

What You Should Know
COVID-19

State of Missouri regional COVID-19 hospitalized cases model

October 28, 2020

Multiple data points inform Missouri's COVID-19 response

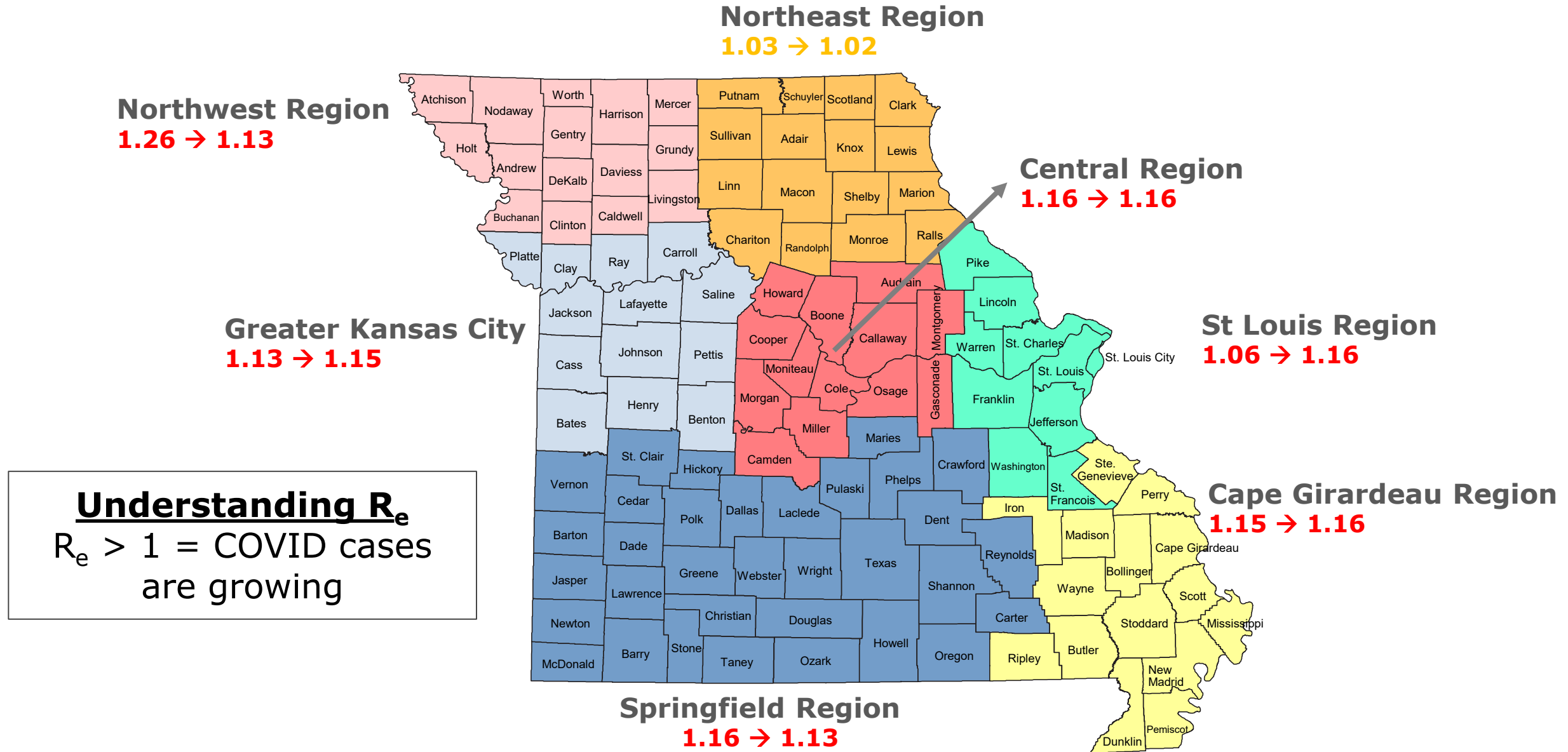
- Syndromic surveillance
- Healthcare system capacity (bed, PPE, and staff availability)
- Testing
- COVID-19 cases and deaths
- Economic and social impact
- Insights from U.S. states, nationally, and other countries
- Evidence from scientific literature
- Mathematical disease modelling

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.

