



THE UNIVERSITY *of* NORTH TEXAS
HEALTH SCIENCE CENTER *at* FORT WORTH

HSC COVID-19 Report #7 – November 20, 2020



COVID-19 in DFW metroplex

**Growth in new positive cases, hospitalizations,
mortality and projections**

Summary from our last report on July 27



- The trend from the statewide data offered some reasons for optimism
- The statewide mask mandate and other local interventions appeared to be effective
- Survey indicated moderate to high compliance in mask usage at public places, especially in high density metropolitan areas
- The case fatality rate had dropped to below 2% compared to 4% in the early days of the pandemic
- We predicted that the COVID-19 death count would reach the peak at around August 1, which has proven to be accurate

Where do we stand now?



- The entire state of Texas including DFW metroplex area has become a hotspot for COVID-19 transmission
- Records for new daily positive cases are made with alarming frequency
- There has been an explosion in new positive COVID-19 cases and increased hospitalizations
- There is a real risk of overwhelming hospital capacities due to daily growth in the number of cases
- Total number of COVID-19 related deaths is expected to grow significantly
- An immediate reversal of trend is imperative

Key questions looming currently



- **What can we expect to see in the near future if there is no reversal of the trend?**
- **If nothing changes, how soon will the hospital capacities be overwhelmed?**
- **Can we expect to see a reversal in trend?**
- **Is another “shelter in place” order necessary to control the spread?**

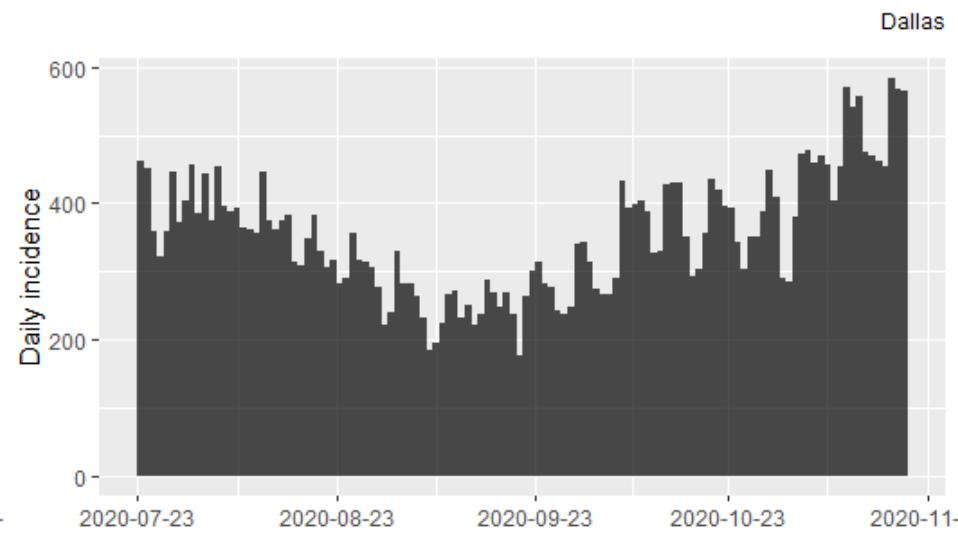
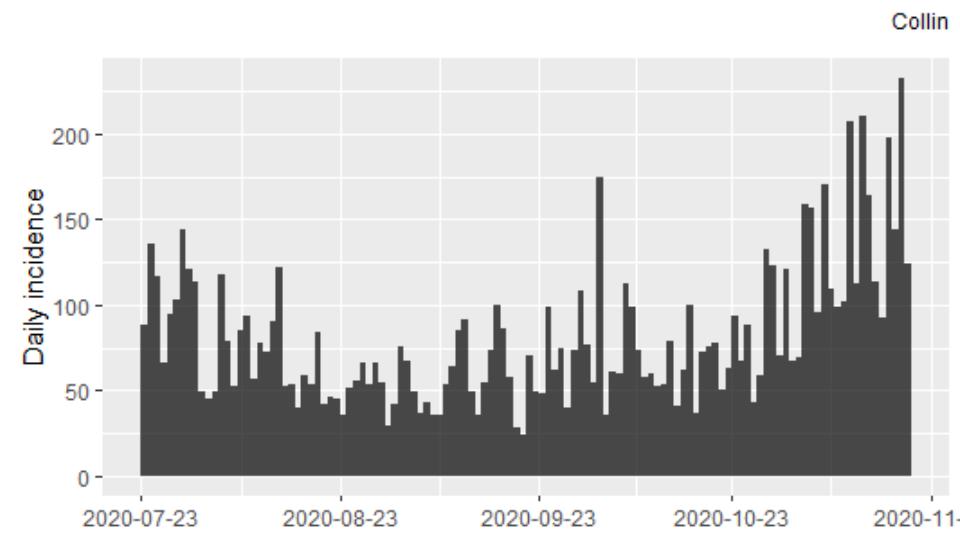
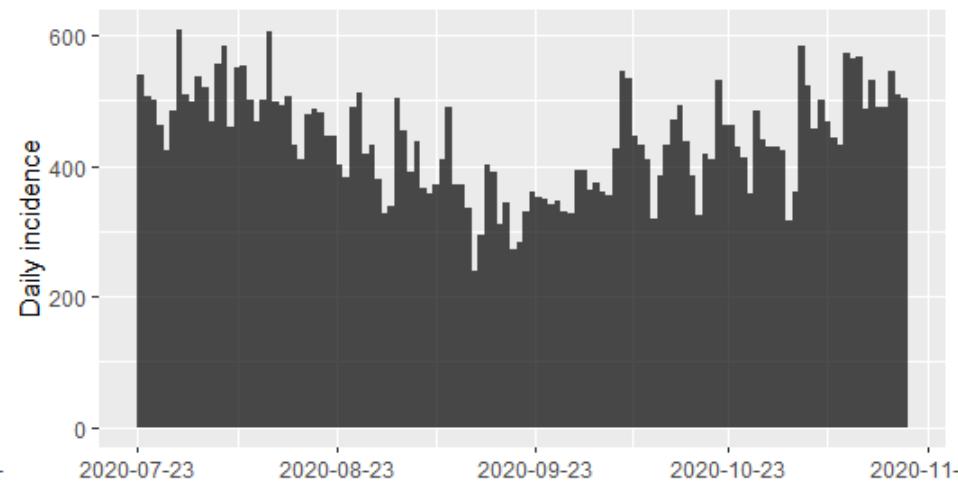
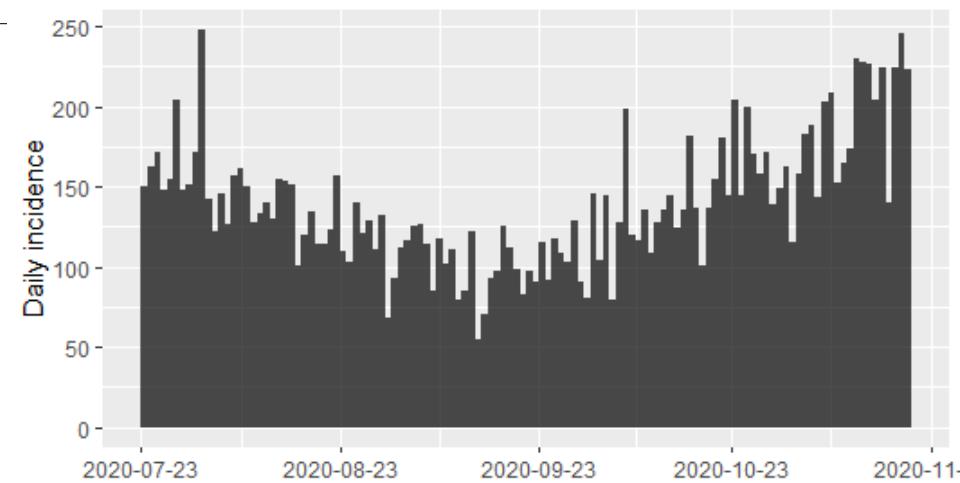
Current transmission rate of the disease



- In epidemiology, the basic reproduction number R_0 , of an infection can be thought of as the expected number of cases directly generated by one case in a population where all individuals are susceptible to infection.
- R_0 is time-varying and, if it goes significantly above 1, there will be a surge in number of cases.
- We will estimate the trend in R_0 for Tarrant county and neighboring counties using ER visits and hospitalization data in North Texas counties for COVID suspect patients.

