



# State of Missouri regional COVID-19 hospitalized cases model

May 25, 2021

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

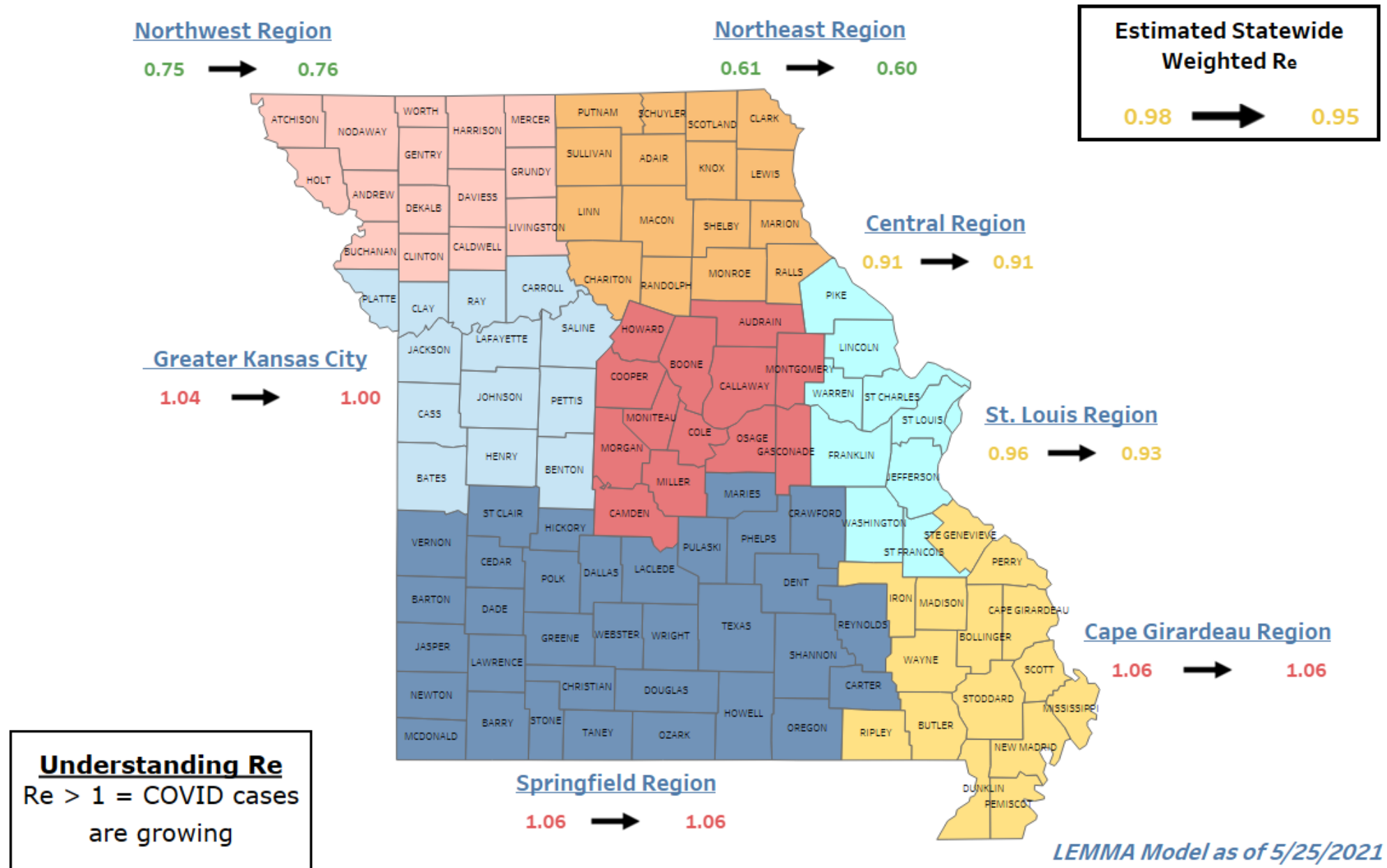
- Syndromic surveillance
- Healthcare system capacity (bed, PPE, and staff availability)
- Testing
- COVID-19 cases and deaths
- Economic and social impact
- Insights from U.S. states, nationally, and other countries
- Evidence from scientific literature
- Mathematical disease modelling

