State of Missouri regional COVID-19 hospitalized cases model

July 1ˢᵗ, 2020

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
Projected hospitalizations for regions in MO with sufficient data, i.e. Kansas City Area, Central, St. Louis Area, Southeast and Southwest	Projected hospitalizations in regions where daily COVID-19 hospitalizations are fewer than 15 because insufficient cases

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

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Greater Kansas City area (Region A)
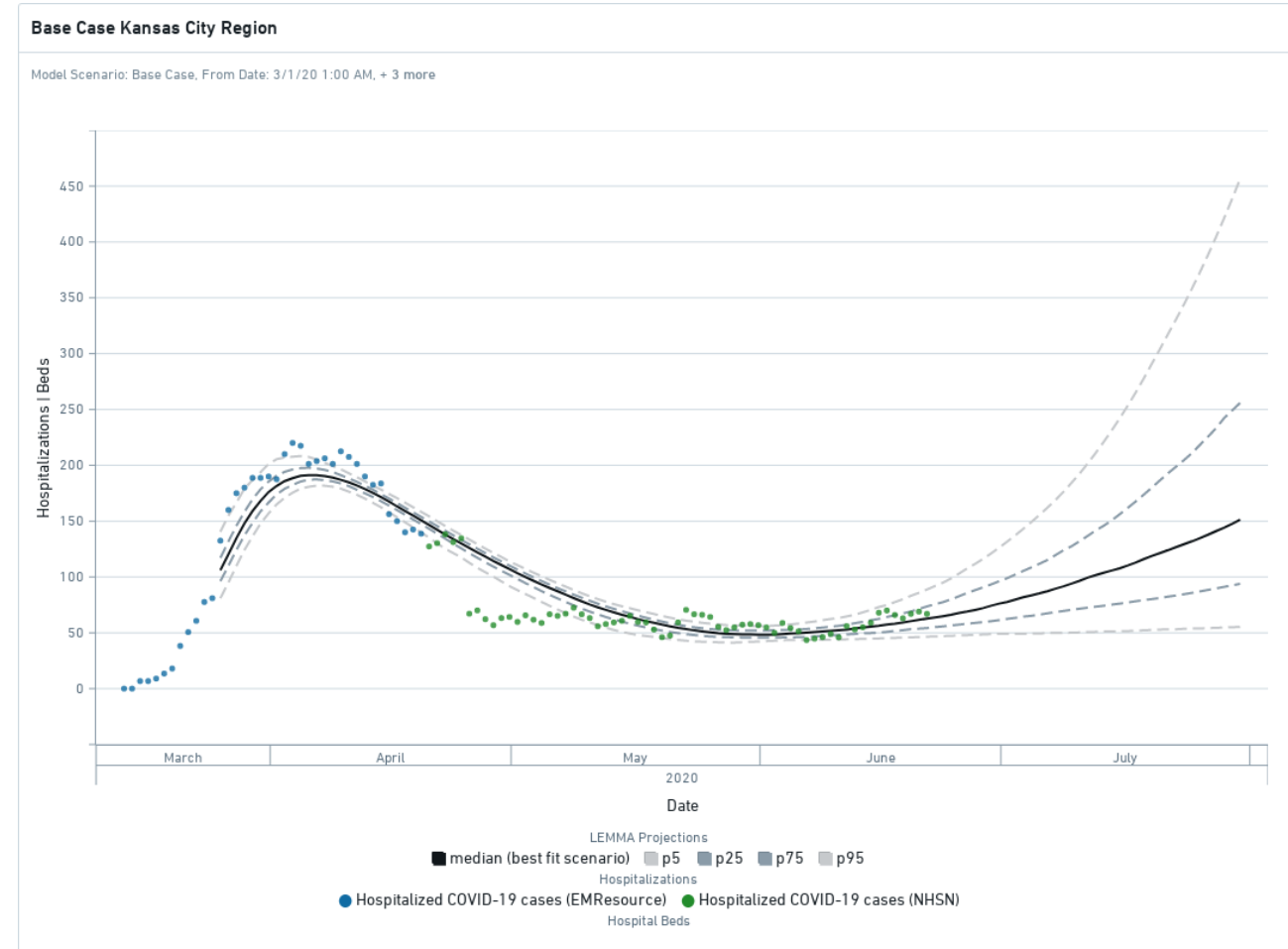
Overview
Population: 1,395,314
Cumulative cases: 4,707
Cumulative deaths: 90
7-day new cases: 577
Week-over-week % case increase: 14%

