State of Missouri regional
COVID-19 hospitalized cases model

July 13, 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")

Click on region name to view details

Northwest Region

0.78 → 1.21

Northeast Region

0.61 → 0.67

Estimated Statewide Weighted Re

0.97 → 0.99

Central Region

1.08 → 1.09

Greater Kansas City

0.95 → 0.97

St. Louis Region

0.89 → 0.90

Cape Girardeau Region

0.94 → 0.95

Springfield Region

1.21 → 1.17

Understanding Re
Re > 1 = COVID cases are growing

LEMMA Model as of 7/13/2021

Map of Missouri counties: ATCHISON, NODAWAY, WORTH, HARRISON, MERCER, PUTNAM, SCHUYLER, SCOTLAND, CLARK, GENTRY, SULLIVAN, ADAIR, KNOX, LEWIS, HOLT, ANDREW, DEKALB, DAVIESS, GRUNDY, LINN, MACON, SHELBY, MARION, BUCHANAN, CLINTON, CALDWELL, LIVINGSTON, CHARITON, RANDOLPH, MONROE, RALLS, PLATTE, CLAY, RAY, CARROLL, SALINE, HOWARD, AUDRAIN, PIKE, JACKSON, LAFAYETTE, BOONE, MONTGOMERY, LINCOLN, COOPER, CALLAWAY, WARREN, ST CHARLES, JOHNSON, PETTIS, MONITEAU, COLE, OSAGE, GASCONADE, FRANKLIN, ST LOUIS, CASS, MORGAN, MILLER, MARIES, CRAWFORD, WASHINGTON, JEFFERSON, HENRY, BENTON, CAMDEN, ST CLAIR, HICKORY, PULASKI, PHELPS, STE GENEVIEVE, ST FRANCOIS, PERRY, VERNON, CEDAR, POLK, DALLAS, LACLEDE, DENT, IRON, MADISON, CAPE GIRARDEAU, BARTON, DADE, GREENE, WEBSTER, WRIGHT, TEXAS, REYNOLDS, BOLLINGER, JASPER, LAWRENCE, SHANNON, WAYNE, SCOTT, NEWTON, CHRISTIAN, DOUGLAS, CARTER, STODDARD, MISSISSIPPI, MCDONALD, BARRY, STONE, TANEY, OZARK, HOWELL, OREGON, RIPLEY, BUTLER, NEW MADRID, DUNKLIN, PEMISCOT

Central (Region F)

Overview*

Population	502,486
Cumulative Cases	55,309
Cumulative Deaths	678
7-day New Cases	1,007
WoW % Case Change	1.9%

Reproductive Rate (Re)***

Pre-intervention	2.30
Last Week	1.08
Current Week	1.09
WoW % Re Change	1.0

Bed / Ventilator Availabilty**

% ICU Beds Occupied	69%
% ICU Beds Occupied C19	12%
% ICU Beds Free	31%
% Ventilators in use	33%
% Ventilators free	67%

