



# State of Missouri regional COVID-19 hospitalized cases model

May 18, 2021

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

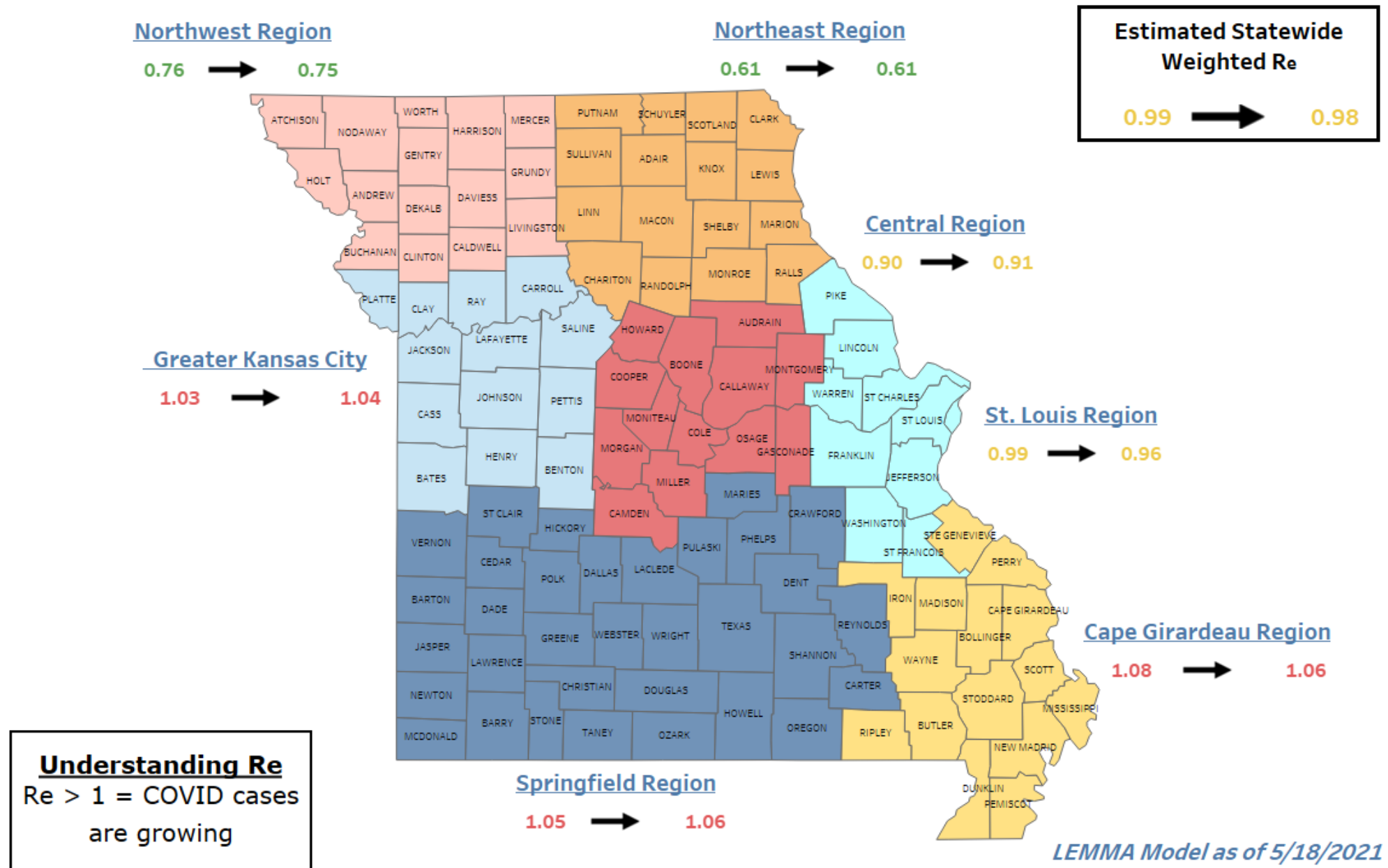
- Syndromic surveillance
- Healthcare system capacity (bed, PPE, and staff availability)
- Testing
- COVID-19 cases and deaths
- Economic and social impact
- Insights from U.S. states, nationally, and other countries
- Evidence from scientific literature
- Mathematical disease modelling