Reproductive rate
Pre-intervention: 2.80 ± 0.15
Today: 1.18 ± 0.08
Change from last week: ↑0.02

Projected COVID-19 hospitalizations

Base Case Kansas City Region

Model Scenario: Base Case, From Date: 3/1/20 1:00 AM, + 3 more

LEMMA Projections
■ median (best fit scenario) ■ p5 ■ p25 ■ p75 ■ p95
Hospitalizations
● Hospitalized COVID-19 cases (EMResource) ● Hospitalized COVID-19 cases (NHSN)
Hospital Beds

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Greater St. Louis area (Region C)

Overview
Population: 2,229,518
Cumulative cases: 10,325
Cumulative deaths: 830
7-day new cases: 830
Week-over-week % case increase: 9%

Reproductive rate
Pre-intervention: 3.39 ± 0.14
Today: 1.12 ± 0.11
Change from last week: →**0.00**
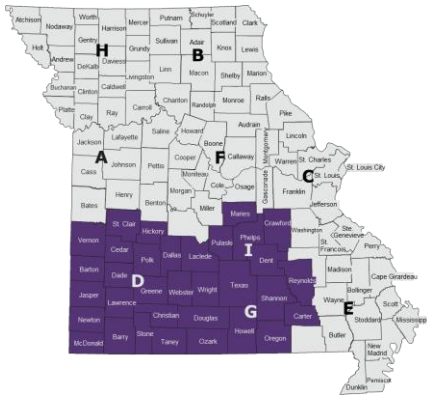
Projected COVID-19 hospitalizations

Base Case St. Louis Region

Model Scenario: Base Case, From Date: 3/1/20 1:00 AM, + 3 more

LEMMA Projections
median (best fit scenario) p5 p25 p75 p95
Peak hospitalizations (best fit scenario)
Hospitalizations
Hospitalized COVID-19 cases (EMResource) Hospitalized COVID-19 cases (NHSN)
Hospital Beds

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RECOVERY PLAN
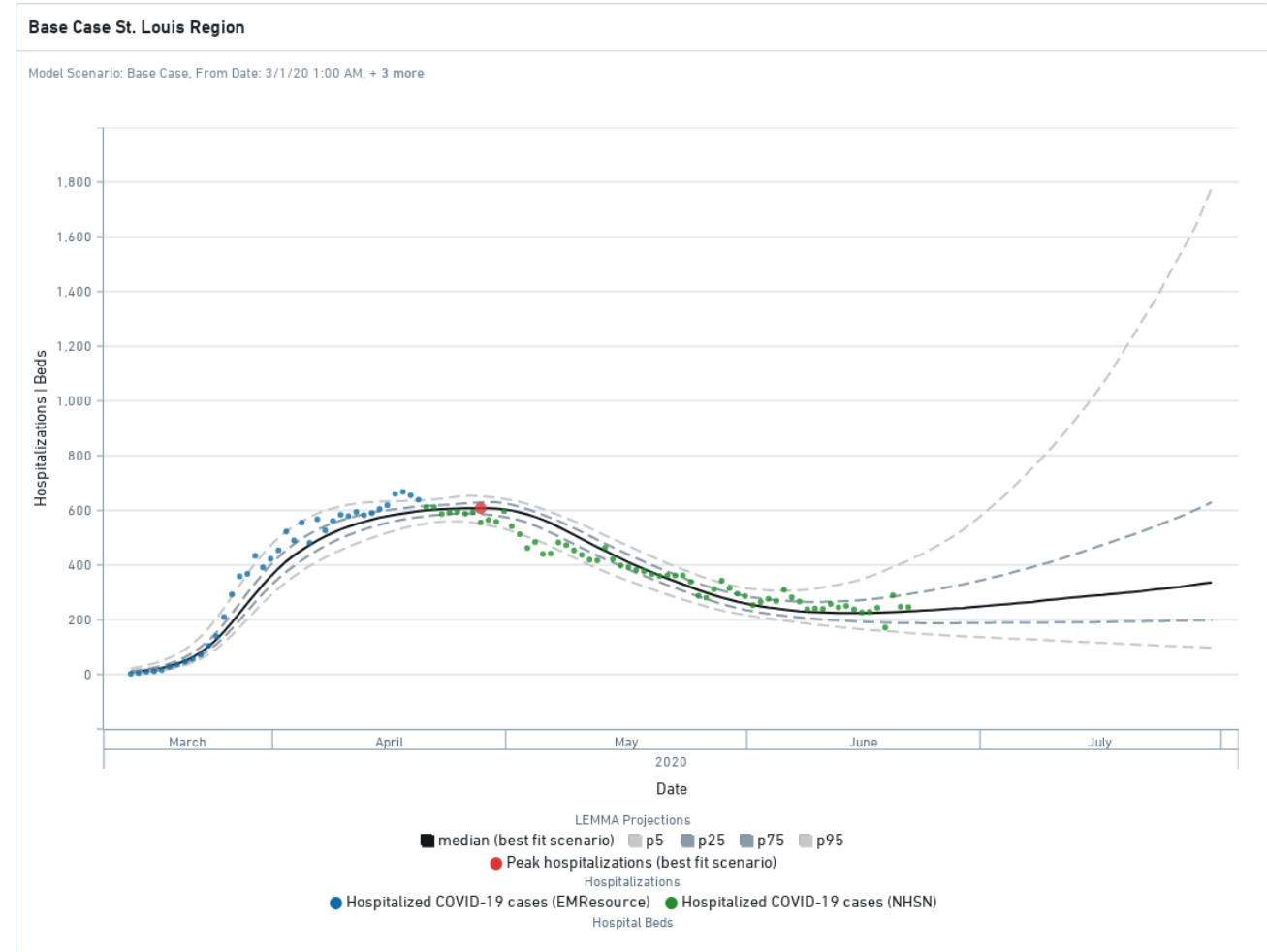
Southwest / Springfield (Regions D,G, I)

