
 deaths\_delta\_tw = deaths - lag(deaths),   
 cases\_relative\_tw = 100 \* (cases - lag(cases)) / lag(cases),   
 deaths\_relative\_tw = 100 \* (deaths - lag(deaths)) / lag(deaths),  
 cases\_spiking = cases\_relative\_tw > lag(cases\_relative\_tw),  
 deaths\_spiking = deaths\_relative\_tw > lag(deaths\_relative\_tw)) %>%   
 #mutate(deaths\_dir = (cases)) %>%   
 ungroup() %>%   
 filter(County == "Montgomery") %>%   
 select(-week\_num)

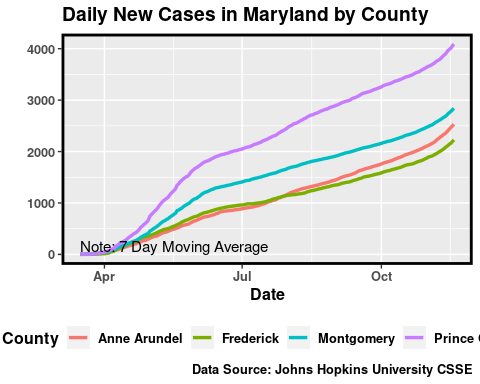
## `summarise()` regrouping output by 'week\_num' (override with `.groups` argument)

two\_week\_sum

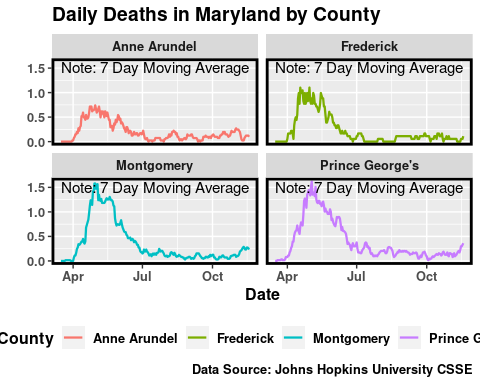
## # A tibble: 19 x 11  
## date County Combined\_Key cases deaths cases\_delta\_tw deaths\_delta\_tw  
## <date> <chr> <chr> <int> <int> <int> <int>  
## 1 2020-03-17 Montg… Montgomery,… 24 0 NA NA  
## 2 2020-03-31 Montg… Montgomery,… 388 1 364 1  
## 3 2020-04-14 Montg… Montgomery,… 1883 54 1495 53  
## 4 2020-04-28 Montg… Montgomery,… 4003 221 2120 167  
## 5 2020-05-12 Montg… Montgomery,… 7130 407 3127 186  
## 6 2020-05-26 Montg… Montgomery,… 10291 567 3161 160  
## 7 2020-06-09 Montg… Montgomery,… 12968 667 2677 100  
## 8 2020-06-23 Montg… Montgomery,… 14204 725 1236 58  
## 9 2020-07-07 Montg… Montgomery,… 15332 752 1128 27  
## 10 2020-07-21 Montg… Montgomery,… 16520 774 1188 22  
## 11 2020-08-04 Montg… Montgomery,… 17910 794 1390 20  
## 12 2020-08-18 Montg… Montgomery,… 19127 812 1217 18  
## 13 2020-09-01 Montg… Montgomery,… 20103 821 976 9  
## 14 2020-09-15 Montg… Montgomery,… 21375 835 1272 14  
## 15 2020-09-29 Montg… Montgomery,… 22512 848 1137 13  
## 16 2020-10-13 Montg… Montgomery,… 23817 856 1305 8  
## 17 2020-10-27 Montg… Montgomery,… 25438 869 1621 13  
## 18 2020-11-10 Montg… Montgomery,… 27731 896 2293 27  
## 19 2020-11-18 Montg… Montgomery,… 29833 916 2102 20  
## # … with 4 more variables: cases\_relative\_tw <dbl>, deaths\_relative\_tw <dbl>,  
## # cases\_spiking <lgl>, deaths\_spiking <lgl>

priority\_counties <- c("Montgomery", "Frederick", "Prince George's", "Anne Arundel")  
  
md\_priority\_ts <- md\_combined\_ts %>%   
 filter(County %in% priority\_counties) %>%   
 group\_by(County) %>%   
 arrange(date) %>%  
 ungroup()

xrange <-range(md\_priority\_ts$date)  
yrange <- range(md\_priority\_ts$cases\_delta\_ma\_per\_hundred\_thousand)  
  
