State of Missouri regional
COVID-19 hospitalized cases model

March 30, 2021

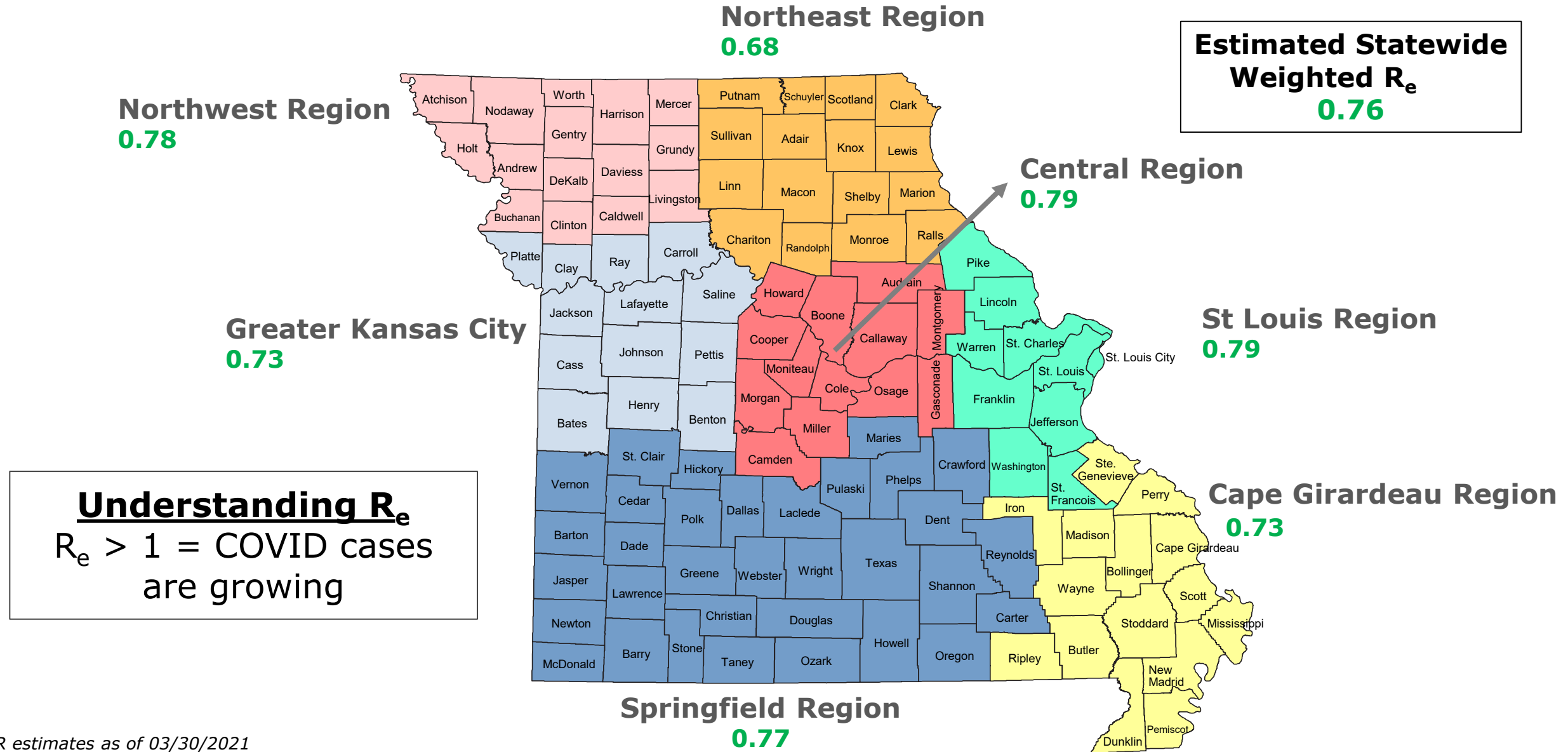# Multiple data points inform Missouri's COVID-19 response

- 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 peaks based on current understanding of policy interventions and human behavior and assumptions about future interventions	Date and magnitude of peaks 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 transmission rate ("R_e") below 1.0 in every Region

Northeast Region
0.68

Northwest Region
0.78

Estimated Statewide Weighted R_e
0.76

Central Region
0.79

Greater Kansas City
0.73

St Louis Region
0.79

Cape Girardeau Region
0.73

Springfield Region
0.77

Understanding R_e
$R_e > 1$ = COVID cases are growing

* R estimates as of 03/30/2021
** This is the first week using the updated LEMMA 2.0 Model. Previous week comparison data is not available.

