What You Should Know
COVID-19

# State of Missouri regional
# COVID-19 hospitalized cases model

**June 8, 2021**

# Multiple data points inform Missouri's COVID-19 response

- Syndromic surveillance

- Healthcare system capacity (bed, PPE, and staff availability)

- Testing

- COVID-19 cases and deaths

- Economic and social impact

- Insights from U.S. states, nationally, and other countries

- Evidence from scientific literature

- Mathematical disease modelling

# Our model estimates possible outcomes based on currently available information

| What does the model tell us | What does it not tell us |
|---|---|
| Range of plausible outcomes based on our current knowledge of COVID-19 in Missouri | What will happen in the future |
| Approximate date and magnitude of peak/s based on current understanding of policy interventions and human behavior and assumptions about future interventions | Date and magnitude of peak/s if there are major changes in planned policy interventions and human behavior |
| Approximate estimate of effective transmission rate across a region | Exact transmission rate in all parts of a region – there may be areas of higher and lower transmission within the region |

**The ability to forecast depends on the quality and availability of data. For a new disease such as COVID-19, much remains uncertain.**

Show Me Strong
RECOVERY PLAN

# Statewide and Regional weekly changes in transmission rate ("Re")



**Northwest Region**
0.76 ➡ 0.76

**Northeast Region**
0.60 ➡ 0.60

**Central Region**
0.93 ➡ 0.98

**Greater Kansas City**
0.97 ➡ 0.96

**St. Louis Region**
0.91 ➡ 0.91

**Cape Girardeau Region**
1.03 ➡ 1.00

**Springfield Region**
1.05 ➡ 1.09

**Estimated Statewide Weighted Re**
0.95 ➡ 0.89

**Understanding Re**
Re > 1 = COVID cases are growing

*LEMMA Model as of 6/8/2021*
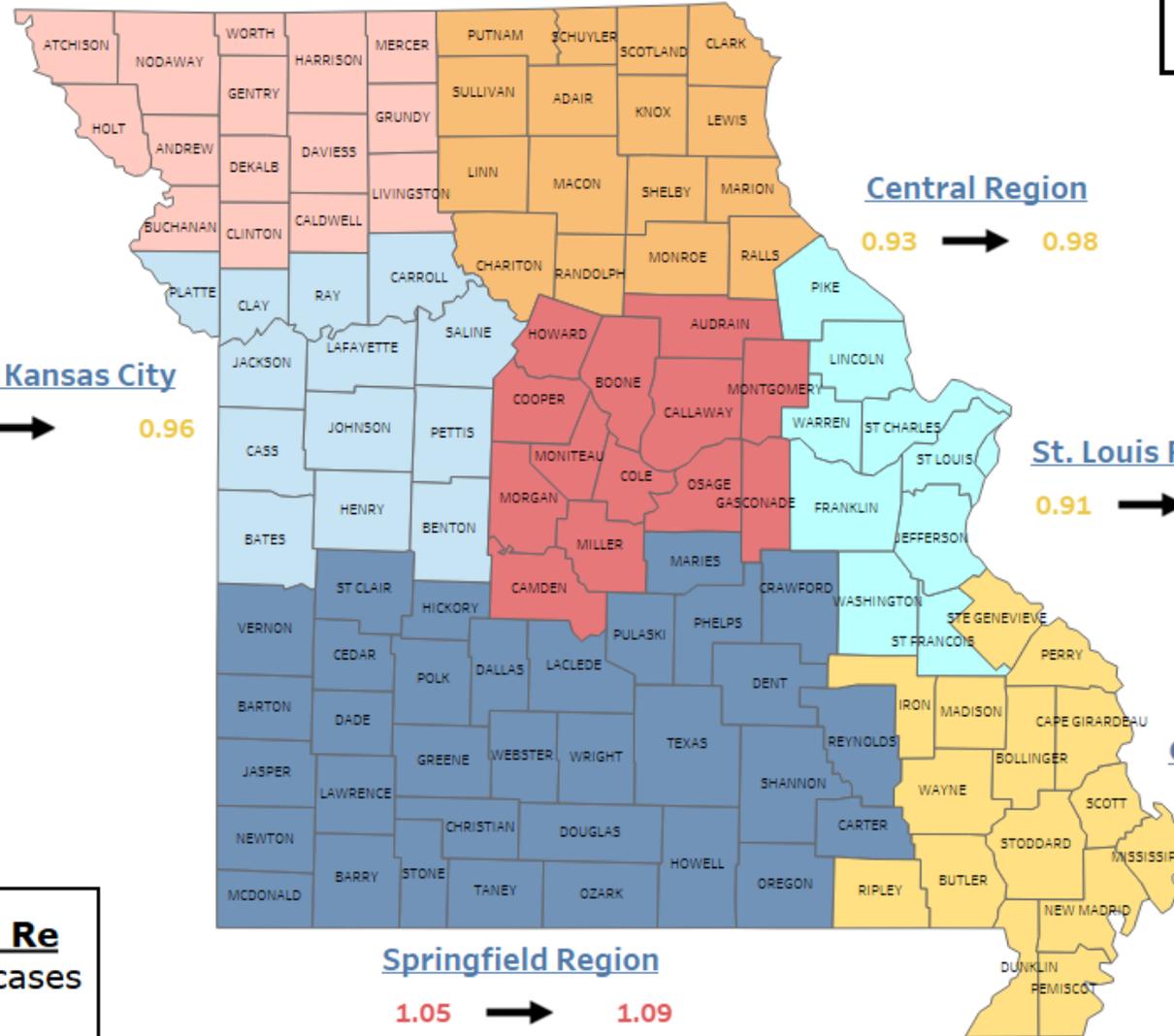
# Central (Region F)