► “ R_e ” rates near or above 1 in nearly every region means the disease is spreading statewide



* Data date range: 10/21/20 - 10/28/202

Central (Region F)



Overview

Population	502,486	
Cumulative Cases	16551	
Cumulative Deaths	150	
7-day New Cases	1641	
WoW % Case Change	11.4%	

Reproductive Rate

Pre-intervention	2.3	
Last Week	1.16	
Current Week	1.16	+/- 0.05
WoW % Change	-0.3%	

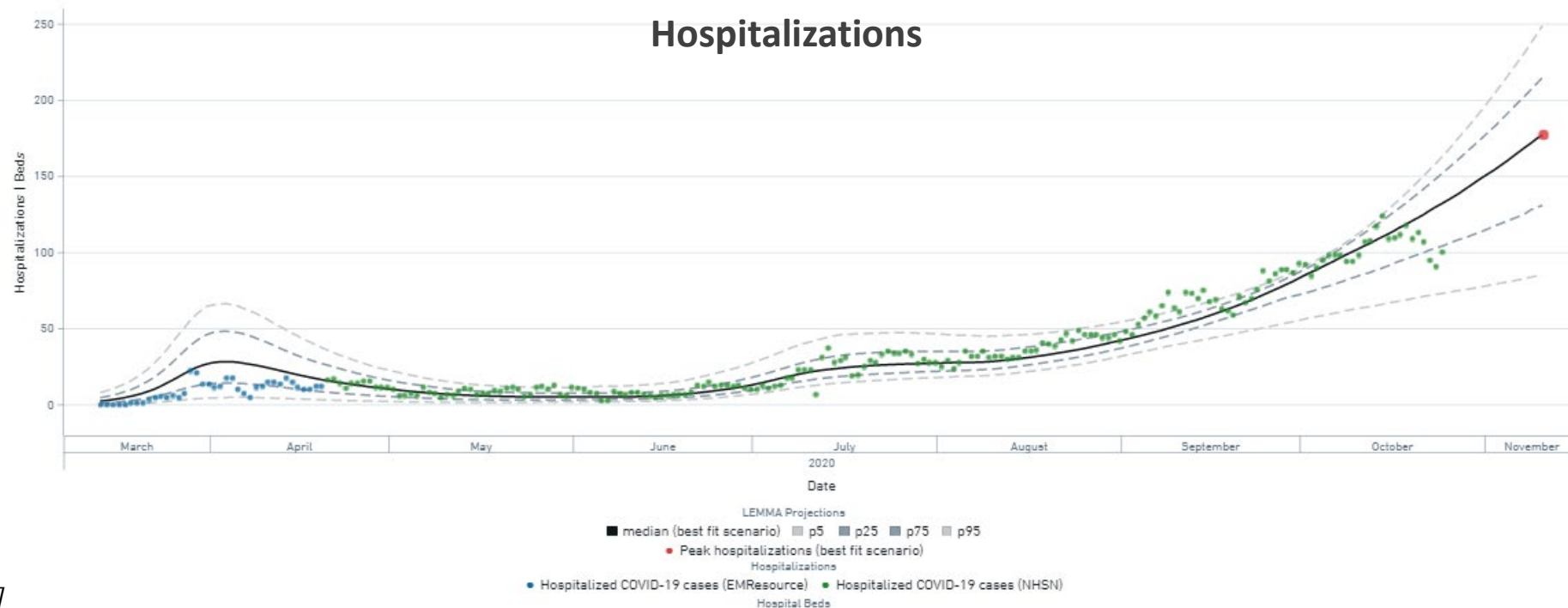
Bed / Ventilator Availability

% ICU Beds Occupied	64%	
% ICU Beds Occupied C19	14%	
% ICU Beds Free	36%	
% Ventilators in use	41%	
% Ventilators available	59%	

