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

HSC COVID-19 Report #5 – July 20, 2020

COVID-19 in DFW metroplex

Efficacy of mask mandates, hospitalizations and projections

Summary from our last report in June 18

- All four counties in the metroplex had consistently seen R_0 values greater than 1 for over two weeks, which clearly indicated a surge in the number of daily new cases
- Among the four counties, the surge in Tarrant county was most alarming
- Without a reversal of trend in surge, the hospitals could reach maximum capacity in 16 days in Tarrant County and 44 days in Dallas county
- Based on data from 150 most affected counties across the nation, we expected to observe a positive impact of the mandate in subsequent days
- We observed a steady decline in retail mobility in all four counties once the threat of surge became apparent (data as of June 23), which provided some optimism
- We concluded that there was no immediate need for any new “Shelter in place” order, but cannot be ruled out as a future action without a reversal of trend

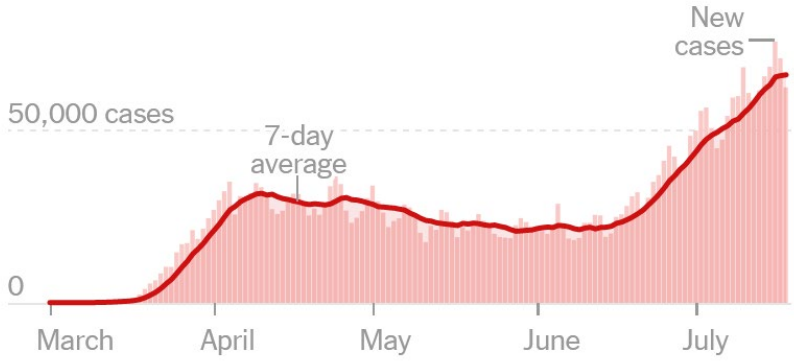
Key questions looming currently

- **Do we have evidence in favor of efficacy of the mask mandate?**
- **Are the hospital capacities still at risk to be overwhelmed?**
- **Have we been able to reverse the trend?**
- **Is our previous position on a new “shelter in place” order still valid?**

How to assess the efficacy of mask mandate?

- We will attempt to assess the efficacy of mask mandates using two broadly different approaches
- First we will assess the efficacy of early intervention from a prevention perspective using state-level data in the 50 states and District of Columbia.
- We will then assess the efficacy of late intervention from a reversal of trend perspective by using county level data in the DFW metroplex

Assessing the efficacy of early mandates



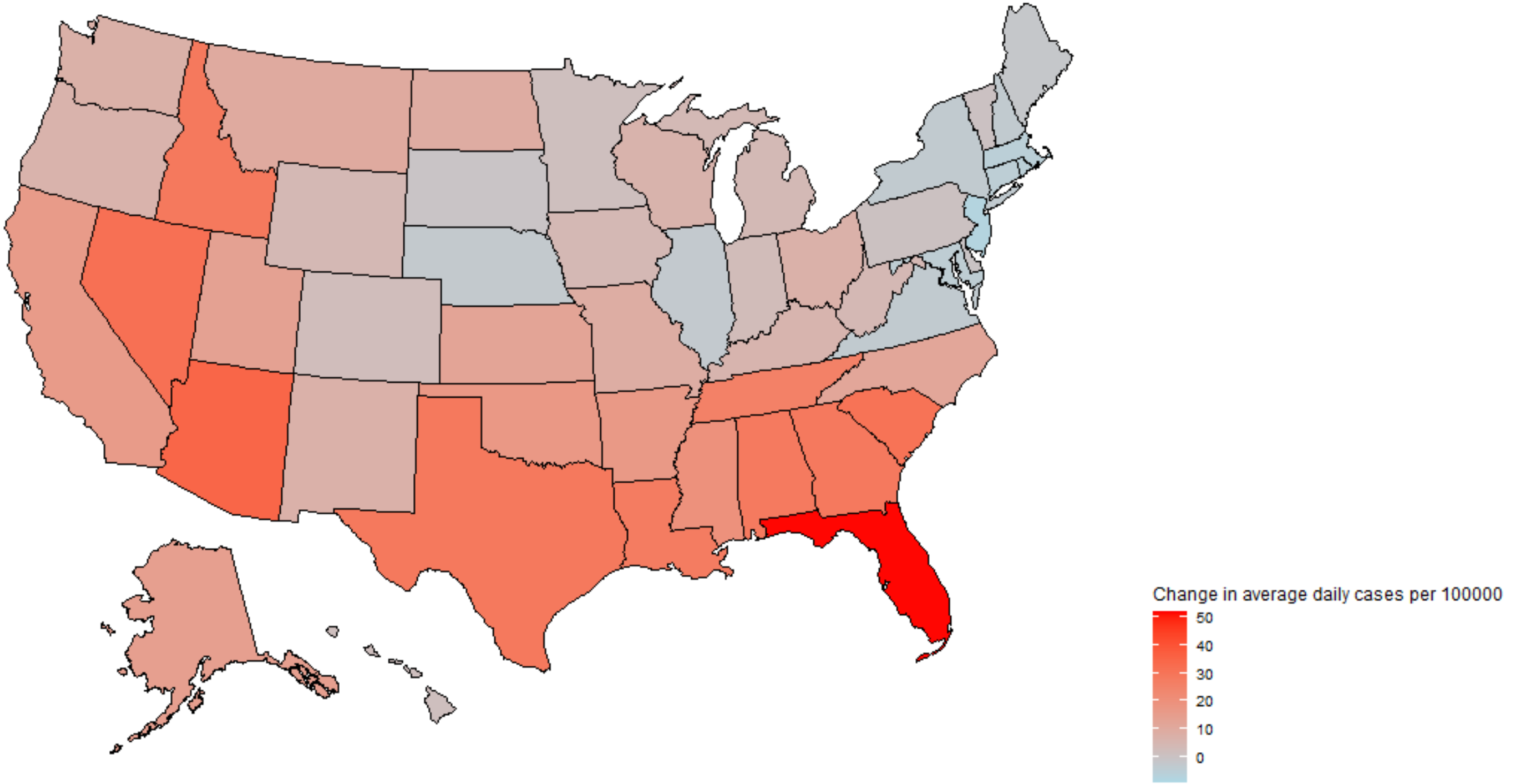
National COVID-19 daily new cases (NY Times)

- **As evident from the plot above, nationally, the initial wave peaked in April and then there was a slow decline till end of May**
- **We identified 14 states (CT, DE, DC, HI, IL, MA, MD, ME, NM, NJ, NY, PA, RI, VA), where an early mandate was issued by May before the surge in June**
- **We will compare the growth in average number of daily cases between end of May and current period between these states and the rest**