## Overview*

| | |
|---|---|
| Population | 502,486 |
| Cumulative Cases | 52,578 |
| Cumulative Deaths | 660 |
| 7-day New Cases | 178 |
| WoW % Case Change | 0.3% |

## Reproductive Rate (Re)***

| | |
|---|---|
| Pre-intervention | 2.30 |
| Last Week | 0.93 |
| Current Week | 0.98 |
| WoW % Re Change | 5.2 |

## Bed / Ventilator Availabilty**

| | |
|---|---|
| % ICU Beds Occupied | 63% |
| % ICU Beds Occupied C19 | 7% |
| % ICU Beds Free | 37% |
| % Ventilators in use | 28% |
| % Ventilators free | 72% |

## Base Case Central Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 22, 2021
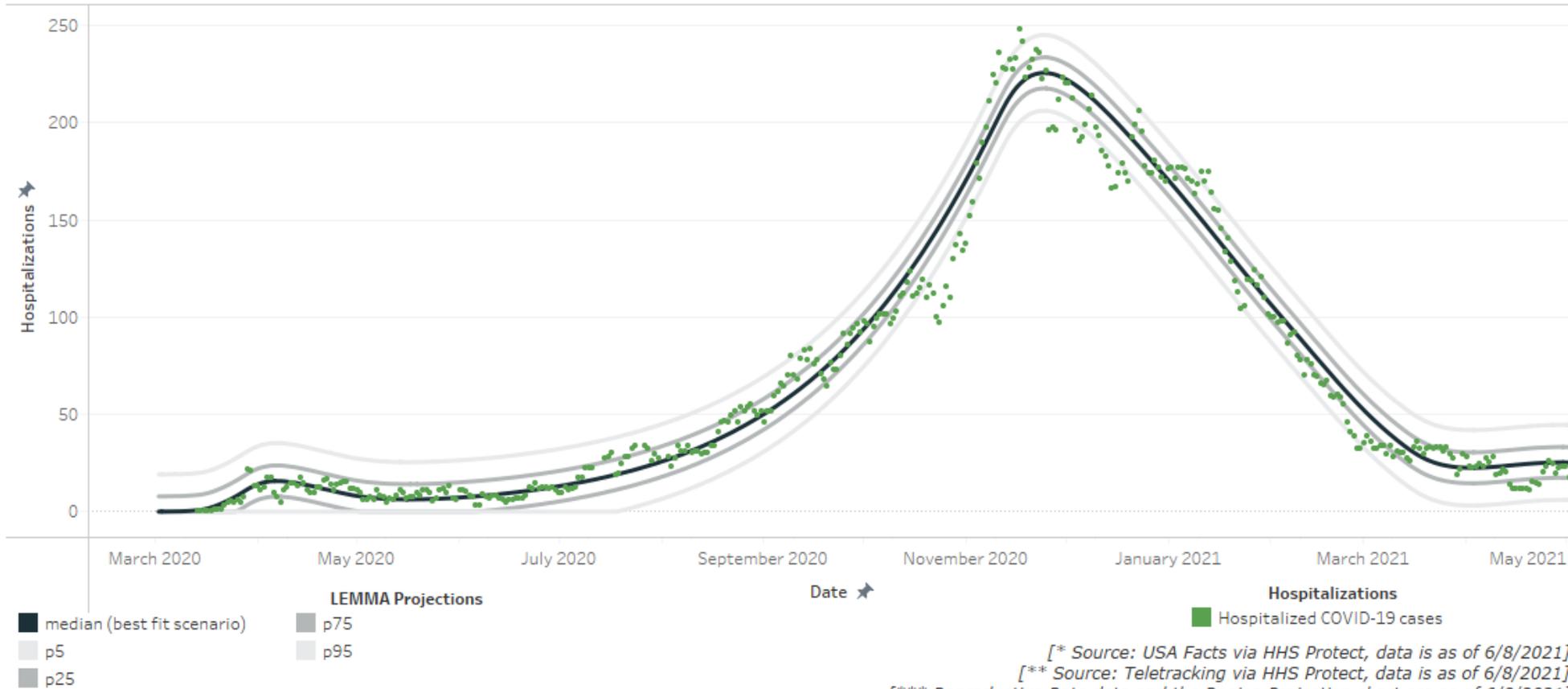


**LEMMA Projections**

- median (best fit scenario)
- p5
- p25
- p75
- p95

**Hospitalizations**

- Hospitalized COVID-19 cases

[* Source: USA Facts via HHS Protect, data is as of 6/8/2021]
[** Source: Teletracking via HHS Protect, data is as of 6/8/2021]
[*** Reproductive Rate data and the Region Projection chart are as of 6/8/2021]

