State of Missouri regional COVID-19 hospitalized cases model

April 20, 2021

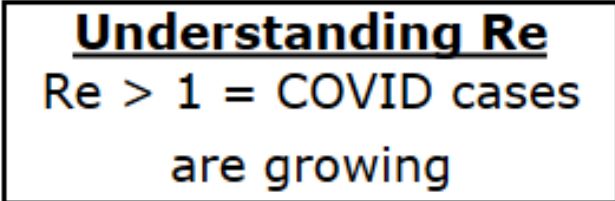# Multiple data points inform Missouri's COVID-19 response

- 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.
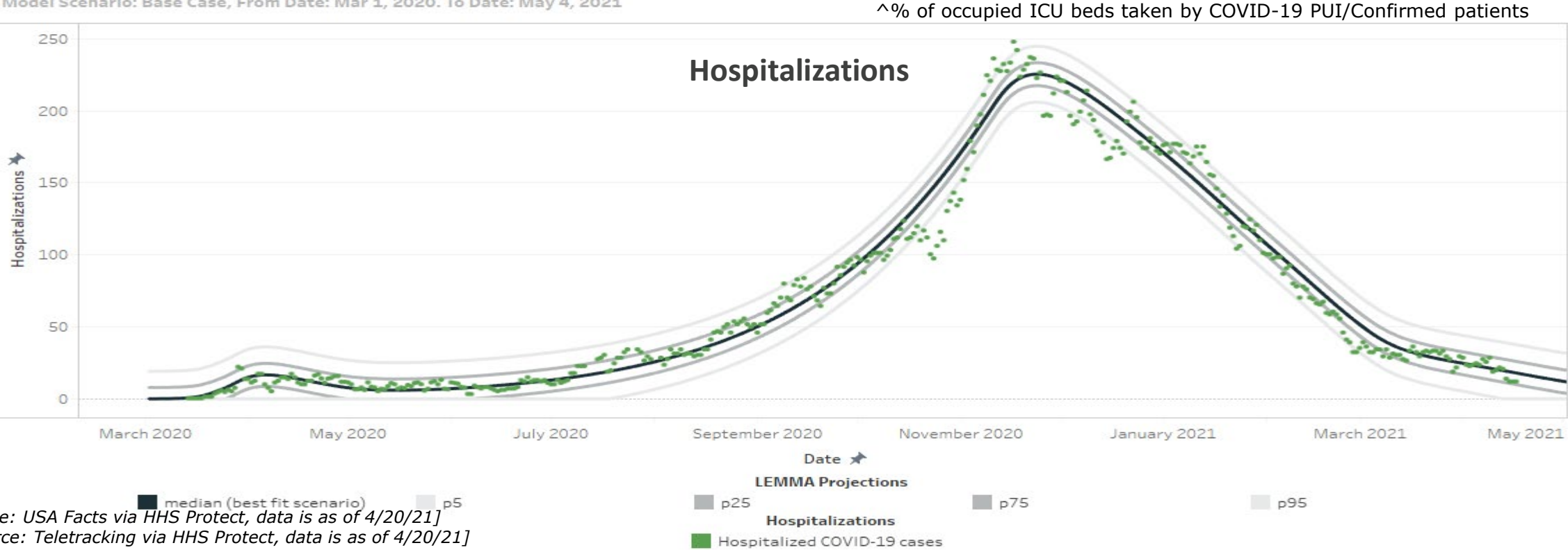
Show Me Strong
RECOVERY PLAN

Statewide transmission rate ("R_e") remains below 1.0

Northwest Region

0.79 ➝ 0.78

Northeast Region

0.62 ➝ 0.62

Estimated Statewide Weighted R_e

0.94 ➝ 0.93

Central Region

0.96 ➝ 0.92

St. Louis Region

1.13 ➝ 1.09

Greater Kansas City

0.88 ➝ 0.96

Cape Girardeau Region

0.71 ➝ 0.70

Understanding Re

Re > 1 = COVID cases are growing

Springfield Region

0.80 ➝ 0.74

LEMMA Model as of 4/20/2021

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Central (Region F)

Overview	
Population	502,486
Cumulative Cases	51,400
Cumulative Deaths	633
7-day New Cases	-392
WoW % Case Change	-0.8%