## 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	52,096
Cumulative Deaths	646
7-day New Cases	127
WoW % Case Change	0.2%

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

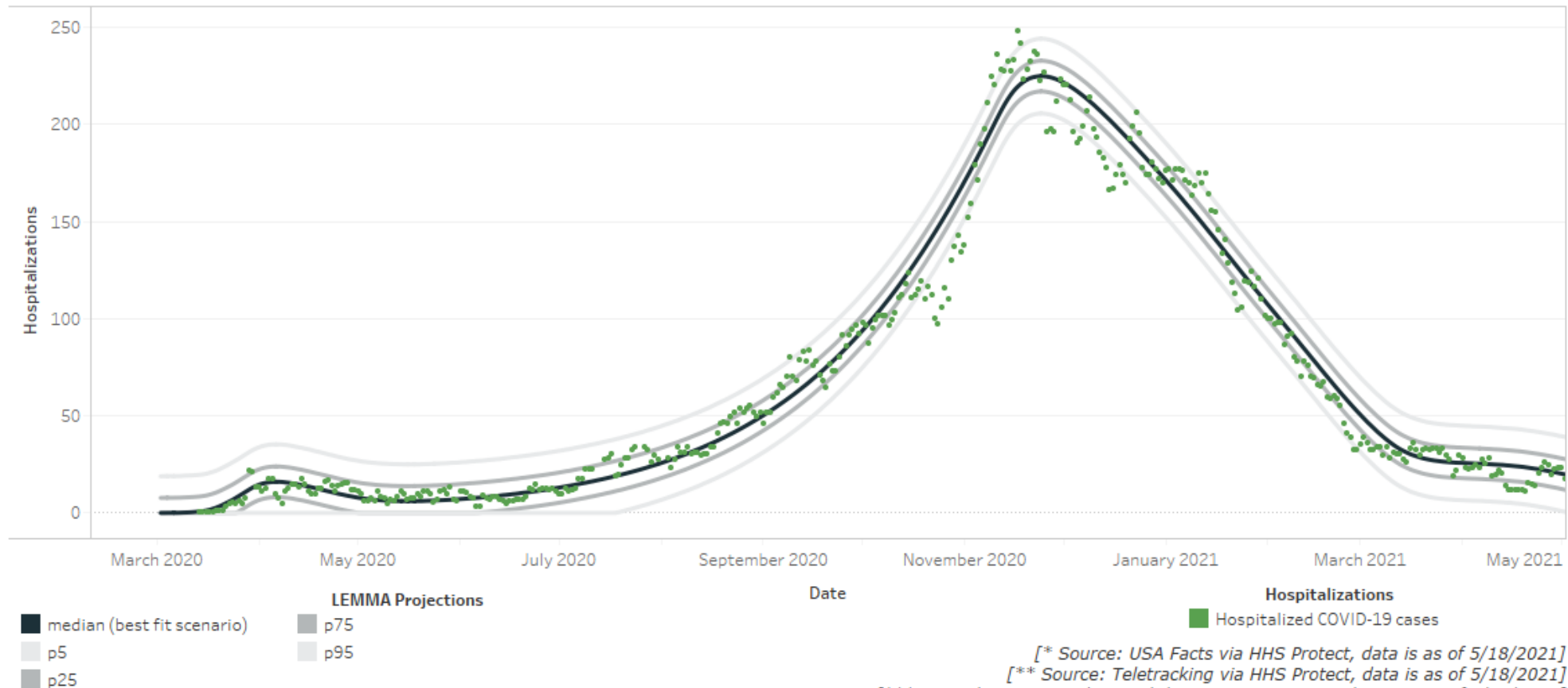
Pre-intervention	2.30
Last Week	0.90
Current Week	0.91
WoW % Re Change	1.4

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	61%
% ICU Beds Occupied C19	2%
% ICU Beds Free	39%
% Ventilators in use	24%
% Ventilators free	76%

## Base Case Central Region

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



[\* Source: USA Facts via HHS Protect, data is as of 5/18/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/18/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/18/2021]

# Greater St. Louis Area (Region C)

[Return to Statewide View](#)