Base Case Central Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jul 25, 2021
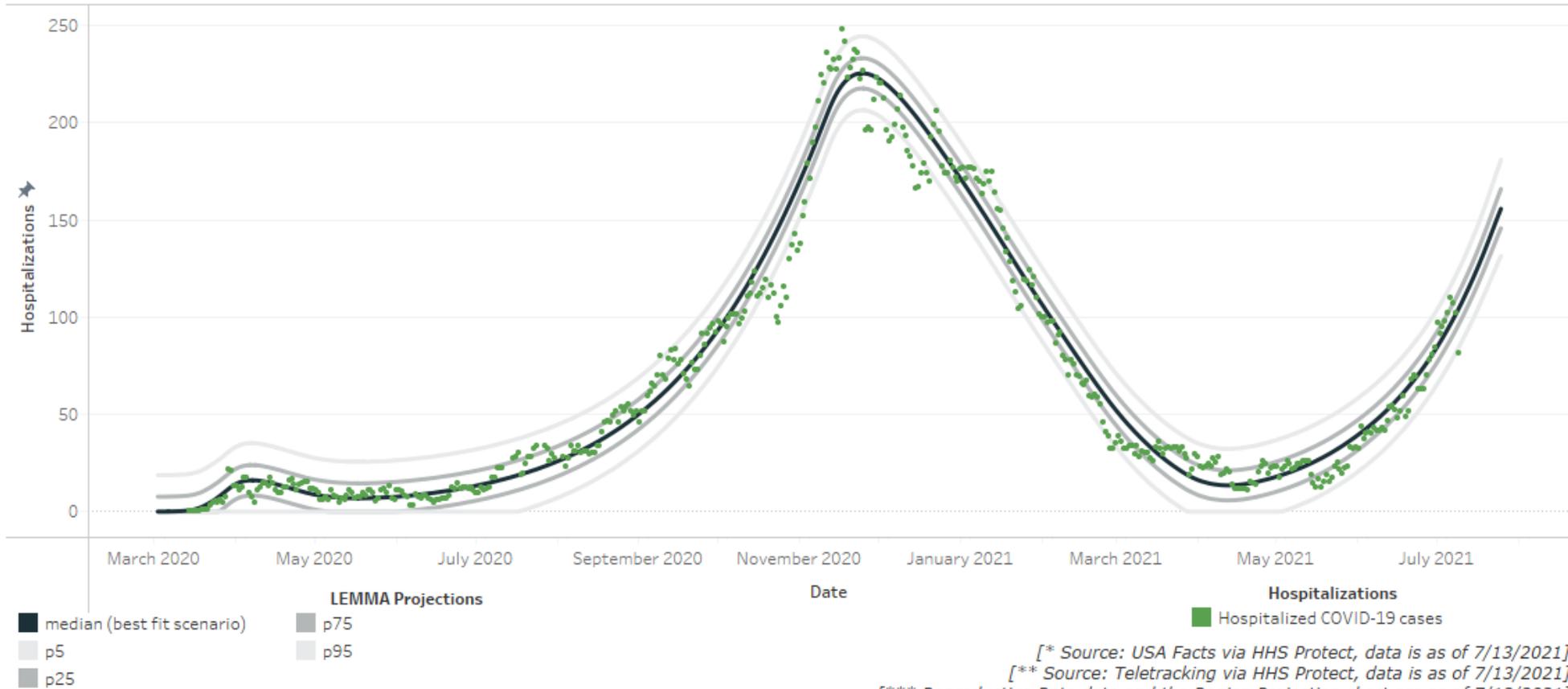
LEMMA Projections
- median (best fit scenario)
- p5
- p25
- p75
- p95

Date

Hospitalizations
- Hospitalized COVID-19 cases

[* Source: USA Facts via HHS Protect, data is as of 7/13/2021]
[** Source: Teletracking via HHS Protect, data is as of 7/13/2021]
[*** Reproductive Rate data and the Region Projection chart are as of 7/13/2021]

Greater St. Louis Area (Region C)

Overview*

Population	2,229,518
Cumulative Cases	224,667
Cumulative Deaths	3,584
7-day New Cases	1,997
WoW % Case Change	0.9%

Reproductive Rate (Re)***

Pre-intervention	3.39
Last Week	0.89
Current Week	0.90
WoW % Re Change	1.2

Bed / Ventilator Availabilty**

% ICU Beds Occupied	85%
% ICU Beds Occupied C19	8%
% ICU Beds Free	15%
% Ventilators in use	34%
% Ventilators free	66%