Reproductive Rate	
Pre-intervention	2.3
Last Week	0.96
Current Week	0.92
WoW % Change	-4.0%

Bed / Ventilator Availability	
% ICU Beds Occupied	61%
% ICU Beds Occupied C19	1%
% ICU Beds Free	39%
% 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: May 4, 2021

Hospitalizations

LEMMA Projections

median (best fit scenario)   p5   p25   p75   p95

Hospitalizations
Hospitalized COVID-19 cases

[* Source: USA Facts via HHS Protect, data is as of 4/20/21]
[** Source: Teletracking via HHS Protect, data is as of 4/20/21]
[*** Reproductive Rate data and the Region Projection chart are as of 4/20/21]

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Greater St Louis Area (Region C)

Overview	
Population	2,229,518
Cumulative Cases	209,479
Cumulative Deaths	3,363
7-day New Cases	-1,442
WoW % Case Change	-0.7%

Reproductive Rate	
Pre-intervention	3.39
Last Week	1.13
Current Week	1.09
WoW % Change	-3.5%

Bed / Ventilator Availability	
% ICU Beds Occupied	79%
% ICU Beds Occupied C19	6%
% ICU Beds Free	21%
% Ventilators in use	33%
% Ventilators available	67%

^% 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: May 4, 2021
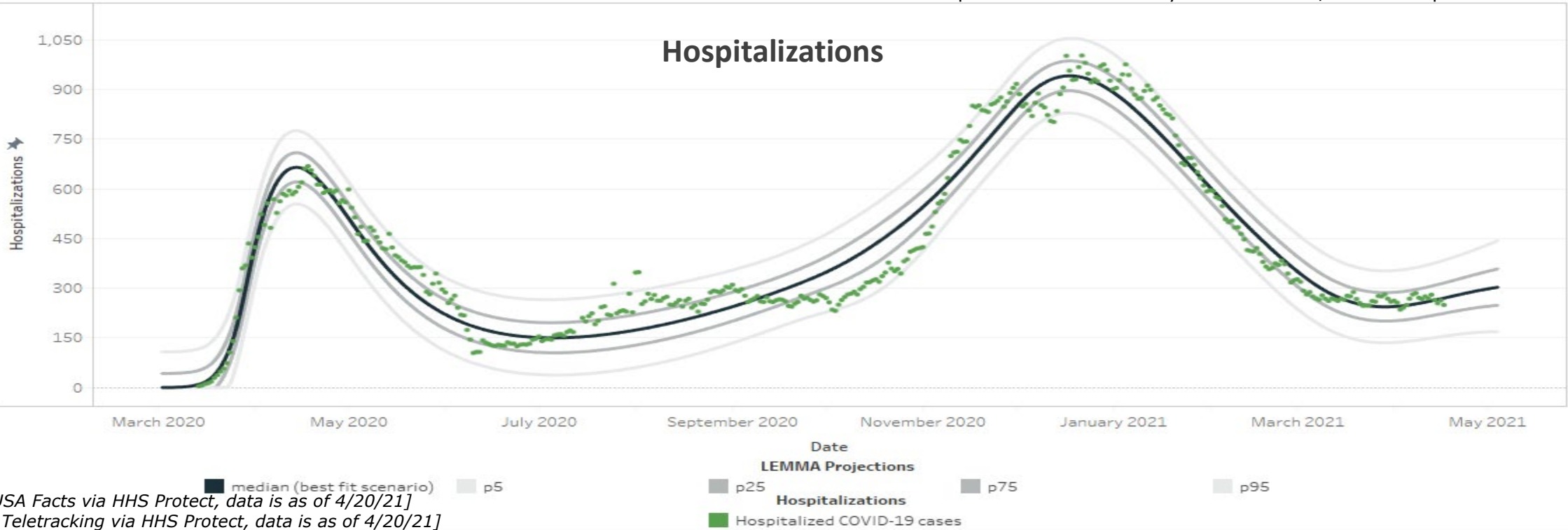
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[** Source: Teletracking via HHS Protect, data is as of 4/20/21]
[*** Reproductive Rate data and the Region Projection chart are as of 4/20/21]

Greater Kansas City Area (Region A)