ER visits for suspected COVID patients in the metroplex

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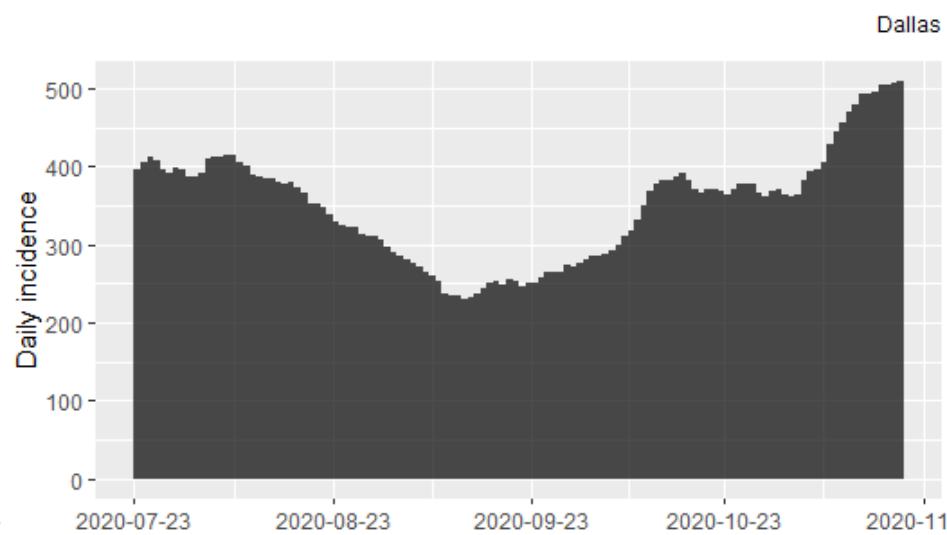
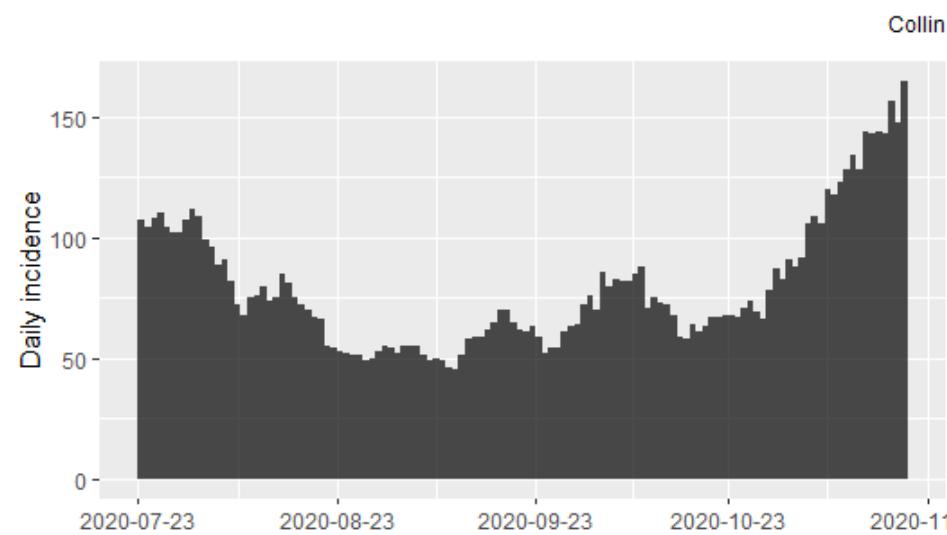
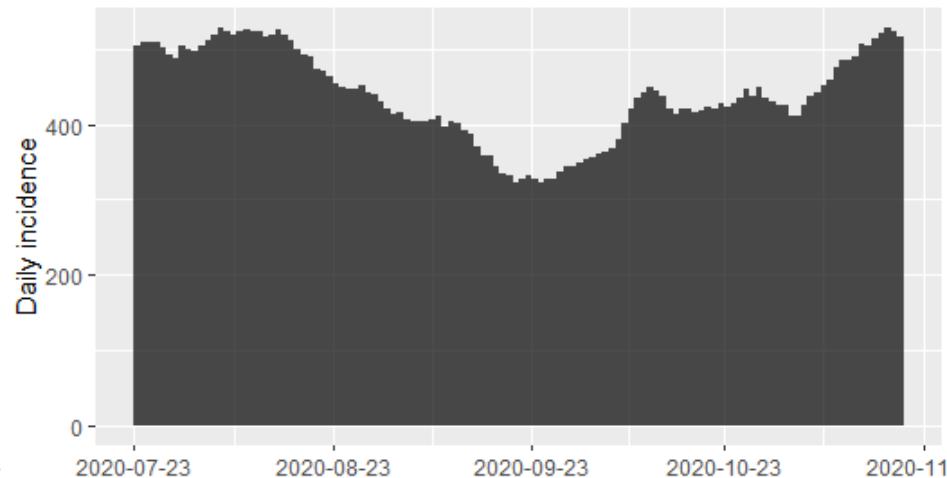
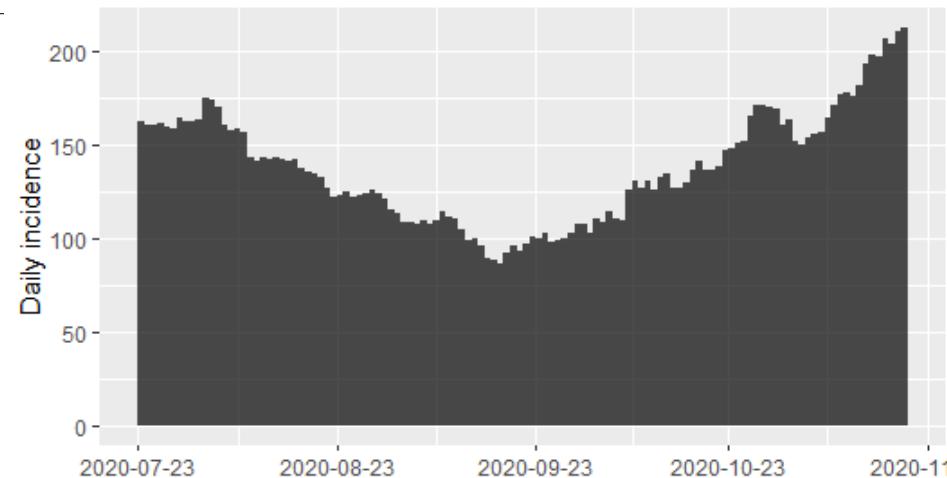
Denton

Dallas

Tarrant

ER visits for suspected COVID patients (smoothed data)

