Show Me Strong RECOVERY PLAN

What You Should Know COVID-19

State of Missouri regional COVID-19 hospitalized cases model

January 5, 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
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.

Transmission rates ("R_e") in several regions remain above 1

Northeast Region
0.95 -> 0.95

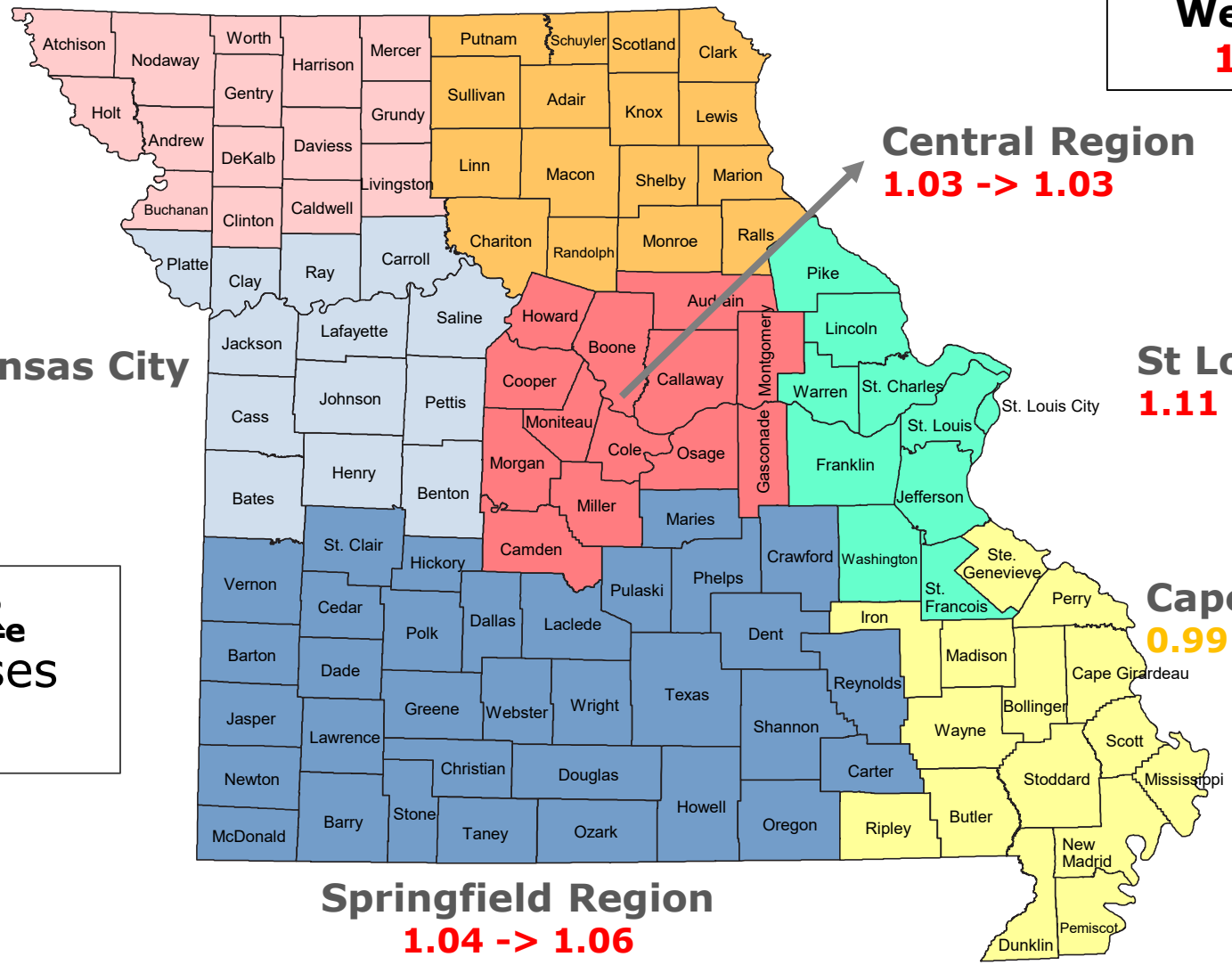
Estimated Statewide Weighted R_e
1.07 -> 1.08