Base Case Central Region

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

Model Scenario: Base Case, From Date: Mar 1, 2020, To Date: Nov 11, 2020, + 2 more



Greater Kansas City Area (Region A)



Overview

Population	1,395,314	
Cumulative Cases	36944	
Cumulative Deaths	503	
7-day New Cases	2483	
WoW % Case Change	7.4%	

Reproductive Rate

Pre-intervention	2.8	
Last Week	1.13	
Current Week	1.15	+/- 0.05
WoW % Change	1.6%	

Bed / Ventilator Availability

% ICU Beds Occupied	66%	
% ICU Beds Occupied C19	12%	
% ICU Beds Free	34%	
% Ventilators in use	21%	
% Ventilators available	79%	

Base Case Kansas City Region

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

Model Scenario: Base Case, From Date: Mar 1, 2020, To Date: Nov 11, 2020, + 2 more



Northeast (Region B)



Overview

Population	179,448	
Cumulative Cases	3905	
Cumulative Deaths	32	
7-day New Cases	440	
WoW % Case Change	13.3%	

Reproductive Rate

Pre-intervention	N/A	
Last Week	1.03	
Current Week	1.02	+/- 0.06
WoW % Change	-0.2%	

Bed / Ventilator Availability

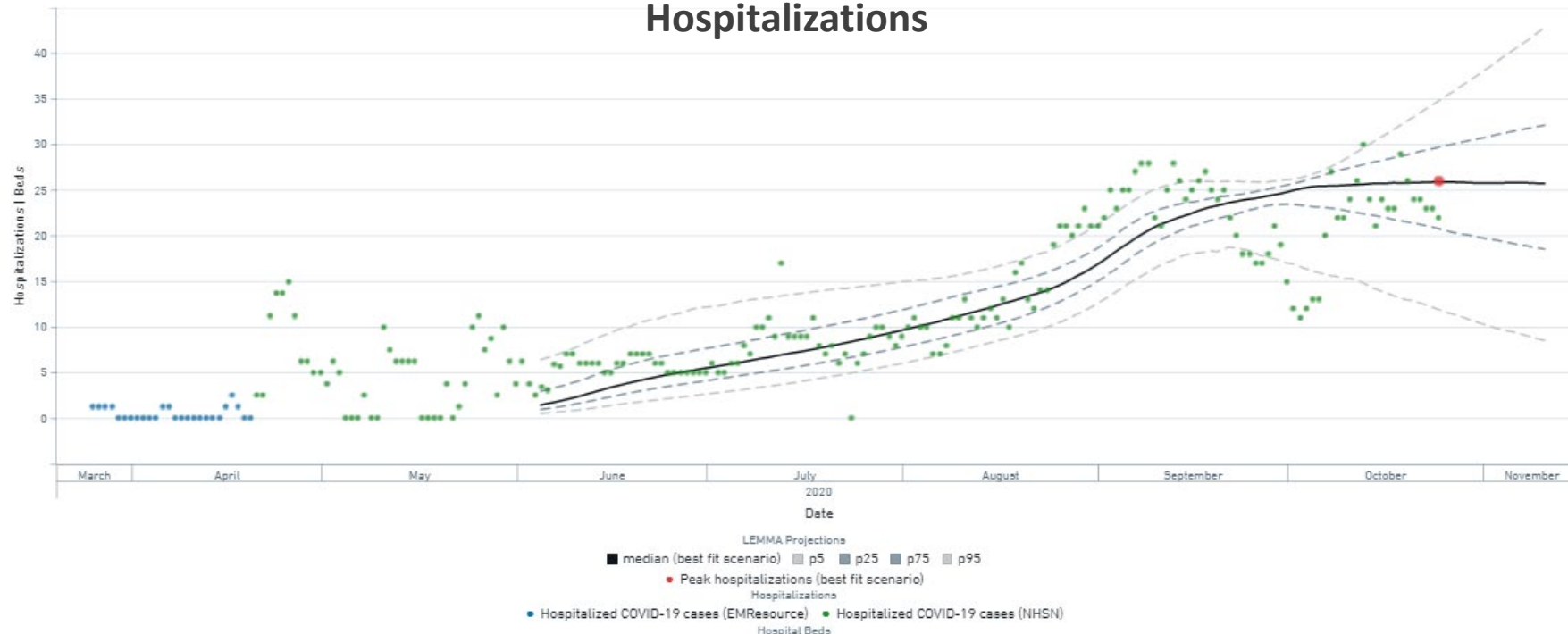
% ICU Beds Occupied	65%	
% ICU Beds Occupied C19	94%	
% ICU Beds Free	35%	
% Ventilators in use	6%	
% Ventilators available	94%	