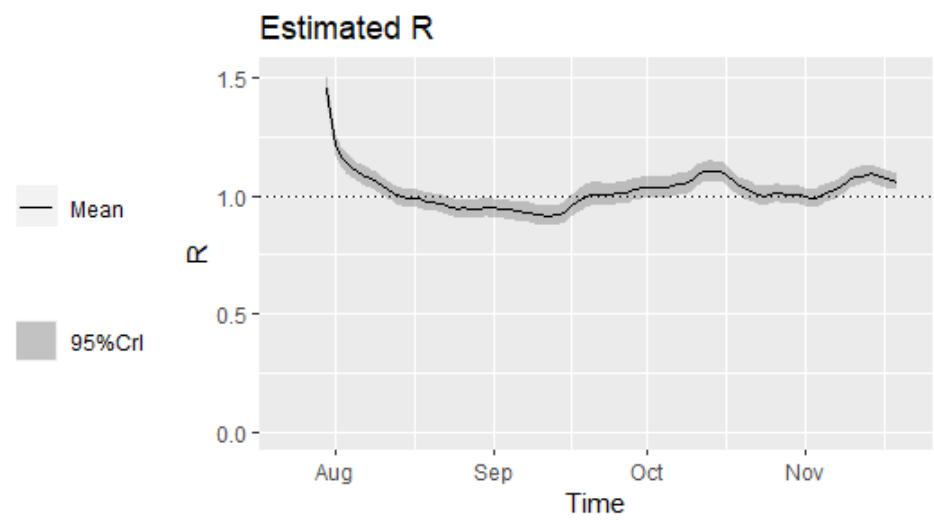
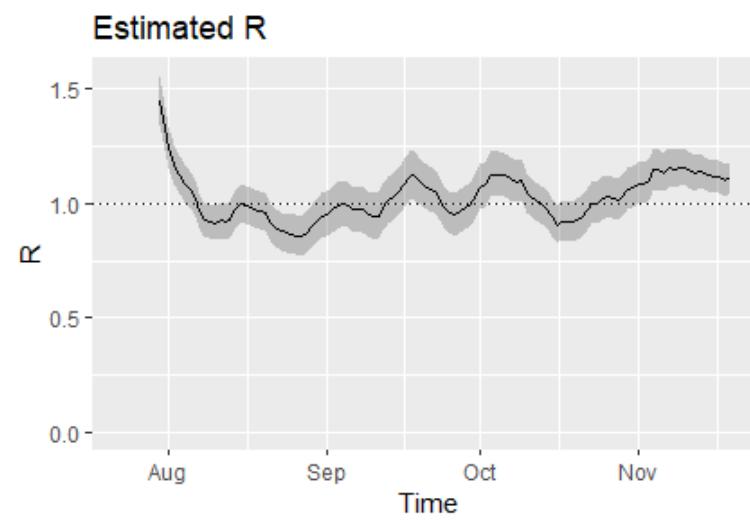
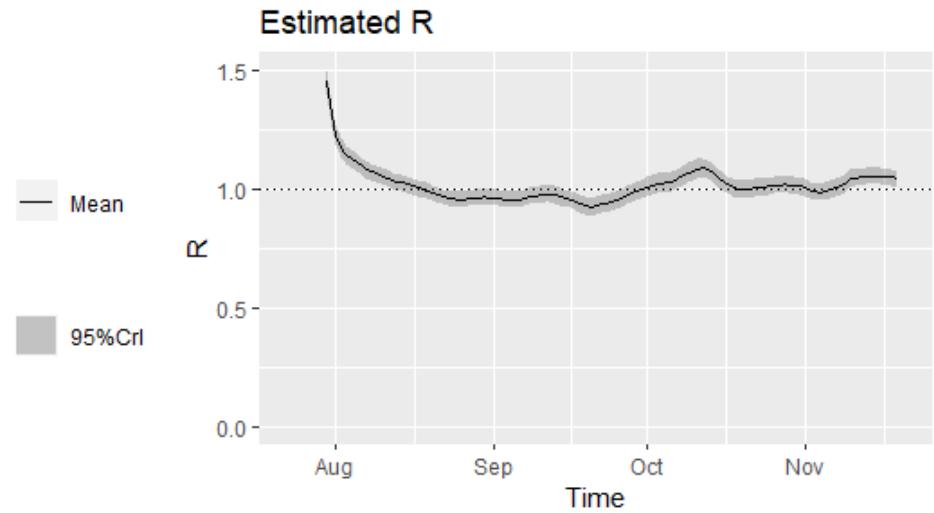
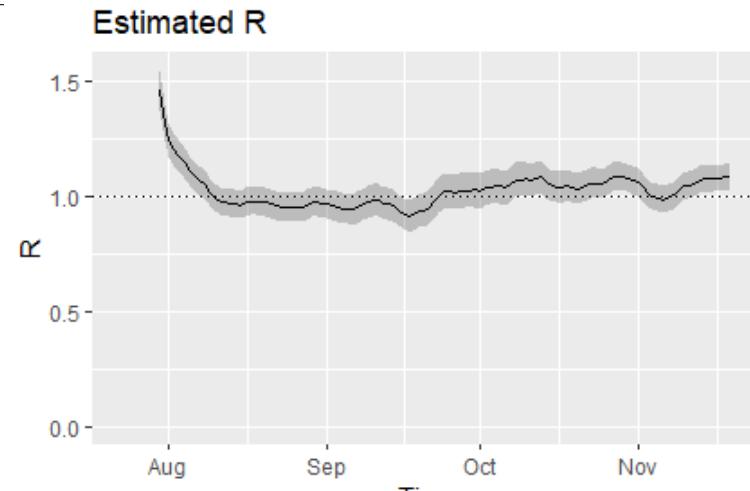
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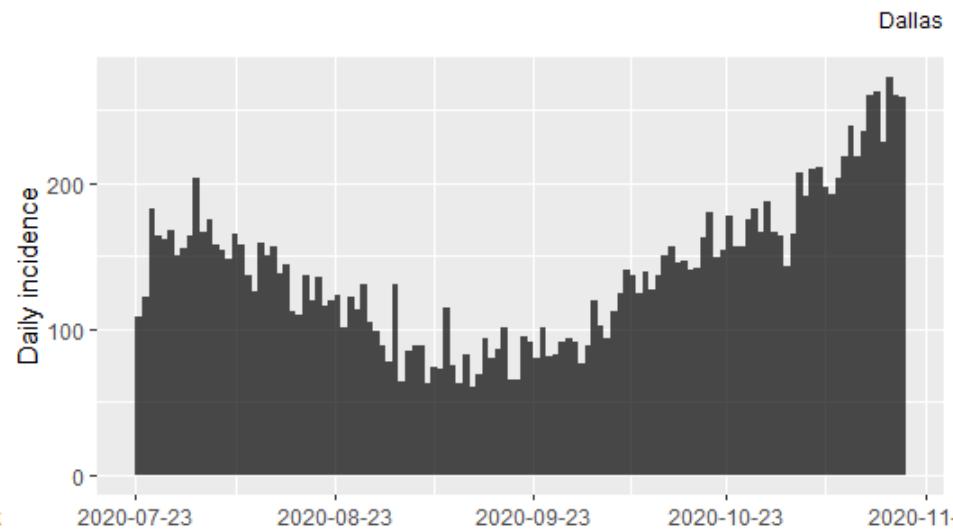
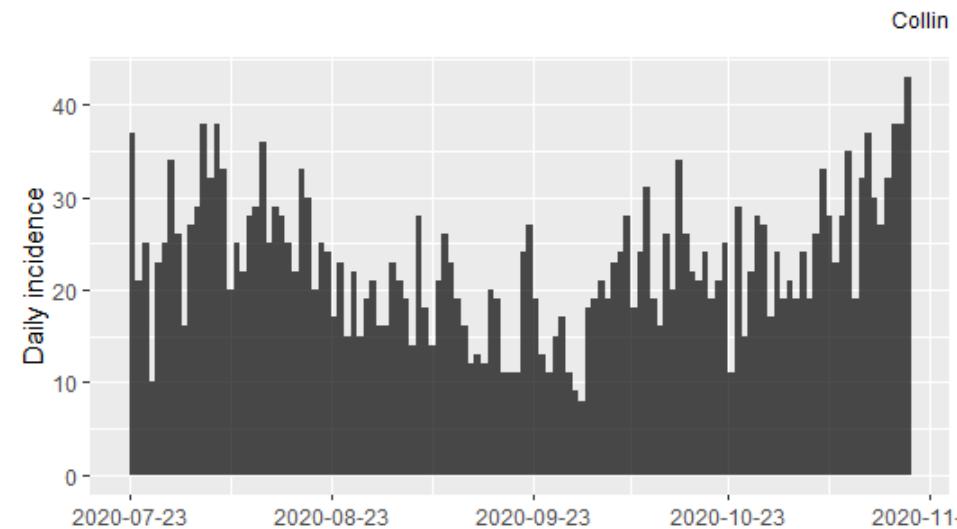
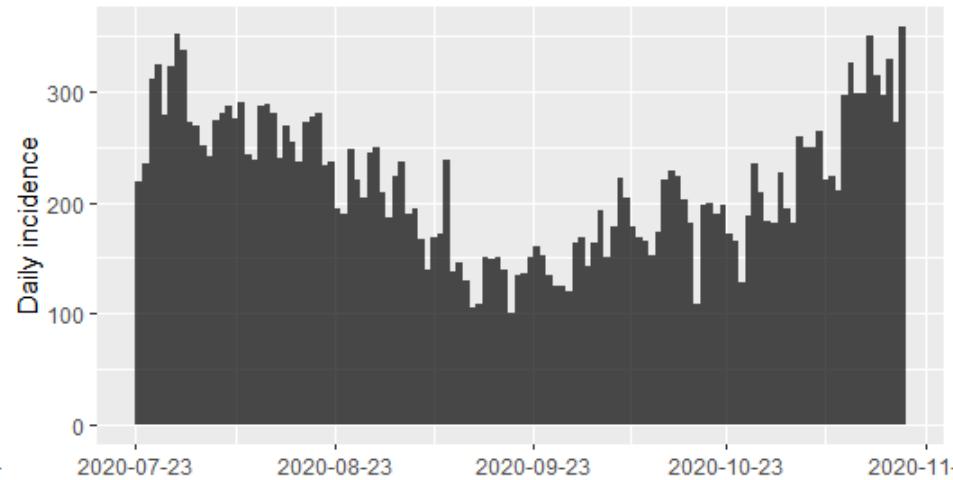
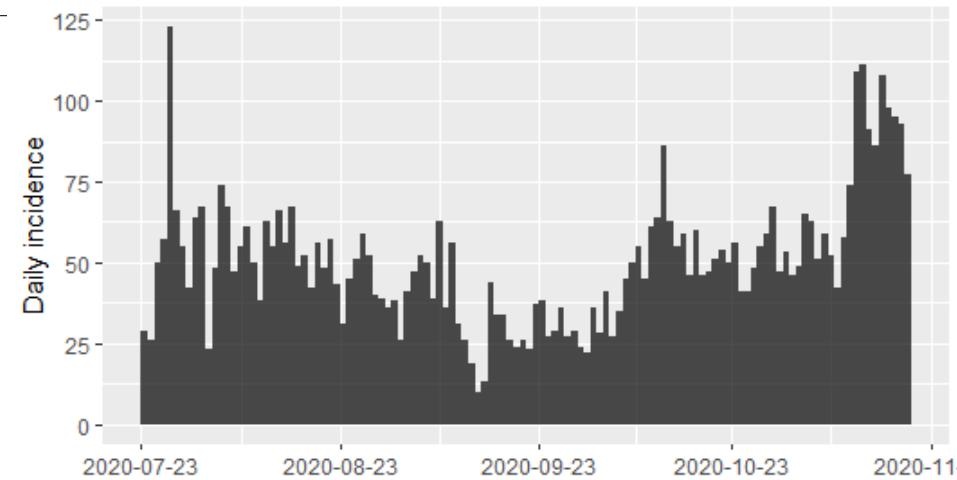
Tarrant

Estimated R_0 in the metroplex (ER visits)