Northwest Region
0.92 -> 1.03

Central Region
1.03 -> 1.03

Greater Kansas City
1.13 -> 1.13

St Louis Region
1.11 -> 1.11



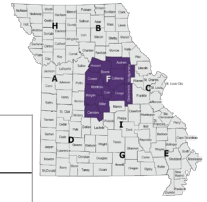
Cape Girardeau Region
0.99 -> 1.02

Springfield Region
1.04 -> 1.06

Understanding R_e
R_e > 1 = COVID cases are growing

** Data date range: 12/29/20 - 01/04/21*

Central (Region F)

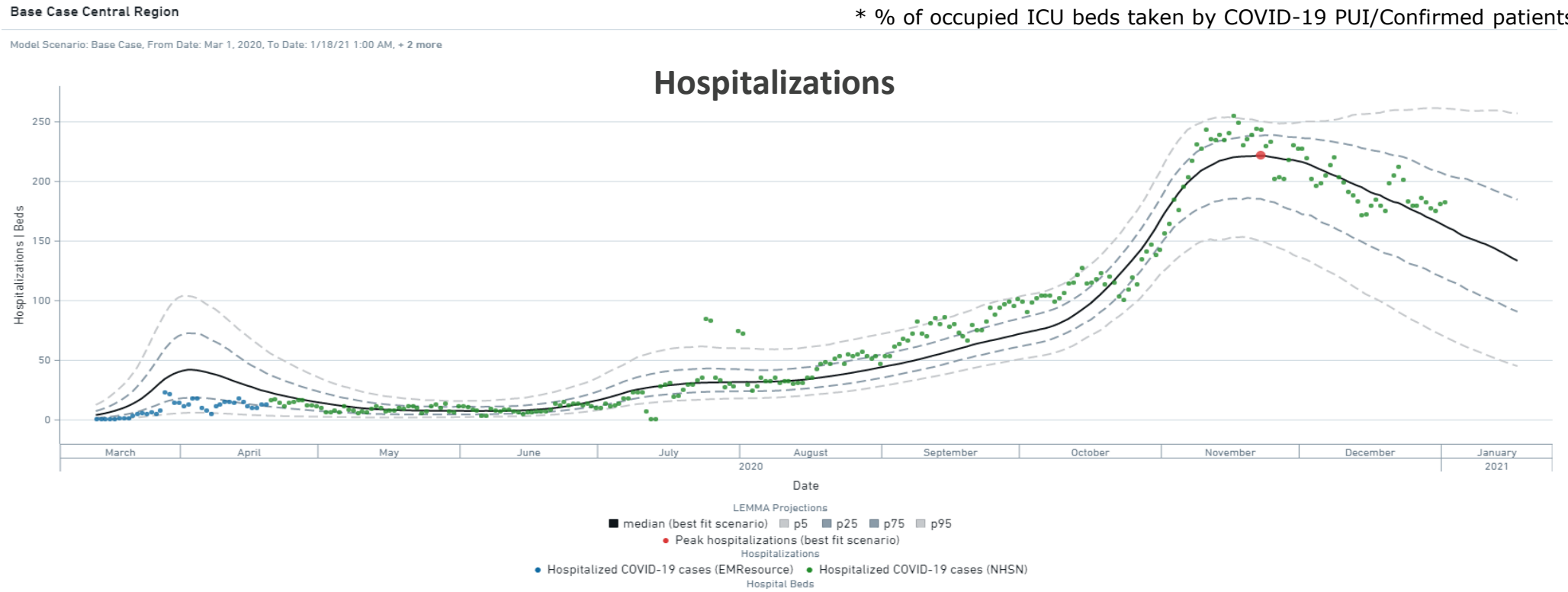


Overview		
Population	502,486	
Cumulative Cases	36473	
Cumulative Deaths	345	
7-day New Cases	-1011	
WoW % Case Change	-2.7%	

Reproductive Rate		
Pre-intervention	2.3	
Last Week	1.03	
Current Week	1.031	+/- 0.05
WoW % Change	0.1%	

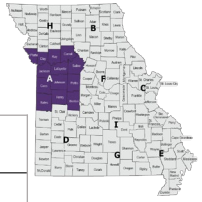
Bed / Ventilator Availability		
% ICU Beds Occupied	65%	
% ICU Beds Occupied C19	16%	
% ICU Beds Free	35%	
% Ventilators in use	34%	
% Ventilators available	66%	

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



[Data updated 01/05/21]

Greater Kansas City Area (Region A)