## 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.**

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



# Central (Region F)

[Return to Statewide View](#)

## Overview\*

Population	502,486
Cumulative Cases	52,227
Cumulative Deaths	650
7-day New Cases	131
WoW % Case Change	0.3%

## Reproductive Rate (Re)\*\*\*

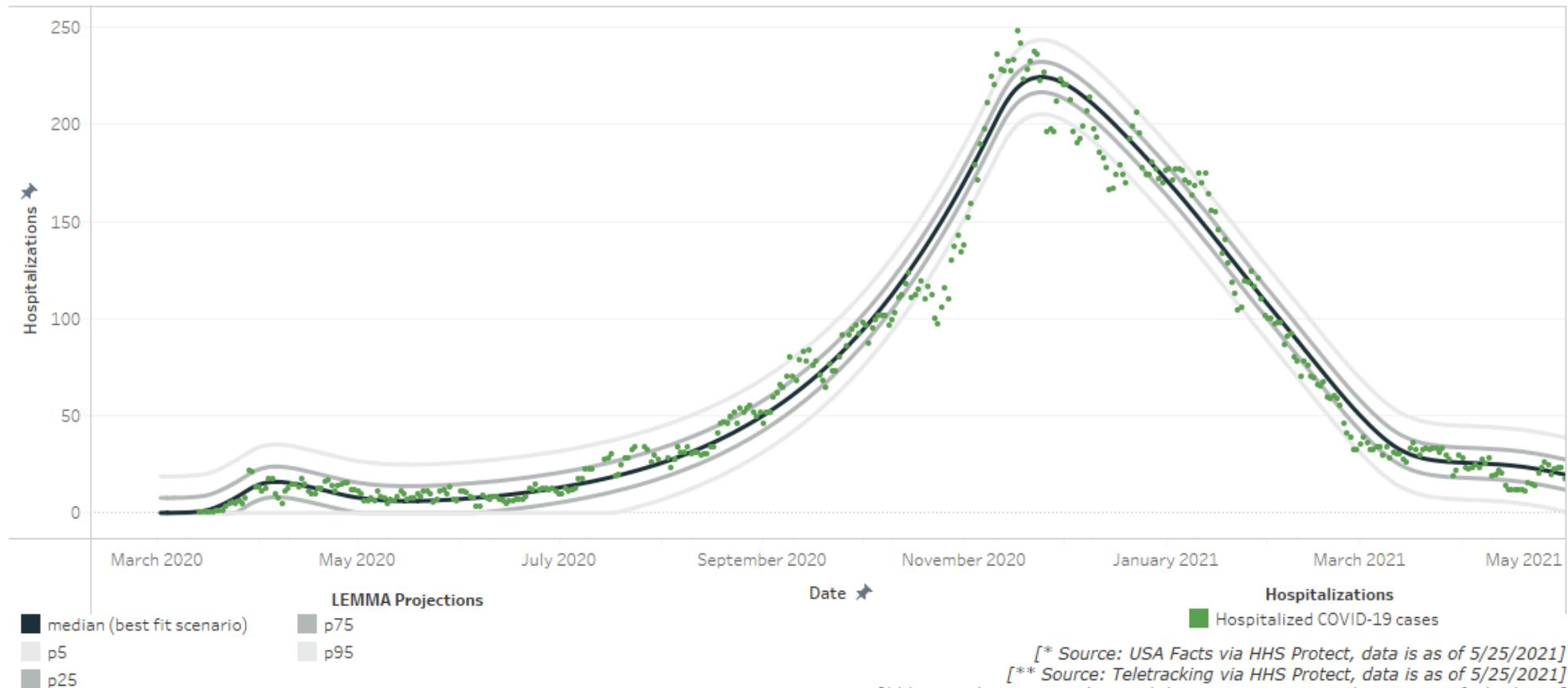
Pre-intervention	2.30
Last Week	0.91
Current Week	0.91
WoW % Re Change	-0.2

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	59%
% ICU Beds Occupied C19	1%
% ICU Beds Free	41%
% Ventilators in use	27%
% Ventilators free	73%

## Base Case Central Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 8, 2021



[\* Source: USA Facts via HHS Protect, data is as of 5/25/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/25/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/25/2021]