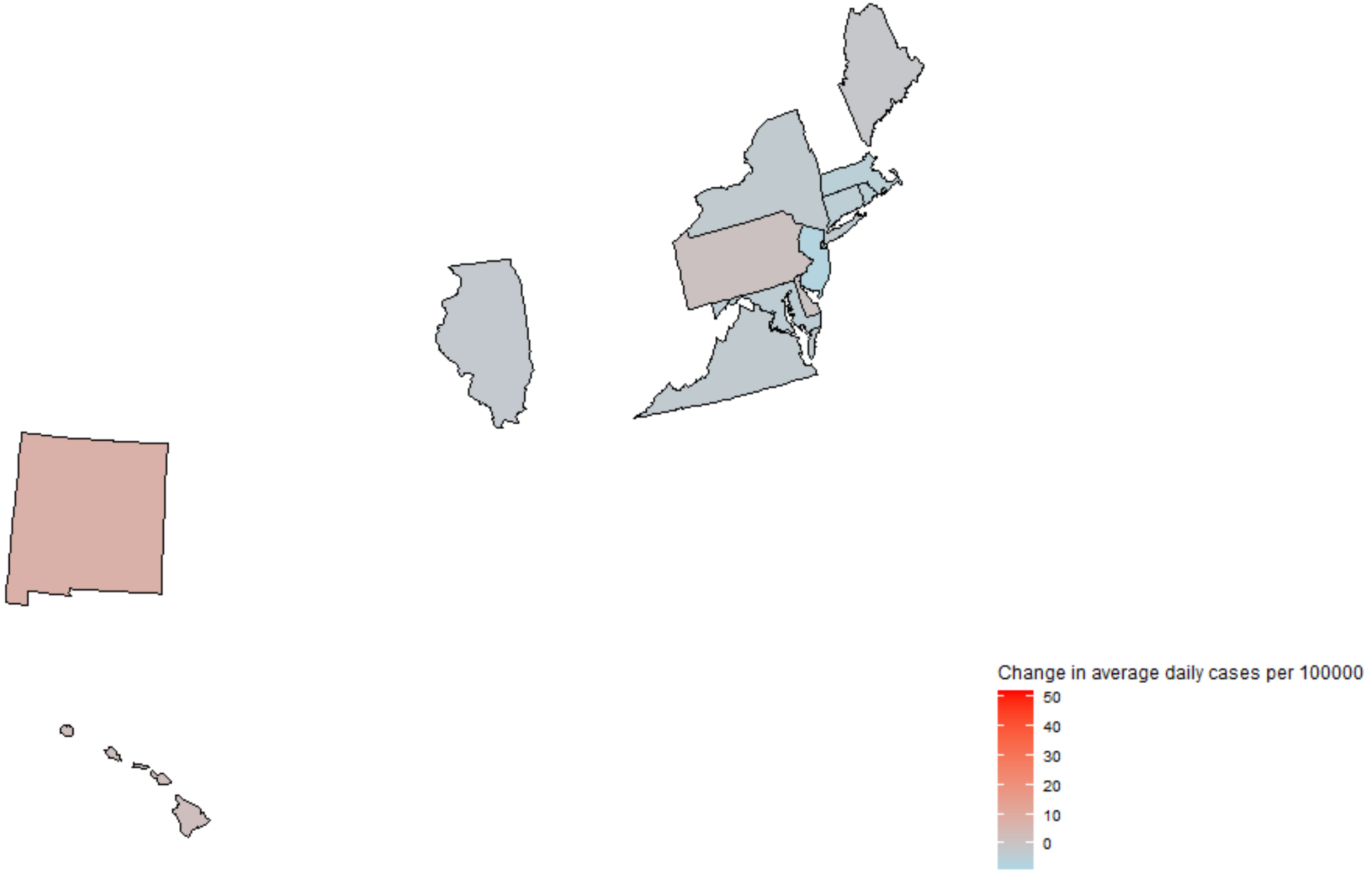
Assessing the efficacy of early mandates

- For each of the 50 states and DC, we first calculated the average number of daily new cases per 100,000 population in the last week of May and the most recent week's available data (July 12-18)
- We then compared the change in average number of daily new cases per 100,000 population between the states with and without statewide mandates
- The results are highly significant statistically with states without a mandate exhibiting on average an increase of 14 daily new cases per 100,000 population as opposed to a decrease in 2.5 daily new cases per 100,000 population for states with a mandate (*p*-value 1.46×10^{-5}).
- The difference is also quite evident from the plots in the following slides

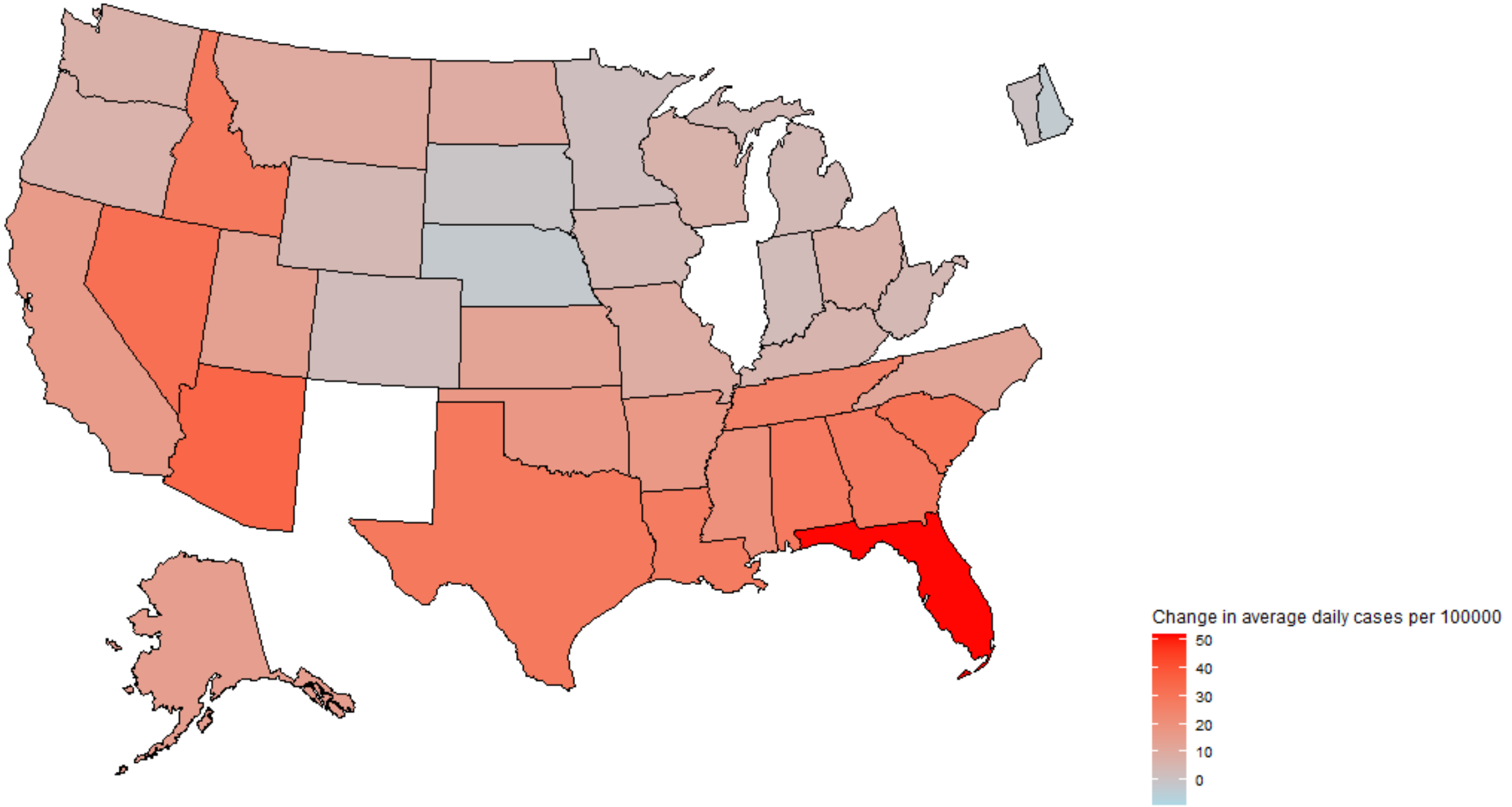
50 States and District of Columbia



States with mask mandate effective in May



States with no mask mandate effective in May



Observations from the plots

- For all the states with a mask mandate effective in May, there is either a decrease in the average number of daily new cases (CT, DE, DC, IL, MA, MD, ME, NJ, NY, RI, VA) or a marginal increase (HI, NM, PA).
- For the states without a mask mandate effective in May, only three states (NE, NH & SD) exhibit a decrease in the average number of daily new cases and each of these three states is sparsely populated.
- The remaining 34 states without mask mandate all exhibit an increase in the average number of daily new cases.
- Furthermore, all the states with biggest increase in the average number of adjusted daily new cases are without mask mandate in May