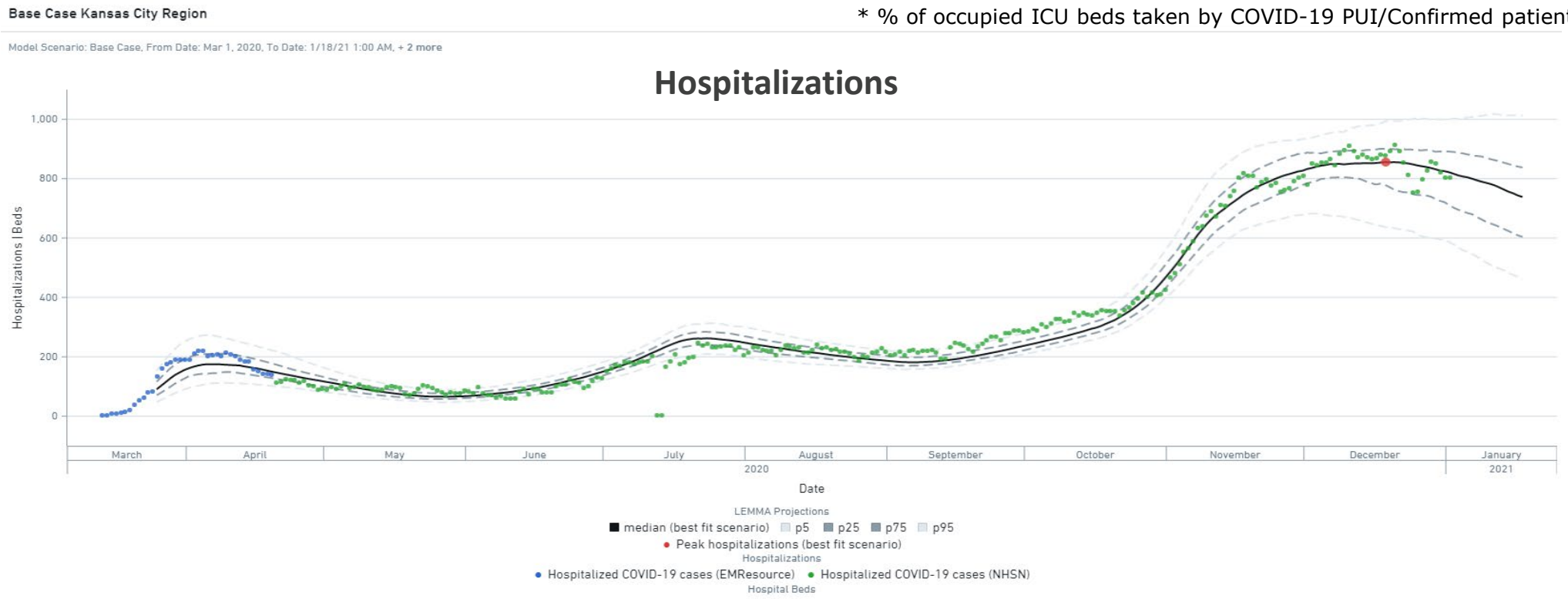


Overview		
Population	1,395,314	
Cumulative Cases	77820	
Cumulative Deaths	873	
7-day New Cases	-2671	
WoW % Case Change	-3.3%	

Reproductive Rate		
Pre-intervention	2.8	
Last Week	1.129	
Current Week	1.13	+/- 0.05
WoW % Change	0.1%	

Bed / Ventilator Availability		
% ICU Beds Occupied	83%	
% ICU Beds Occupied C19	21%	
% ICU Beds Free	17%	
% Ventilators in use	32%	
% Ventilators available	68%	

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



[Data updated 01/05/21]