# Greater St. Louis Area (Region C)

[Return to Statewide View](#)

## Overview\*

Population	2,229,518
Cumulative Cases	217,594
Cumulative Deaths	3,466
7-day New Cases	998
WoW % Case Change	0.5%

## Reproductive Rate (Re)\*\*\*

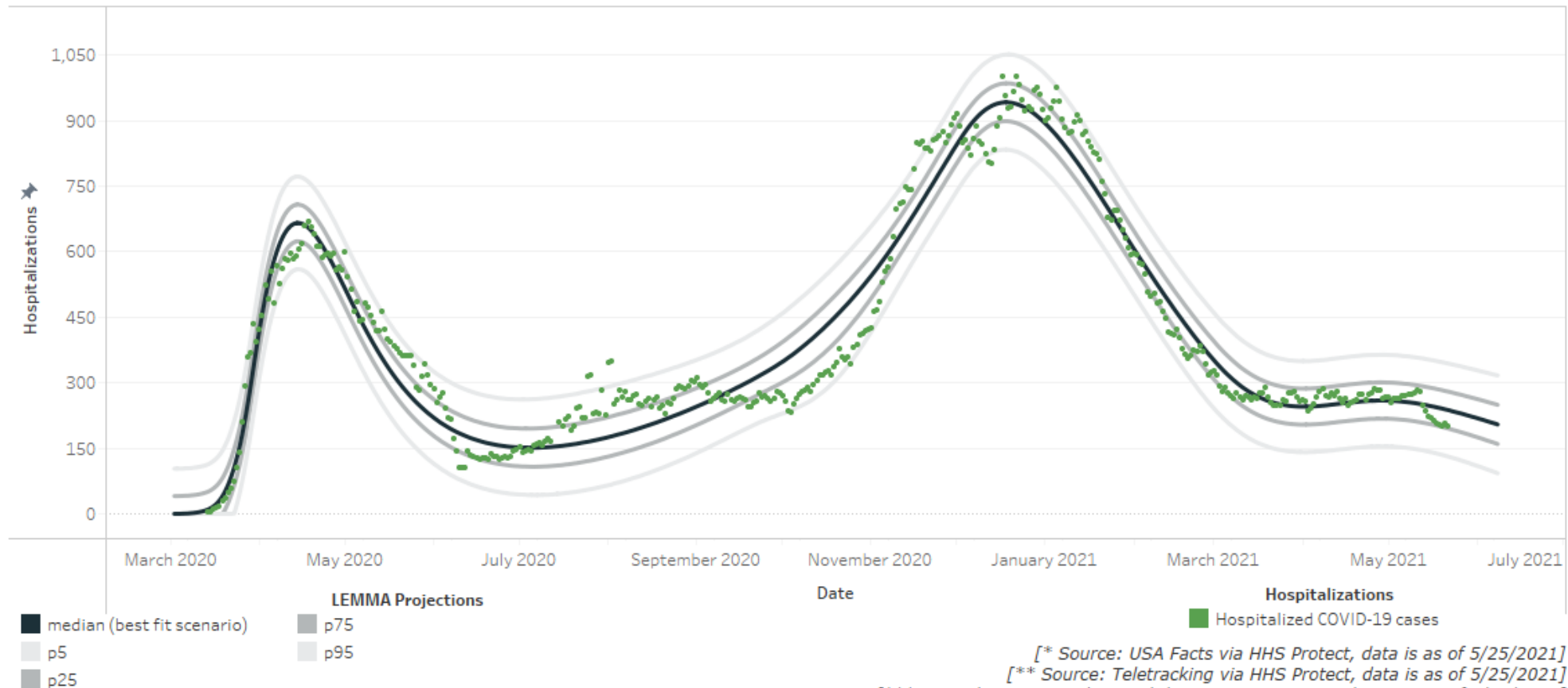
Pre-intervention	3.39
Last Week	0.96
Current Week	0.93
WoW % Re Change	-2.4

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	83%
% ICU Beds Occupied C19	6%
% ICU Beds Free	17%
% Ventilators in use	32%
% Ventilators free	68%

## Base Case St. Louis Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 8, 2021



[\* Source: USA Facts via HHS Protect, data is as of 5/25/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/25/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/25/2021]

# Greater Kansas City Area (Region A)

[Return to Statewide View](#)