Conclusions and limitations

- **Both the formal statistical analysis and empirical observations lead to the same conclusion; the states with an early mask mandate have been able to protect against the June surge**
- **However, it should be noted that the analysis is purely based on state mandates**
- **Many cities and counties have local mandates in effect and the impact of the local mandates is not captured in the analysis**
- **Furthermore, issuance of mandate does not necessarily imply compliance and we do not have compliance data currently available to adjust for**
- **Nonetheless, the observed effect is large enough to conclude with confidence that the overall impact of early mask mandates has been positive in preventing a surge**

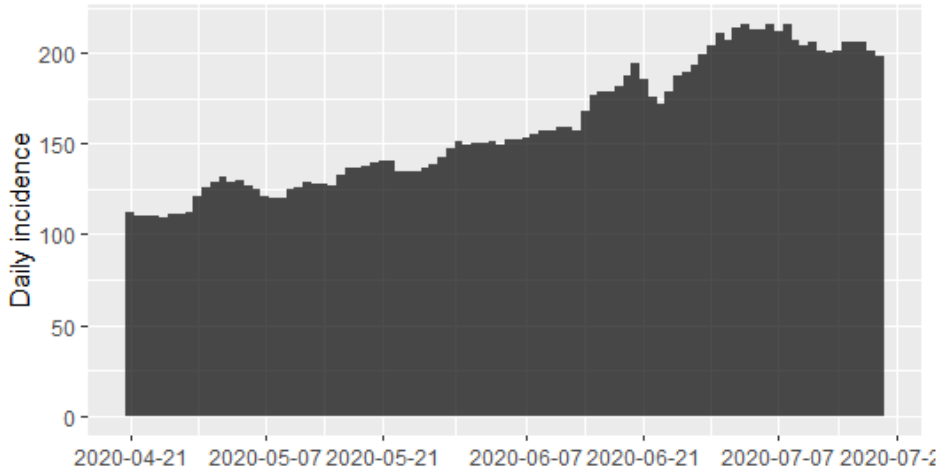
Assessing the efficacy of late mandates in controlling the June surge

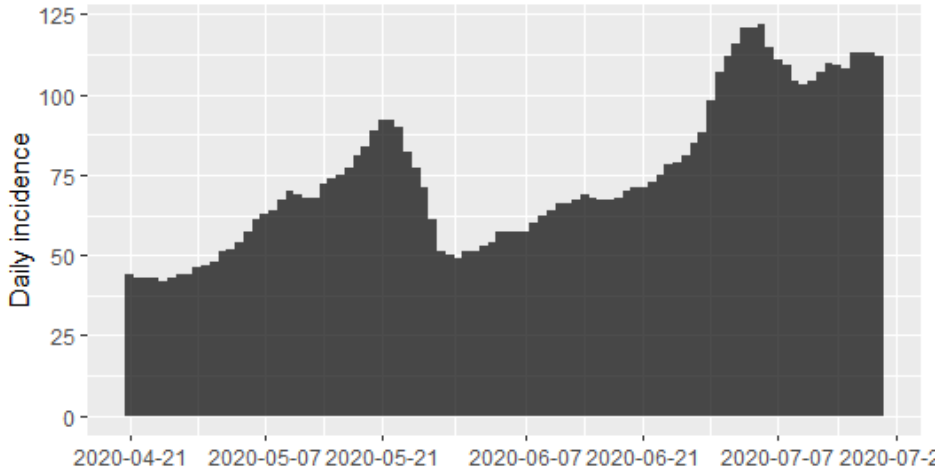
- Once the surge in the number of new cases across the nation became apparent in mid-June, issuance of mask mandates have been more prevalent at city, county and state levels since then
- However, due to the lag in the appearance of symptoms after infection, testing and reporting, any impact of a new policy on the transmission of the disease is only apparent after approximately 10-14 days
- Since the local and recent state mandates have been issued over an extended period beginning the third week of June, a comprehensive study on the efficacy of these late mandates is currently not feasible
- We will study the efficacy of the local mandates in Dallas and Tarrant counties towards reversing the trend