p11 <- ggplot(md\_priority\_ts, aes(x = date, y = cases\_per\_hundred\_thousand, color = County)) +  
 #geom\_col(position = "stack", aes(group=County), size = 1.2) +  
 geom\_line(aes(group=County), size = 1.2) +   
 labs(y = "", title = "Daily New Cases in Maryland by County", x = "Date") +   
 theme(legend.position = "bottom") +   
 annotate(geom = "text", x = xrange[1], y = yrange[2], label = paste(strwrap("Note: 7 Day Moving Average", 40), collapse = "\n"), hjust = 0, vjust = 0, size = 4)+   
 #facet\_wrap("County") +  
 pq+jhu\_caption  
p11



sum\_deaths <- md\_priority\_ts %>% ungroup() %>% group\_by(date) %>% select(date, deaths\_delta\_ma\_per\_hundred\_thousand) %>% mutate(deaths\_delta = sum(deaths\_delta\_ma\_per\_hundred\_thousand))  
max\_deaths <- max(sum\_deaths$deaths\_delta\_ma\_per\_hundred\_thousand)  
  
xrange <-range(md\_priority\_ts$date)  
yrange <- range(0, max\_deaths)  
  
p12 <- md\_priority\_ts %>% ggplot(aes(group = County, x = date, y = deaths\_delta\_ma\_per\_hundred\_thousand, color = County)) +  
 #geom\_col(position = "stack", aes(group=County), size = 1.2) +  
 geom\_line(aes(group=County), size = 0.8) +   
 labs(y = "", title = "Daily Deaths in Maryland by County", x = "Date") +   
 theme(legend.position = "bottom") +   
 #xlim(date("2020-03-01"),date("2020-07-15"))+  
 annotate(geom = "text", x = xrange[2], y = yrange[2], label = paste(strwrap("Note: 7 Day Moving Average", 40), collapse = "\n"), hjust = 1, vjust = 1, size = 4) +   
 pq+jhu\_caption+  
 facet\_wrap("County")  
p12



md\_sum\_ts <- md\_combined\_ts %>%   
 arrange(date) %>%   
 group\_by(date) %>%   
 summarise(population = uid\_states$Population[26], cases = sum(cases), cases\_it = cases / 1000, cases\_delta = sum(cases\_delta), cases\_per\_hundred\_thousand = 100000 \* cases / population, cases\_perc = 100 \* cases\_delta / lag(cases), deaths = sum(deaths), deaths\_delta = sum(deaths\_delta), deaths\_perc = as.double(100 \* deaths\_delta / lag(deaths)), deaths\_per\_hundred\_thousand = 100000 \* deaths / population)

## `summarise()` ungrouping output (override with `.groups` argument)

md\_sum\_ts %<>%   
 mutate(lag\_cases = as.double(lag(cases)), relative = cases\_delta / lag\_cases, cases\_delta\_ma = movingAverage(cases\_delta),  
 cases\_perc = case\_when(  
 cases\_perc == Inf ~ 100,  
 TRUE ~ (100 \* sum(cases\_delta) / lag\_cases)), cases\_dir = (cases\_delta\_ma < lag(cases\_delta\_ma)),  
 cases\_perc\_ma = movingAverage(cases\_perc),  
 lag\_deaths = as.double(lag(deaths)), relative = deaths\_delta / lag\_deaths, deaths\_delta\_ma = movingAverage(deaths\_delta),  
 deaths\_perc = case\_when(  
 deaths\_perc == Inf ~ 100,  
 TRUE ~ (100 \* deaths\_delta / lag\_deaths)), deaths\_dir = (deaths\_delta\_ma <= lag(deaths\_delta\_ma)),  
 deaths\_perc\_ma = movingAverage(deaths\_perc)) %>%   
 ungroup()  
md\_sum\_ts[is.na(md\_sum\_ts)] <- as.double(0)  
md\_sum\_ts[md\_sum\_ts == Inf]<- as.double(100)  
md\_sum\_ts %<>%  
 mutate(cases\_dir = factor(md\_sum\_ts$cases\_dir, labels = c("red", "green")))  
md\_sum\_ts\_last30 <- md\_sum\_ts %>%   
 filter(date %in% sinceMarch16)

md\_sum\_cases\_today <- md\_sum\_ts\_last30 %>%   
 select(date, cases, cases\_delta, cases\_per\_hundred\_thousand, cases\_delta\_ma) %>%   
 tail(1)  
md\_sum\_cases\_today

## # A tibble: 1 x 5  
## date cases cases\_delta cases\_per\_hundred\_thousand cases\_delta\_ma  
## <date> <int> <dbl> <dbl> <dbl>  
## 1 2020-11-18 171823 2018 2493. 1914.