## Overview\*

Population	1,395,314
Cumulative Cases	130,423
Cumulative Deaths	1,732
7-day New Cases	684
WoW % Case Change	0.5%

## Reproductive Rate (Re)\*\*\*

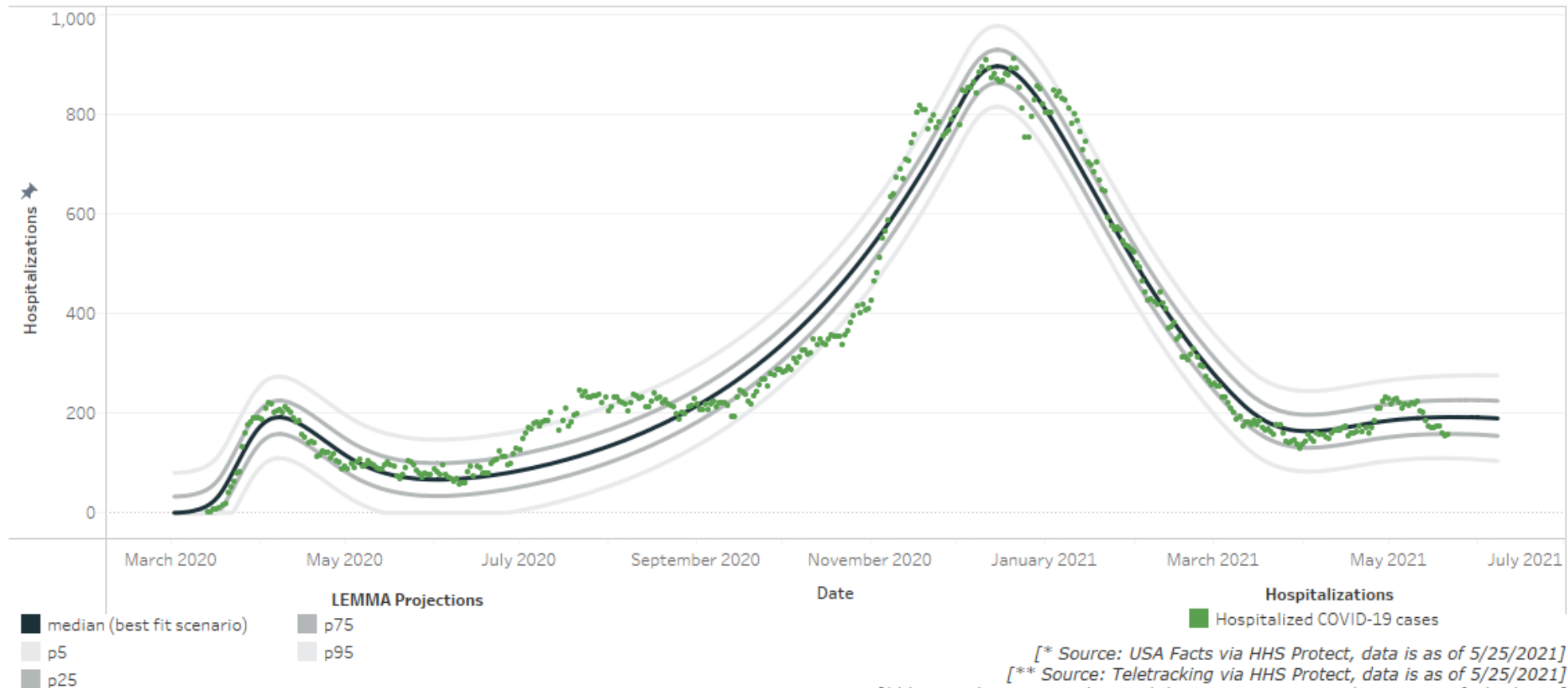
Pre-intervention	2.80
Last Week	1.04
Current Week	1.00
WoW % Re Change	-3.2

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	76%
% ICU Beds Occupied C19	6%
% ICU Beds Free	24%
% Ventilators in use	18%
% Ventilators free	82%

## Base Case Kansas City Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 8, 2021



[\* Source: USA Facts via HHS Protect, data is as of 5/25/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/25/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/25/2021]

# Northeast (Region B)

[Return to Statewide View](#)