Hospitalization for suspected COVID patients in the metroplex

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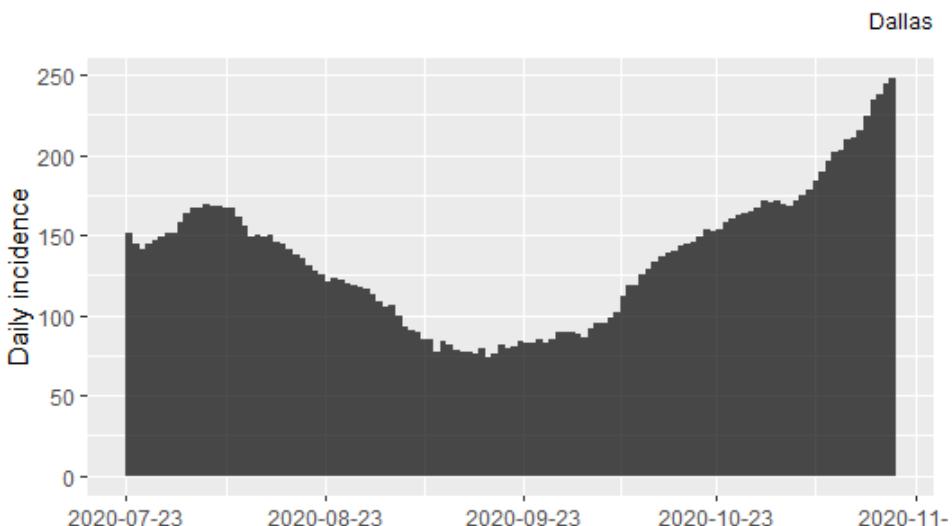
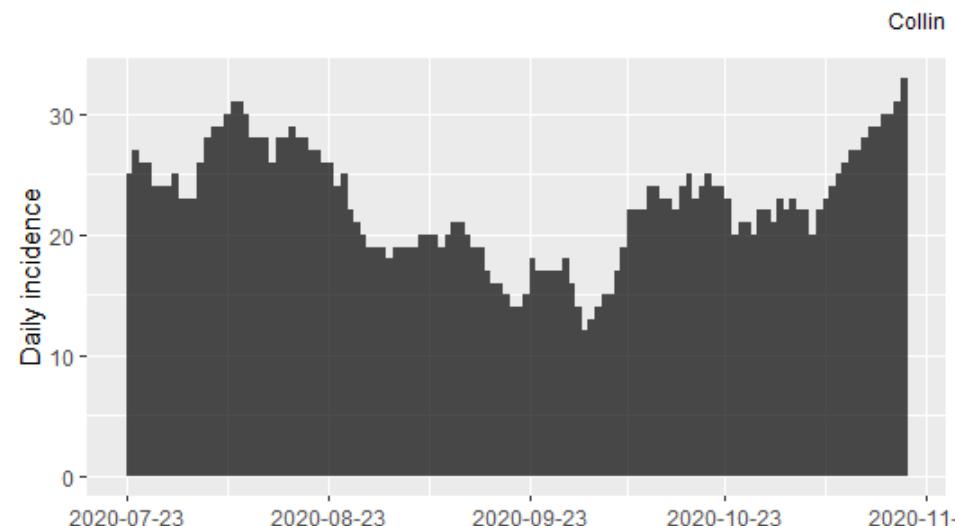
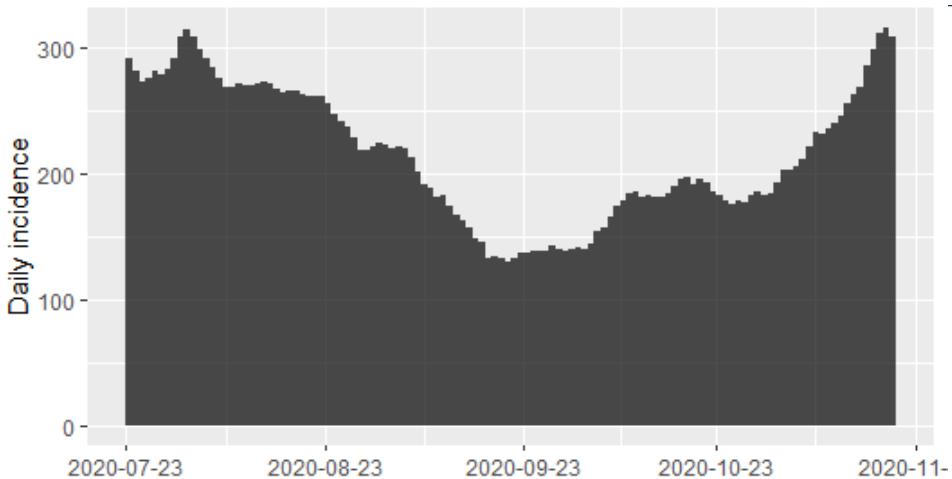
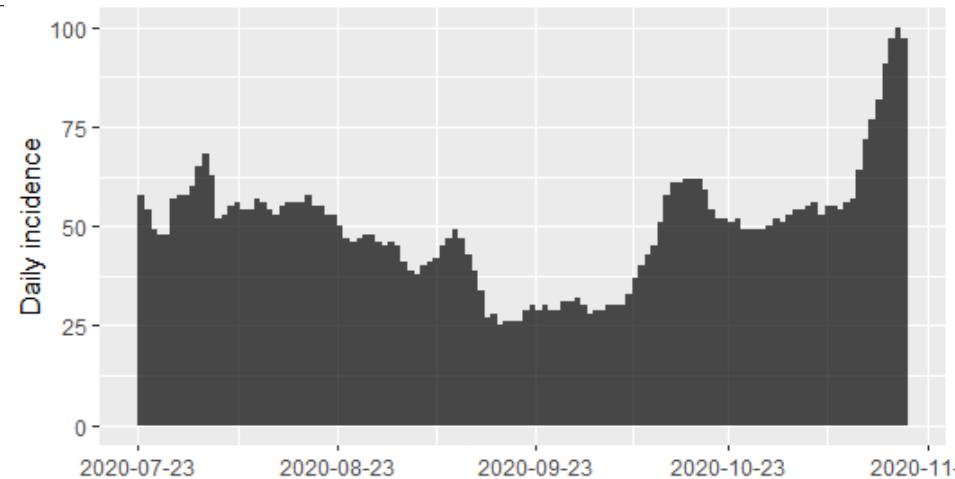
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Tarrant

Hospitalization for suspected COVID patients (smoothed)



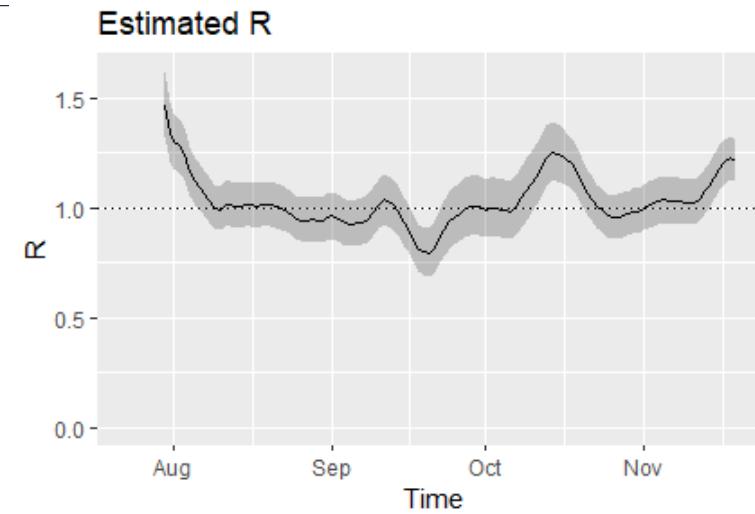
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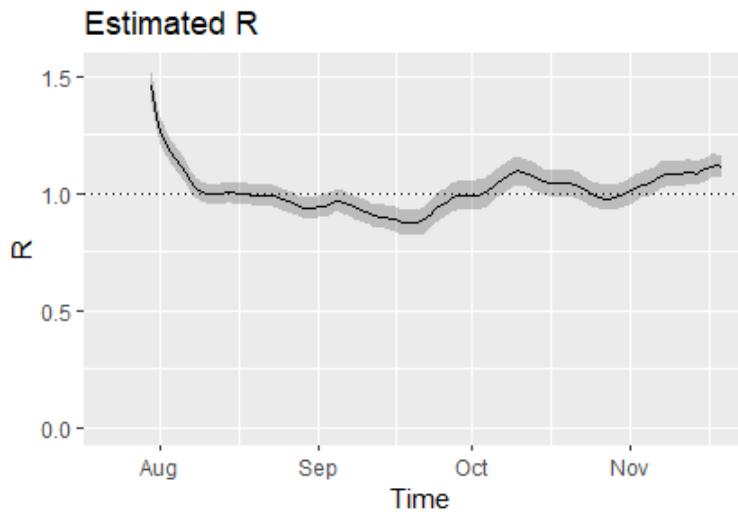
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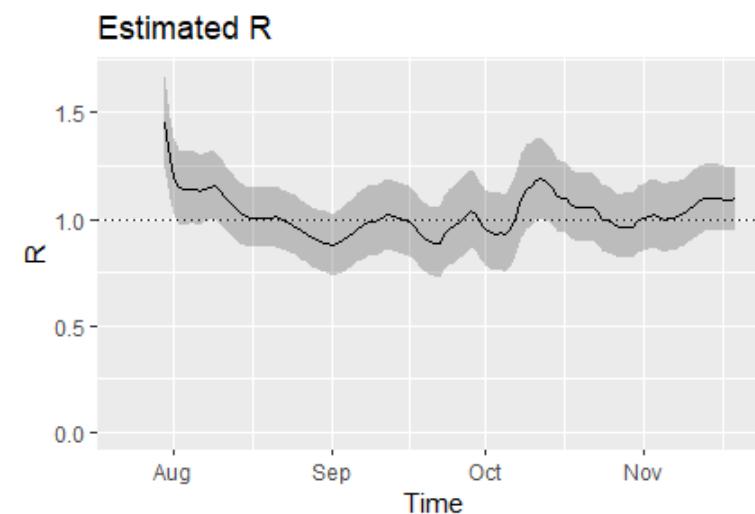
Estimated R_0 in the metroplex from hospitalization