## Overview\*

Population	2,229,518
Cumulative Cases	216,596
Cumulative Deaths	3,432
7-day New Cases	1,227
WoW % Case Change	0.6%

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

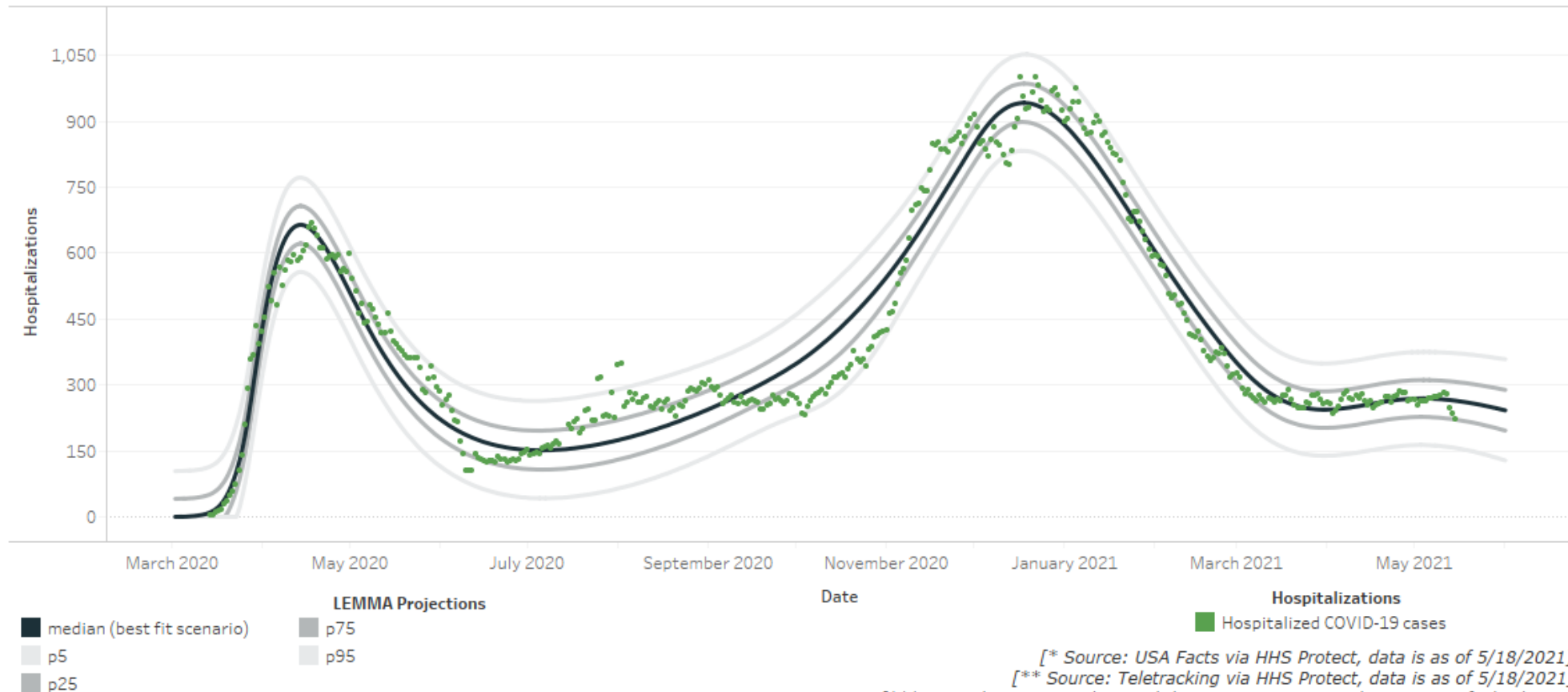
Pre-intervention	3.39
Last Week	0.99
Current Week	0.96
WoW % Re Change	-3.0

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	81%
% ICU Beds Occupied C19	7%
% ICU Beds Free	19%
% Ventilators in use	31%
% Ventilators free	69%

## Base Case St. Louis Region

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



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[\*\* Source: Teletracking via HHS Protect, data is as of 5/18/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/18/2021]

# Greater Kansas City Area (Region A)

[Return to Statewide View](#)

## Overview\*

Population	1,395,314
Cumulative Cases	129,739
Cumulative Deaths	1,716
7-day New Cases	833
WoW % Case Change	0.6%