## Overview\*

Population	179,448
Cumulative Cases	18,817
Cumulative Deaths	225
7-day New Cases	186
WoW % Case Change	1.0%

## Reproductive Rate (Re)\*\*\*

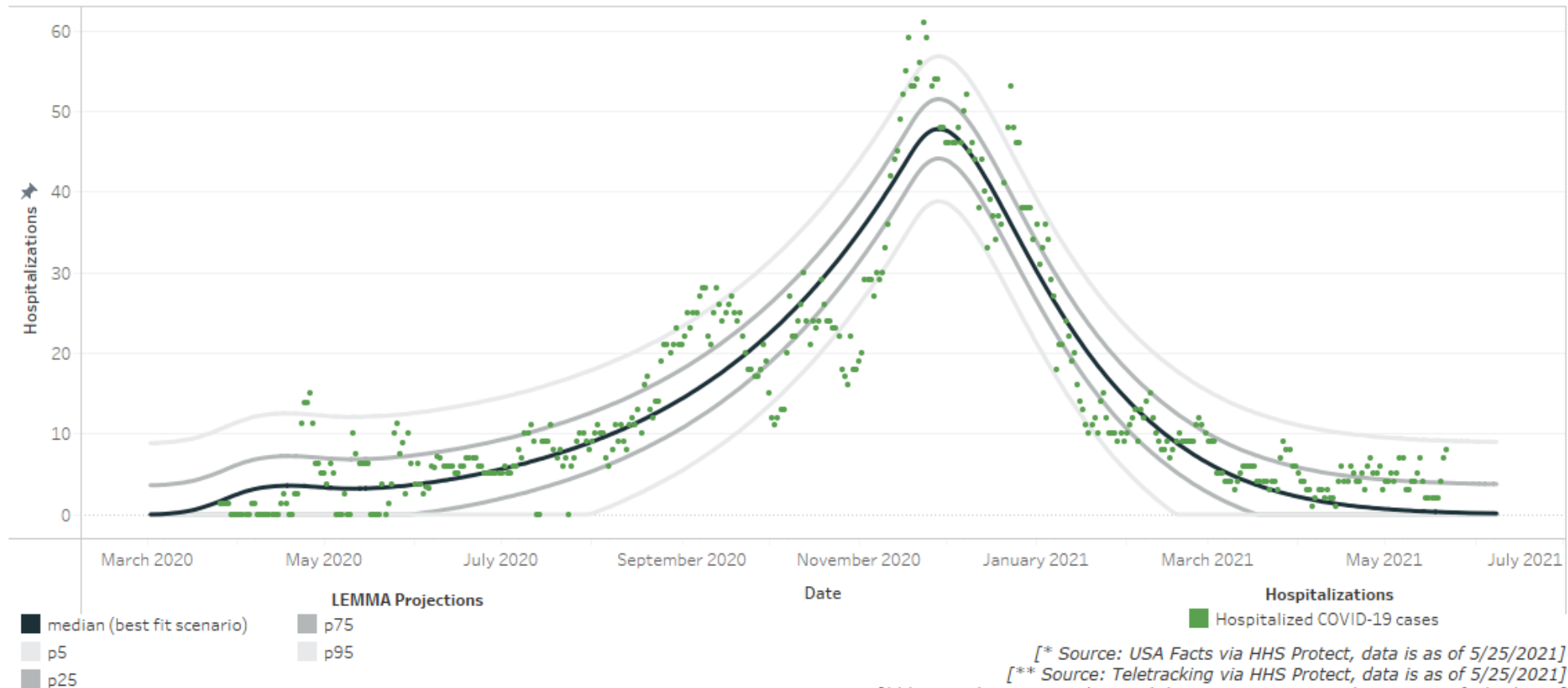
Pre-intervention	2.15
Last Week	0.61
Current Week	0.60
WoW % Re Change	-1.0

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	67%
% ICU Beds Occupied C19	7%
% ICU Beds Free	33%
% Ventilators in use	18%
% Ventilators free	83%

## Base Case Northeast Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 8, 2021



[\* Source: USA Facts via HHS Protect, data is as of 5/25/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/25/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/25/2021]



# Northwest (Region H)

[Return to Statewide View](#)

## Overview\*

Population	234,361
Cumulative Cases	24,065
Cumulative Deaths	445
7-day New Cases	169
WoW % Case Change	0.7%