Base Case St. Louis Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jul 26, 2021
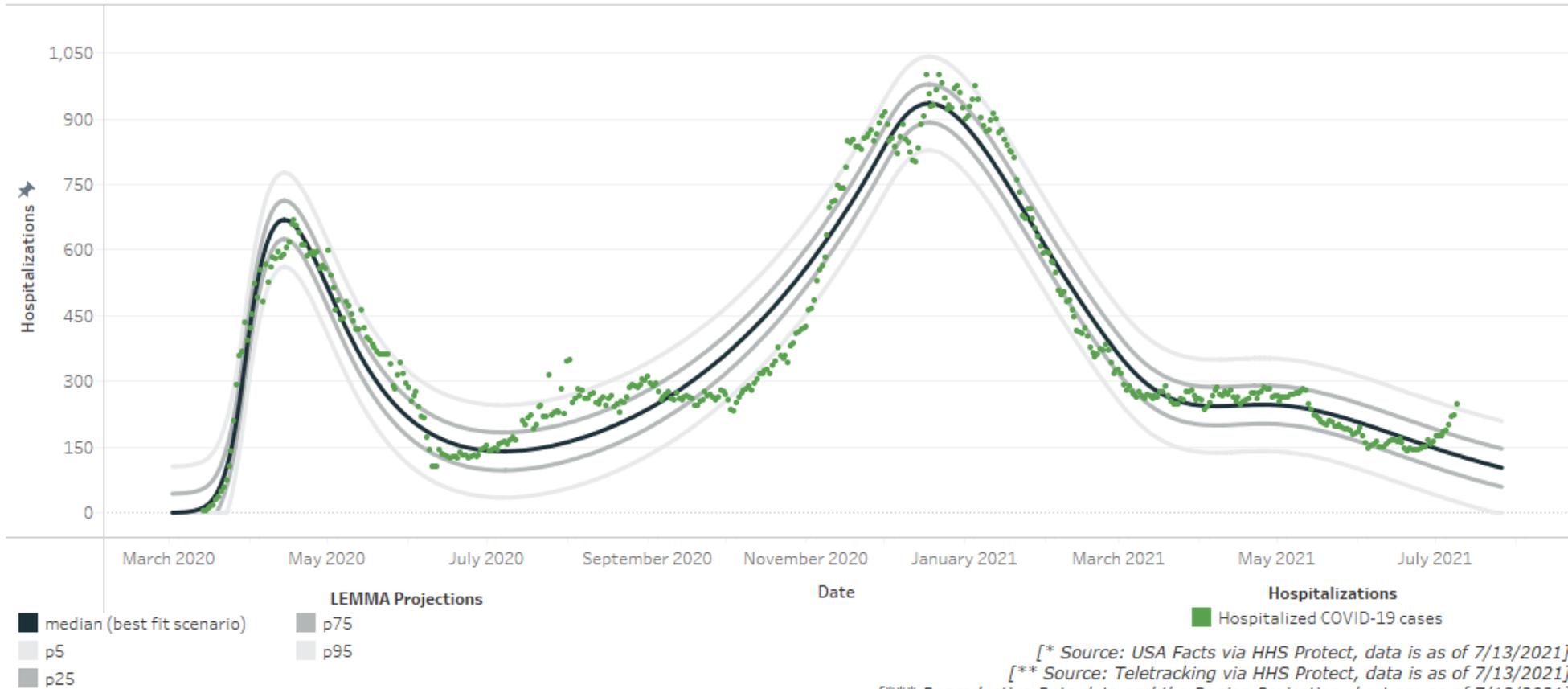
LEMMA Projections
- median (best fit scenario)
- p5
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- p75
- p95

Hospitalizations
- Hospitalized COVID-19 cases

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Greater Kansas City Area (Region A)

Overview*

Population	1,395,314
Cumulative Cases	136,392
Cumulative Deaths	1,818
7-day New Cases	1,732
WoW % Case Change	1.3%

Reproductive Rate (Re)***

Pre-intervention	2.80
Last Week	0.95
Current Week	0.97
WoW % Re Change	1.6

Bed / Ventilator Availabilty**

% ICU Beds Occupied	76%
% ICU Beds Occupied C19	10%
% ICU Beds Free	24%
% Ventilators in use	20%
% Ventilators free	80%