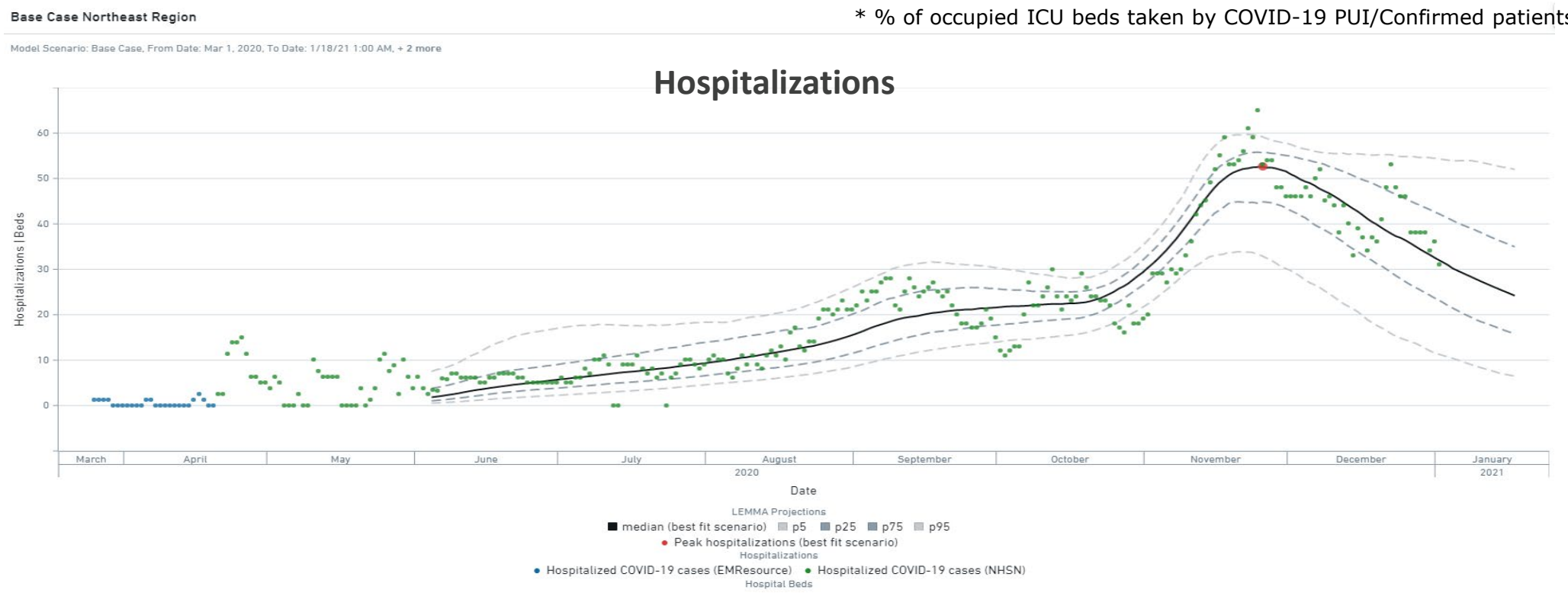
Northeast (Region B)

Overview		
Population	179,448	
Cumulative Cases	10210	
Cumulative Deaths	91	
7-day New Cases	-360	
WoW % Case Change	-3.4%	

Reproductive Rate		
Pre-intervention	N/A	
Last Week	0.954	
Current Week	0.953	+/- 0.06
WoW % Change	-0.1%	

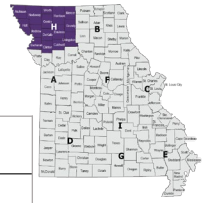
Bed / Ventilator Availability		
% ICU Beds Occupied	67%	
% ICU Beds Occupied C19	50%	
% ICU Beds Free	33%	
% Ventilators in use	25%	
% Ventilators available	75%	

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



[Data updated 01/05/21]

Northwest (Region H)