## Reproductive Rate (Re)\*\*\*

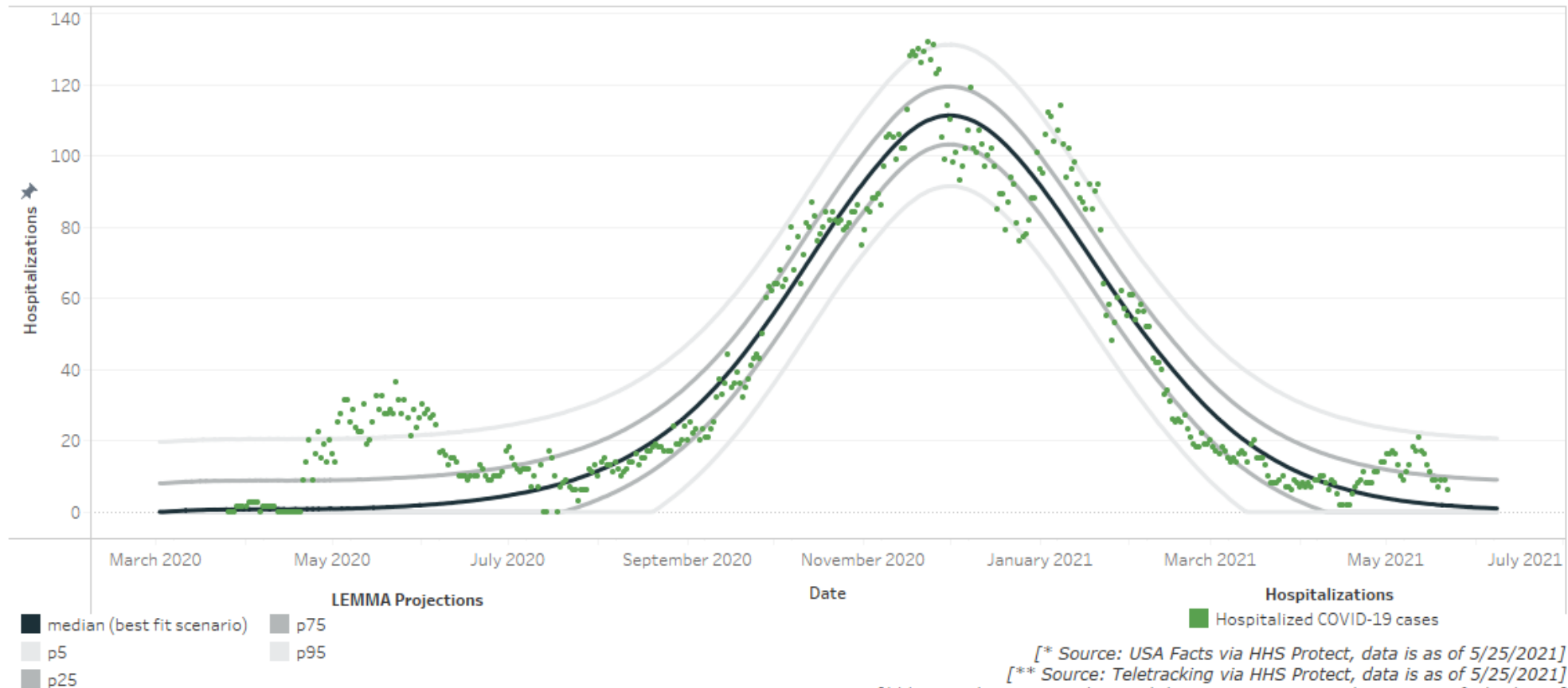
Pre-intervention	1.24
Last Week	0.75
Current Week	0.76
WoW % Re Change	0.4

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	69%
% ICU Beds Occupied C19	13%
% ICU Beds Free	31%
% Ventilators in use	8%
% Ventilators free	92%

## Base Case Northwest Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 8, 2021



[\* Source: USA Facts via HHS Protect, data is as of 5/25/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/25/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/25/2021]

# Southeast / Cape Girardeau (Region E)

[Return to Statewide View](#)

## Overview\*

Population	363,478
Cumulative Cases	38,290
Cumulative Deaths	581
7-day New Cases	175
WoW % Case Change	0.5%