Base Case Kansas City Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jul 26, 2021
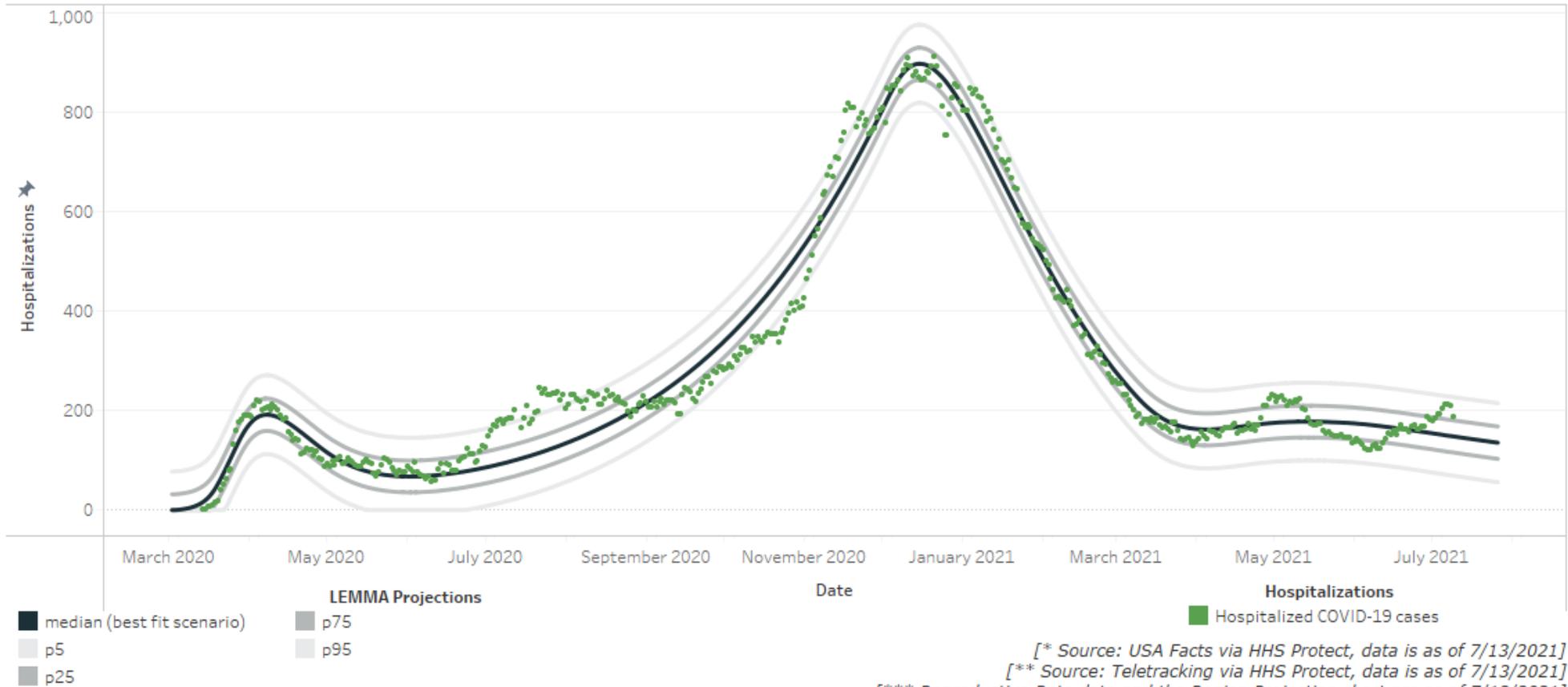
LEMMA Projections
- median (best fit scenario)
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- p75
- p95

Hospitalizations
- Hospitalized COVID-19 cases

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Northeast (Region B)

Overview*

Population	179,448
Cumulative Cases	20,107
Cumulative Deaths	239
7-day New Cases	204
WoW % Case Change	1.0%

Reproductive Rate (Re)***

Pre-intervention	2.15
Last Week	0.61
Current Week	0.67
WoW % Re Change	11.1

Bed / Ventilator Availabilty**

% ICU Beds Occupied	73%
% ICU Beds Occupied C19	38%
% ICU Beds Free	27%
% Ventilators in use	20%
% Ventilators free	80%