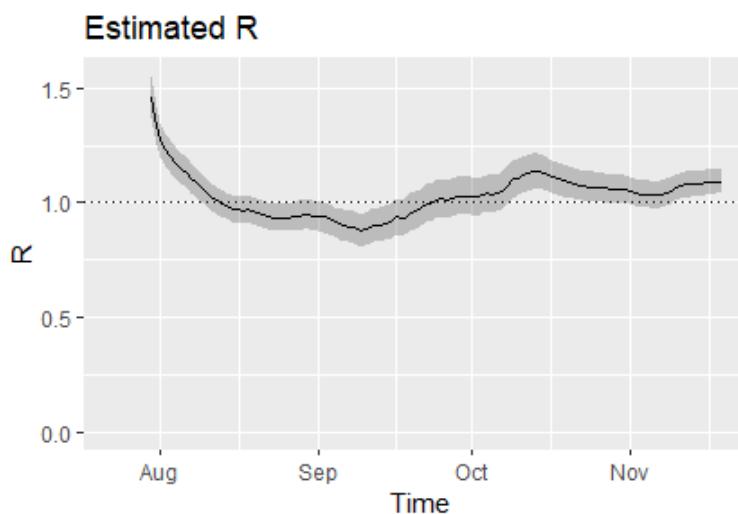
— Mean
— 95% Crl



— Mean
— 95% Crl



— Mean
— 95% Crl



— Mean
— 95% Crl

Takeaways from time-varying R_0 trend



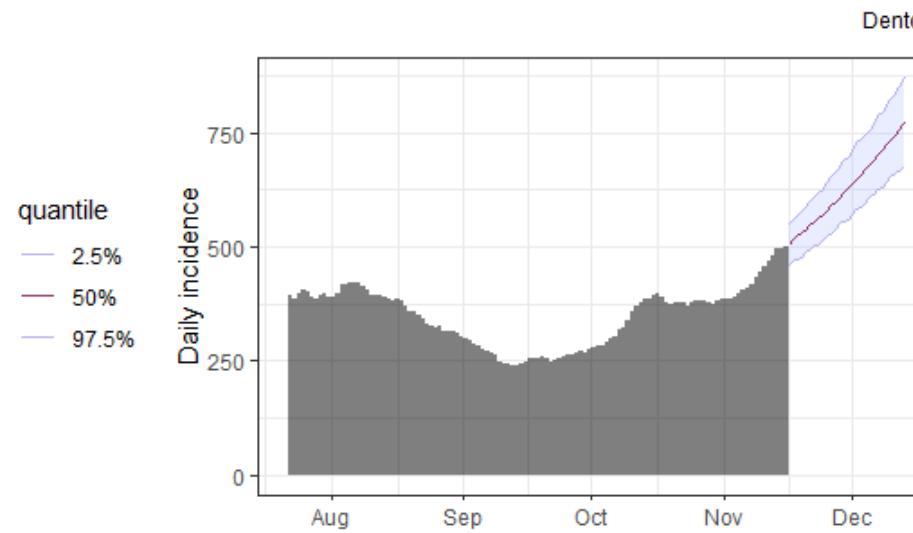
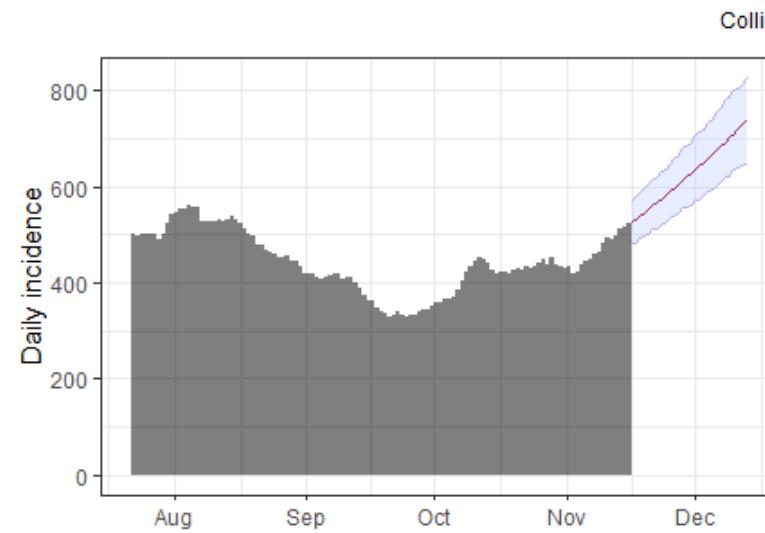
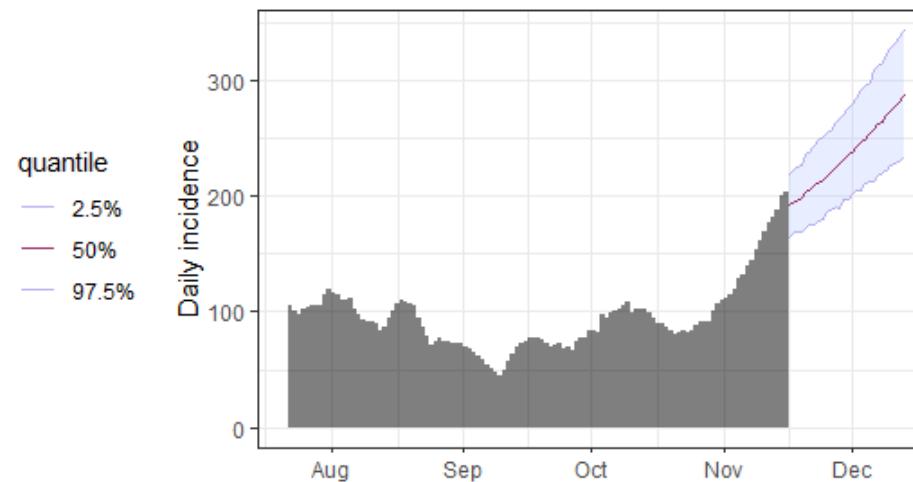
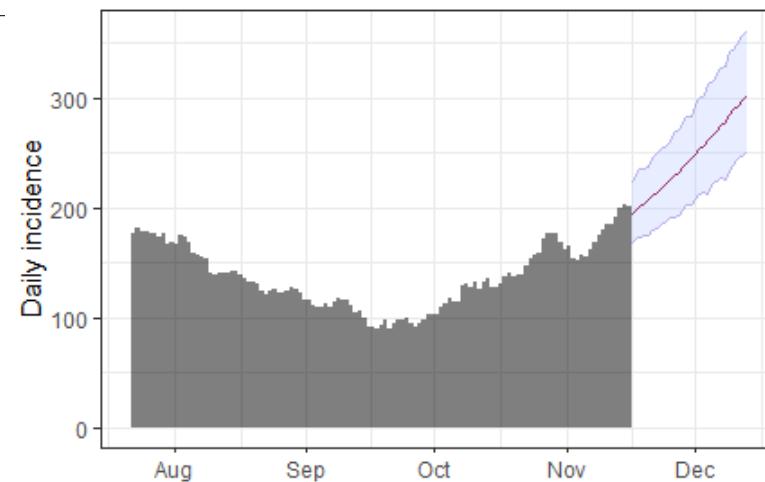
- Currently, all four counties in the metroplex have consistently seen R_0 values greater than 1 for the last three weeks, which clearly indicates a big surge in the number of daily new cases, ER visits and hospitalization.
- Unless there is a reversal of trend, we run the risk of reaching maximum capacity in hospitals very quickly.
- Once hospitals operate at or above normal maximum capacity, fatality rate is likely to go up due to potential lack of best treatment

What to expect in the near future?



- We will project the number of new COVID-19 related ER visits and hospitalization numbers for the next four weeks for two different scenarios
- First, we will make our projections assuming that there is no change in the current trend – Scenario 1
- Next, we will make our projections assuming that with the extended coverage of the alarming situation in the media as well as other local measures (such as switching instruction at Fort Worth ISD to online only) will be somewhat effective causing a modest reduction of 0.1 in the R_0 value – Scenario 2

Daily new COVID-related ER visits - Scenario 1

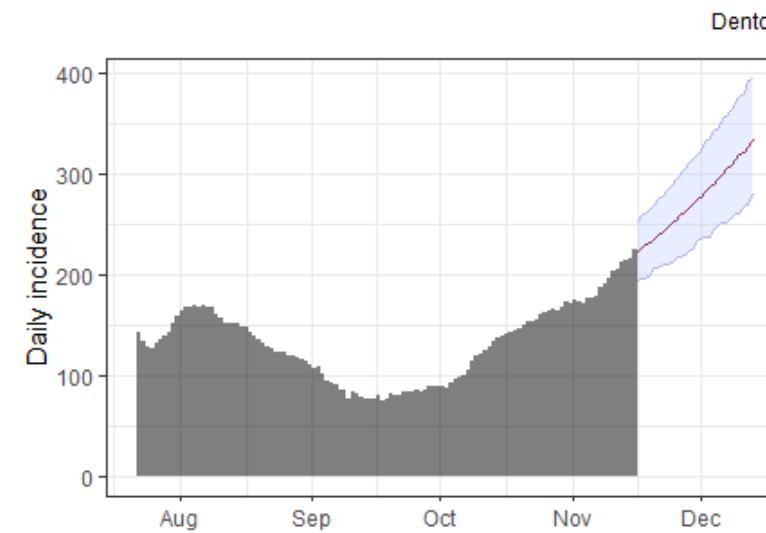
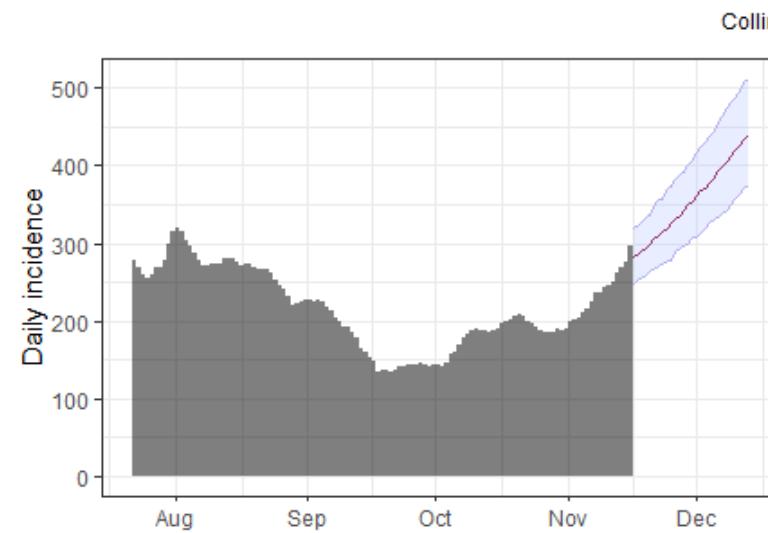
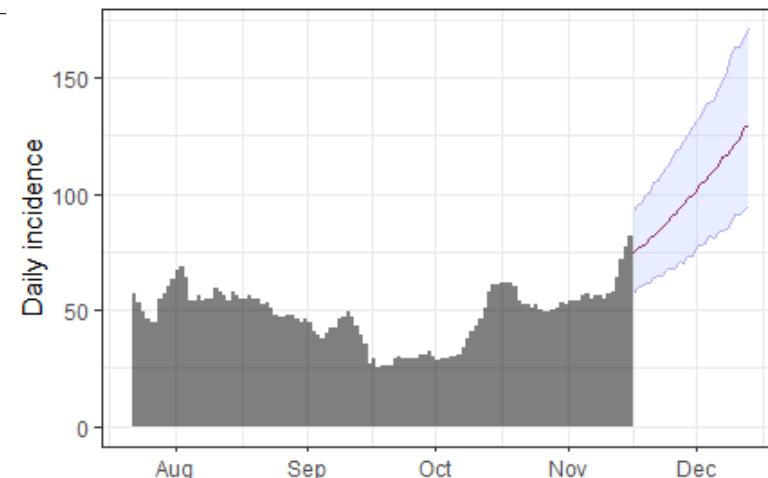