Overview

Population: 1,221,847
Cumulative cases: 2,099
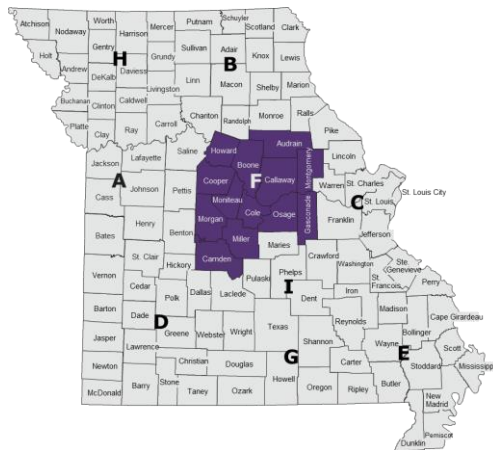**Cumulative deaths**: 20
7-day new cases: 570
Week-over-week % case increase: 37%

Reproductive rate

Pre-intervention: **2.36** ± 0.16
Today: **1.10** ± 0.09
Change from last week: ↓**0.05**

Projected COVID-19 hospitalizations
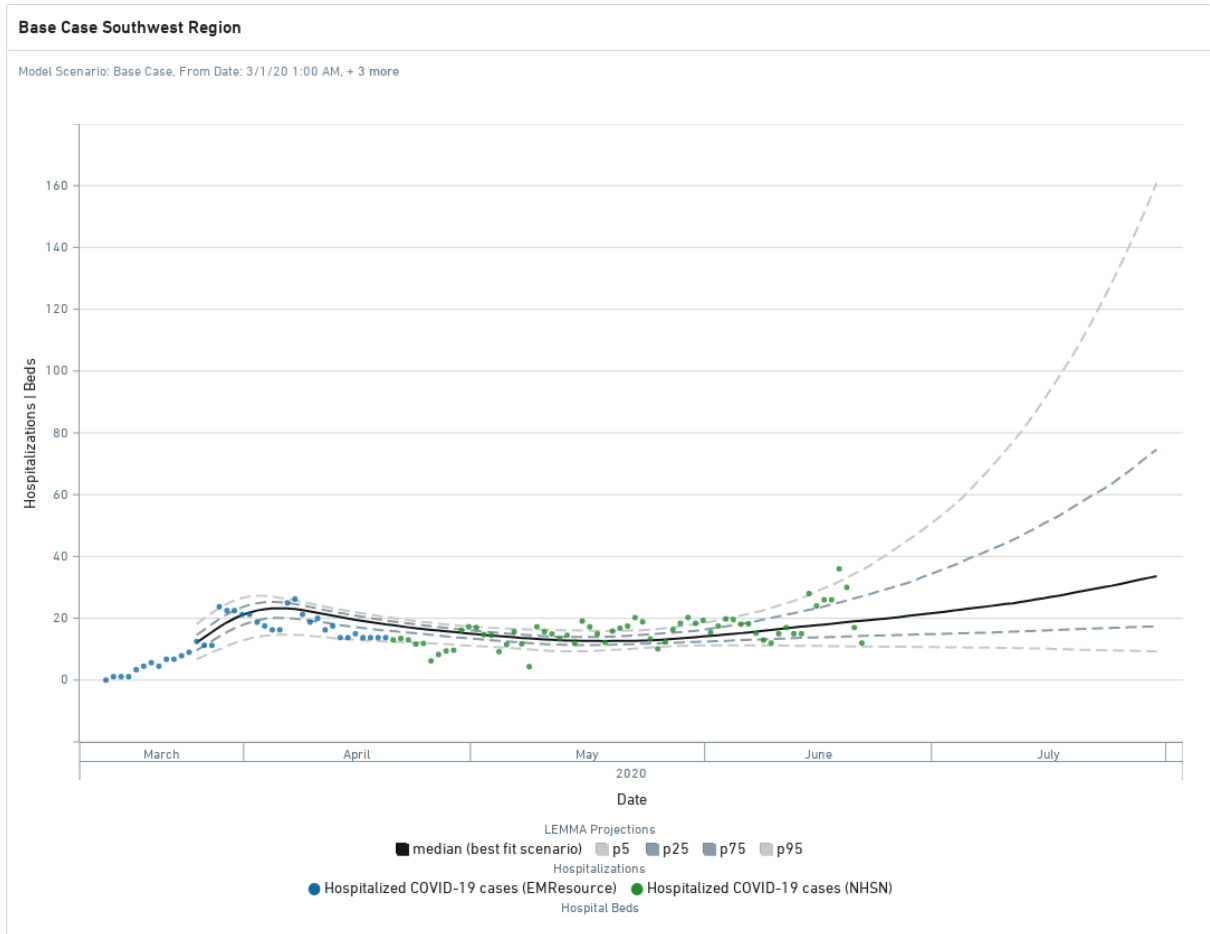
Base Case Southwest Region

Model Scenario: Base Case, From Date: 3/1/20 1:00 AM, + 3 more

Note: Due to low levels of hospitalized COVID-19 cases, modelling projections are highly sensitive to slight shifts in observed data and must be interpreted with extra caution.

Source: State of MO, MHA, WUSTL analysis; USA Facts; US Census Bureau

Southeast / Cape Girardeau (Region E)

Overview
Population: 363,478
Cumulative cases: 1,022
Cumulative deaths: 33
7-day new cases: 110
Week-over-week % case increase: 12%

Reproductive rate
Pre-intervention: **2.61** ± 0.15
Today: **1.34** ± 0.07
Change from last week: ↓**0.01**