# Greater St. Louis Area (Region C)

## Overview*

| | |
|---|---|
| Population | 2,229,518 |
| Cumulative Cases | 219,116 |
| Cumulative Deaths | 3,513 |
| 7-day New Cases | 716 |
| WoW % Case Change | 0.3% |

## Reproductive Rate (Re)***

| | |
|---|---|
| Pre-intervention | 3.39 |
| Last Week | 0.91 |
| Current Week | 0.91 |
| WoW % Re Change | -0.7 |

## Bed / Ventilator Availabilty**

| | |
|---|---|
| % ICU Beds Occupied | 80% |
| % ICU Beds Occupied C19 | 5% |
| % ICU Beds Free | 20% |
| % Ventilators in use | 30% |
| % Ventilators free | 70% |

## Base Case St. Louis Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 22, 2021
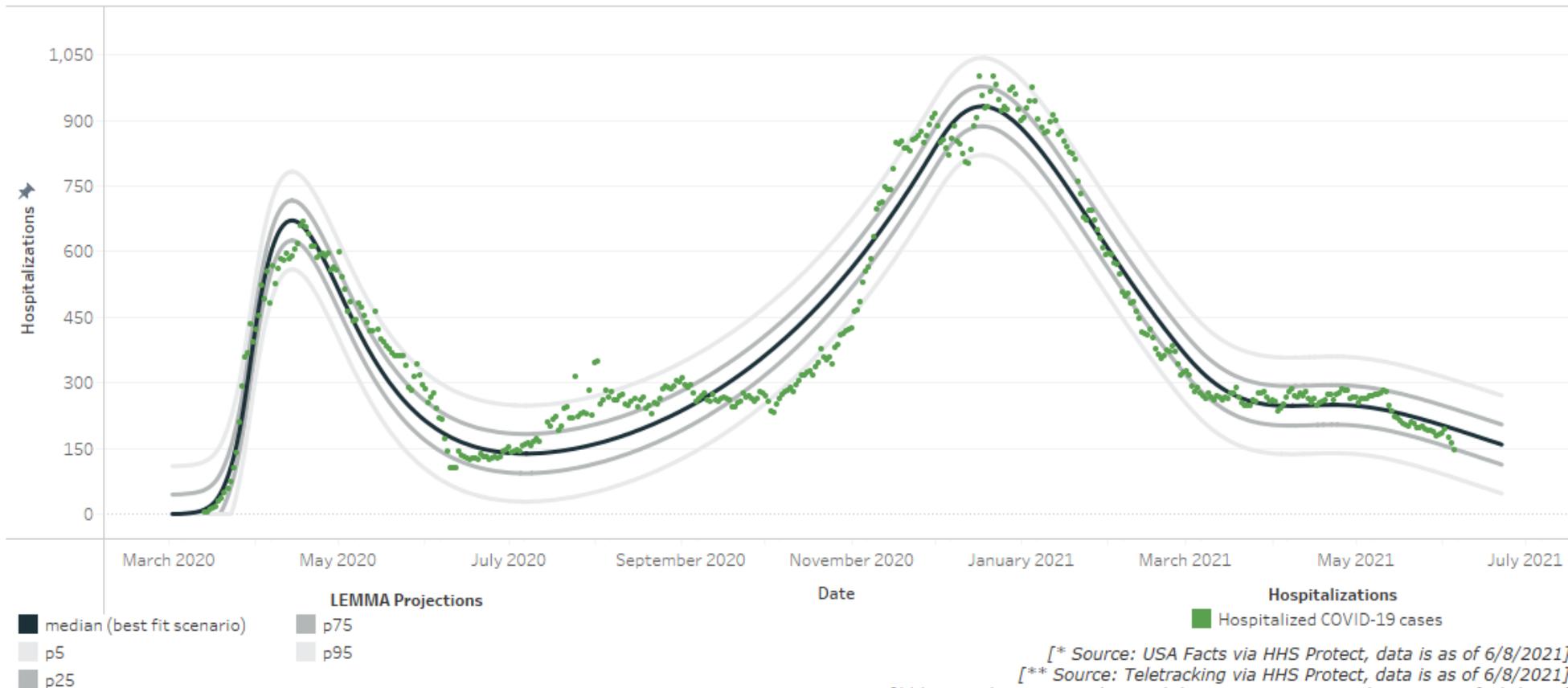


**LEMMA Projections**
- median (best fit scenario)
- p5
- p25
- p75
- p95

**Hospitalizations**
- Hospitalized COVID-19 cases

[* Source: USA Facts via HHS Protect, data is as of 6/8/2021]
[** Source: Teletracking via HHS Protect, data is as of 6/8/2021]
[*** Reproductive Rate data and the Region Projection chart are as of 6/8/2021]

# Greater Kansas City Area (Region A)

## Overview*

| | |
|---|---|
| Population | 1,395,314 |
| Cumulative Cases | 131,593 |
| Cumulative Deaths | 1,771 |
| 7-day New Cases | 571 |
| WoW % Case Change | 0.4% |