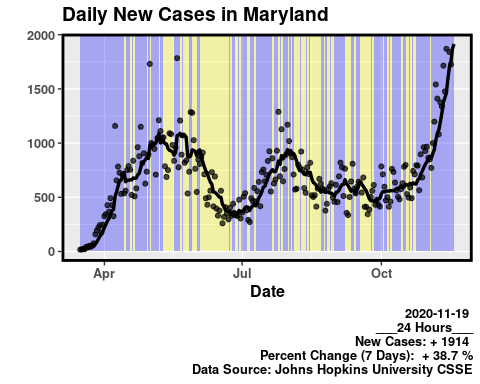
md\_sum\_deaths\_today <- md\_sum\_ts\_last30 %>%   
 select(date, deaths, deaths\_delta, deaths\_per\_hundred\_thousand, deaths\_delta\_ma) %>%   
 tail(1)  
md\_sum\_deaths\_today

## # A tibble: 1 x 5  
## date deaths deaths\_delta deaths\_per\_hundred\_thousand deaths\_delta\_ma  
## <date> <int> <dbl> <dbl> <dbl>  
## 1 2020-11-18 4333 20 62.9 14.9

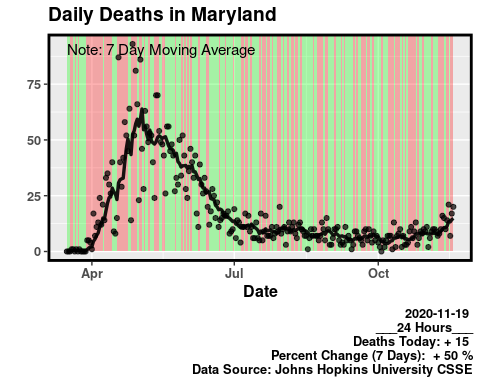
mortality\_rate <- md\_sum\_deaths\_today$deaths / md\_sum\_cases\_today$cases  
mortality\_rate \* 100

## [1] 2.521781

xrange <-range(md\_sum\_ts\_last30$date)  
yrange <- range(md\_sum\_ts\_last30$cases\_delta)  
  
cases\_today\_md <- round(md\_sum\_cases\_today$cases\_delta\_ma[1], 0)  
cases\_last\_week\_md <- md\_sum\_ts$cases\_delta\_ma[nrow(md\_sum\_ts)-7]  
  
perc\_change\_md <- round(((cases\_today\_md - cases\_last\_week\_md)/cases\_last\_week\_md),3)\*100  
perc\_change\_txt <- function(x){  
 if (x > 0) {  
 out\_text <- paste("+", as.character(abs(x)))  
 out\_text  
 }  
 else {  
 out\_text <- paste("-", as.character(abs(x)))  
 out\_text  
 }  
}  
  
cases\_text\_md <- paste(as.character(today()),"\n","\_\_\_24 Hours\_\_\_\nNew Cases: +", as.character(cases\_today\_md), "\nPercent Change (7 Days): ", perc\_change\_txt(perc\_change\_md), "%\nData Source: Johns Hopkins University CSSE")  
  
md\_p1 <- md\_sum\_ts\_last30 %>% ggplot() +   
 geom\_rect(md\_sum\_ts\_last30, x=md\_sum\_ts\_last30$date, y = md\_sum\_ts\_last30$cases\_delta\_ma, mapping = aes(xmin = lag(date), xmax = date, fill = cases\_dir), ymin = 0, ymax = Inf, alpha = 0.3) +   
 geom\_line(aes(x = date, y = cases\_delta\_ma, color = ""), size = 1.2) +  
 geom\_point(aes(x=date, y=cases\_delta, color=""), alpha = 0.7)+  
 scale\_color\_manual(values = "black")+  
 scale\_fill\_manual(values = c("blue", "yellow"))+  
 labs(y = "", title = "Daily New Cases in Maryland", x = "Date") +  
 theme(legend.position = "none") +  
 pq+  
 ylim(0,max(md\_sum\_ts\_last30$cases\_delta\_ma))+  
 annotate(geom = "text", x = xrange[1], y = yrange[2], label = paste("Note: 7 Day Moving Average", collapse = "\n"), hjust = 0, vjust = 1, size = 4)+  
 labs(caption=cases\_text\_md, vjust= 0)  
md\_p1