Projected COVID-19 hospitalizations
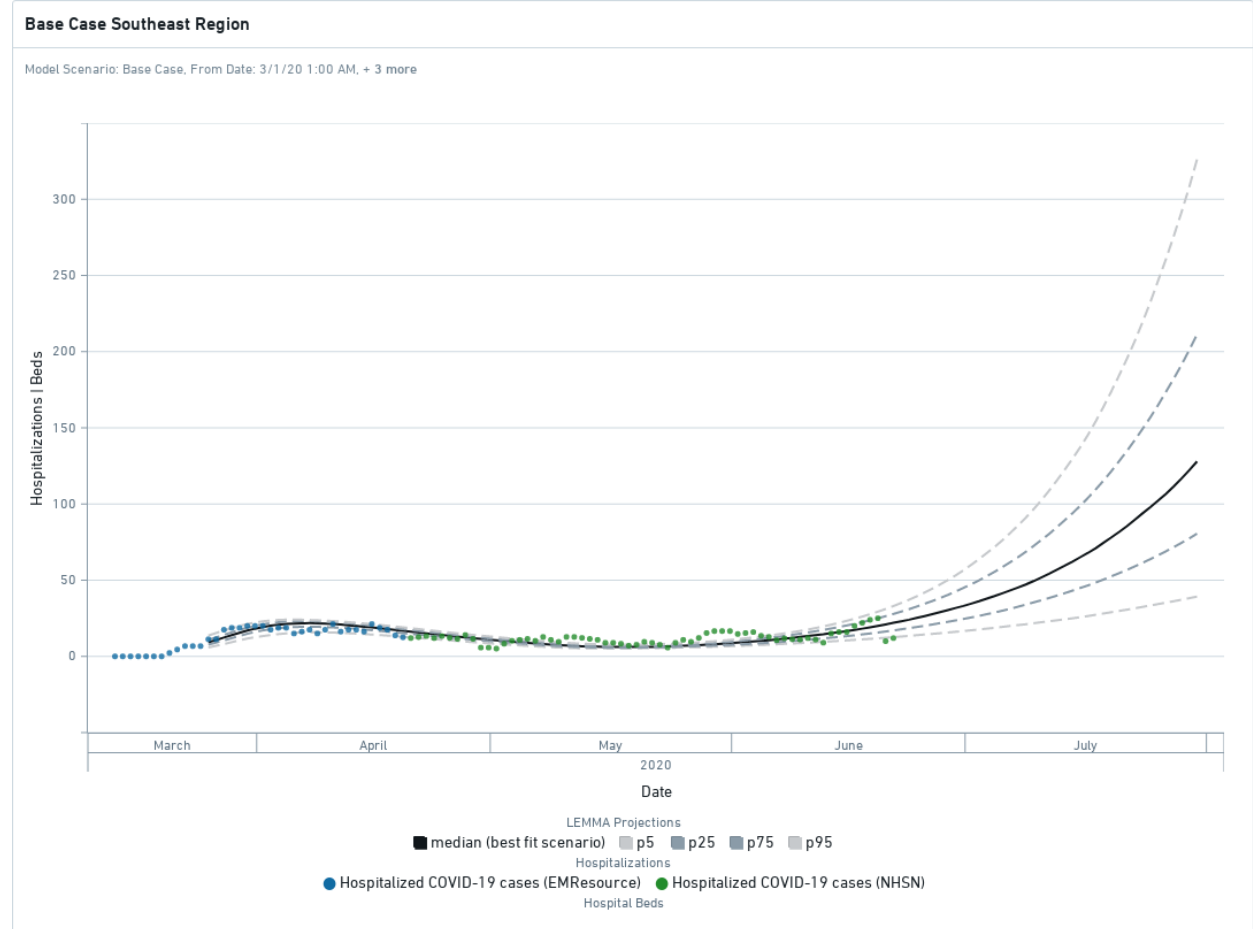
Base Case Southeast Region

Model Scenario: Base Case, From Date: 3/1/20 1:00 AM, + 3 more

LEMMA Projections
median (best fit scenario) p5 p25 p75 p95
Hospitalizations
● Hospitalized COVID-19 cases (EMResource) ● Hospitalized COVID-19 cases (NHSN)
Hospital Beds

Note: Due to low levels of hospitalized COVID-19 cases, modelling projections are highly sensitive to slight shifts in observed data and must be interpreted with extra caution.

Source: State of MO, MHA, WUSTL analysis; USA Facts; US Census Bureau

Central (Region F)

Overview
Population: 502,486
Cumulative cases: 768
Cumulative deaths: 8
7-day new cases: 119
Week-over-week % case increase: 18%

Reproductive rate
Pre-intervention: **2.30** ± 0.08
Today: **1.08** ± 0.11
Change from last week: ↓**0.03**