## Reproductive Rate (Re)***

| | |
|---|---|
| Pre-intervention | 2.80 |
| Last Week | 0.97 |
| Current Week | 0.96 |
| WoW % Re Change | -1.2 |

## Bed / Ventilator Availabilty**

| | |
|---|---|
| % ICU Beds Occupied | 71% |
| % ICU Beds Occupied C19 | 5% |
| % ICU Beds Free | 29% |
| % Ventilators in use | 17% |
| % Ventilators free | 83% |

## Base Case Kansas City Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 22, 2021
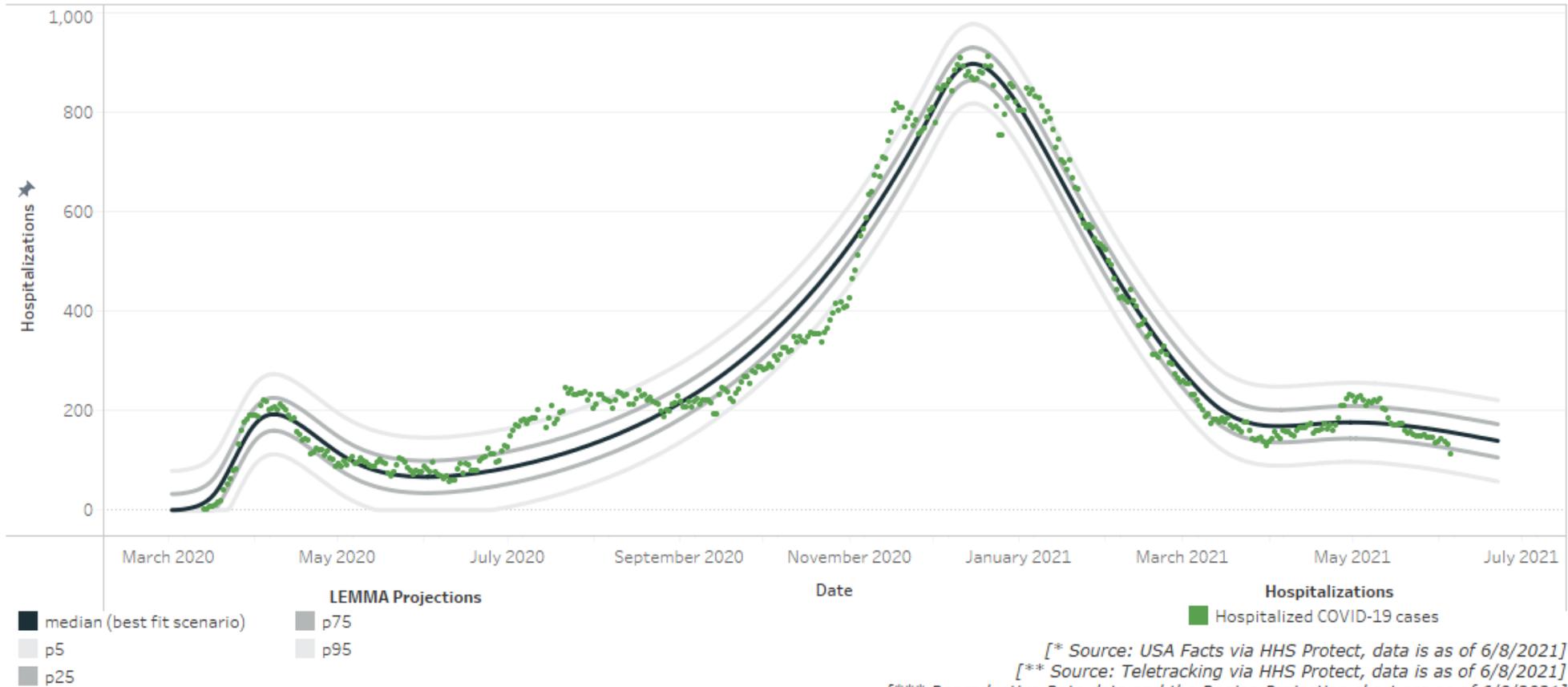


**LEMMA Projections**
- median (best fit scenario)
- p5
- p25
- p75
- p95

**Hospitalizations**
- Hospitalized COVID-19 cases

*[* Source: USA Facts via HHS Protect, data is as of 6/8/2021]*
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*[*** Reproductive Rate data and the Region Projection chart are as of 6/8/2021]*

# Northeast (Region B)

## Overview*

| | |
|---|---|
| Population | 179,448 |
| Cumulative Cases | 19,246 |
| Cumulative Deaths | 229 |
| 7-day New Cases | 185 |
| WoW % Case Change | 1.0% |

## Reproductive Rate (Re)***

| | |
|---|---|
| Pre-intervention | 2.15 |
| Last Week | 0.60 |
| Current Week | 0.60 |
| WoW % Re Change | 0.7 |

## Bed / Ventilator Availabilty**

| | |
|---|---|
| % ICU Beds Occupied | 64% |
| % ICU Beds Occupied C19 | 0% |
| % ICU Beds Free | 36% |
| % Ventilators in use | 8% |
| % Ventilators free | 93% |