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

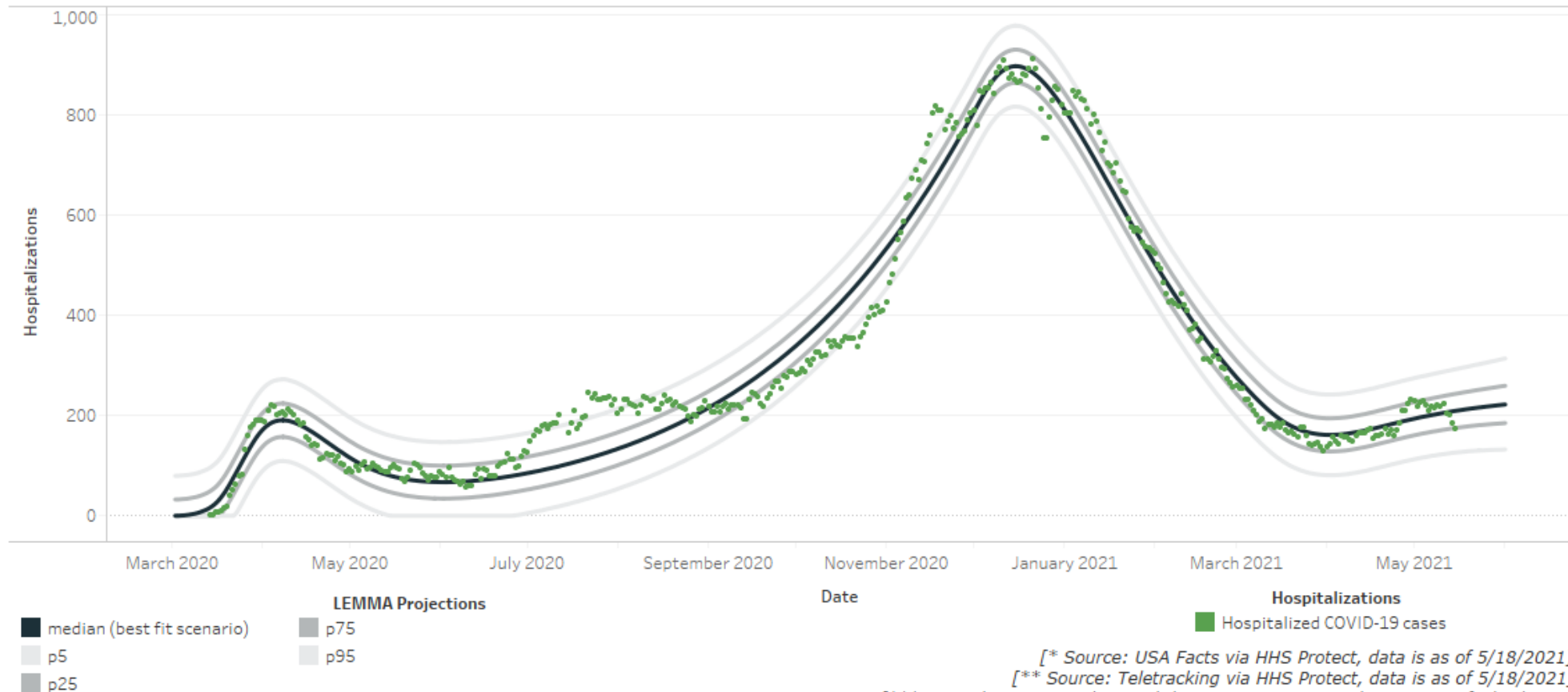
Pre-intervention	2.80
Last Week	1.03
Current Week	1.04
WoW % Re Change	0.6

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	72%
% ICU Beds Occupied C19	8%
% ICU Beds Free	28%
% Ventilators in use	19%
% Ventilators free	81%

## Base Case Kansas City Region

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



[\* Source: USA Facts via HHS Protect, data is as of 5/18/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/18/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/18/2021]

# Northeast (Region B)

[Return to Statewide View](#)

## Overview\*

Population	179,448
Cumulative Cases	18,631
Cumulative Deaths	211
7-day New Cases	90
WoW % Case Change	0.5%