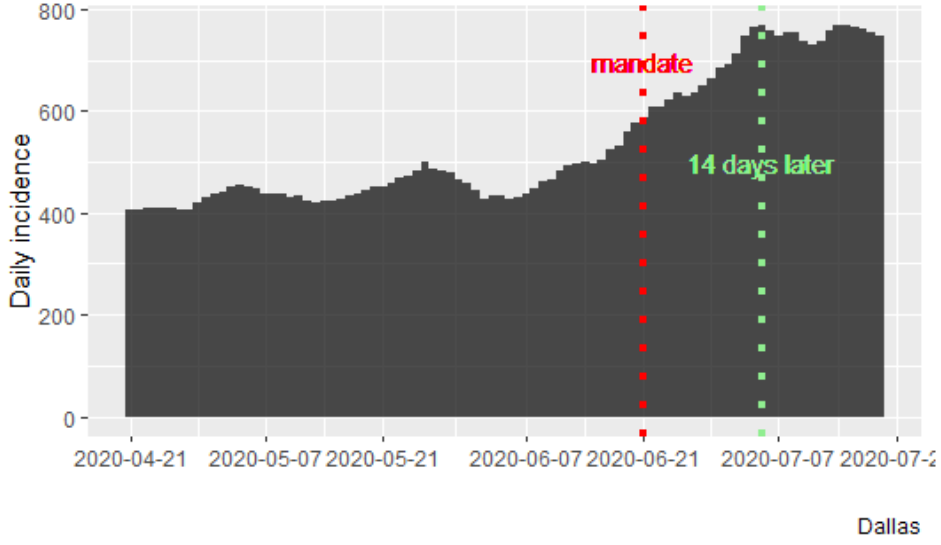
The method

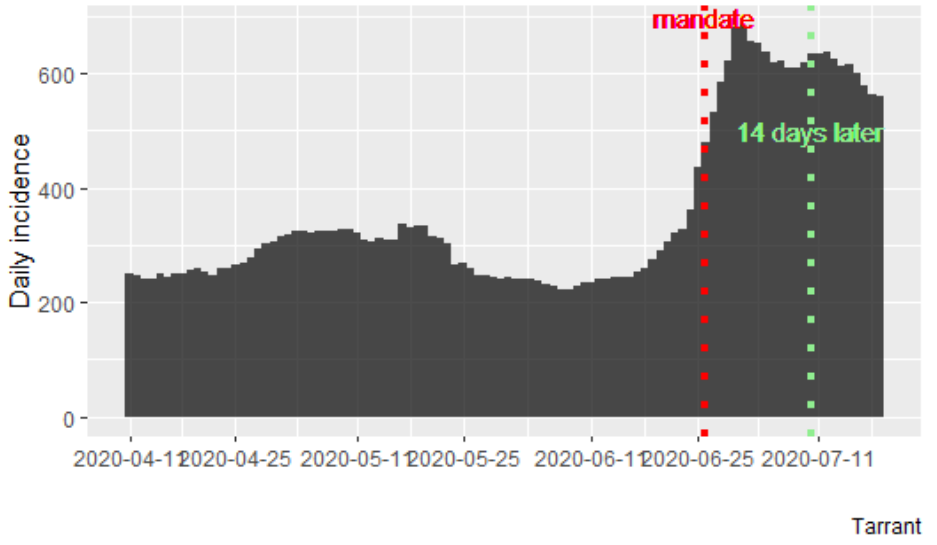
- We will evaluate the efficacy of the local mandates by studying the number of daily new cases and the corresponding transmission rate of the disease
- In epidemiology, the basic reproduction number R_0, of an infection can be thought of as the expected number of cases directly generated by one case 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 separately using hospitalization and ER visit data in North Texas counties for COVID suspect patients.