Dallas

Tarrant

Daily new COVID-related Hospitalization - Scenario 1

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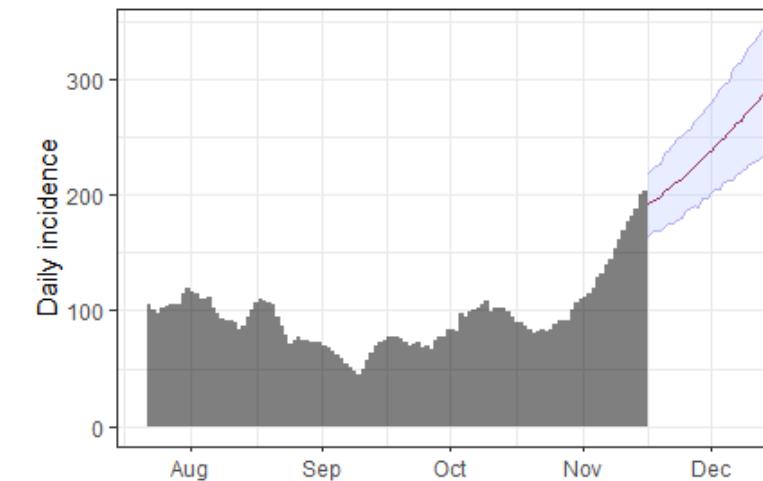
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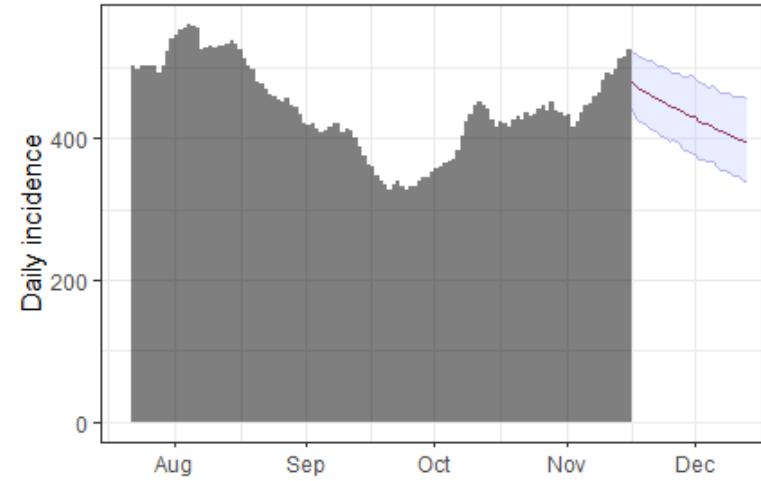
Daily new COVID-related ER visits - Scenario 2



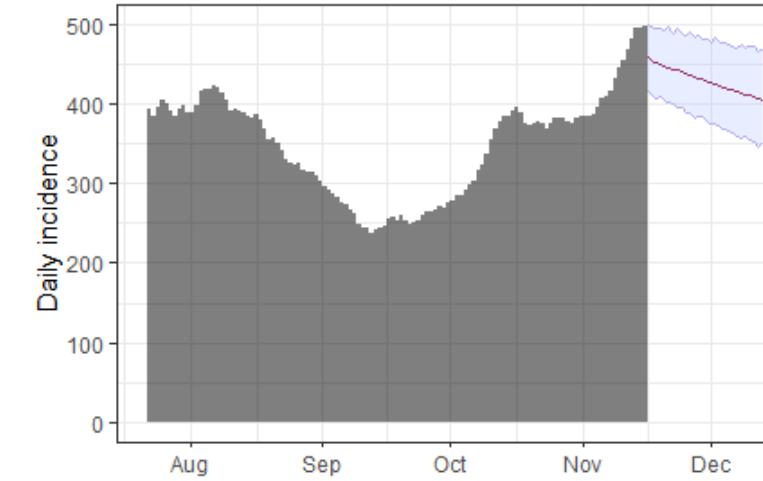
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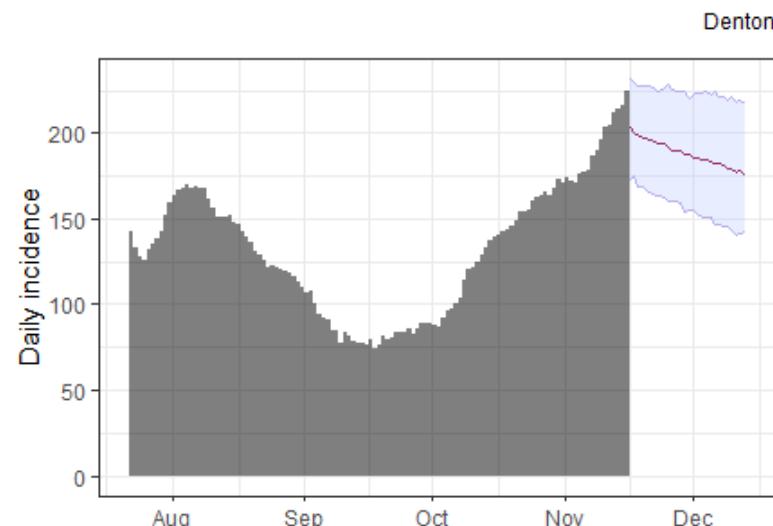
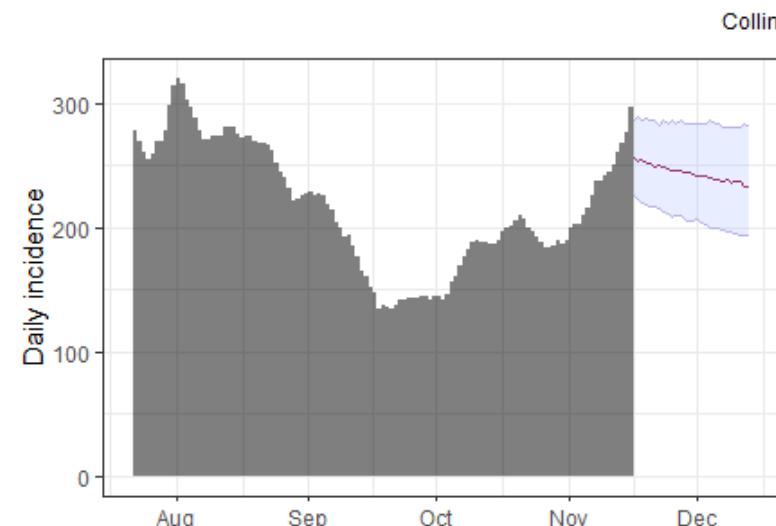
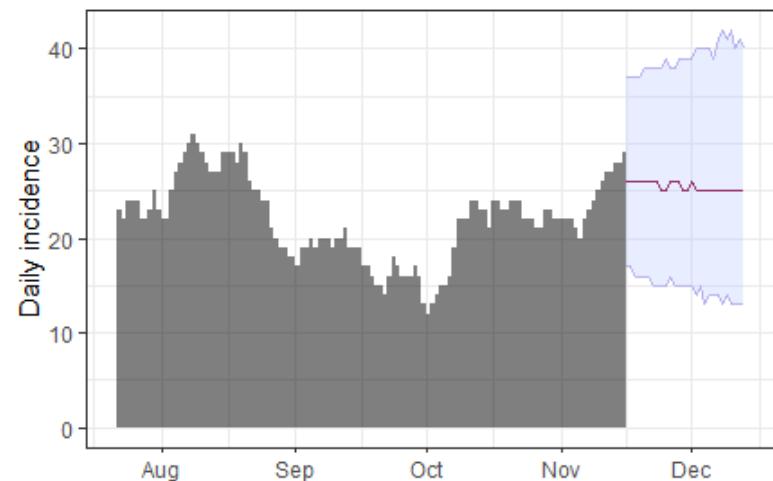


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Daily new COVID-related Hospitalization Scenario 2



Dallas

Tarrant

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Will the hospital capacities reach 100%?