Projected COVID-19 hospitalizations
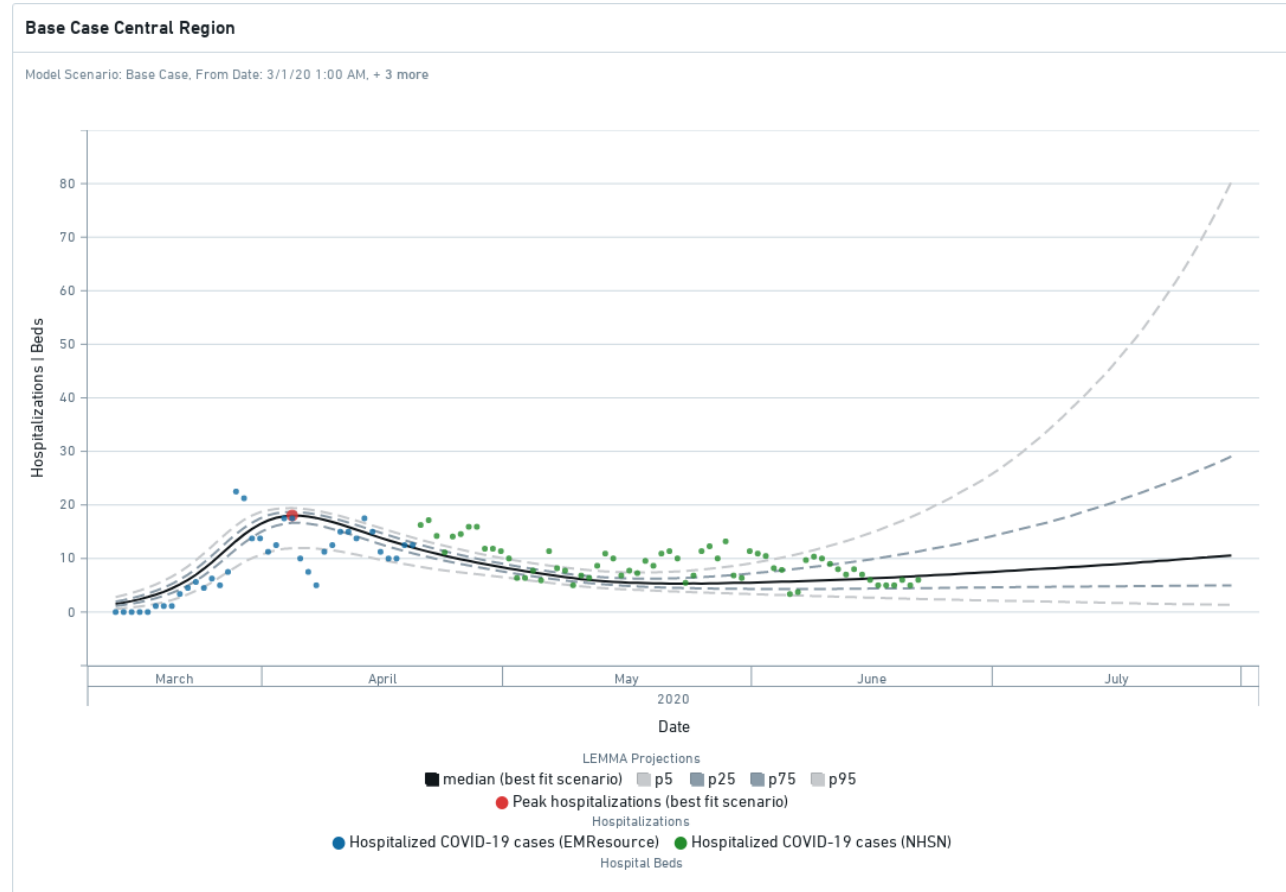
Note: Due to low levels of hospitalized COVID-19 cases, modelling projections are highly sensitive to slight shifts in observed data and must be interpreted with extra caution.

Source: State of MO, MHA, WUSTL analysis

Northwest (Region H)

Overview
Population: 234,361
Cumulative cases: 1,068
Cumulative deaths: 12
7-day new cases: 55
Week-over-week % case increase: 5%

Reproductive rate
Pre-intervention: **1.24** ± 0.08
Today: **0.59** ± 0.10
Change from last week: N/A