ER visits for suspected COVID patients in the metroplex

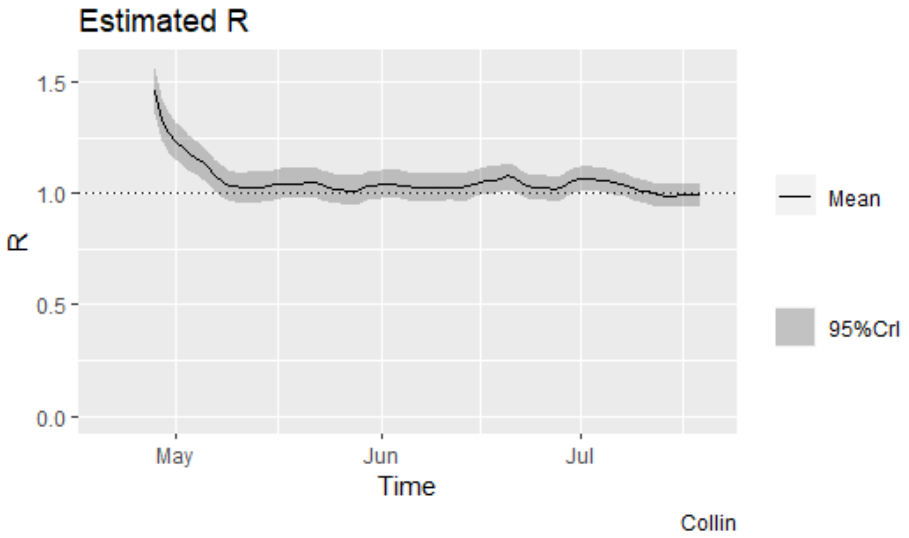




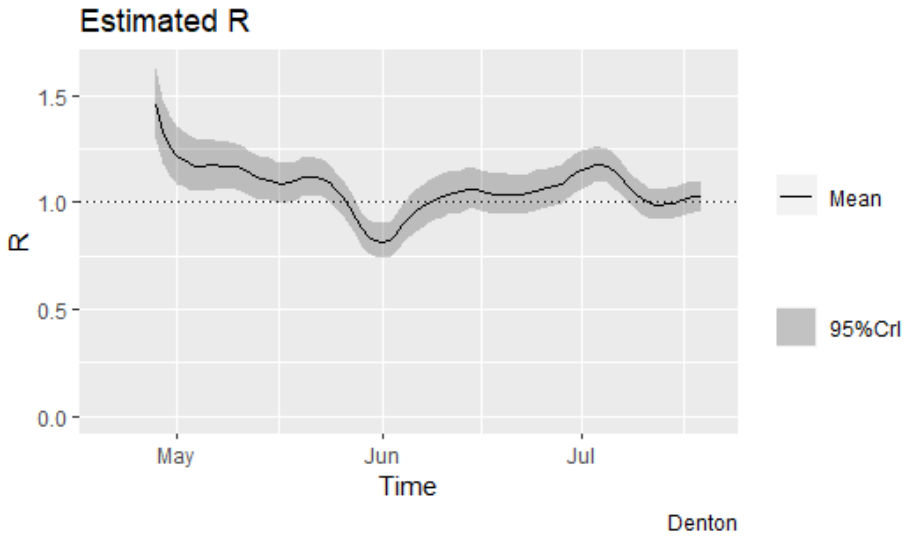




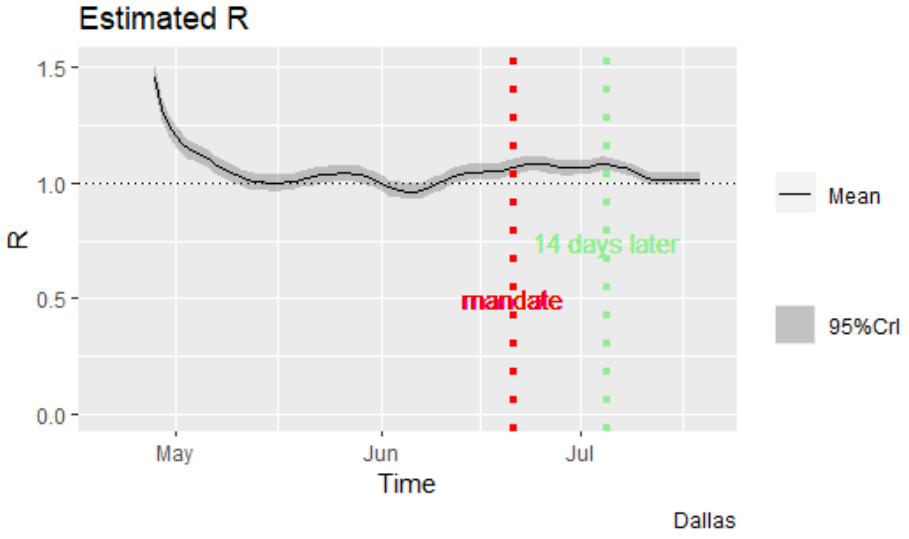
Current estimated R_0 in the metroplex



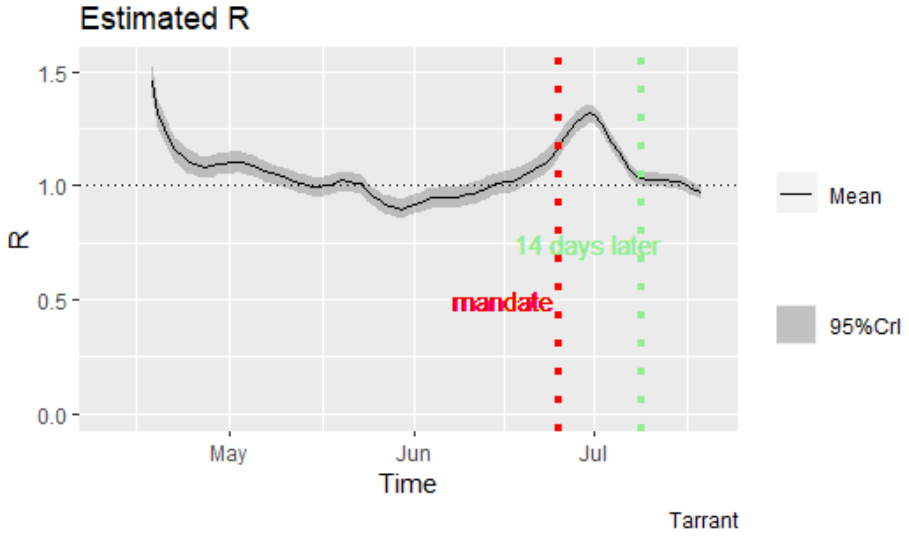
Collin



Denton

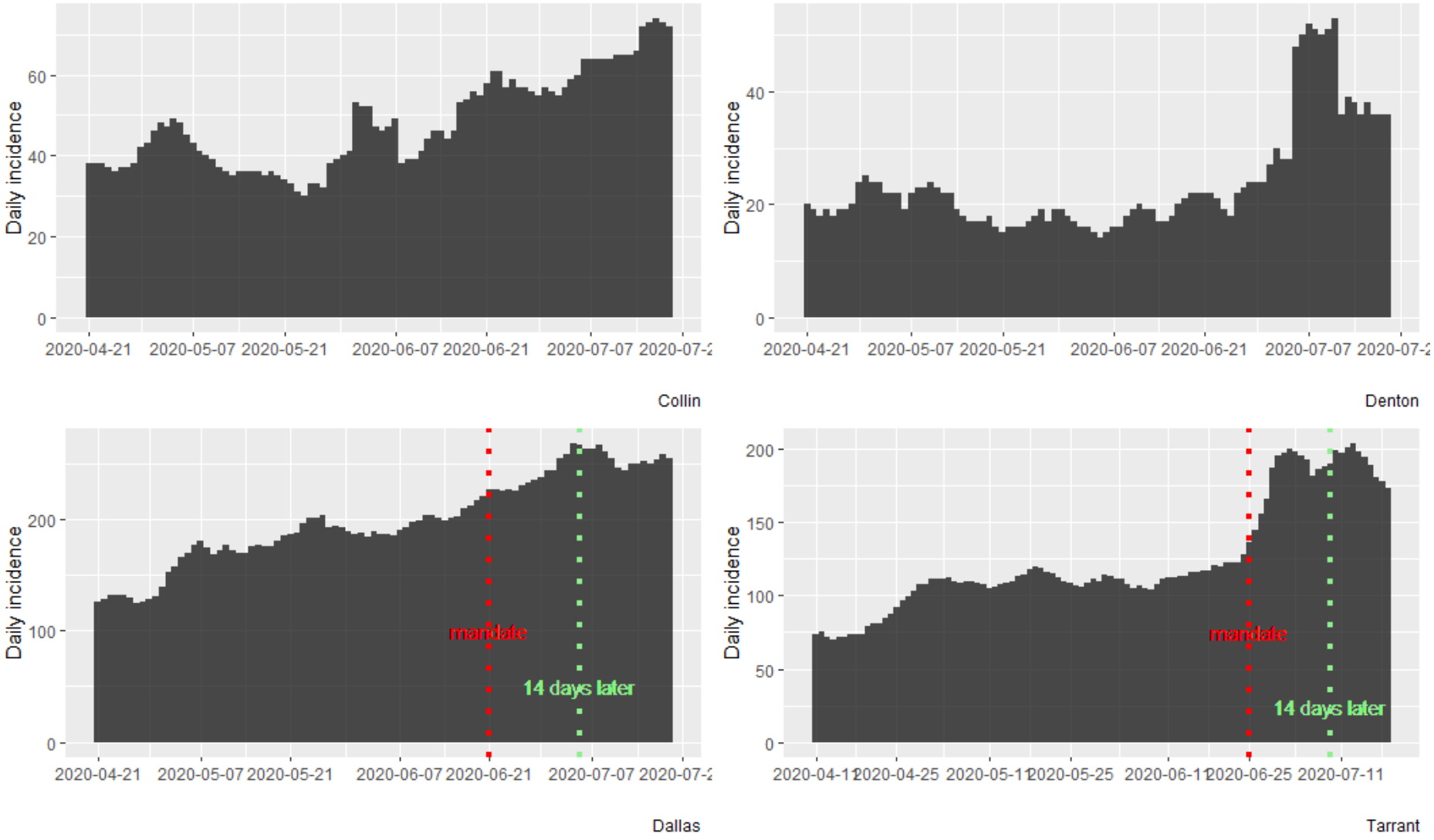


Dallas

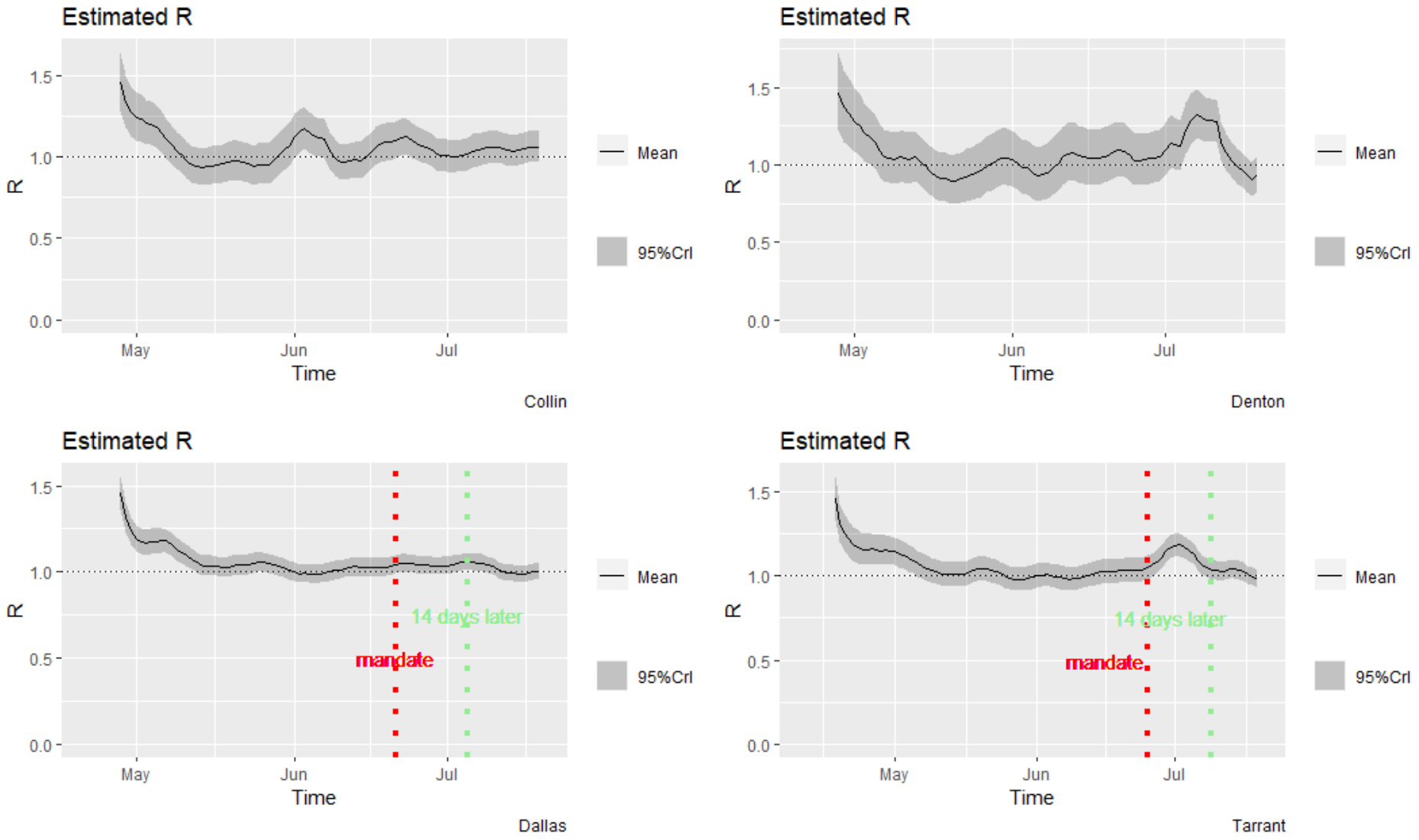


Tarrant

Hospitalization for suspected COVID patients in the metroplex



Estimated R_0 using hospitalization data



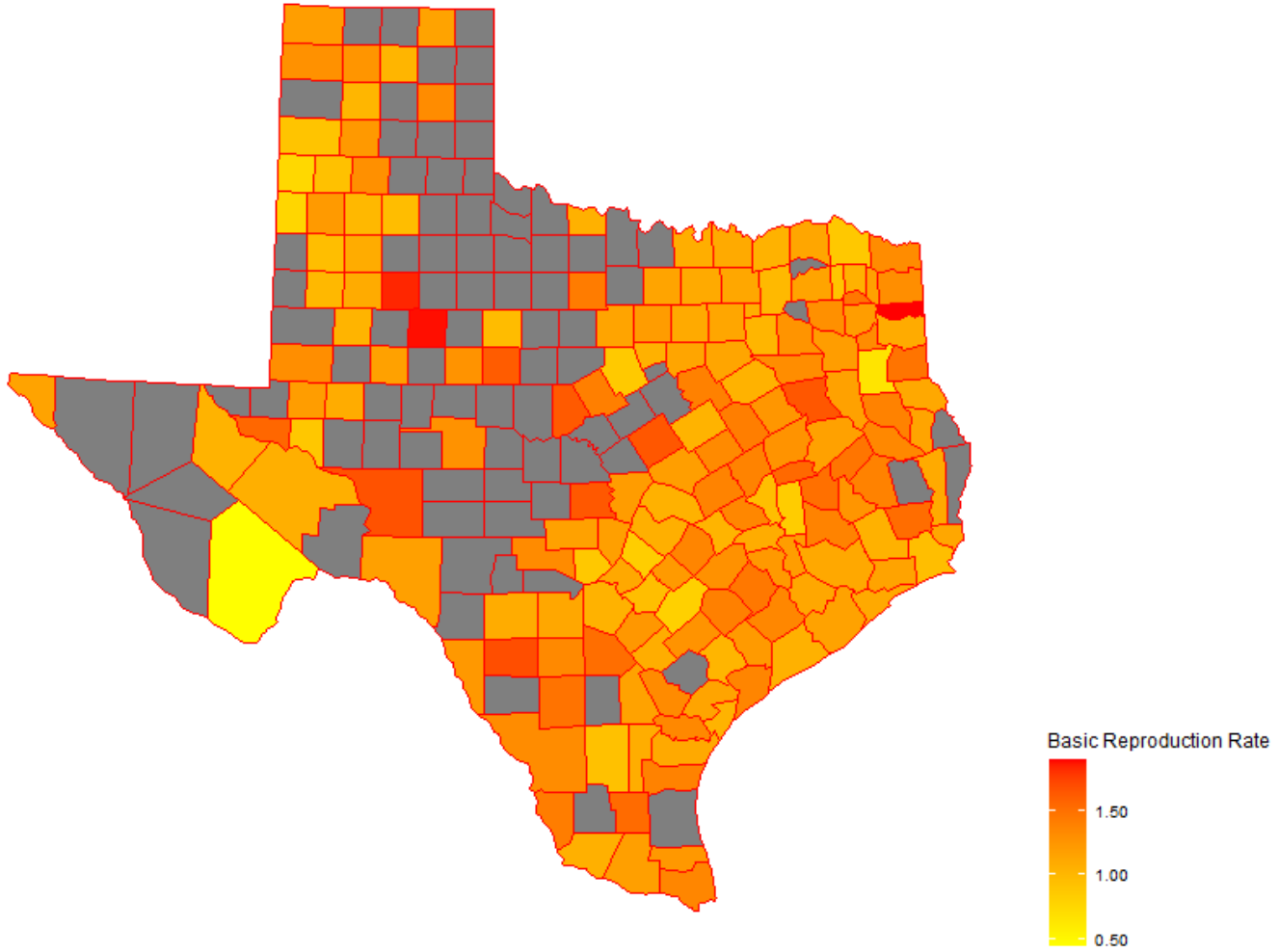
Takeaways from time-varying R_0 trend

- Currently, all four counties in the metroplex have R_0 values close to 1, which clearly indicates a stabilization in terms of growth.
- A reversal in the trend is quite apparent in both Dallas and Tarrant counties in the expected timeframe based on mask mandate with Tarrant County depicting a sharp change.
- The same trend is visible in the raw daily hospitalization and ER visits data for suspected COVID patients.
- There has not been a county-wide mandate in Collin and Denton counties, although a mandate has been issued for the city of Denton.
- The ER visit data for Collin county indicate a small reversal, but hospitalization data indicates growth.
- In Denton county, hospitalization data indicates reversal of trend

Has the mask mandate been effective locally?

- The answer is a resounding “Yes”.
- Any potential effect of the mandate was expected to be apparent in the first week of July
- A reversal in the trend of R_0 values, daily ER visits and hospitalization is apparent since early July in all counties except Collin
- It is important to observe that Collin county is not enforcing the mask mandate
- Denton county is also not enforcing the mask mandate, but the largest city Denton is enforcing the mandate
- The fact that Collin county is exhibiting the least change in the positive direction further reinforces the efficacy of the mandate
- In fact, current data projects a growth in hospitalization for Collin county