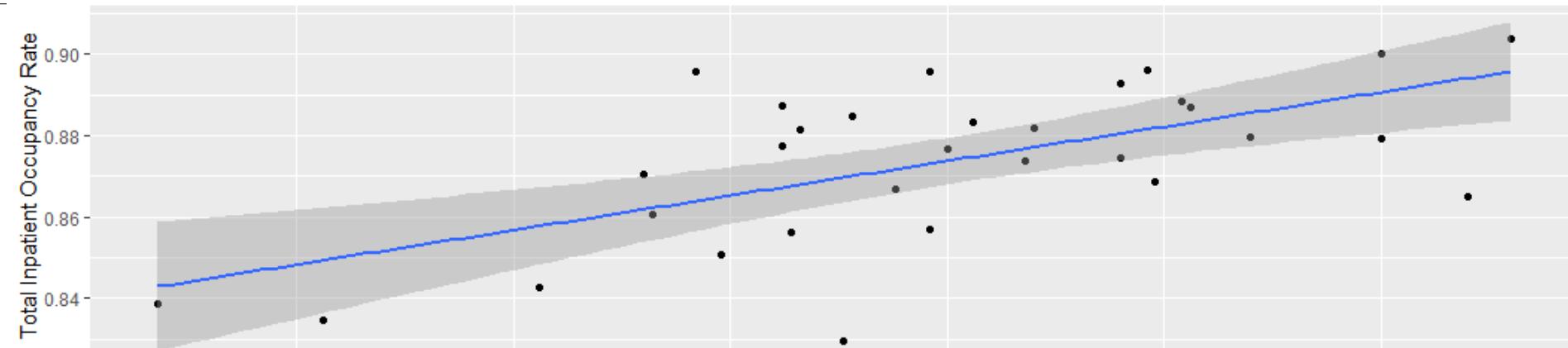


- This is currently the burning question as the number of daily cases and hospital admits are rising
- This is a difficult question to answer as the situation is continuously evolving and the facilities are making arrangements to increase capacity
- Even with increased capacity, adequate staffing with health care professionals can also pose some challenge
- Nonetheless, we will make some estimates for Dallas and Tarrant counties under the simplified assumption that the current trend in hospitalization continues and hospital capacity remains at current level

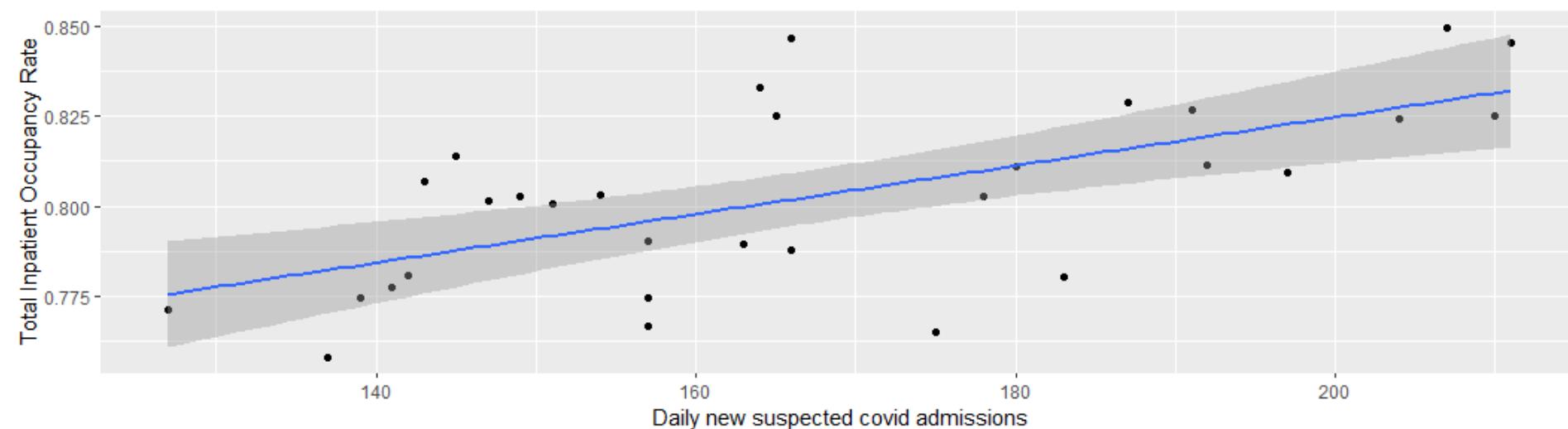
A simple model for prediction

- There is a fairly strong association between new daily COVID-19 related admissions and occupancy percentage as can be seen in the figure in the next slide
- We will use linear regression for each of Tarrant and Dallas counties to estimate the expected level of new daily COVID-19 related admissions for hospitals to reach occupancy at maximum capacity
- We will then use our projected number of new daily COVID-19 related admissions to estimate the number of days to reach maximum capacity

Relationship between new COVID related admits and Occupancy



Dallas



Tarrant

Crude estimates for hospitals to reach max capacity



- **Exploiting the linear relationship between new daily COVID-19 related admissions and occupancy percentage, we estimate that 100% occupancy will be reached when expected number of new daily COVID-19 related admissions reaches 371 in Tarrant County, and 460 in Dallas County**
- **If the current growth rate in the number of new daily COVID-19 related admissions remain unchanged, either of the two counties may reach maximum capacity in the next 30 days.**
- **However, many individual hospitals are already operating at or near maximum capacity.**
- **Also, it needs to be reiterated that these estimates are crude, since conditions are evolving, and the growth is exponential in nature.**

Can we expect to see a reversal in trend??



- The raw data on the numbers of new cases, ER visits and hospitalizations currently does not indicate any reversal of trend yet
- However, to observe the impact of any new policy or change in behavior, there is typically a lag of approximately 10-12 days
- There has been a lot of coverage in the local, state and national media regarding the imminent threat from uncontrolled growth in the spread of the pandemic
- It is possible that the general public get more vigilant and exhibit better compliance with local guidelines/mandates.

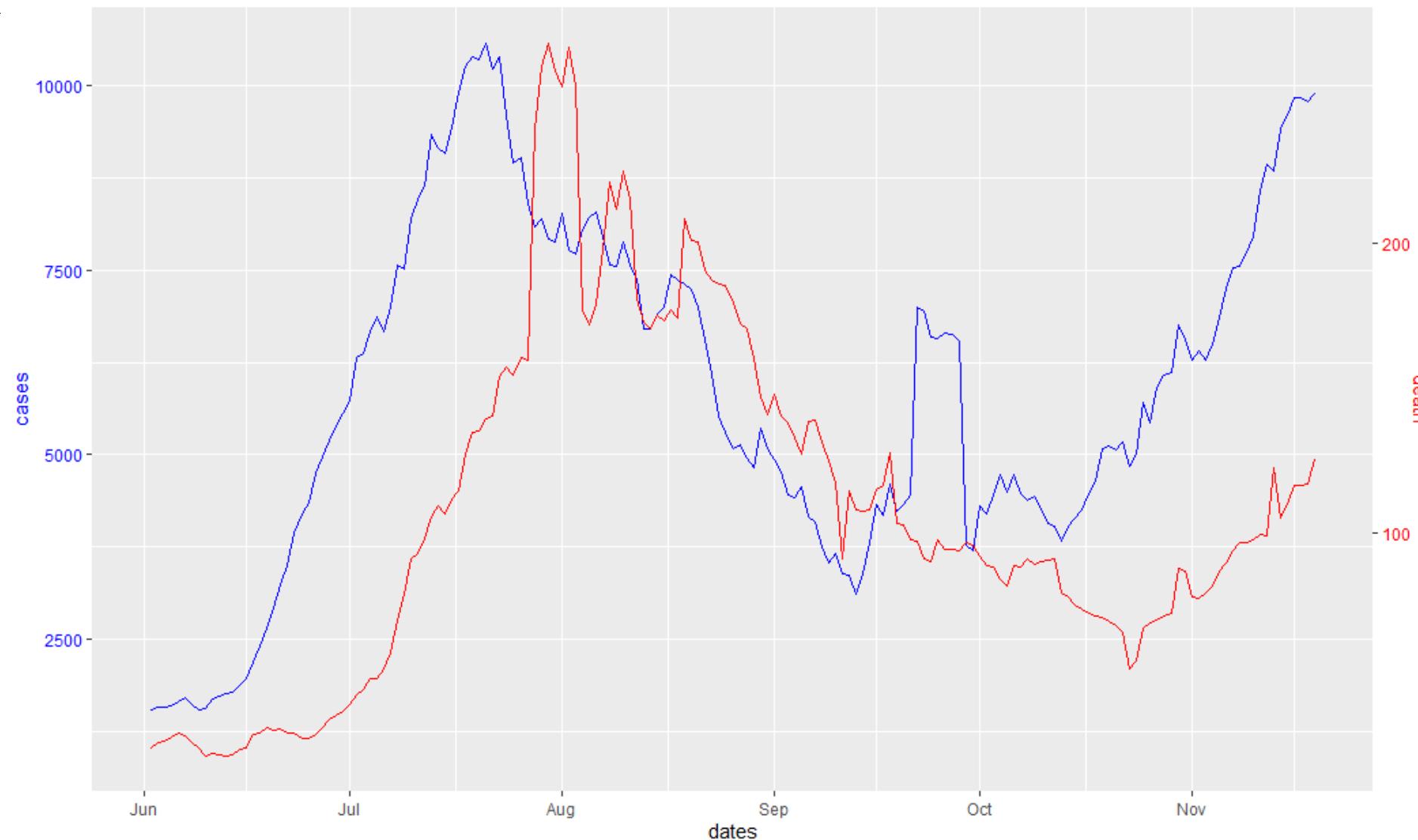
COVID-19 related mortality in Texas



- **With a big surge in the number of cases, it is inevitable that death counts will also exhibit a surge**
- **However, there is a significant lag in mortality trend from the daily reported cases trend**
- **In our last report, we estimated the lag to be 14 days**
- **Our estimate of the lag stays the same in our current report as well**
- **The lag can be visualized in the following slide**
- **We expect the death count to grow significantly for the next couple of weeks and present our forecast**