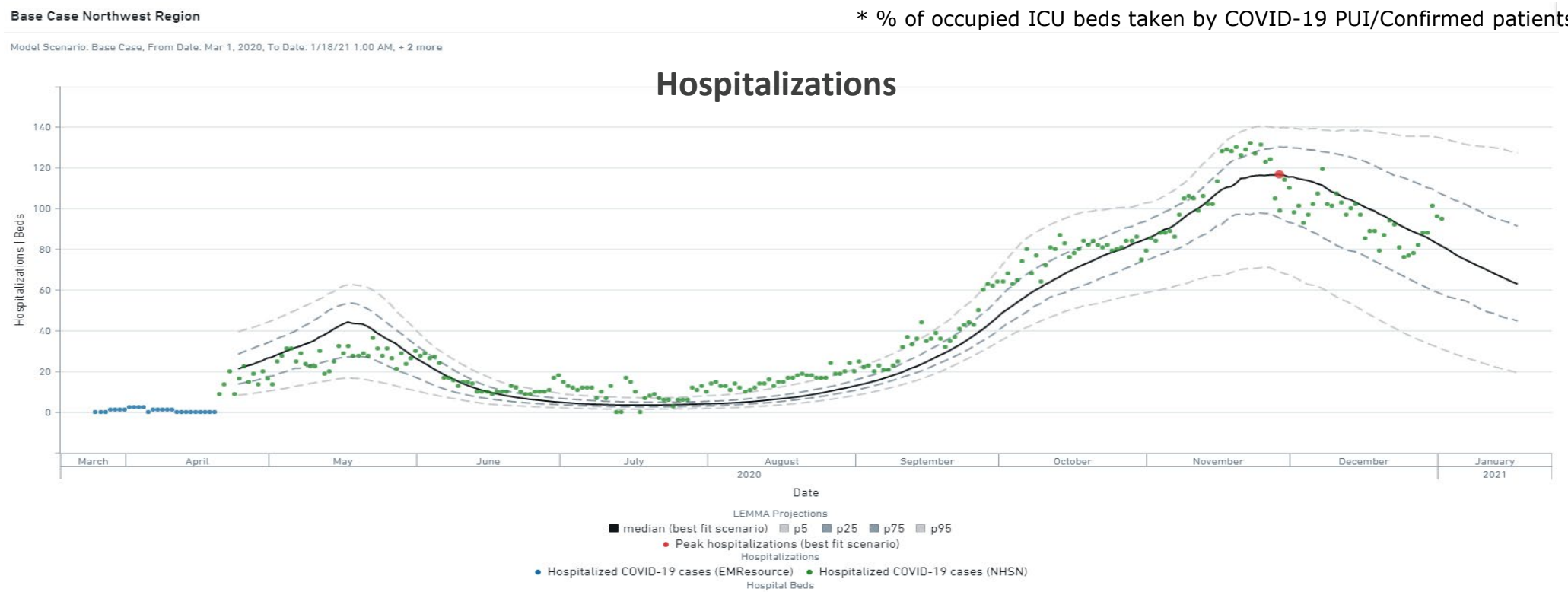


Overview		
Population	234,361	
Cumulative Cases	14865	
Cumulative Deaths	267	
7-day New Cases	-392	
WoW % Case Change	-2.6%	

Reproductive Rate		
Pre-intervention	1.24	
Last Week	0.918	
Current Week	1.028	+/- 0.07
WoW % Change	12.0%	

Bed / Ventilator Availability		
% ICU Beds Occupied	63%	
% ICU Beds Occupied C19	30%	
% ICU Beds Free	37%	
% Ventilators in use	21%	
% Ventilators available	79%	

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



[Data updated 01/05/21]

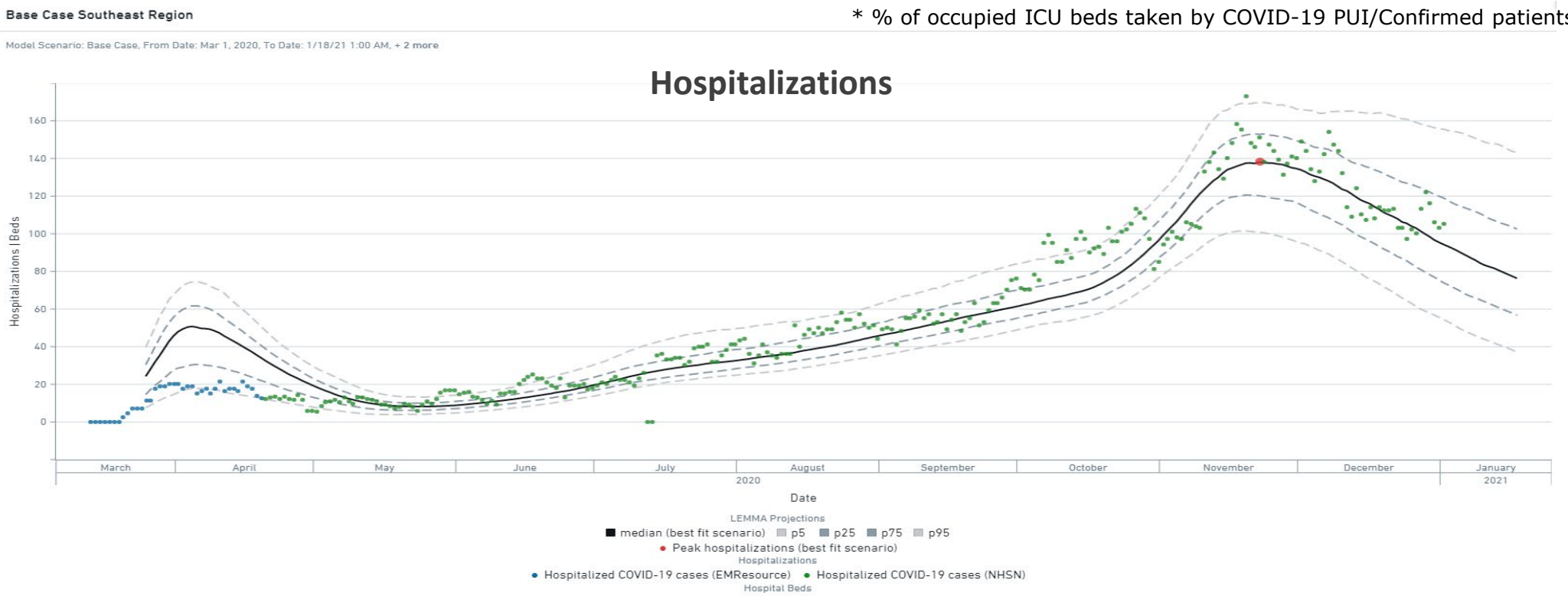
Southeast / Cape Girardeau (Region E)