## Base Case Northeast Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 22, 2021
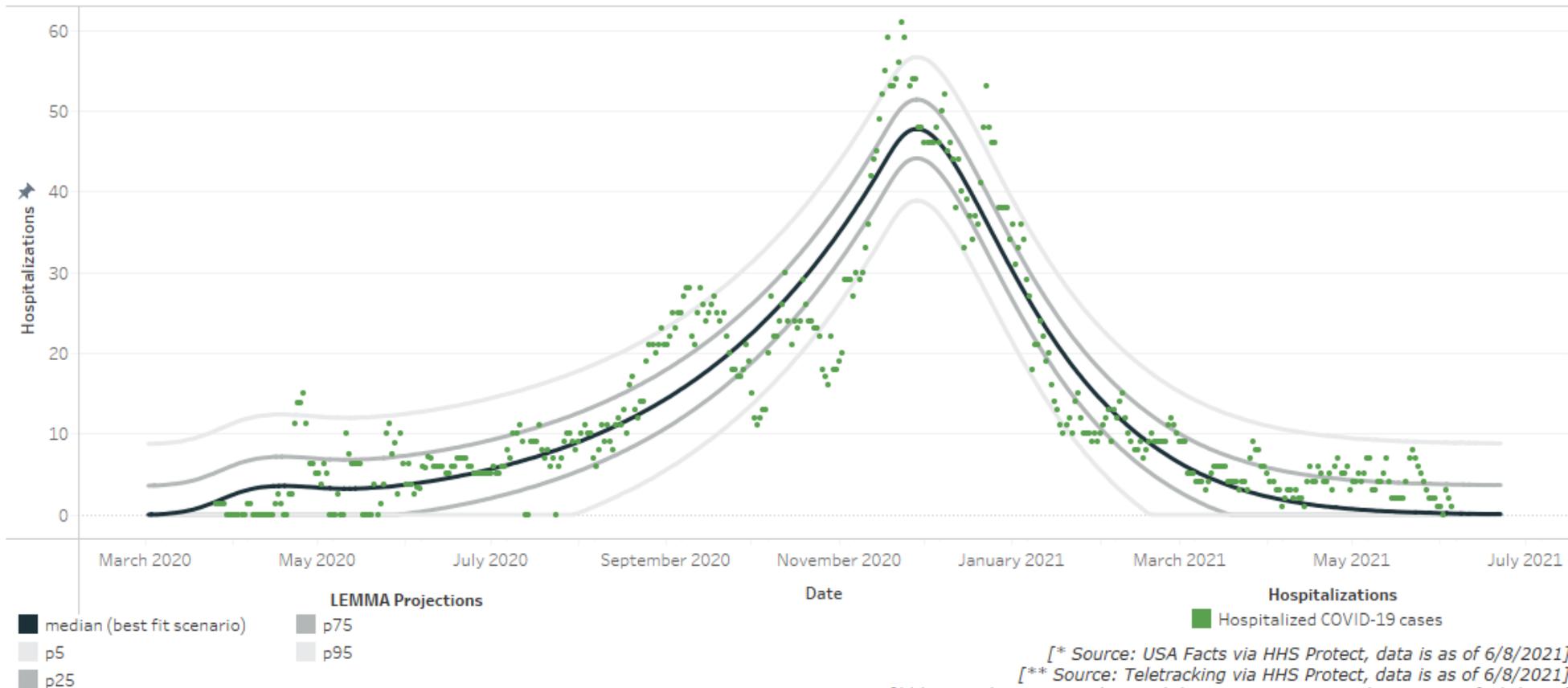


**LEMMA Projections**

- median (best fit scenario)
- p5
- p25
- p75
- p95

**Hospitalizations**

- Hospitalized COVID-19 cases

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[*** Reproductive Rate data and the Region Projection chart are as of 6/8/2021]

# Northwest (Region H)

## Overview*

| | |
|---|---|
| Population | 234,361 |
| Cumulative Cases | 24,475 |
| Cumulative Deaths | 446 |
| 7-day New Cases | 168 |
| WoW % Case Change | 0.7% |

## Reproductive Rate (Re)***

| | |
|---|---|
| Pre-intervention | 1.24 |
| Last Week | 0.76 |
| Current Week | 0.76 |
| WoW % Re Change | 0.4 |

## Bed / Ventilator Availabilty**

| | |
|---|---|
| % ICU Beds Occupied | 63% |
| % ICU Beds Occupied C19 | 13% |
| % ICU Beds Free | 38% |
| % Ventilators in use | 16% |
| % Ventilators free | 84% |