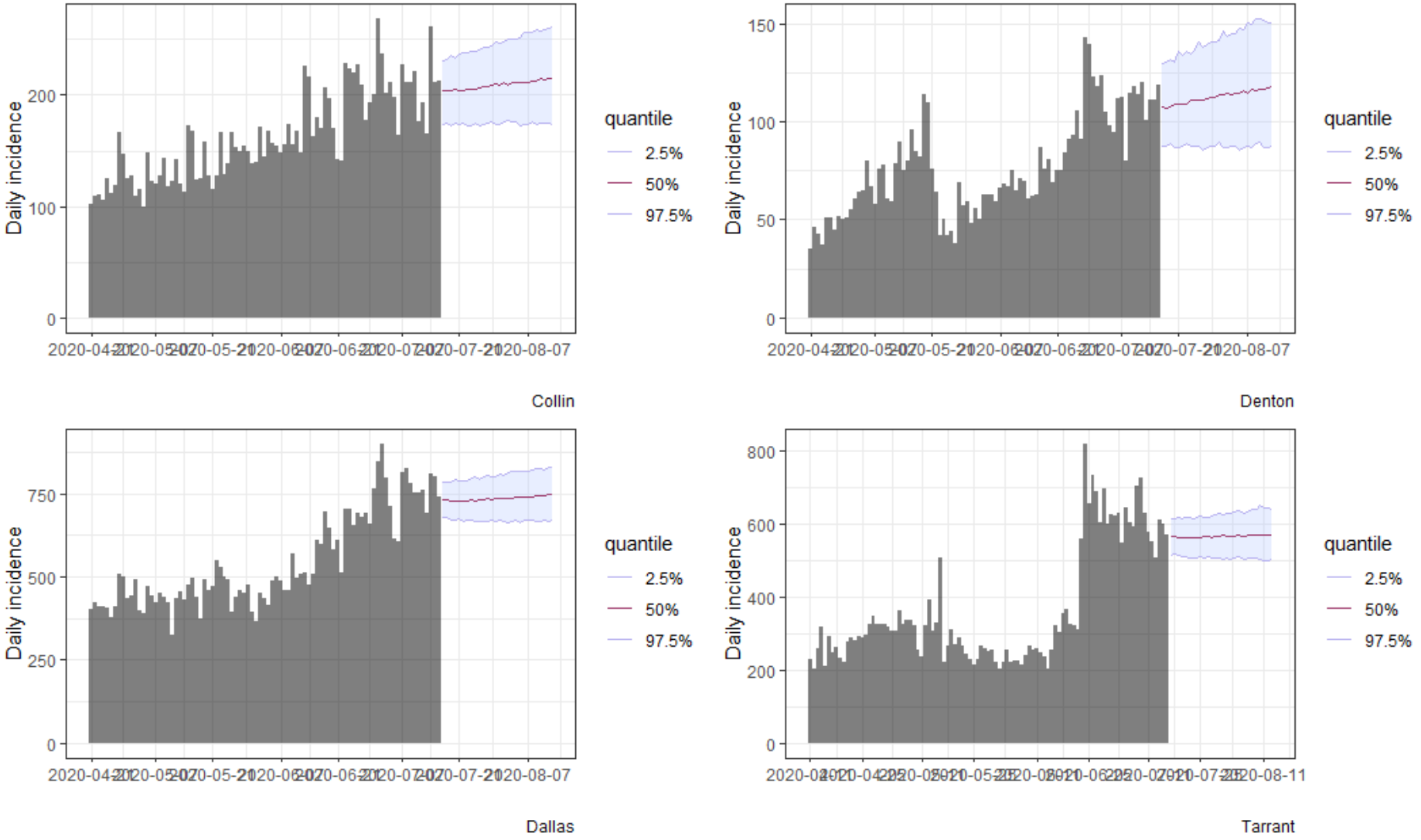
Current estimated R_0 in Texas counties with more than 50 cases



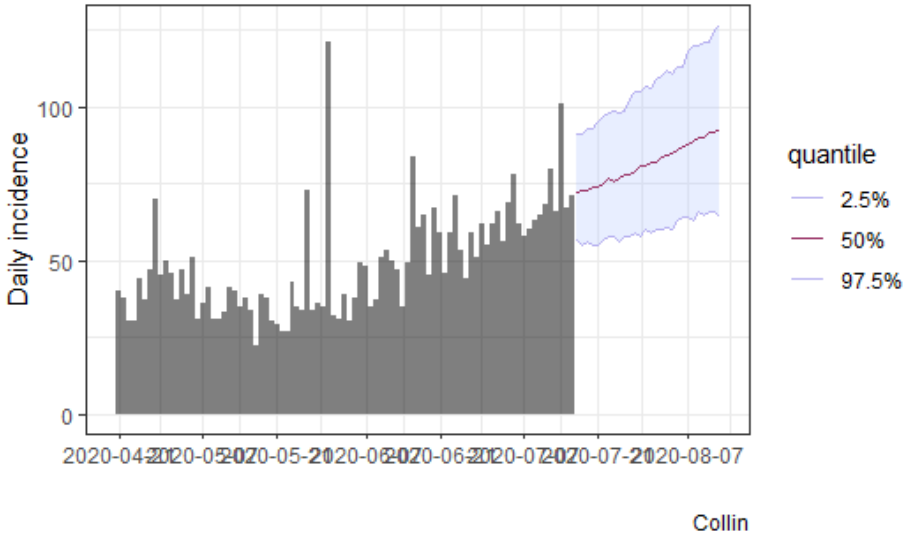
What to expect in the near future?

- **We will project the number of new COVID-19 related ER visits and hospitalization numbers for the next four weeks assuming that there is no change in the current trend**

Projections for future ER visits



Projection for future daily hospitalization



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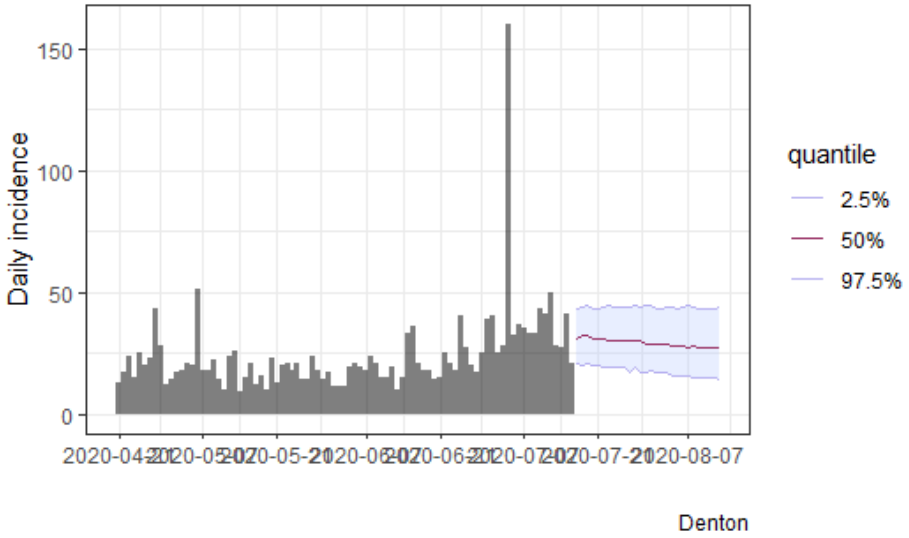
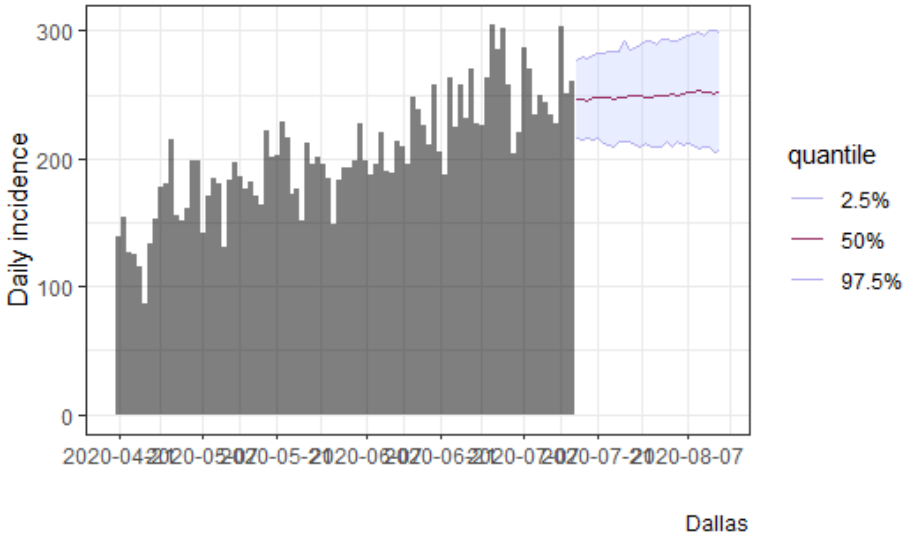
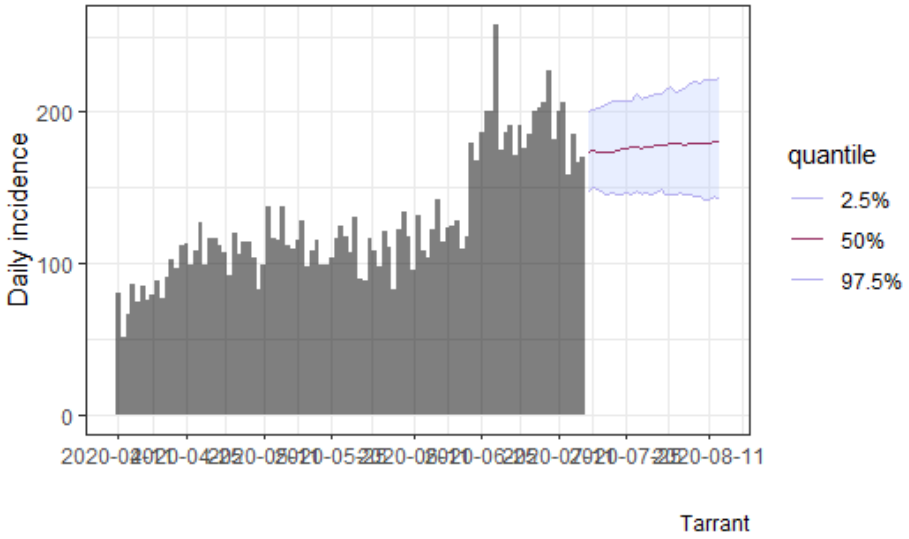