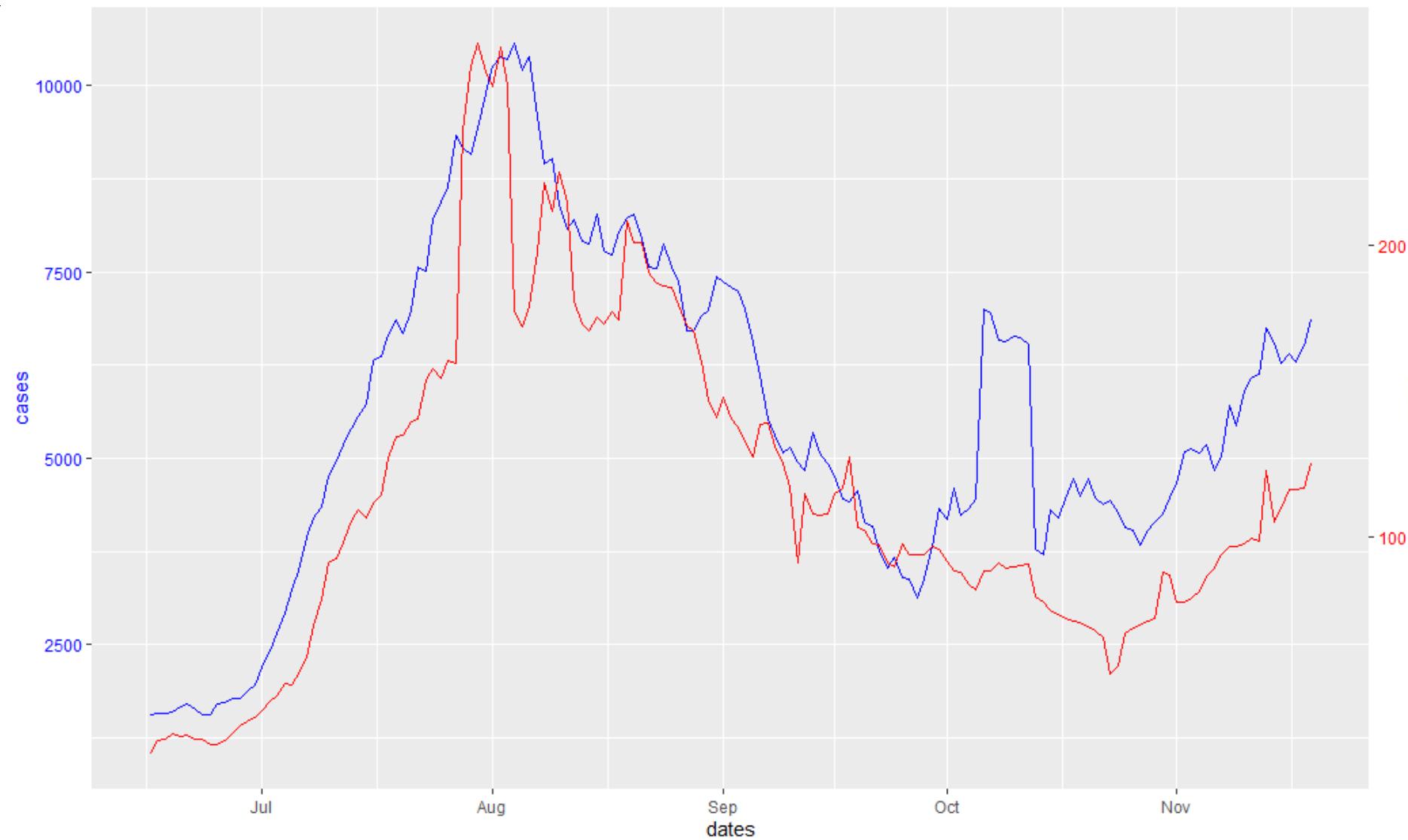
Daily statewide reported cases and death (smoothed)

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Daily cases shifted by 14 days to account for the lag

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COVID-19 related mortality forecast



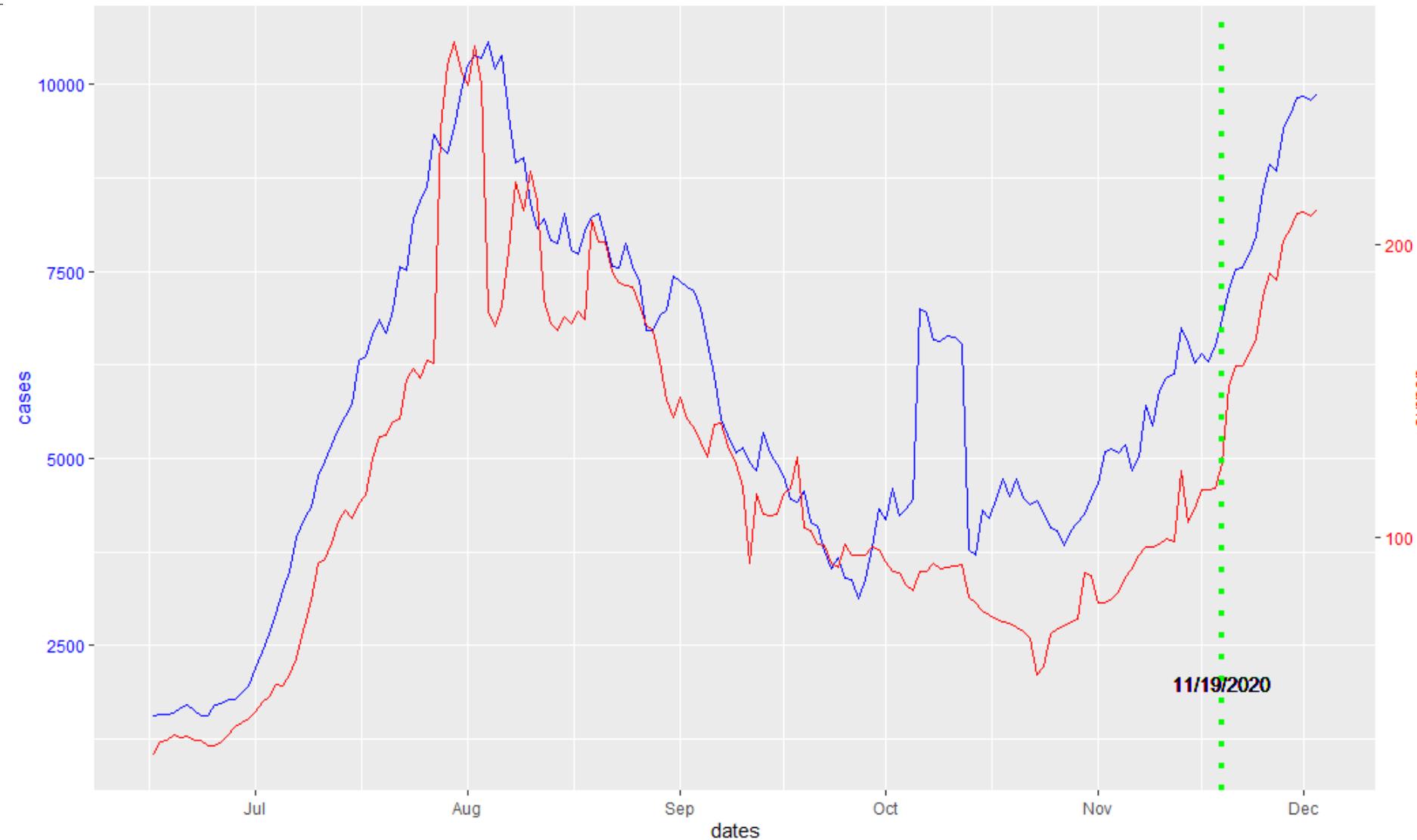
- **Slide 21 overlays the mortality data on the daily reported cases data to visually observe the lag in trend**
- **Our analysis finds a lag of 14 days between the trend for daily new reported cases and the daily new reported deaths offer the best fit with a very high correlation of 0.91**
- **Slide 26 overlays the mortality data on the daily reported cases data accounting for the 14-day lag in trend offering a near perfect match**

Mortality forecast for the next two weeks



- We use regression to forecast the number of deaths in the next 14 days
- Our forecast on the number of deaths is presented in the following two slides
- The peak in daily death count is not expected to reach in the next 14 days
- We must emphasize that this is a short-term projection based on the current trend on the daily reported cases
- Our estimate of the current case-fatality rate in Texas is approximately 1.7% which is same as our estimate in July, but much lower than the case-fatality rate in the early days of the pandemic (4%)
- We project a total COVID related death count of 2600 in the next 14 days in Texas

Mortality forecast for the next two weeks using cases data for the last two weeks after accounting for the lag



What are the causes for the recent surge?



- The recent surge can possibly be attributed to a number of factors
- Even though people are mostly compliant on wearing masks and maintaining social distancing in retail facilities, mask compliance has been observed to be limited in outdoor locations
- As weather gets colder, people spend more time indoors
- There have been several instances of super-spreader events from indoor residential social gatherings
- It is physically impossible to use face coverings in bars and restaurants while eating/drinking which significantly elevates the risk of disease transmission
- There has been several instances of hospital employees getting exposed and sick creating additional stress in the hospital system

Recommendations



- **To prevent a catastrophic effect on the healthcare system from a continuing surge, the following steps are suggested**
- **Closure of bars and further restricting dine-in should be considered**
- **Social distancing guidelines should be strictly adhered, and masks should be worn even in outdoor locations when in proximity of other individuals**
- **Residential social gatherings should be strictly avoided, or individuals should get tested before such gatherings**
- **Family holiday gatherings should be avoided (Thanksgiving, Christmas, Hanukkah)**
- **Testing should be expanded to asymptomatic individuals to detect community spreads early**

Recommendations (cont.)

- Apartment complexes are potential hot-spots
- Gyms and social gathering places in the apartment complexes should be closed
- Movement to retail facilities should be restricted to absolute necessity
- If possible, wear KN-95 masks
- If all else fails, “Shelter in place” orders in targeted areas must be considered
- There has been a noticeable COVID fatigue in the general public, which is understandable due to the long haul with no end in sight (until recently)
- However, help is on the way with two recent highly successful vaccine trials
- We can eradicate the virus once the vaccines are commercially available
- But we need to be patient and vigilant till then

Data sources used for this analysis



- **Case and mortality counts in US counties - Johns Hopkins Coronavirus Resource Center and the COVID tracking project**
- **Global case and mortality counts - European Centre for Disease Prevention and Control**
- **Global mobility data (including US counties) – Google COVID-19 community mobility report**
- **Case and mortality counts in Tarrant County – Tarrant County Public Health (TCPH)**
- **ER visits, hospital admits, ICU admits in North Texas counties - North Central Texas Trauma Regional Advisory Council (NCTTRAC)**
- **Case and mortality counts in Texas – Texas Department of Health Services**