## Base Case Northwest Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 22, 2021
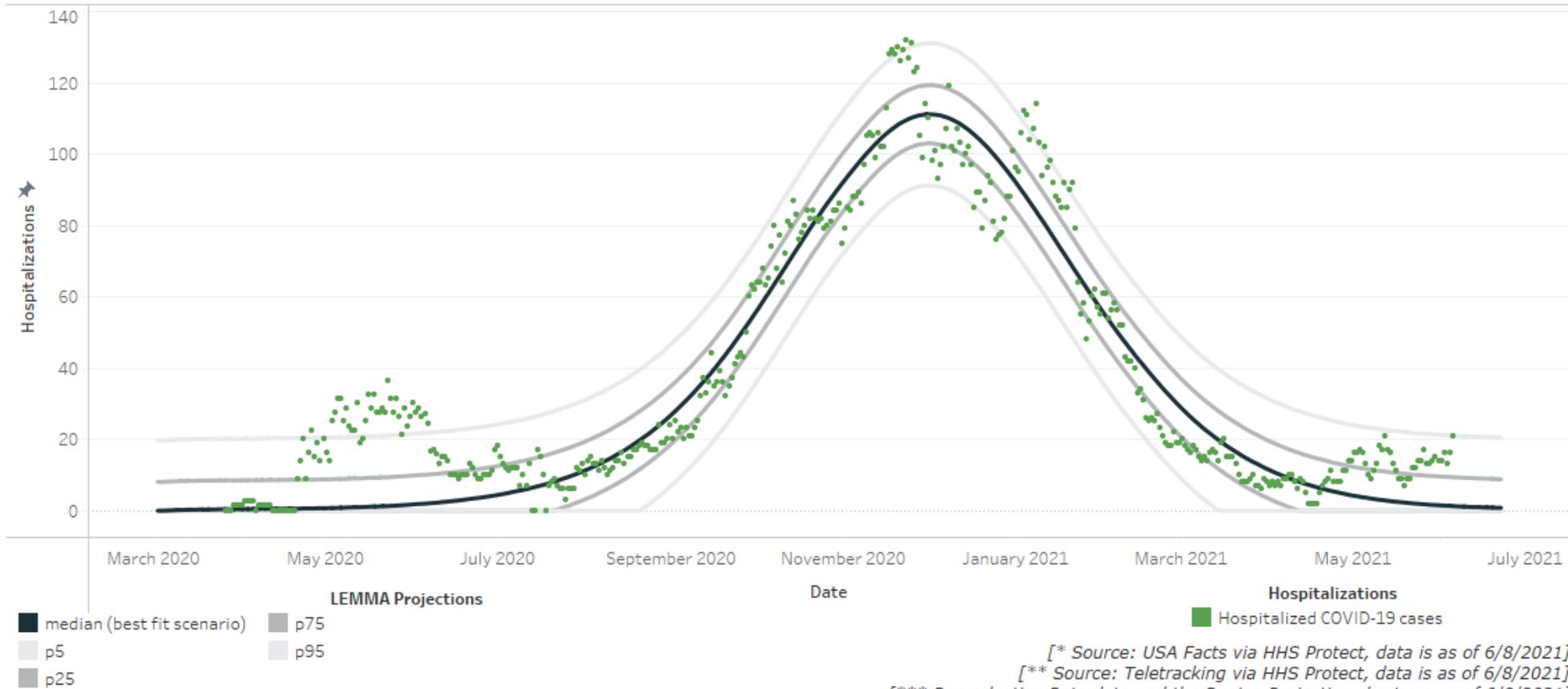


LEMMA Projections

Date

Hospitalizations

- median (best fit scenario)
- p5
- p25
- p75
- p95
- Hospitalized COVID-19 cases

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[*** Reproductive Rate data and the Region Projection chart are as of 6/8/2021]

# Southeast / Cape Girardeau (Region E)

## Overview*

| | |
|---|---|
| Population | 363,478 |
| Cumulative Cases | 38,567 |
| Cumulative Deaths | 587 |
| 7-day New Cases | 102 |
| WoW % Case Change | 0.3% |

## Reproductive Rate (Re)***

| | |
|---|---|
| Pre-intervention | 2.61 |
| Last Week | 1.03 |
| Current Week | 1.00 |
| WoW % Re Change | -2.9 |

## Bed / Ventilator Availabilty**

| | |
|---|---|
| % ICU Beds Occupied | 56% |
| % ICU Beds Occupied C19 | 2% |
| % ICU Beds Free | 44% |
| % Ventilators in use | 19% |
| % Ventilators free | 81% |