## Reproductive Rate (Re)\*\*\*

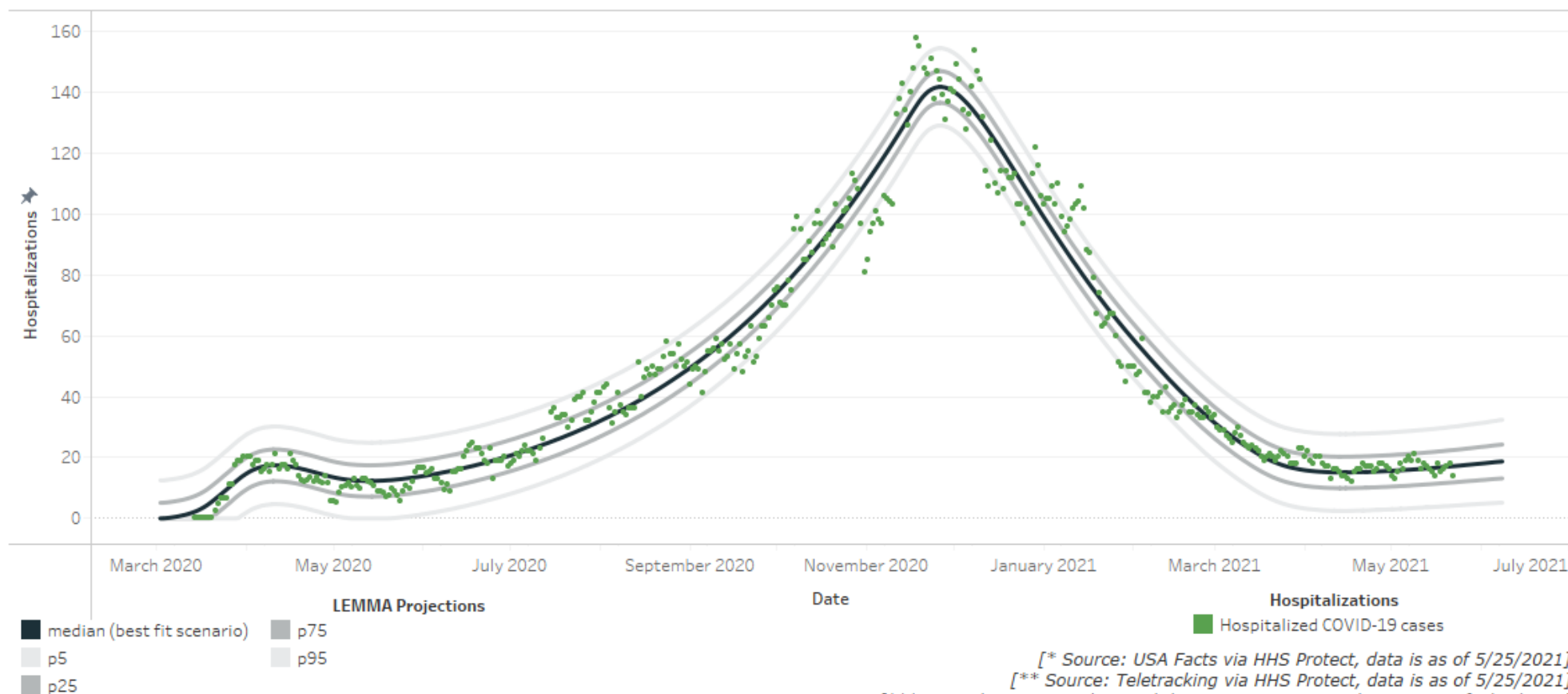
Pre-intervention	2.61
Last Week	1.06
Current Week	1.06
WoW % Re Change	0.6

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	54%
% ICU Beds Occupied C19	1%
% ICU Beds Free	46%
% Ventilators in use	17%
% Ventilators free	83%

## Base Case Southeast Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 8, 2021



[\* Source: USA Facts via HHS Protect, data is as of 5/25/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/25/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/25/2021]

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

[Return to Statewide View](#)

## Overview\*

Population	1,221,847
Cumulative Cases	114,846
Cumulative Deaths	1,907
7-day New Cases	668
WoW % Case Change	0.6%