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

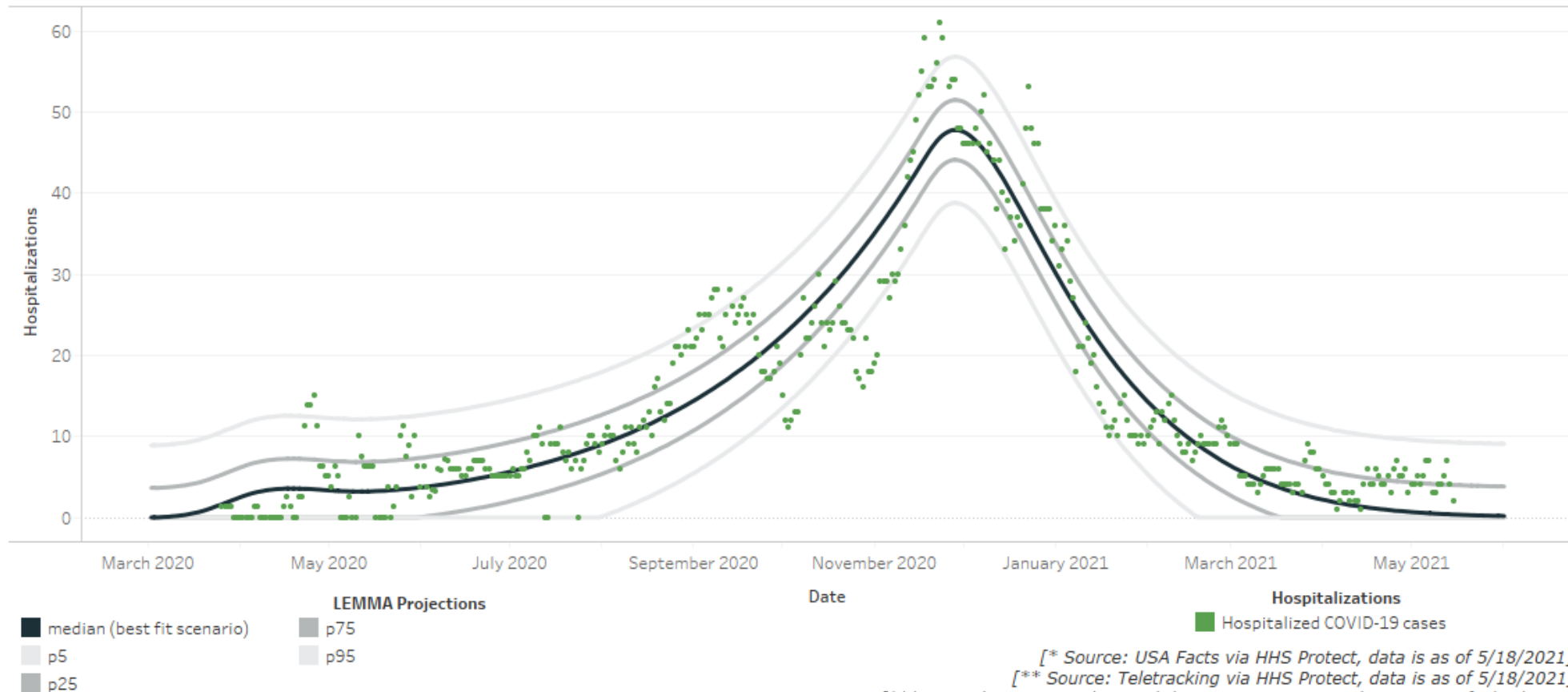
Pre-intervention	2.15
Last Week	0.61
Current Week	0.61
WoW % Re Change	-0.2

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	69%
% ICU Beds Occupied C19	4%
% ICU Beds Free	31%
% Ventilators in use	5%
% Ventilators free	95%

## Base Case Northeast Region

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



[\* Source: USA Facts via HHS Protect, data is as of 5/18/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/18/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/18/2021]



# Northwest (Region H)

[Return to Statewide View](#)

## Overview\*

Population	234,361
Cumulative Cases	23,896
Cumulative Deaths	443
7-day New Cases	110
WoW % Case Change	0.5%