Base Case Northeast Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jul 26, 2021
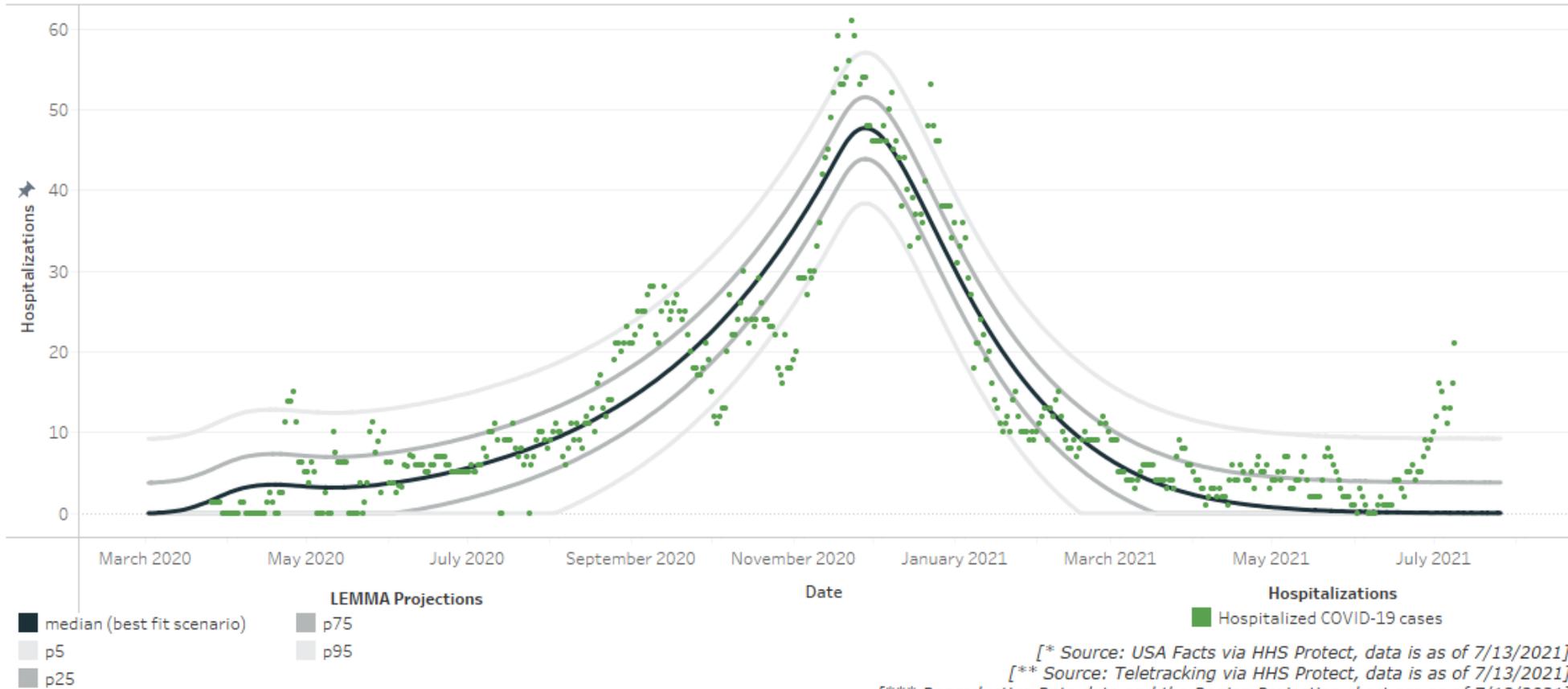
LEMMA Projections

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

Hospitalizations

- Hospitalized COVID-19 cases

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Northwest (Region H)

Overview*

Population	234,361
Cumulative Cases	26,164
Cumulative Deaths	459
7-day New Cases	492
WoW % Case Change	1.9%

Reproductive Rate (Re)***

Pre-intervention	1.24
Last Week	0.78
Current Week	1.21
WoW % Re Change	54.5

Bed / Ventilator Availabilty**

% ICU Beds Occupied	69%
% ICU Beds Occupied C19	28%
% ICU Beds Free	31%
% Ventilators in use	19%
% Ventilators free	81%