Denton



Dallas

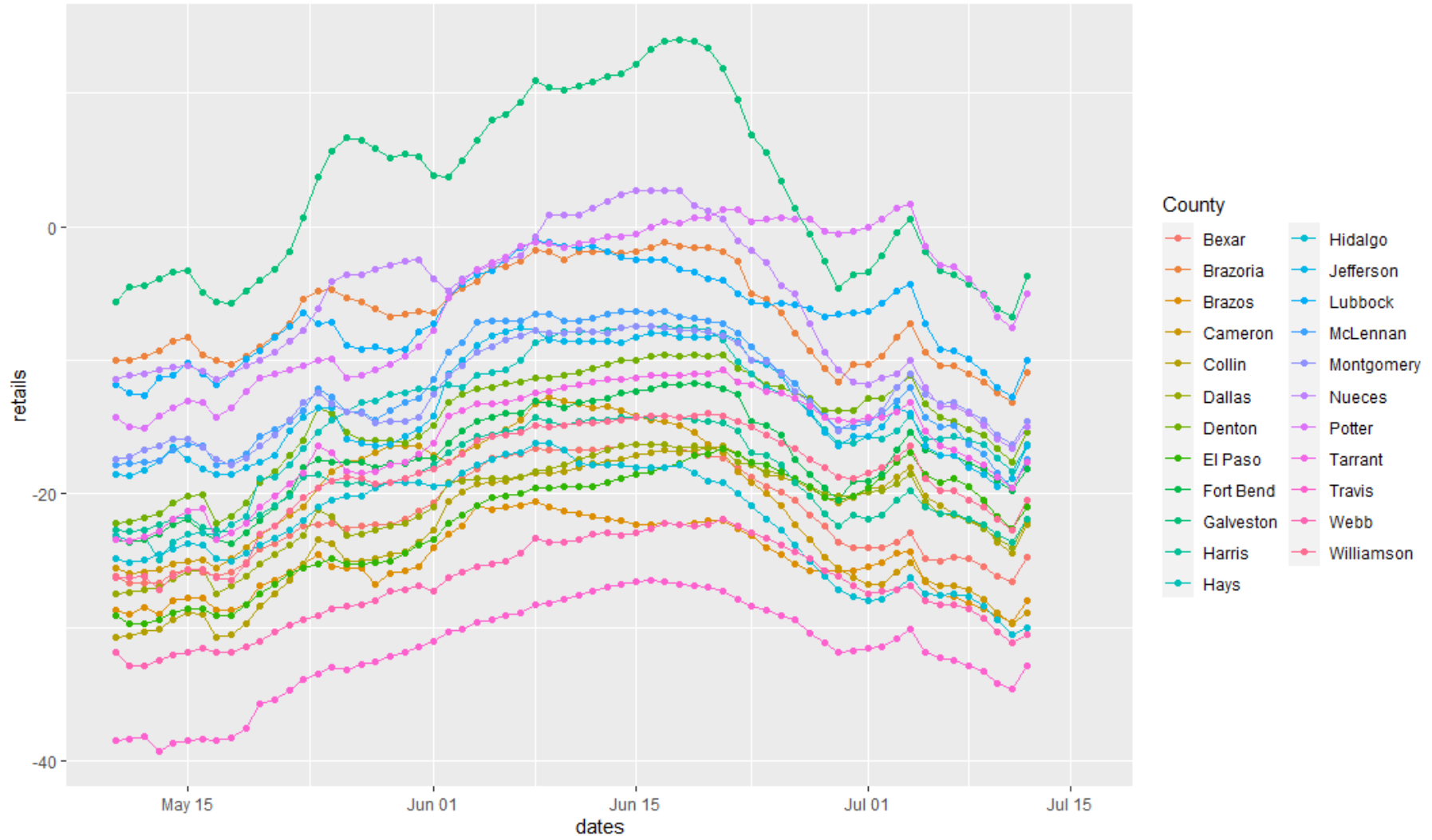


Tarrant

Will the hospital capacities be overwhelmed?

- The current projections indicate that it is unlikely to happen in the immediate future
- However, there is projected growth in hospitalization in Collin county
- It is important to observe that Collin county has not been enforcing a mask mandate
- However, the hospitals are currently operating at close to 80% capacity
- Since the number of daily new cases are still very high, we do not have a lot of headroom in the event things take a negative turn
- Apart from the availability of hospital beds, we also need to consider availability of enough healthcare personnel at hospitals
- There is some evidence of fatigue for healthcare workers from their relentless work since the start of the pandemic

Retail mobility for North Texas counties



Observations from retail mobility data

- We specifically considered twelve counties in Texas which recorded at least 3000 COVID-19 cases
- In each of the counties, there has been a steady increase in retail mobility that continued till around June 18
- In each of the counties, there has been a reversal of retail mobility trend since then
- In an earlier report, we noted that apparently people's collective action in terms of mobility is dictated by perceived threat from the pandemic
- We are currently observing a similar behavior in terms of steady decline in retail mobility
- The decline in retail mobility is likely to have contributed to the stabilization in the number of new cases

Is a new “shelter in place” order necessary?

- There are two reasons to not call for a new “shelter in place” right now
- First, usage of masks in public places has been mandated and data suggests a stabilization in the number of daily new cases
- Second, there has been a steady decline in retail mobility since around June 18
- The decline may also have helped in controlling the transmission
- However, since the number of daily new cases is still high, there is little headroom towards handling another surge
- A few days of good data shouldn’t make us complacent because it’s a long game until we have a vaccine or a treatment that’s established to work very well
- A “shelter in place” measure should not be ruled out in the event of another surge

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)

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