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

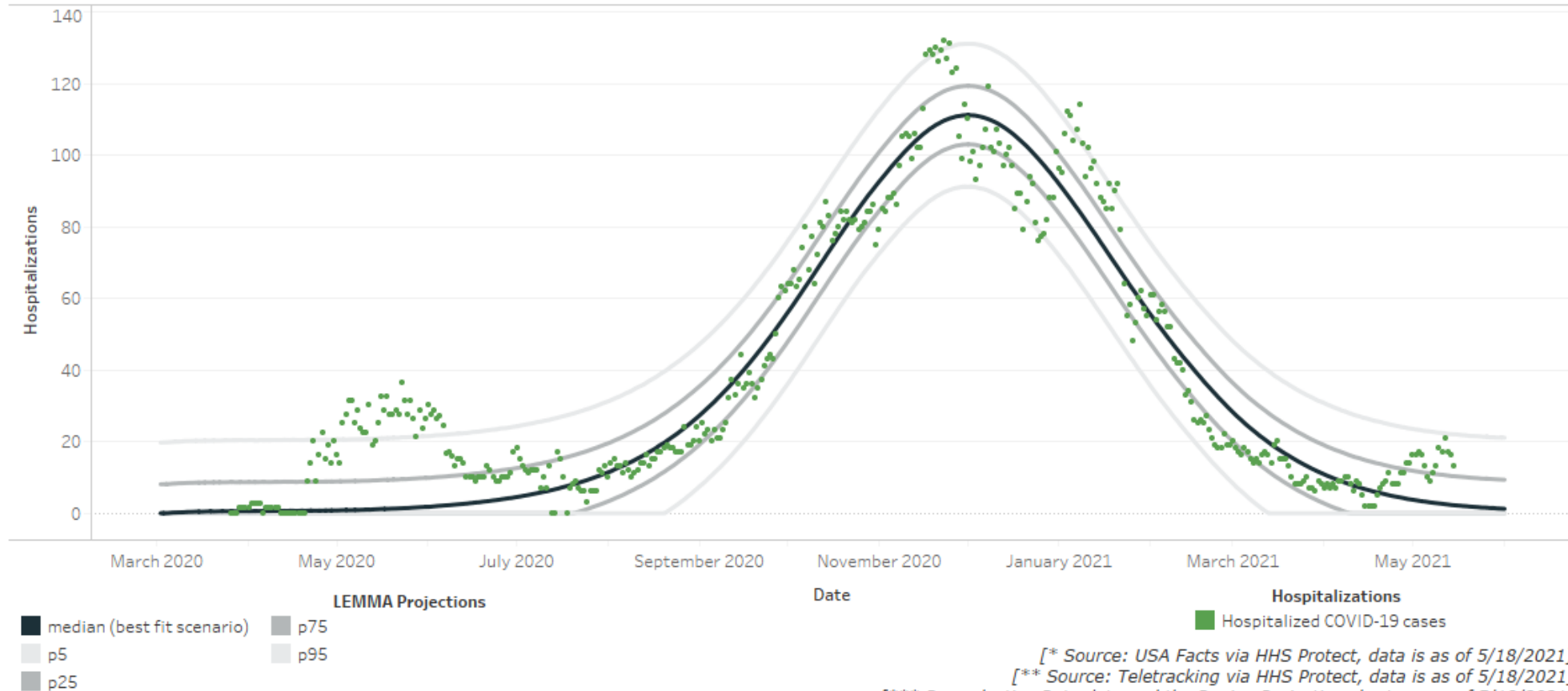
Pre-intervention	1.24
Last Week	0.76
Current Week	0.75
WoW % Re Change	-0.5

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	69%
% ICU Beds Occupied C19	6%
% ICU Beds Free	31%
% Ventilators in use	16%
% Ventilators free	84%

## Base Case Northwest Region

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



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[\*\* Source: Teletracking via HHS Protect, data is as of 5/18/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/18/2021]

# Southeast / Cape Girardeau (Region E)

[Return to Statewide View](#)

## Overview\*

Population	363,478
Cumulative Cases	38,115
Cumulative Deaths	529
7-day New Cases	138
WoW % Case Change	0.4%