Overview		
Population	363,478	
Cumulative Cases	26330	
Cumulative Deaths	308	
7-day New Cases	-628	
WoW % Case Change	-2.3%	

Reproductive Rate		
Pre-intervention	2.61	
Last Week	0.994	
Current Week	1.016	+/- 0.05
WoW % Change	2.2%	

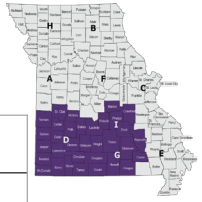
Bed / Ventilator Availability		
% ICU Beds Occupied	66%	
% ICU Beds Occupied C19	16%	
% ICU Beds Free	34%	
% Ventilators in use	28%	
% Ventilators available	72%	

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



[Data updated 01/05/21]

Southwest / Springfield (Regions D,G, I)

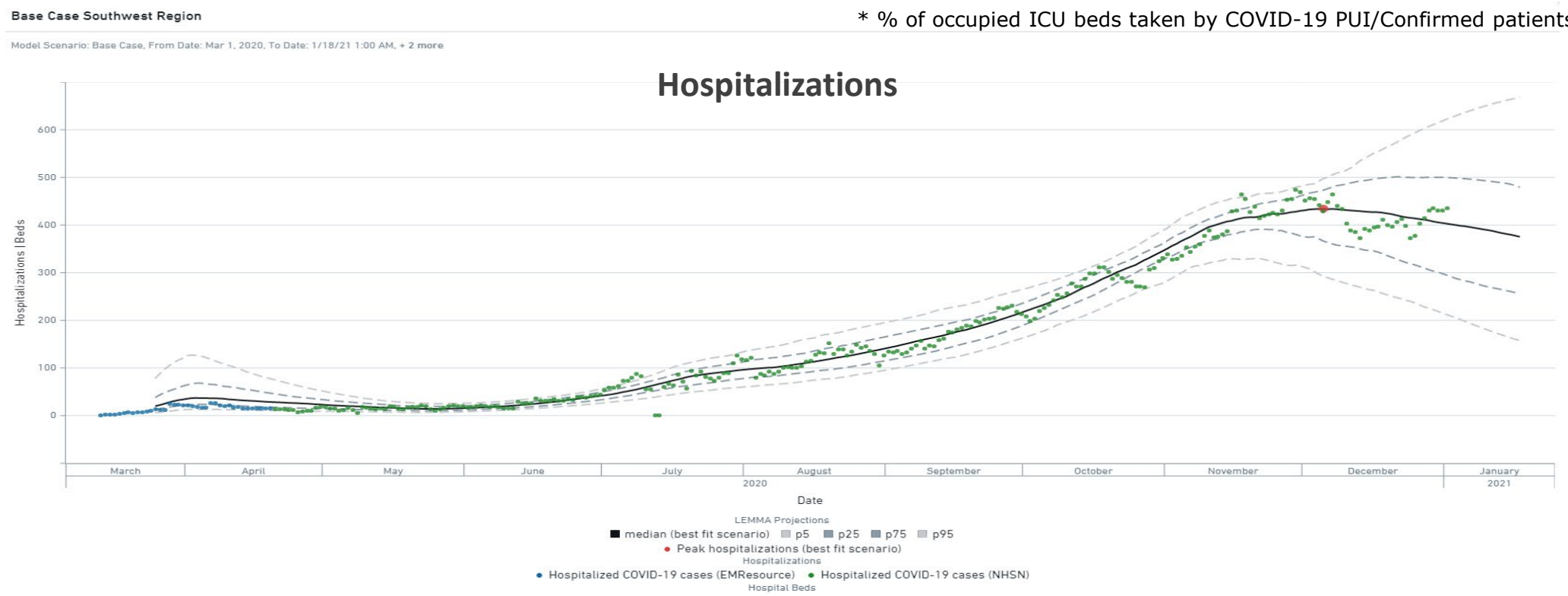


Overview		
Population	1,221,847	
Cumulative Cases	69534	
Cumulative Deaths	1011	
7-day New Cases	-2393	
WoW % Case Change	-3.3%	

Reproductive Rate		
Pre-intervention	2.36	
Last Week	1.041	
Current Week	1.062	+/- 0.06
WoW % Change	2.0%	

Bed / Ventilator Availability		
% ICU Beds Occupied	80%	
% ICU Beds Occupied C19	33%	
% ICU Beds Free	20%	
% Ventilators in use	31%	
% Ventilators available	69%	

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



[Data updated 01/05/21]

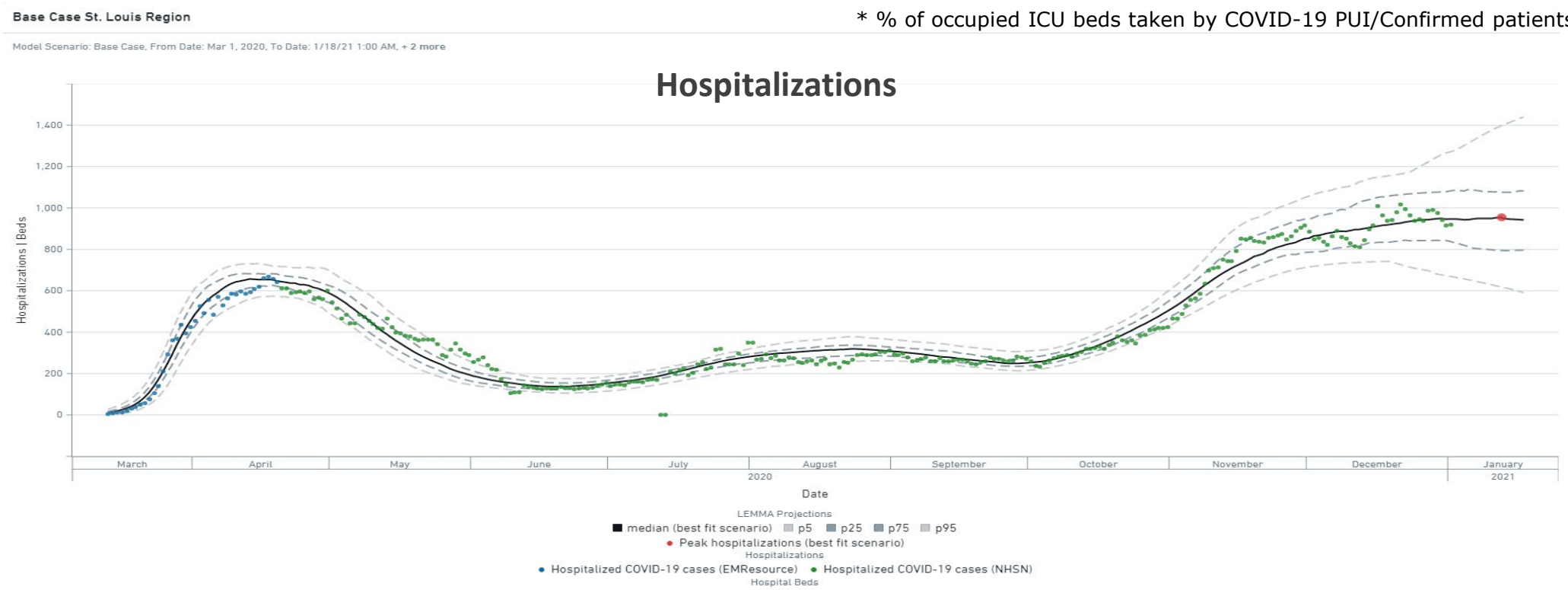
Greater St Louis Area (Region C)