Base Case Northwest Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jul 26, 2021
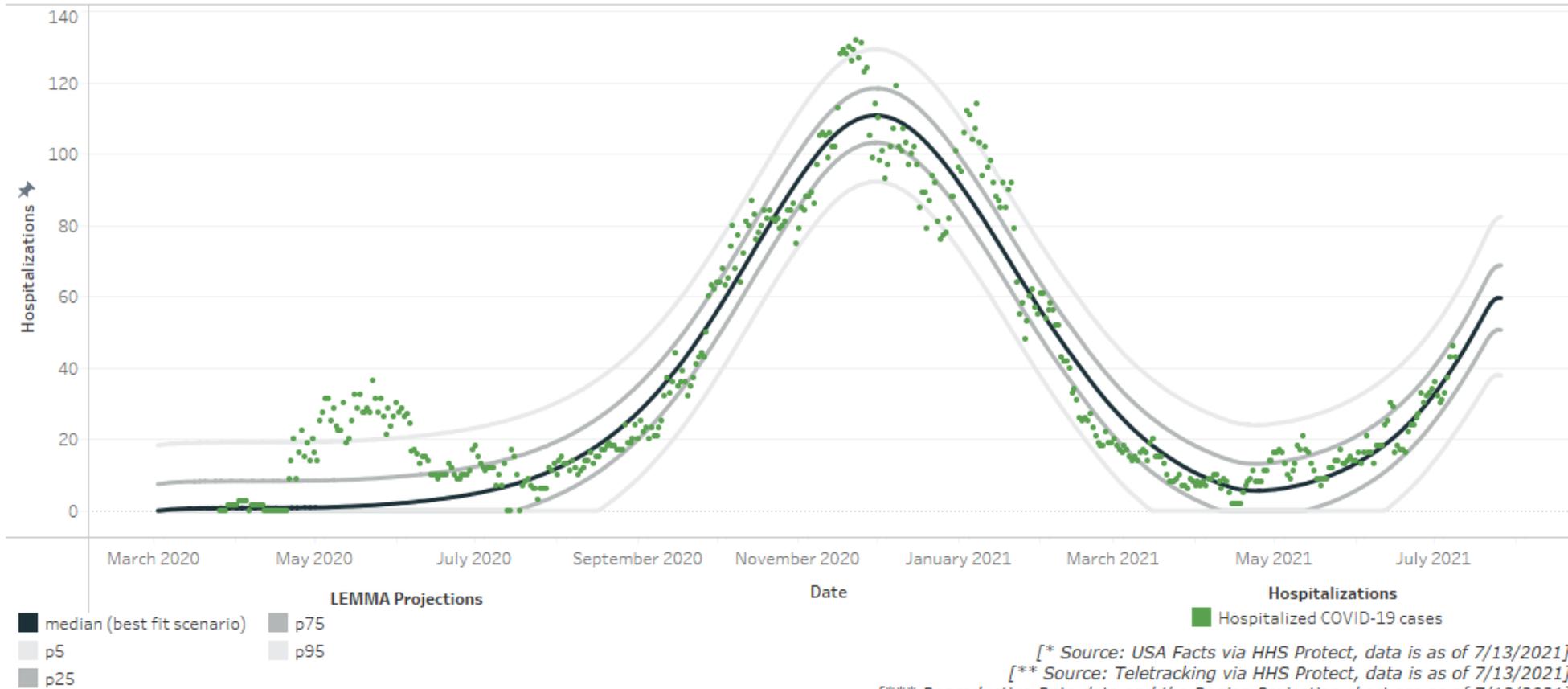
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Hospitalizations
- Hospitalized COVID-19 cases

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Southeast / Cape Girardeau (Region E)

Overview*

Population	363,478
Cumulative Cases	39,365
Cumulative Deaths	599
7-day New Cases	205
WoW % Case Change	0.5%

Reproductive Rate (Re)***

Pre-intervention	2.61
Last Week	0.94
Current Week	0.95
WoW % Re Change	0.7

Bed / Ventilator Availabilty**

% ICU Beds Occupied	63%
% ICU Beds Occupied C19	5%
% ICU Beds Free	37%
% Ventilators in use	25%
% Ventilators free	75%