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

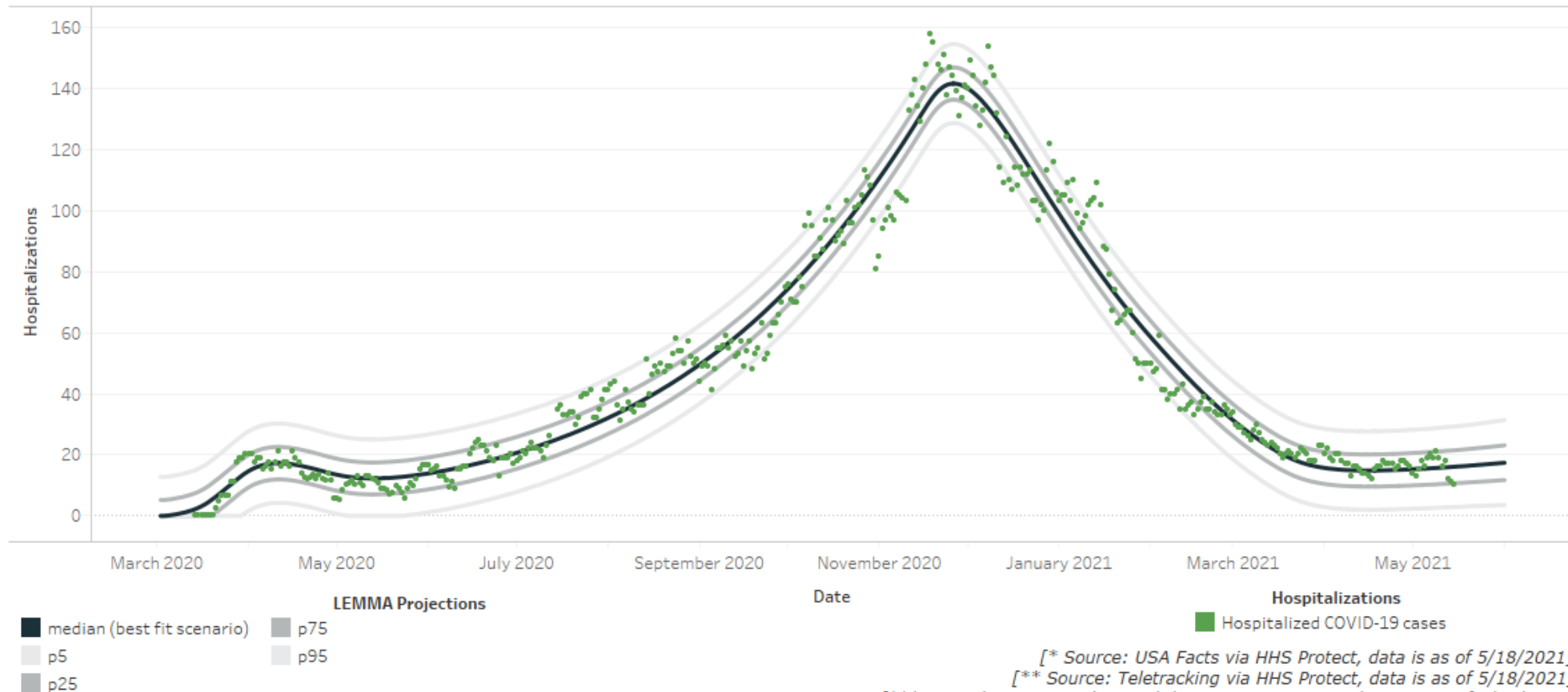
Pre-intervention	2.61
Last Week	1.08
Current Week	1.06
WoW % Re Change	-2.2

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	57%
% ICU Beds Occupied C19	4%
% ICU Beds Free	43%
% Ventilators in use	17%
% Ventilators free	83%

## Base Case Southeast Region

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



[\* Source: USA Facts via HHS Protect, data is as of 5/18/2021]

[\*\* Source: Teletracking via HHS Protect, data is as of 5/18/2021]

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

[Return to Statewide View](#)

## Overview\*

Population	1,221,847
Cumulative Cases	114,178
Cumulative Deaths	1,882
7-day New Cases	473
WoW % Case Change	0.4%