## Base Case Southeast Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 22, 2021
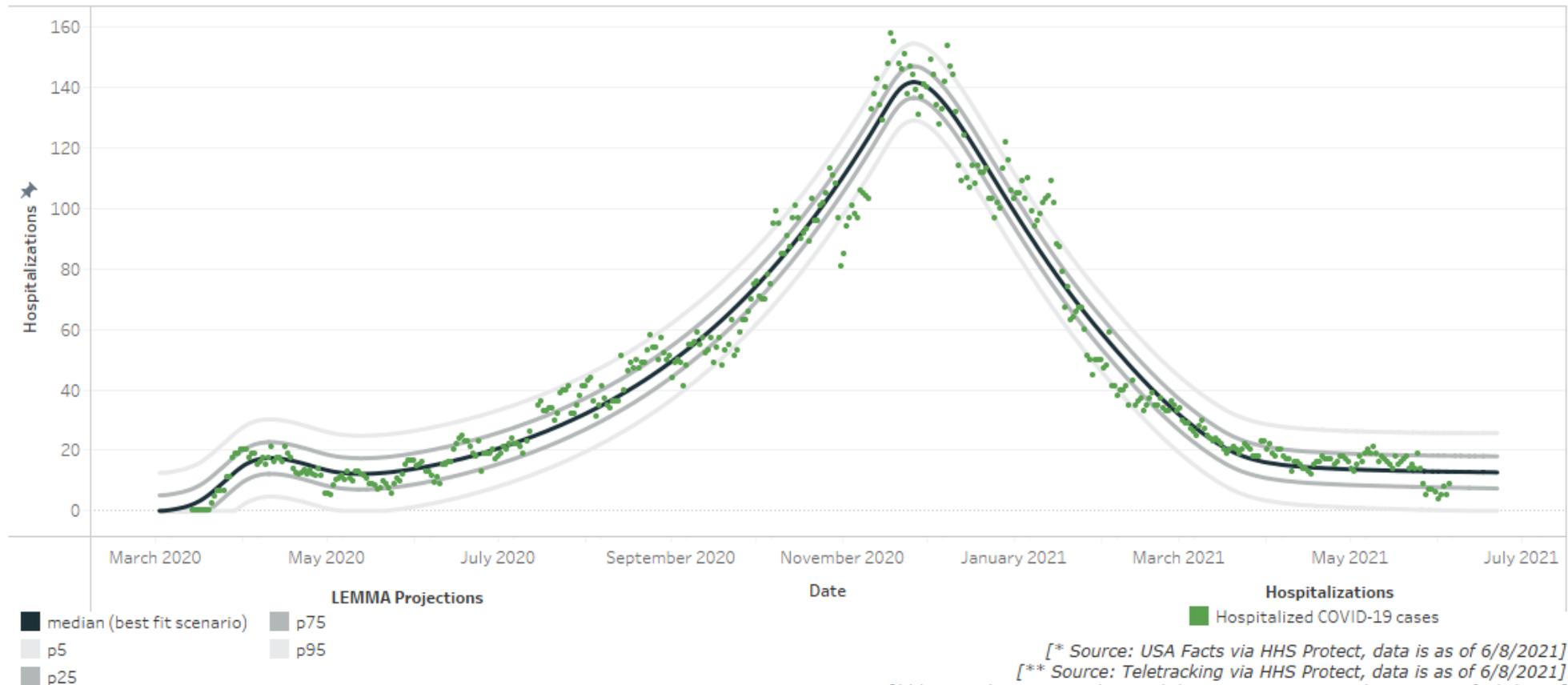


**LEMMA Projections**

- median (best fit scenario)
- p5
- p25
- p75
- p95

**Hospitalizations**

- Hospitalized COVID-19 cases

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[*** Reproductive Rate data and the Region Projection chart are as of 6/8/2021]

# Southwest / Springfield (Region D,G,I)

## Overview*

| | |
|---|---|
| Population | 1,221,847 |
| Cumulative Cases | 116,769 |
| Cumulative Deaths | 1,935 |
| 7-day New Cases | 1,042 |
| WoW % Case Change | 0.9% |

## Reproductive Rate (Re)***

| | |
|---|---|
| Pre-intervention | 2.36 |
| Last Week | 1.05 |
| Current Week | 1.09 |
| WoW % Re Change | 4.3 |

## Bed / Ventilator Availabilty**

| | |
|---|---|
| % ICU Beds Occupied | 82% |
| % ICU Beds Occupied C19 | 12% |
| % ICU Beds Free | 18% |
| % Ventilators in use | 23% |
| % Ventilators free | 77% |