Base Case Northeast Region

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

Model Scenario: Base Case, From Date: Mar 1, 2020, To Date: Nov 11, 2020, + 2 more

Hospitalizations



Northwest (Region H)



Overview

Population	234,361	
Cumulative Cases	7039	
Cumulative Deaths	117	
7-day New Cases	514	
WoW % Case Change	8.1%	

Reproductive Rate

Pre-intervention	1.24	
Last Week	1.25	
Current Week	1.13	+/- 0.07
WoW % Change	-10.1%	

Bed / Ventilator Availability

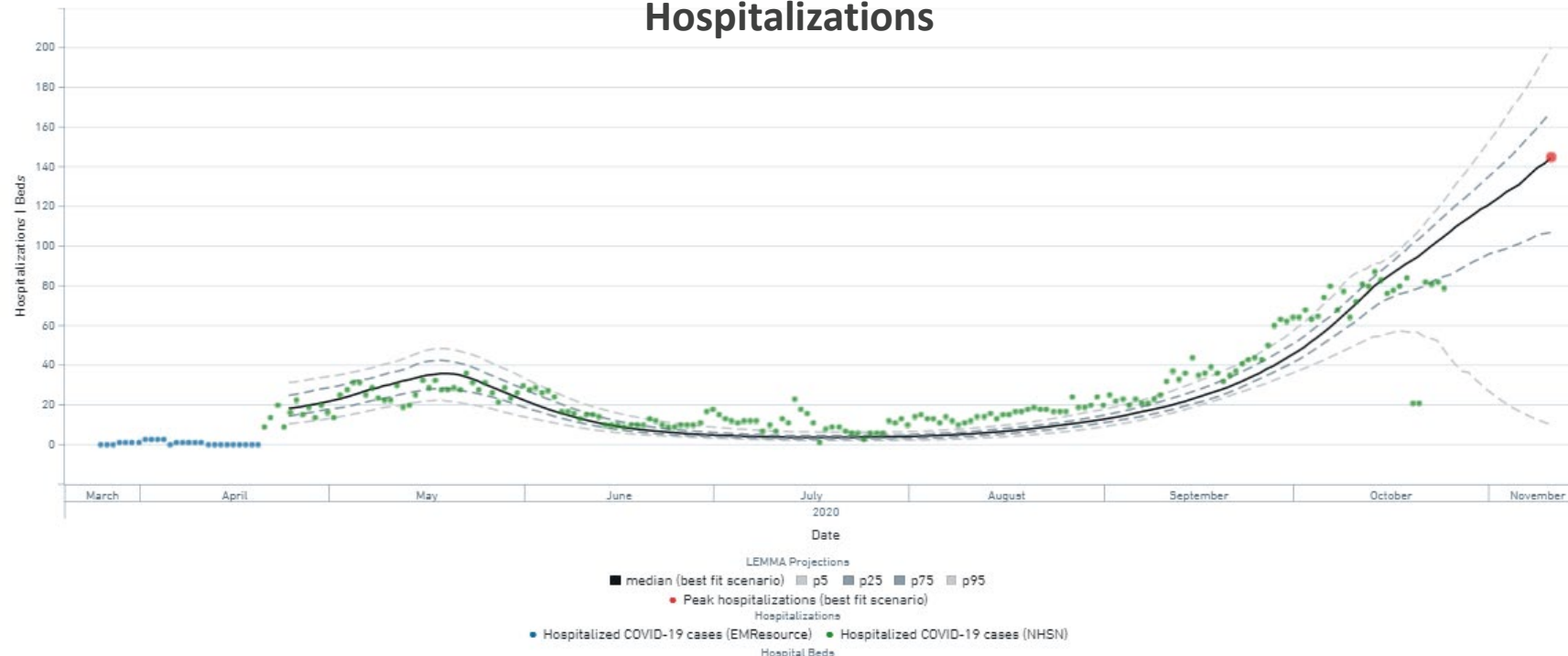
% ICU Beds Occupied	81%	
% ICU Beds Occupied C19	28%	
% ICU Beds Free	19%	
% Ventilators in use	28%	
% Ventilators available	72%	