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

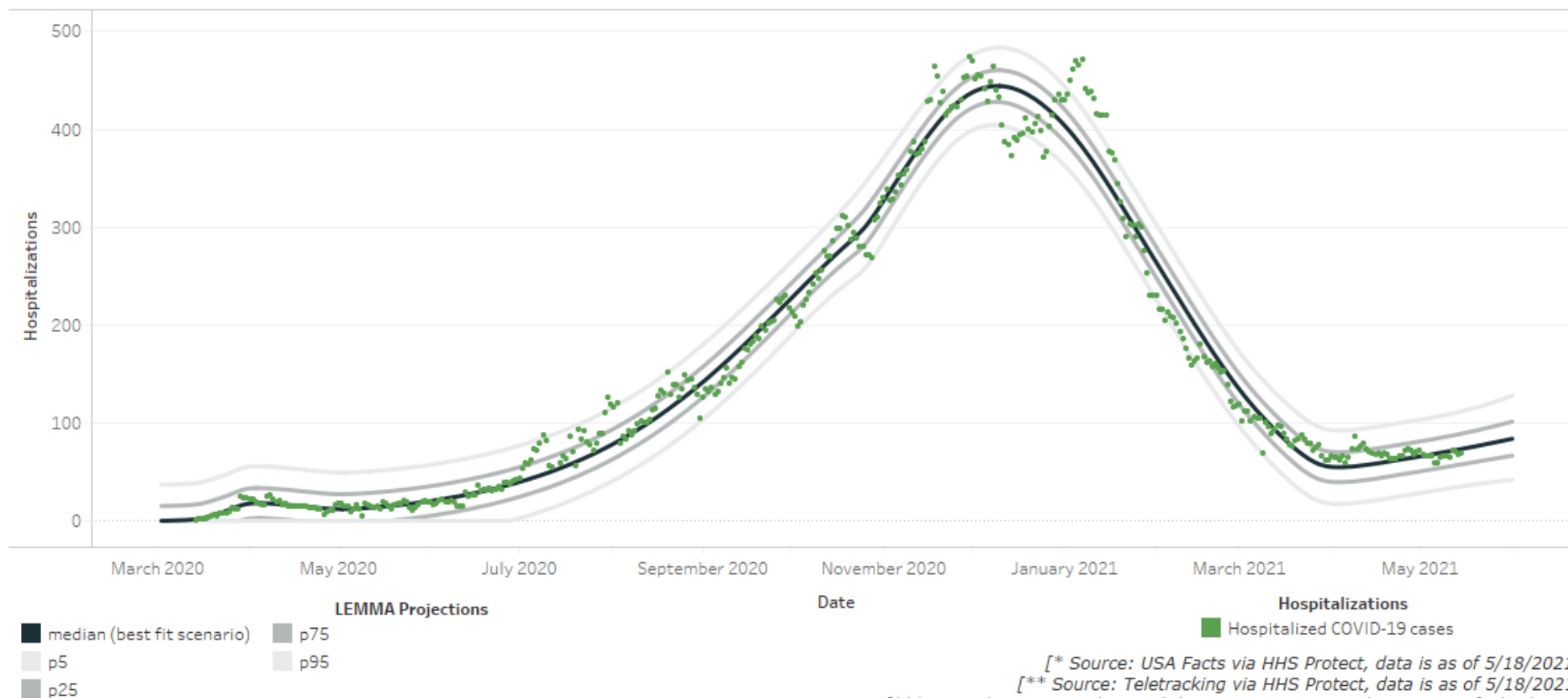
Pre-intervention	2.36
Last Week	1.05
Current Week	1.06
WoW % Re Change	0.3

## Bed / Ventilator Availability\*\*

% ICU Beds Occupied	57%
% ICU Beds Occupied C19	5%
% ICU Beds Free	43%
% Ventilators in use	19%
% Ventilators free	81%

## Base Case Southwest Region

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



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[\*\* Source: Teletracking via HHS Protect, data is as of 5/18/2021]

[\*\*\* Reproductive Rate data and the Region Projection chart are as of 5/18/2021]

# 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
    Susceptible --> Exposed
    Exposed --> Infectious
    Infectious --> EffectivelyVaccinated[Effectively Vaccinated]
    Infectious --> Removed
    EffectivelyVaccinated --> Removed
    Infectious --> Hospitalized
    Hospitalized --> Floor
    Hospitalized --> ICU
    Hospitalized --> 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)