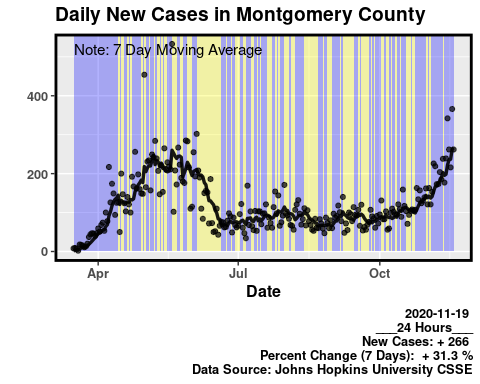
xrange <-range(md\_sum\_ts\_last30$date)  
yrange <- range(md\_sum\_ts\_last30$deaths\_delta)  
  
  
deaths\_today\_md <- round(md\_sum\_deaths\_today$deaths\_delta\_ma[1],0)  
deaths\_last\_week\_md <- md\_sum\_ts$deaths\_delta\_ma[nrow(md\_sum\_ts)-7]  
  
perc\_deaths\_md <- round(((deaths\_today\_md - deaths\_last\_week\_md)/deaths\_last\_week\_md),3)\*100  
deaths\_text\_md <- paste(as.character(today()),"\n","\_\_\_24 Hours\_\_\_\nDeaths Today: +", as.character(deaths\_today\_md), "\nPercent Change (7 Days): ", perc\_change\_txt(perc\_deaths\_md), "%\nData Source: Johns Hopkins University CSSE")  
  
md\_p2 <- md\_sum\_ts\_last30 %>% ggplot() +   
 geom\_rect(md\_sum\_ts\_last30, x=md\_sum\_ts\_last30$date, y = md\_sum\_ts\_last30$deaths\_delta, mapping = aes(xmin = lag(date), xmax = date, fill = deaths\_dir), ymin = 0, ymax = Inf, alpha = 0.3) +   
 geom\_point(aes(x = date, y = deaths\_delta, color = ""), alpha = 0.7)+  
 geom\_line(aes(x = date, y = deaths\_delta\_ma), size = 1.2, alpha = 0.9) +  
 scale\_fill\_manual(values = c("red", "green", "red"))+  
 scale\_color\_manual(values = c("black", "black", "black"))+  
 labs(y = "", title = "Daily Deaths in Maryland", x = "Date") +  
 theme(legend.position = "none") +  
 pq +   
 ylim(0,max(md\_sum\_ts\_last30$deaths\_delta))+  
 annotate(geom = "text", x = xrange[1], y = yrange[2], label = paste("Note: 7 Day Moving Average", collapse = "\n"), hjust = 0, vjust = 1, size = 4)+jhu\_caption+  
 labs(caption=deaths\_text\_md, vjust= 1)  
md\_p2



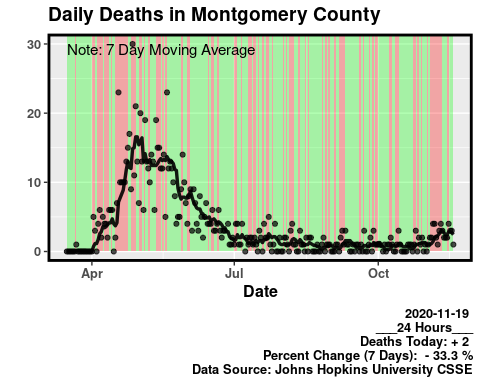
Montgomery County Data

montgomery\_ts <- md\_combined\_ts %>%   
 filter(County == "Montgomery") %>%   
 mutate(cases\_dir = (cases\_delta\_ma <= lag(cases\_delta\_ma)), deaths\_dir = (deaths\_delta\_ma <= lag(deaths\_delta\_ma))) %>%   
 filter(date %in% sinceMarch16)

xrange <-range(montgomery\_ts$date)  
yrange <- range(montgomery\_ts$cases\_delta)  
  
cases\_today\_moco <- round(montgomery\_ts$cases\_delta\_ma[nrow(montgomery\_ts)],0)  
cases\_last\_week\_moco <- montgomery\_ts$cases\_delta\_ma[nrow(montgomery\_ts)-7]  
  