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Central (Region F)

Overview*	
Population	502,486
Cumulative Cases	46,505
Cumulative Deaths	625
7-day New Cases	305
WoW % Case Change	0.7%

Reproductive Rate**	
Pre-intervention	2.3
Last Week	N/A
Current Week	0.79
WoW % Change	N/A

Bed / Ventilator Availability*	
% ICU Beds Occupied	57%
% ICU Beds Occupied C19	0%
% ICU Beds Free	43%
% Ventilators in use	29%
% Ventilators available	71%

* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Base Case Central Region
Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Apr 11, 2021

Hospitalizations

LEMMA Projections

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

Hospitalizations
- Hospitalized COVID-19 cases
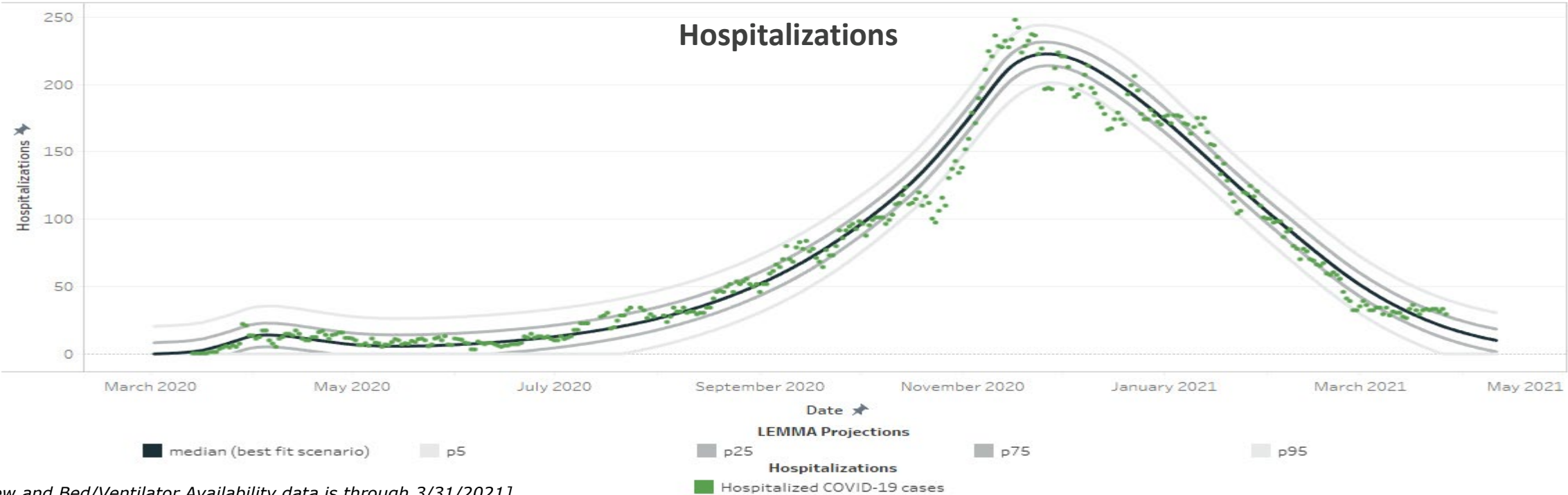
[*Overview and Bed/Ventilator Availability data is through 3/31/2021]
[** Reproductive Rate data and the Region Projection chart are as of 3/30/21. This is the first week using the updated LEMMA 2.0 Model. Previous week comparison data is not available.]