Base Case Southeast Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jul 26, 2021
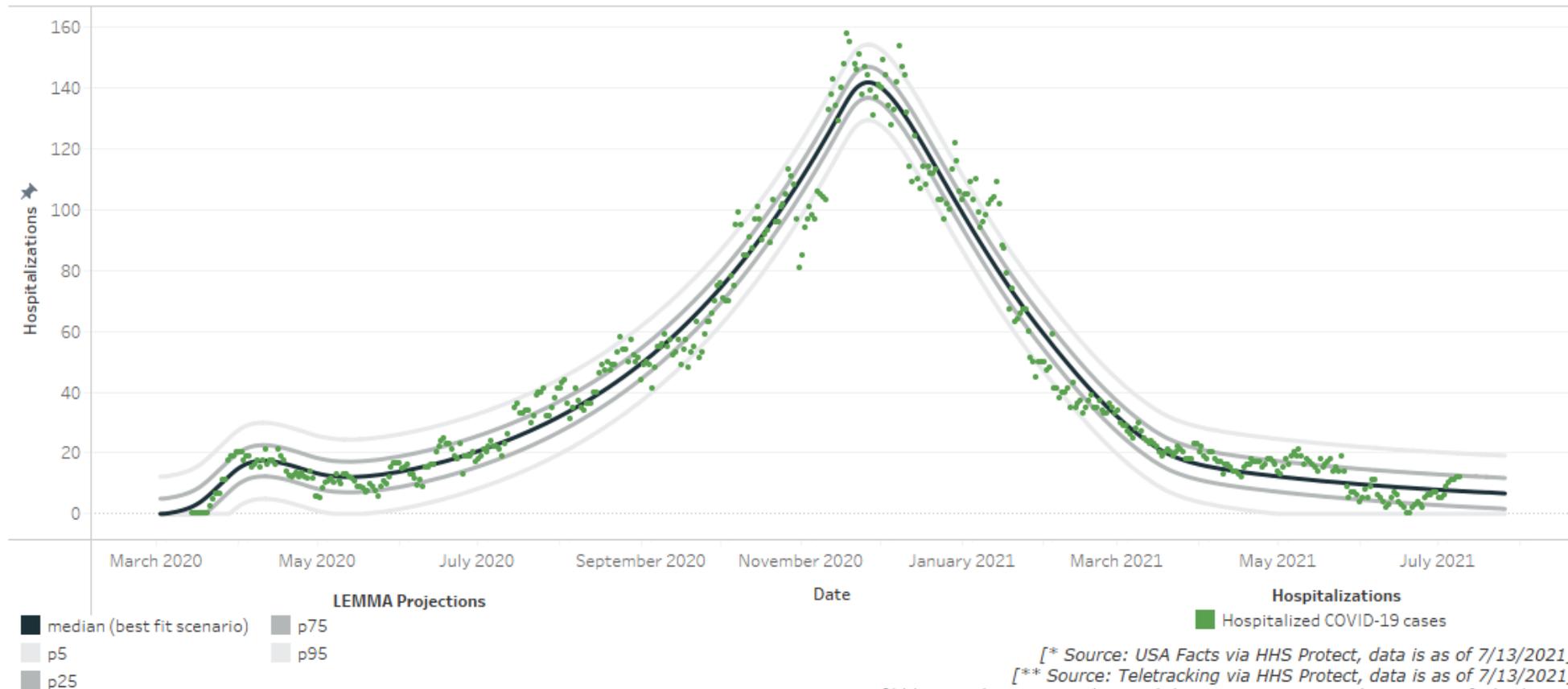
LEMMA Projections

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Hospitalizations
- Hospitalized COVID-19 cases

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Southwest / Springfield (Region D,G,I)

Overview*

Population	1,221,847
Cumulative Cases	130,688
Cumulative Deaths	2,010
7-day New Cases	4,429
WoW % Case Change	3.5%