Overview	
Population	1,395,314
Cumulative Cases	125,850
Cumulative Deaths	1,670
7-day New Cases	-2,138
WoW % Case Change	-1.7%

Reproductive Rate	
Pre-intervention	2.8
Last Week	0.88
Current Week	0.96
WoW % Change	9.2%

Bed / Ventilator Availability	
% ICU Beds Occupied	74%
% ICU Beds Occupied C19	5%
% ICU Beds Free	26%
% 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: May 4, 2021

Hospitalizations

LEMMA Projections

legend: median (best fit scenario), p5, p25, p75, p95
Hospitalizations
Hospitalized COVID-19 cases

Northeast (Region B)
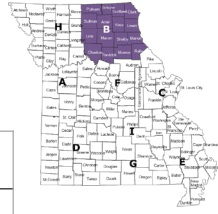
Overview	
Population	179,448
Cumulative Cases	18,326
Cumulative Deaths	207
7-day New Cases	-478
WoW % Case Change	-2.5%

Reproductive Rate	
Pre-intervention	N/A
Last Week	0.62
Current Week	0.62
WoW % Change	-0.5%

Bed / Ventilator Availability	
% ICU Beds Occupied	35%
% ICU Beds Occupied C19	8%
% ICU Beds Free	65%
% Ventilators in use	10%
% Ventilators available	90%

^% 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: May 4, 2021

Hospitalizations

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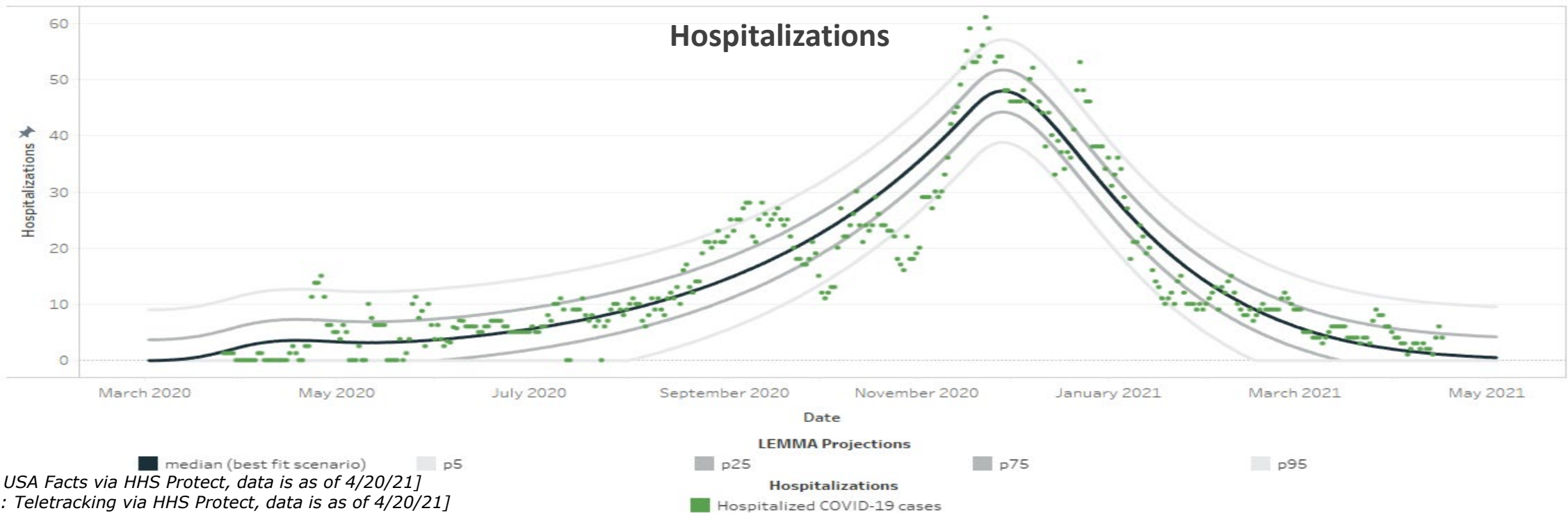
Northwest (Region H)
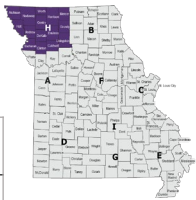
Overview	
Population	234,361
Cumulative Cases	23,523
Cumulative Deaths	437
7-day New Cases	-586
WoW % Case Change	-2.4%