Greater St Louis Area (Region C)

Overview*	
Population	2,229,518
Cumulative Cases	176,304
Cumulative Deaths	3,284
7-day New Cases	2,146
WoW % Case Change	1.2%

Reproductive Rate**	
Pre-intervention	3.39
Last Week	N/A
Current Week	0.79
WoW % Change	N/A

Bed / Ventilator Availability*	
% ICU Beds Occupied	82%
% ICU Beds Occupied C19	6%
% ICU Beds Free	18%
% Ventilators in use	36%
% Ventilators available	64%

* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Base Case St. Louis Region
Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Apr 11, 2021
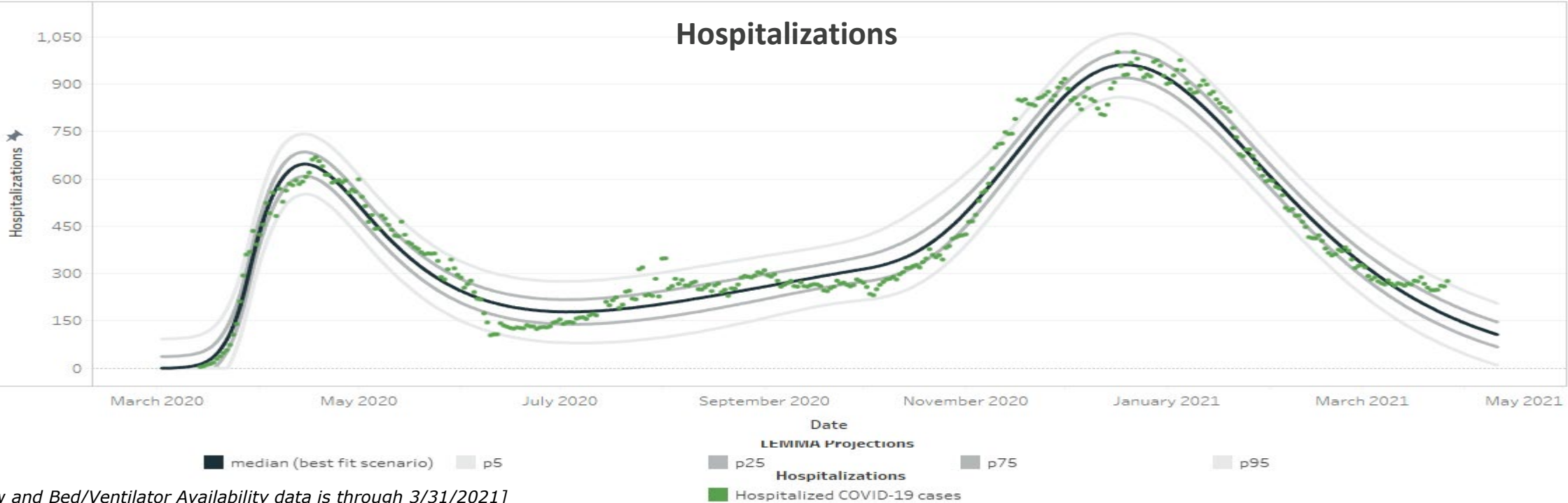
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Greater Kansas City Area (Region A)

Overview*	
Population	1,395,314
Cumulative Cases	107,647
Cumulative Deaths	1,632
7-day New Cases	775
WoW % Case Change	0.7%

Reproductive Rate**	
Pre-intervention	2.8
Last Week	N/A
Current Week	0.73
WoW % Change	N/A

Bed / Ventilator Availability*	
% ICU Beds Occupied	68%
% ICU Beds Occupied C19	5%
% ICU Beds Free	32%
% Ventilators in use	20%
% Ventilators available	80%

* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Base Case Kansas City Region
Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Apr 11, 2021

Hospitalizations

LEMMA Projections

- median (best fit scenario)
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Hospitalizations
- Hospitalized COVID-19 cases

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Northeast (Region B)

Overview*	
Population	179,448
Cumulative Cases	13,491
Cumulative Deaths	201
7-day New Cases	141
WoW % Case Change	1.1%

Reproductive Rate**	
Pre-intervention	N/A
Last Week	N/A
Current Week	0.68
WoW % Change	N/A

Bed / Ventilator Availability*	
% ICU Beds Occupied	58%
% ICU Beds Occupied C19	0%
% ICU Beds Free	42%
% Ventilators in use	5%
% Ventilators available	95%

* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Base Case Northeast Region
Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Apr 11, 2021