Overview		
Population	2,229,518	
Cumulative Cases	129954	
Cumulative Deaths	2042	
7-day New Cases	-4170	
WoW % Case Change	-3.1%	

Reproductive Rate		
Pre-intervention	3.39	
Last Week	1.106	
Current Week	1.106	+/- 0.03
WoW % Change	0.0%	

Bed / Ventilator Availability		
% ICU Beds Occupied	76%	
% ICU Beds Occupied C19	19%	
% ICU Beds Free	24%	
% Ventilators in use	38%	
% Ventilators available	62%	

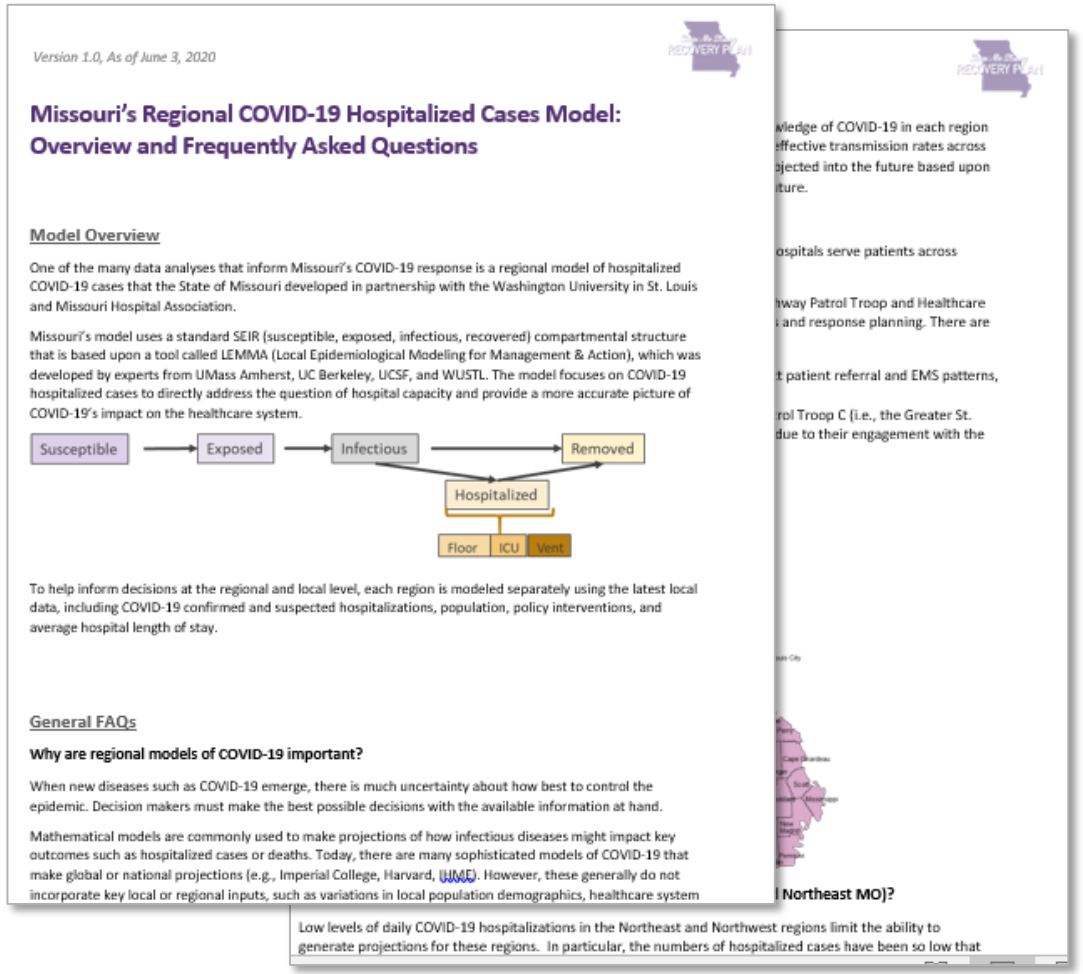
* % of occupied ICU beds taken by COVID-19 PUI/Confirmed patients



[Data updated 01/05/21]

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'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.

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, IHME). However, these generally do not incorporate key local or regional inputs, such as variations in local population demographics, healthcare system

wledge of COVID-19 in each region
effective transmission rates across
jected into the future based upon
ture.

ospitals serve patients across

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and response planning. There are

t patient referral and EMS patterns,

rol Troop C (i.e., the Greater St.
due to their engagement with the

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)