perc\_change\_moco <- round(((cases\_today\_moco - cases\_last\_week\_moco)/cases\_last\_week\_moco),3)\*100  
cases\_text\_moco <- paste(as.character(today()),"\n","\_\_\_24 Hours\_\_\_\nNew Cases: +", as.character(cases\_today\_moco), "\nPercent Change (7 Days): ", perc\_change\_txt(perc\_change\_moco), "%\nData Source: Johns Hopkins University CSSE")  
  
mont\_p1 <- montgomery\_ts %>% ggplot() +   
 geom\_rect(montgomery\_ts, x=montgomery\_ts$date, y = montgomery\_ts$cases\_delta, mapping = aes(xmin = lag(date), xmax = date, fill = cases\_dir), ymin = 0, ymax = Inf, alpha = 0.3) +   
 geom\_point(aes(x=date, y=cases\_delta, color=""), alpha = 0.7)+   
 geom\_line(aes(x = date, y = cases\_delta\_ma, color = ""), size = 1.2, alpha = 0.9) +  
 scale\_color\_manual(values = "black", "black")+  
 scale\_fill\_manual(values = c("blue", "yellow"))+  
 labs(y = "", title = "Daily New Cases in Montgomery County", x = "Date") +  
 theme(legend.position = "none") +  
 pq+  
 ylim(0,max(montgomery\_ts$cases\_delta))+  
 annotate(geom = "text", x = xrange[1], y = yrange[2], label = paste("Note: 7 Day Moving Average", collapse = "\n"), hjust = 0, vjust = 1, size = 4)+jhu\_caption+  
 labs(caption=cases\_text\_moco, vjust= 1)  
mont\_p1



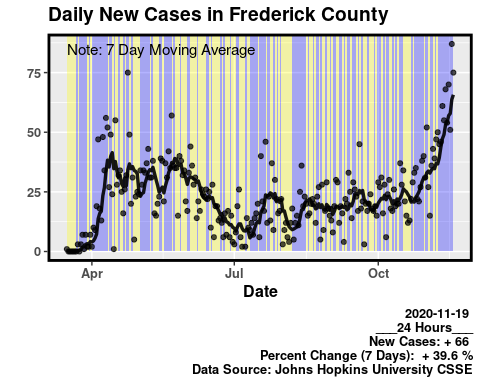
xrange <-range(montgomery\_ts$date)  
yrange <- range(montgomery\_ts$deaths\_delta)  
  
deaths\_today\_moco <- round(montgomery\_ts$deaths\_delta\_ma[nrow(montgomery\_ts)],0)  
deaths\_last\_week\_moco <- montgomery\_ts$deaths\_delta\_ma[nrow(montgomery\_ts)-7]  
  
perc\_deaths\_moco <- round(((deaths\_today\_moco - deaths\_last\_week\_moco)/deaths\_last\_week\_moco),3)\*100  
deaths\_text\_moco <- paste(as.character(today()),"\n","\_\_\_24 Hours\_\_\_\nDeaths Today: +", as.character(deaths\_today\_moco), "\nPercent Change (7 Days): ", perc\_change\_txt(perc\_deaths\_moco), "%\nData Source: Johns Hopkins University CSSE")  
  
mont\_p2 <- montgomery\_ts %>% ggplot() +   
 geom\_rect(montgomery\_ts, x=montgomery\_ts$date, y = montgomery\_ts$deaths\_delta\_ma, mapping = aes(xmin = lag(date), xmax = date, fill = deaths\_dir), ymin = 0, ymax = Inf, alpha = 0.3) +   
 geom\_point(aes(x = date, y = deaths\_delta, color = ""), alpha = 0.7)+  
 geom\_line(aes(x = date, y = deaths\_delta\_ma, color = ""), size = 1.2, alpha = 0.9) +  
 scale\_fill\_manual(values = c("red", "green"))+  
 scale\_color\_manual(values = "black", "black")+  
 labs(y = "", title = "Daily Deaths in Montgomery County", x = "Date") +  
 theme(legend.position = "none") +  
 pq +   
 ylim(0,max(montgomery\_ts$deaths\_delta))+  
 annotate(geom = "text", x = xrange[1], y = yrange[2], label = paste("Note: 7 Day Moving Average", collapse = "\n"), hjust = 0, vjust = 1, size = 4)+jhu\_caption+  
 labs(caption=deaths\_text\_moco, vjust= 1)  
mont\_p2