Hospitalizations

LEMMA Projections
Hospitalizations

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- p95
- Hospitalized COVID-19 cases
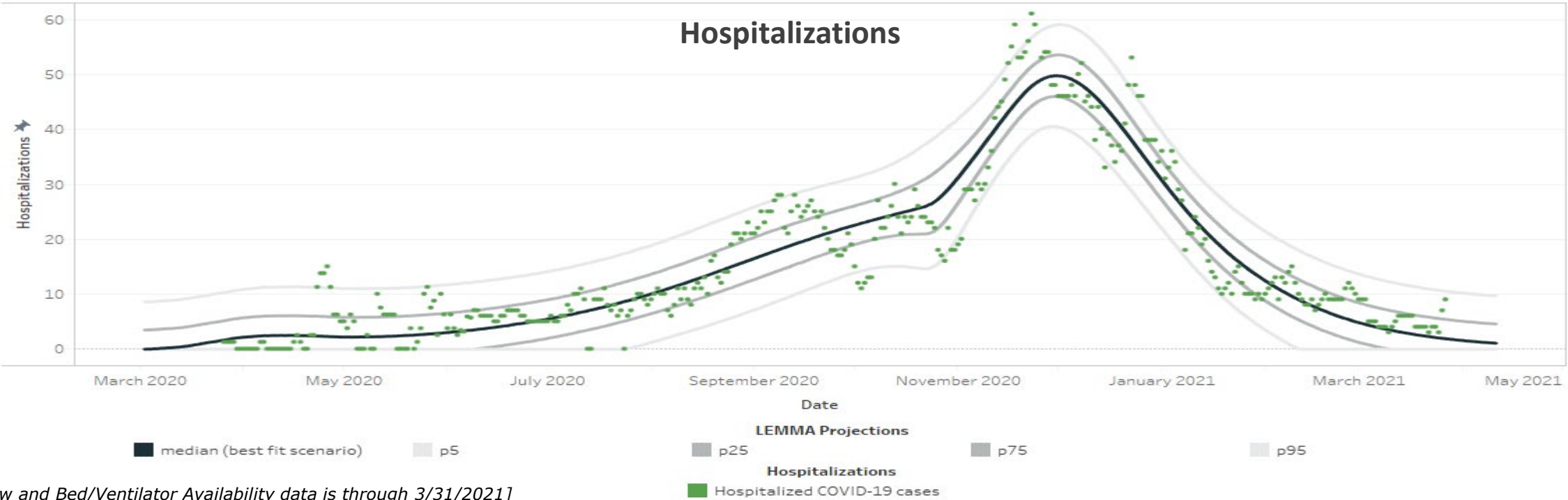
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Northwest (Region H)
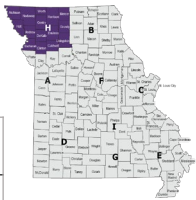
Overview*	
Population	234,361
Cumulative Cases	18,962
Cumulative Deaths	432
7-day New Cases	87
WoW % Case Change	0.5%

Reproductive Rate**	
Pre-intervention	1.24
Last Week	N/A
Current Week	0.78
WoW % Change	N/A

Bed / Ventilator Availability*	
% ICU Beds Occupied	78%
% ICU Beds Occupied C19	0%
% ICU Beds Free	22%
% Ventilators in use	19%
% Ventilators available	81%

* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Base Case Northwest Region
Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Apr 11, 2021