COVID-19 hospitalizations (projections coming soon)
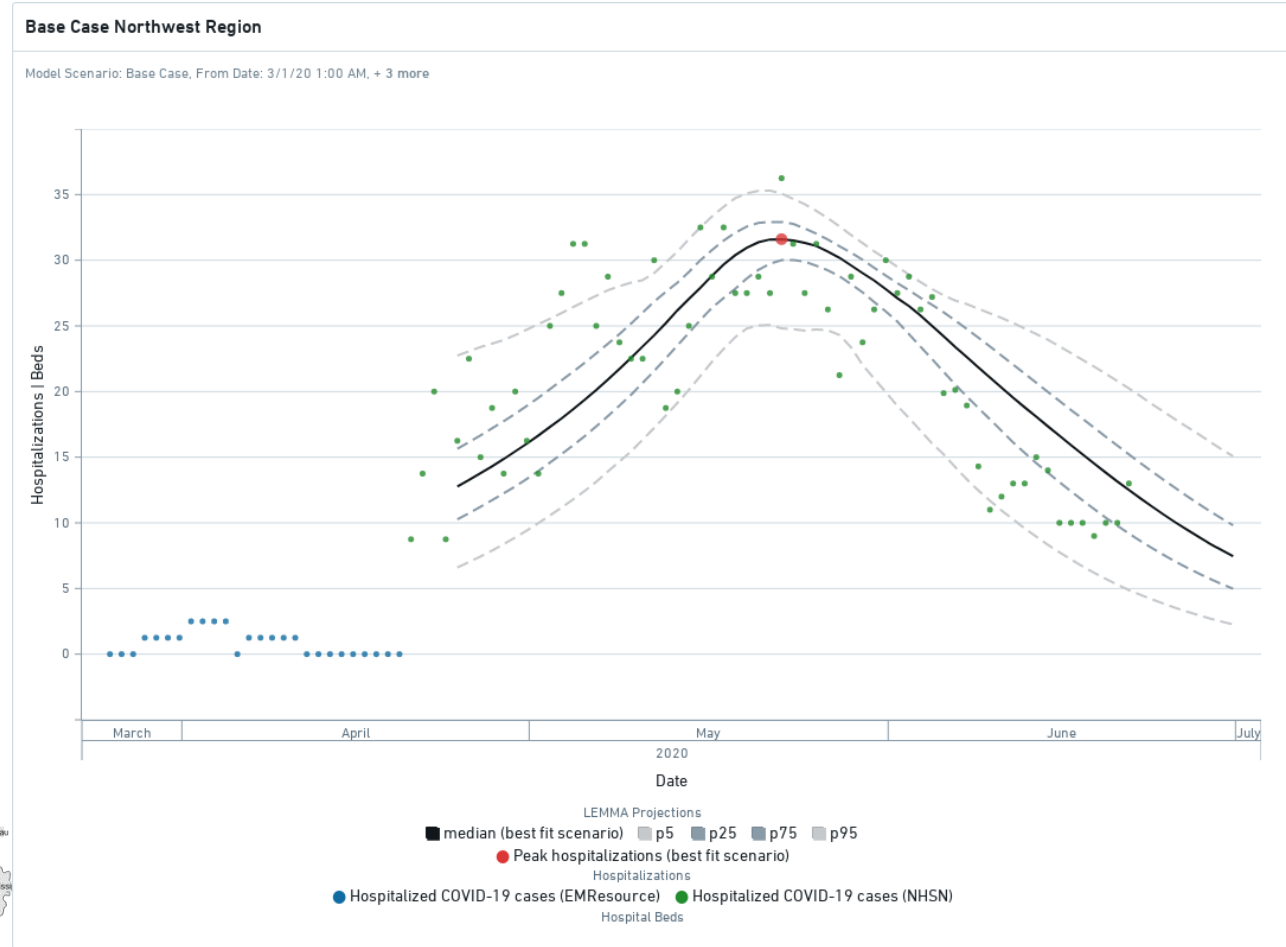
Note: Due to low levels of hospitalized COVID-19 cases, modelling projections are highly sensitive to slight shifts in observed data and must be interpreted with extra caution.

Source: State of MO, MHA, WUSTL analysis

See FAQs for additional details

Link here: https://health.mo.gov/living/healthcondiseases/communicable/novel-coronavirus/pdf/modeling-faqs06032020.pdf