Frederick County Data

frederick\_ts <- md\_combined\_ts %>%   
 filter(County == "Frederick") %>%   
 mutate(cases\_dir = (cases\_delta\_ma <= lag(cases\_delta\_ma)), deaths\_dir = (deaths\_delta\_ma <= lag(deaths\_delta\_ma))) %>%   
 filter(date %in% sinceMarch16)

xrange <-range(frederick\_ts$date)  
yrange <- range(frederick\_ts$cases\_delta)  
  
cases\_today\_fr <- round(frederick\_ts$cases\_delta\_ma[nrow(frederick\_ts)])  
cases\_last\_week\_fr <- frederick\_ts$cases\_delta\_ma[nrow(frederick\_ts)-7]  
  
perc\_change\_fr <- round(((cases\_today\_fr - cases\_last\_week\_fr)/cases\_last\_week\_fr),3)\*100  
cases\_text\_fr <- paste(as.character(today()),"\n","\_\_\_24 Hours\_\_\_\nNew Cases: +", as.character(cases\_today\_fr), "\nPercent Change (7 Days): ", perc\_change\_txt(perc\_change\_fr), "%\nData Source: Johns Hopkins University CSSE")  
  
fred\_p1 <- frederick\_ts %>% ggplot() +   
 geom\_rect(frederick\_ts, x=frederick\_ts$date, y = frederick\_ts$cases\_delta, mapping = aes(xmin = lag(date), xmax = date, fill = cases\_dir), ymin = 0, ymax = Inf, alpha = 0.3) +   
 geom\_point(aes(x=date, y=cases\_delta, color=""), alpha = 0.7)+   
 geom\_line(aes(x = date, y = cases\_delta\_ma, color = ""), size = 1.2, alpha = 0.9) +  
 scale\_color\_manual(values ="black", "black")+  
 scale\_fill\_manual(values = c("blue", "yellow"))+  
 labs(y = "", title = "Daily New Cases in Frederick County", x = "Date") +  
 theme(legend.position = "none") +  
 pq+  
 ylim(0,max(frederick\_ts$cases\_delta))+  
 annotate(geom = "text", x = xrange[1], y = yrange[2], label = paste("Note: 7 Day Moving Average", collapse = "\n"), hjust = 0, vjust = 1, size = 4)+jhu\_caption+  
 labs(caption=cases\_text\_fr, vjust= 1)  
fred\_p1



Percent Change in Deaths (5 Day Moving Average)

xrange <-range(frederick\_ts$date)  
yrange <- range(frederick\_ts$deaths\_delta)  
  
deaths\_today\_fr <- round(frederick\_ts$deaths\_delta[nrow(frederick\_ts)],0)  
deaths\_last\_week\_fr <- frederick\_ts$deaths\_delta\_ma[nrow(frederick\_ts)-7]  
  
perc\_deaths\_fr <- round(((deaths\_today\_fr - deaths\_last\_week\_fr)/deaths\_last\_week\_fr),3)\*100  
deaths\_text\_fr <- paste(as.character(mdy(as.character(today()))),"\n","\_\_\_24 Hours\_\_\_\nDeaths Today: +", as.character(deaths\_today\_fr), "\nPercent Change (7 Days): ", perc\_change\_txt(perc\_deaths\_fr), "%\nData Source: Johns Hopkins University CSSE")  
  
fred\_p2 <- frederick\_ts %>% ggplot() +   
 geom\_rect(frederick\_ts, x=frederick\_ts$date, y = frederick\_ts$deaths\_delta\_ma, mapping = aes(xmin = lag(date), xmax = date, fill = deaths\_dir), ymin = 0, ymax = Inf, alpha = 0.3) +   
 geom\_point(aes(x = date, y = deaths\_delta), alpha = 0.7)+  
 geom\_line(aes(x = date, y = deaths\_delta\_ma), size = 1.2, alpha = 0.9) +  
 scale\_fill\_manual(values = c("red", "green"))+  
 #scale\_color\_manual(values = "black")+  
 labs(y = "", title = "Daily Deaths in Frederick County", x = "Date") +  
 theme(legend.position = "none", plot.tag = element\_text(hjust = 0, vjust = 1, size = 12)) +  
 pq +   
 ylim(0,max(frederick\_ts$deaths\_delta))+  
 annotate(geom = "text", x = xrange[2], y = yrange[2], label = paste("Note: 7 Day Moving Average", collapse = "\n"), hjust = 1, vjust = 1, size = 4)+  
 jhu\_caption+  
 labs(caption=deaths\_text\_fr, vjust= 1)  
  
fred\_p2