Base Case Northwest Region

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

Model Scenario: Base Case, From Date: Mar 1, 2020, To Date: Nov 11, 2020, + 2 more

Hospitalizations



Southeast / Cape Girardeau (Region E)



Overview

Population	363,478	
Cumulative Cases	12308	
Cumulative Deaths	169	
7-day New Cases	1236	
WoW % Case Change	11.6%	

Reproductive Rate

Pre-intervention	2.61	
Last Week	1.15	
Current Week	1.16	+/- 0.05
WoW % Change	1.0%	

Bed / Ventilator Availability

% ICU Beds Occupied	63%	
% ICU Beds Occupied C19	24%	
% ICU Beds Free	37%	
% Ventilators in use	36%	
% Ventilators available	64%	

Base Case Southeast Region

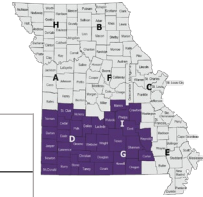
* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients

Model Scenario: Base Case, From Date: Mar 1, 2020, To Date: Nov 11, 2020, + 2 more

Hospitalizations



Southwest / Springfield (Regions D,G, I)



Overview

Population	1,221,847	
Cumulative Cases	36232	
Cumulative Deaths	471	
7-day New Cases	3093	
WoW % Case Change	9.6%	

Reproductive Rate

Pre-intervention	2.36	
Last Week	1.16	
Current Week	1.13	+/- 0.06
WoW % Change	-2.4%	

Bed / Ventilator Availability

% ICU Beds Occupied	67%	
% ICU Beds Occupied C19	22%	
% ICU Beds Free	33%	
% Ventilators in use	28%	
% Ventilators available	72%	

Base Case Southwest Region

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

Model Scenario: Base Case, From Date: Mar 1, 2020, To Date: Nov 11, 2020, - 2 more

Hospitalizations



Greater St Louis Area (Region C)