Appendix

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

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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
- **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)
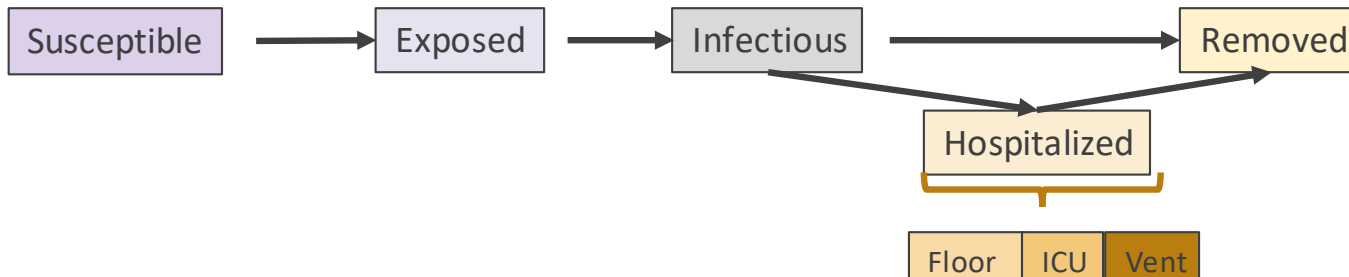
Projections are made for each Emergency Response region with sufficient data
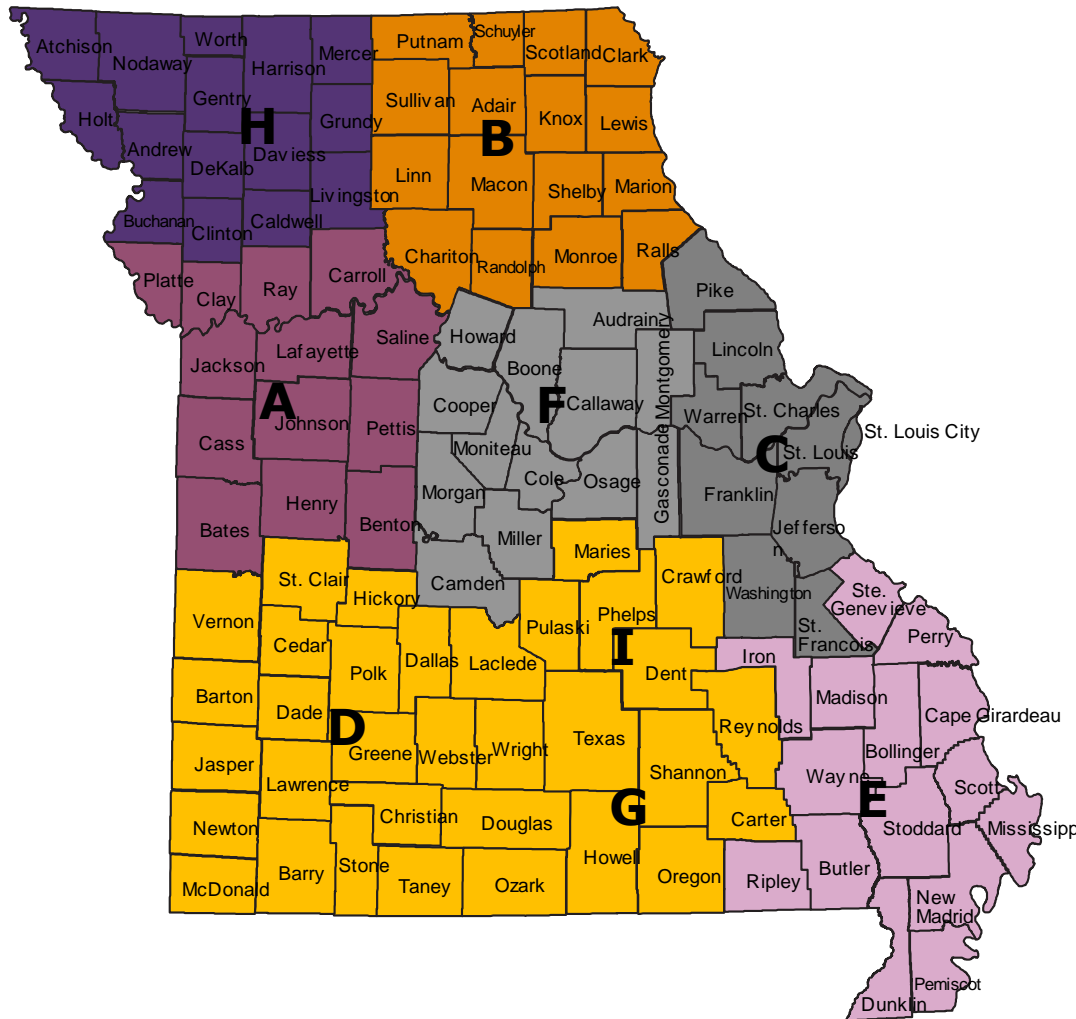
- **Low levels of daily COVID-19 hospitalizations in the Northeast and Northwest regions** limit the ability to generate projections for these regions
  - Northeast: Average of 4 daily confirmed or suspected COVID hospitalizations from 3/26 to 6/1
  - Northwest: Average of 17 daily confirmed or suspected COVID hospitalizations from 3/26 to 6/1

- **Projections are available for all other regions**

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