## Reproductive Rate (Re)\*\*\*

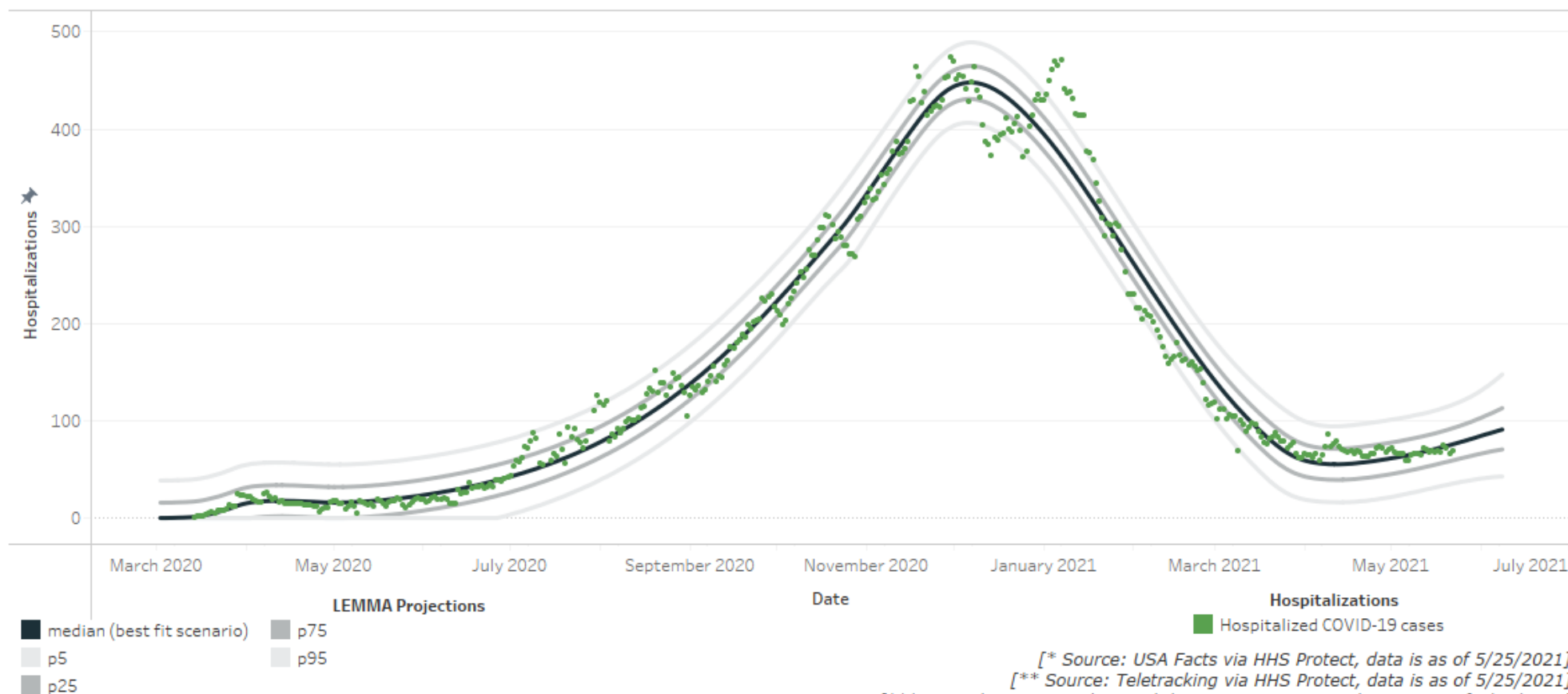
Pre-intervention	2.36
Last Week	1.06
Current Week	1.06
WoW % Re Change	0.7

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	76%
% ICU Beds Occupied C19	6%
% ICU Beds Free	24%
% Ventilators in use	19%
% Ventilators free	81%

## Base Case Southwest Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jun 8, 2021



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[\*\* Source: Teletracking via HHS Protect, data is as of 5/25/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/25/2021]

# 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.

```

graph LR
    EV[Effectively Vaccinated] --> S[Susceptible]
    S --> E[Exposed]
    E --> I[Infectious]
    I --> R[Removed]
    I --> H[Hospitalized]
    H --> F[Floor]
    H --> ICU[ICU]
    H --> W[Ward]
  
```

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)