Hospitalizations

LEMMA Projections

■ median (best fit scenario)   p5   p25   p75   p95

Hospitalizations
■ Hospitalized COVID-19 cases
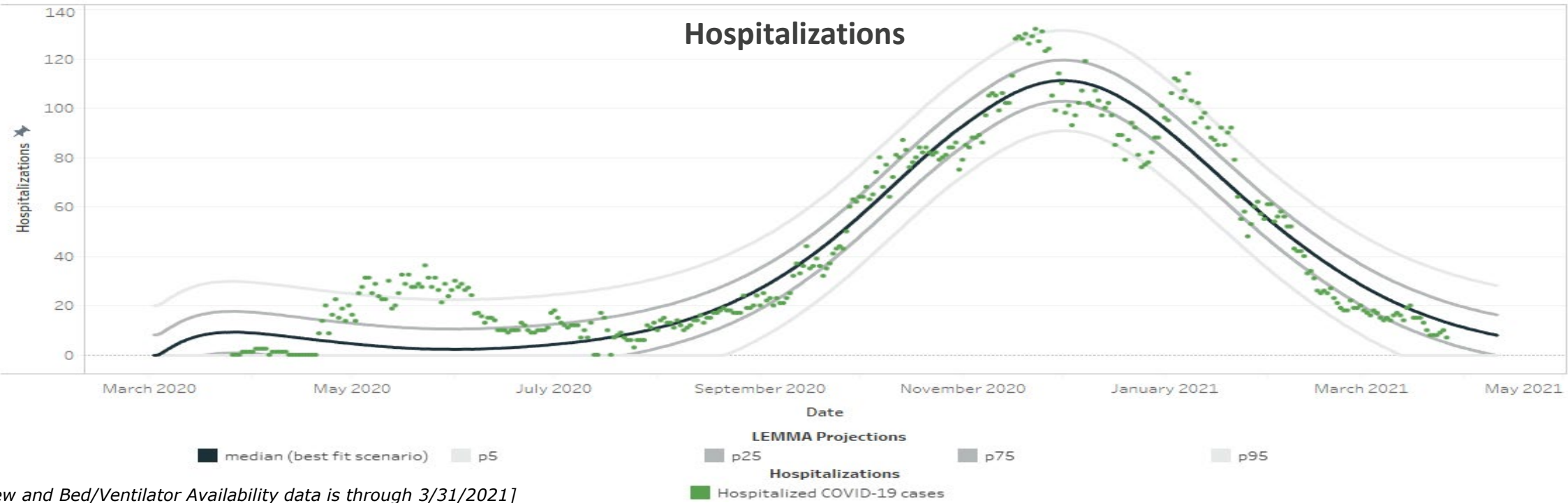
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Southeast / Cape Girardeau (Region E)
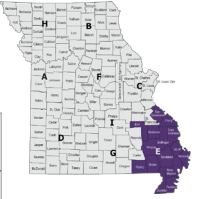
Overview*	
Population	363,478
Cumulative Cases	32,754
Cumulative Deaths	515
7-day New Cases	211
WoW % Case Change	0.6%

Reproductive Rate**	
Pre-intervention	2.61
Last Week	N/A
Current Week	0.73
WoW % Change	N/A

Bed / Ventilator Availability*	
% ICU Beds Occupied	58%
% ICU Beds Occupied C19	3%
% ICU Beds Free	42%
% Ventilators in use	19%
% Ventilators available	81%

* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Base Case Southeast Region
Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Apr 11, 2021

Hospitalizations

LEMMA Projections

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Hospitalizations
- Hospitalized COVID-19 cases
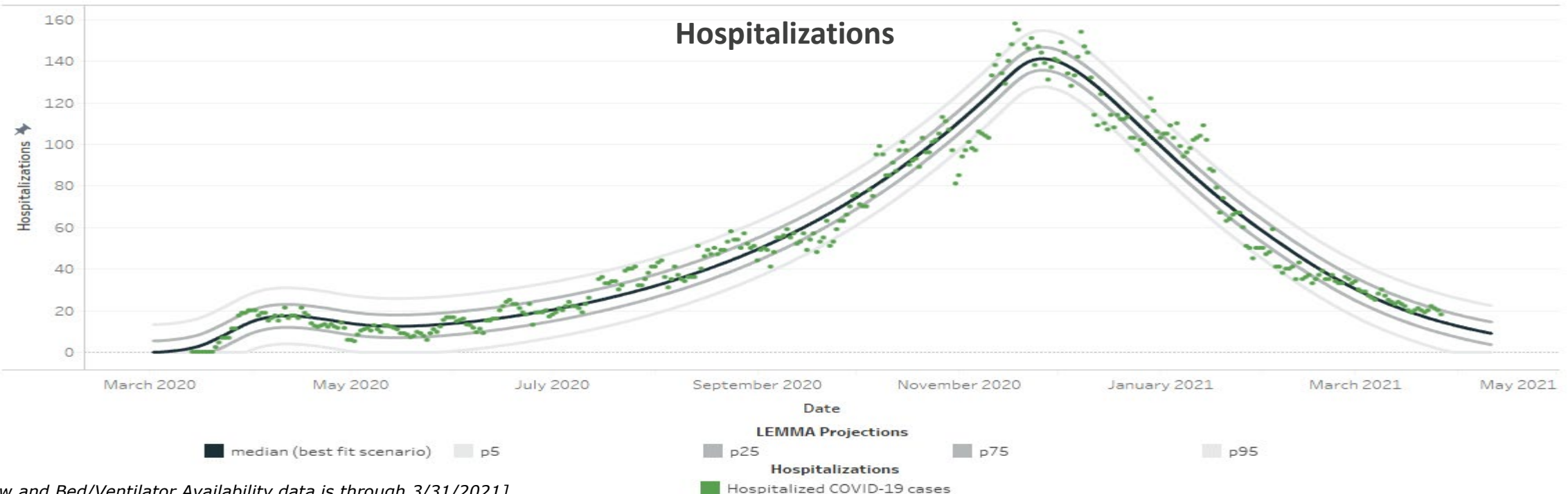
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Southwest / Springfield (Regions D,G, I)
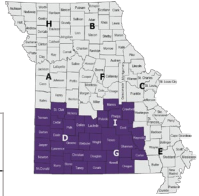
Overview*	
Population	1,221,847
Cumulative Cases	93,724
Cumulative Deaths	1,819
7-day New Cases	713
WoW % Case Change	0.8%