Overview

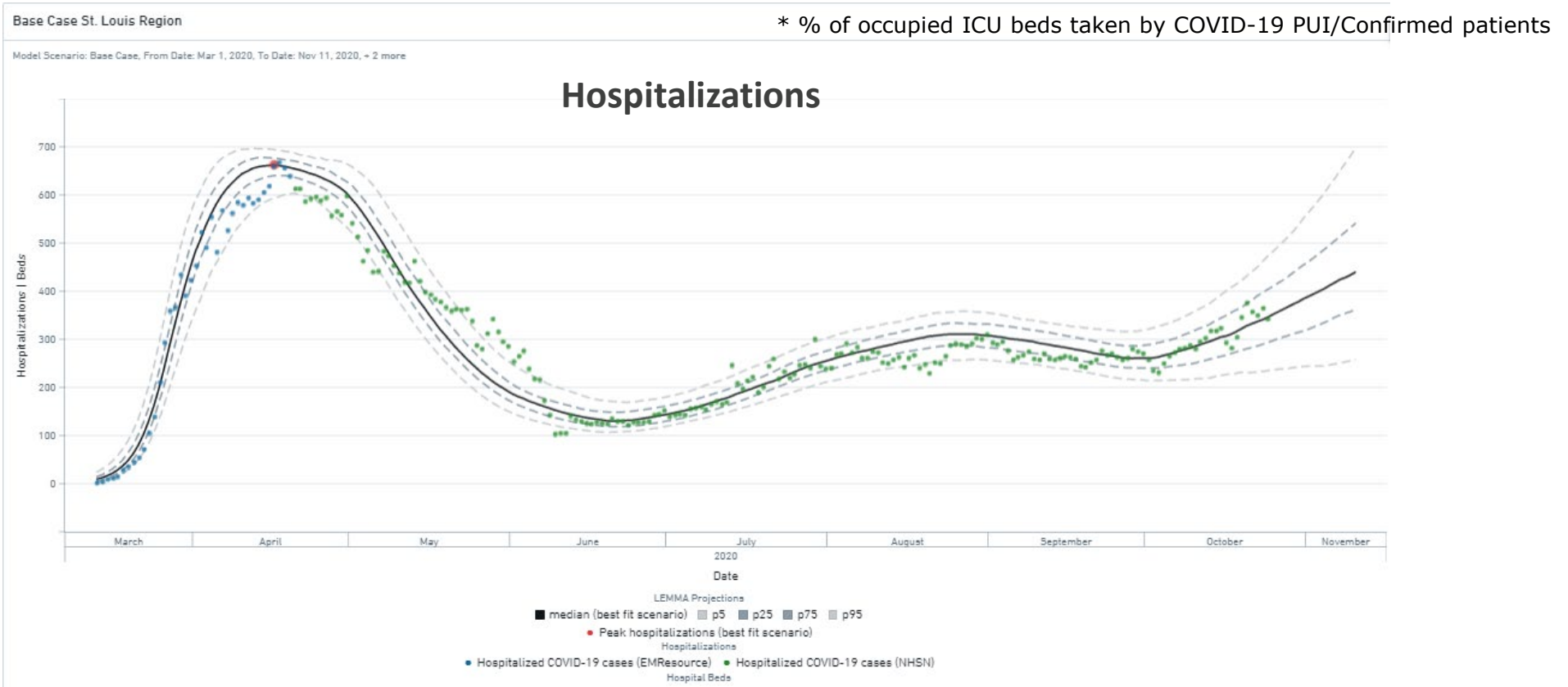
Population	2,229,518	
Cumulative Cases	61653	
Cumulative Deaths	1428	
7-day New Cases	4356	
WoW % Case Change	7.8%	

Reproductive Rate

Pre-intervention	3.39	
Last Week	1.06	
Current Week	1.16	+/- 0.03
WoW % Change	10.2%	

Bed / Ventilator Availability

% ICU Beds Occupied	70%	
% ICU Beds Occupied C19	15%	
% ICU Beds Free	30%	
% Ventilators in use	39%	
% Ventilators available	61%	



See FAQs for additional details

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

Version 1.0, As of June 3, 2020

Missouri RECOVERY PLAN

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
    S[Susceptible] --> E[Exposed]
    E --> I[Infectious]
    I --> R[Removed]
    I --> H[Hospitalized]
    H --> F[Floor]
    H --> ICU[ICU]
    H --> V[Vent]
        
```

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 much uncertainty about how best to control the epidemic. Decision makers must make the best possible decisions with the available information at hand.

Mathematical models are commonly used to make projections of 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., Imperial College, Harvard, [UW-Madison](#)). However, these generally do not incorporate key local or regional inputs, such as variations in local population demographics, healthcare system

Missouri RECOVERY PLAN

Northeast MO)?

Low levels of daily COVID-19 hospitalizations in the Northeast and Northwest regions limit the ability to generate projections for these regions. In particular, the numbers of hospitalized cases have been so low that

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
- **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)