Reproductive Rate (Re)***

Pre-intervention	2.36
Last Week	1.21
Current Week	1.17
WoW % Re Change	-2.8

Bed / Ventilator Availabilty**

% ICU Beds Occupied	82%
% ICU Beds Occupied C19	40%
% ICU Beds Free	18%
% Ventilators in use	30%
% Ventilators free	70%

Base Case Southwest Region

Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Jul 26, 2021
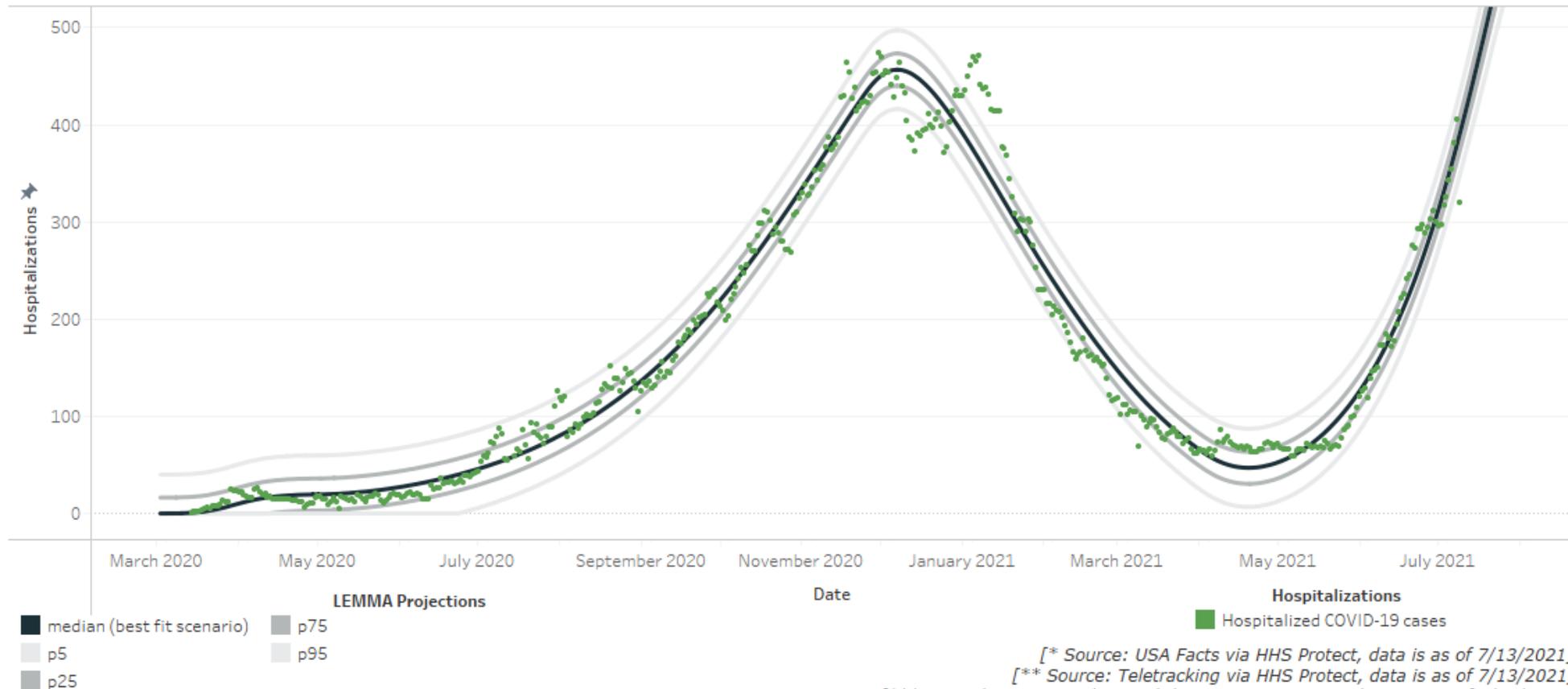
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Hospitalizations

- 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

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)

```
                          Effectively Vaccinated

Susceptible → Exposed → Infectious →                → Removed
                                     Hospitalized

                                 Floor | ICU | Vent
```