Reproductive Rate**	
Pre-intervention	2.36
Last Week	N/A
Current Week	0.77
WoW % Change	N/A

Bed / Ventilator Availability*	
% ICU Beds Occupied	80%
% ICU Beds Occupied C19	3%
% ICU Beds Free	20%
% Ventilators in use	17%
% Ventilators available	83%

* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Base Case Southwest Region
Model Scenario: Base Case, From Date: Mar 1, 2020. To Date: Apr 11, 2021

Hospitalizations

LEMMA Projections

Hospitalizations

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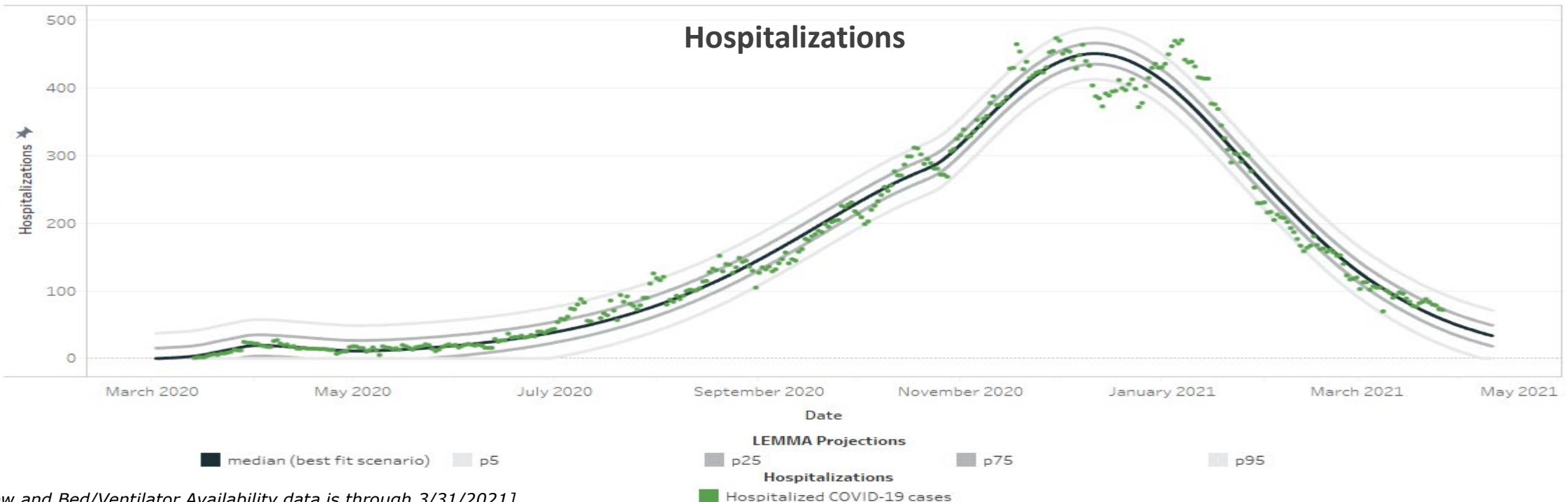
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See FAQs for additional details

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)