## Base Case Southwest Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 22, 2021



**LEMMA Projections**

- median (best fit scenario)
- p5
- p25
- p75
- p95

Date

**Hospitalizations**

- Hospitalized COVID-19 cases

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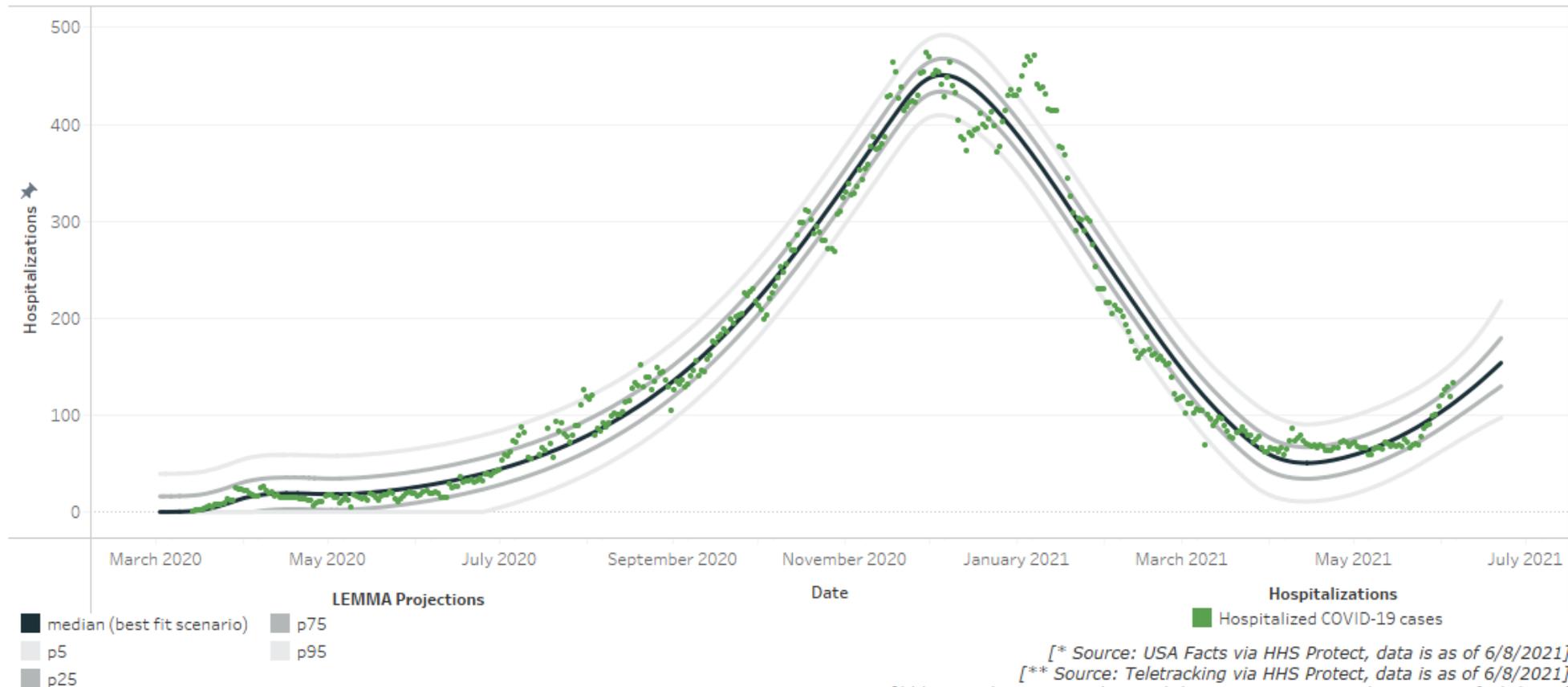
# See FAQs for additional details

Link here: **https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/pdf/modeling-faqs.pdf**

Version 2.0, As of March 30, 2021

## Missouri's Regional COVID-19 Hospitalized Cases Model: Overview and Frequently Asked Questions

### Model Overview

One of the many data analyses that inform Missouri's COVID-19 response is a regional model of hospitalized COVID-19 cases that the State of Missouri developed in partnership with the Washington University in St. Louis and Missouri Hospital Association.

Missouri's model uses a standard SEIR (susceptible, exposed, infectious, recovered) compartmental structure that is based upon a tool called LEMMA (Local Epidemiological Modeling for Management & Action), which was developed by experts from UMass Amherst, UC Berkeley, UCSF, and WUSTL. The model focuses on COVID-19 hospitalized cases to directly address the question of hospital capacity and provide a more accurate picture of COVID-19's impact on the healthcare system.



To help inform decisions at the regional and local level, each region is modeled separately using the latest local data, including COVID-19 confirmed and suspected hospitalizations, population, policy interventions, and average hospital length of stay.

### General FAQs

**Why are regional models of COVID-19 important?**

When new diseases such as COVID-19 emerge, there is uncertainty about how best to control the epidemic. Decision makers must make their decisions with the best available information at hand.

Mathematical models are commonly used tools to help us understand how infectious diseases might impact key outcomes such as hospitalized cases or deaths. Today, there are many sophisticated models of COVID-19 that make global or national projections (e.g., see the Centers for Disease Control and Prevention's latest compilation

# Regional COVID-19 transmission models help inform local policy, public health, and business decisions

- Mathematical models are commonly used to make projections of infectious disease epidemics (e.g., tuberculosis, HIV)

- Many sophisticated models on COVID-19 make global or national projections (e.g., Imperial College, Harvard, IHME)

- However, these generally do not incorporate critical local or regional inputs, such as:
  - Variations in local population size and age structure
  - Date and nature of social distancing and other policies

- Regional projections are important because:
  - Regional epidemics may differ markedly from the national average
  - Policy response occurs at state, county, and municipal levels

# State of MO, WUSTL, and MHA have developed a regional model of hospitalized COVID-19 cases

- **Standard SEIR model that combines universal characteristics of COVID-19 infection (e.g., transmission parameters) with local inputs to support regional decision making**
  - Mathematical model developed by experts from UMass Amherst, UC Berkeley, UCSF, and WUSTL
  - Uses a statistical approach that adjusts underlying parameters as new data are observed

- **Customized using the latest local data from Missouri's emergency response regions, including:**
  - COVID-19 positives and PUIs
  - Population and age structure
  - Policy interventions
  - Avg. hospital length of stay
  - Vaccination rate by age and vaccine efficacy

- **Projects COVID-19 hospitalized cases** to directly address the question of hospital capacity and provide a more accurate picture on COVID-19's impact on the healthcare system

## Model Structure (SEIR)