Reproductive Rate	
Pre-intervention	1.24
Last Week	0.79
Current Week	0.78
WoW % Change	-1.4%

Bed / Ventilator Availability	
% ICU Beds Occupied	72%
% ICU Beds Occupied C19	3%
% ICU Beds Free	28%
% Ventilators in use	14%
% Ventilators available	86%

^% 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: May 4, 2021

Hospitalizations

LEMMA Projections

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

Hospitalizations

■ Hospitalized COVID-19 cases
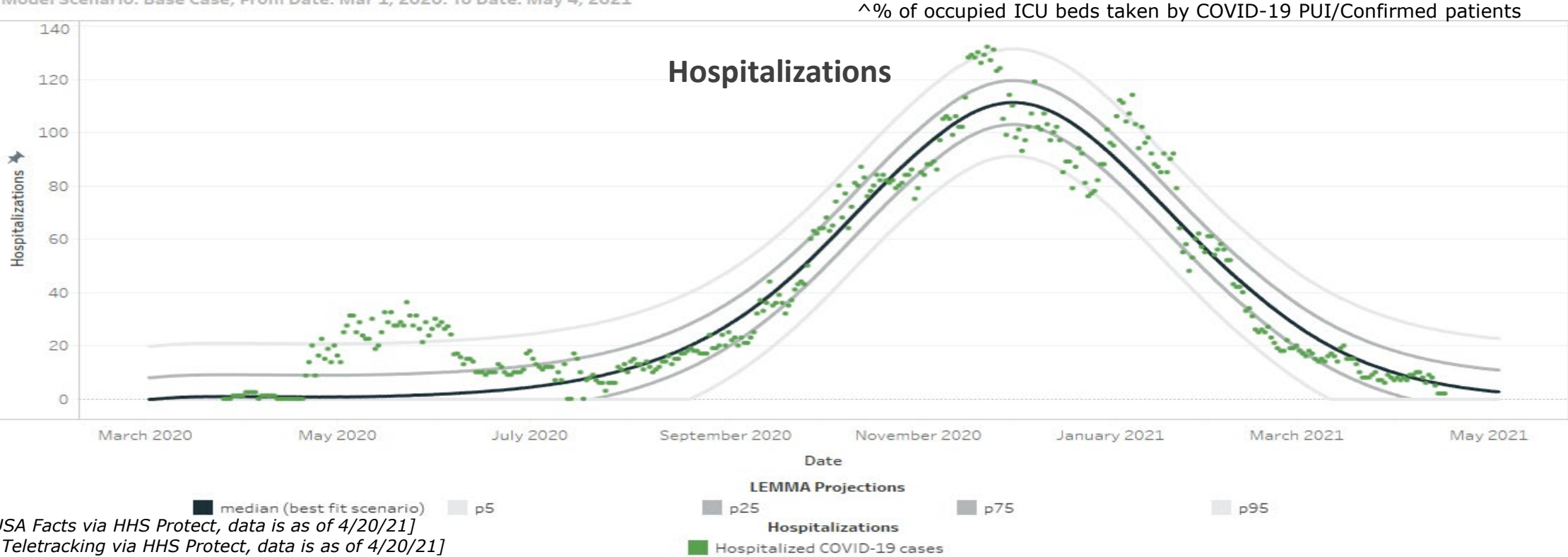
Southeast / Cape Girardeau (Region E)
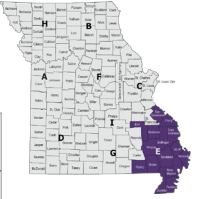
Overview	
Population	363,478
Cumulative Cases	37,489
Cumulative Deaths	525
7-day New Cases	-558
WoW % Case Change	-1.5%

Reproductive Rate	
Pre-intervention	2.61
Last Week	0.71
Current Week	0.70
WoW % Change	-1.7%

Bed / Ventilator Availability	
% ICU Beds Occupied	50%
% ICU Beds Occupied C19	0%
% ICU Beds Free	50%
% 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: May 4, 2021

Hospitalizations

LEMMA Projections

Hospitalizations

- median (best fit scenario)
- p5
- p25
- p75
- p95
- Hospitalized COVID-19 cases

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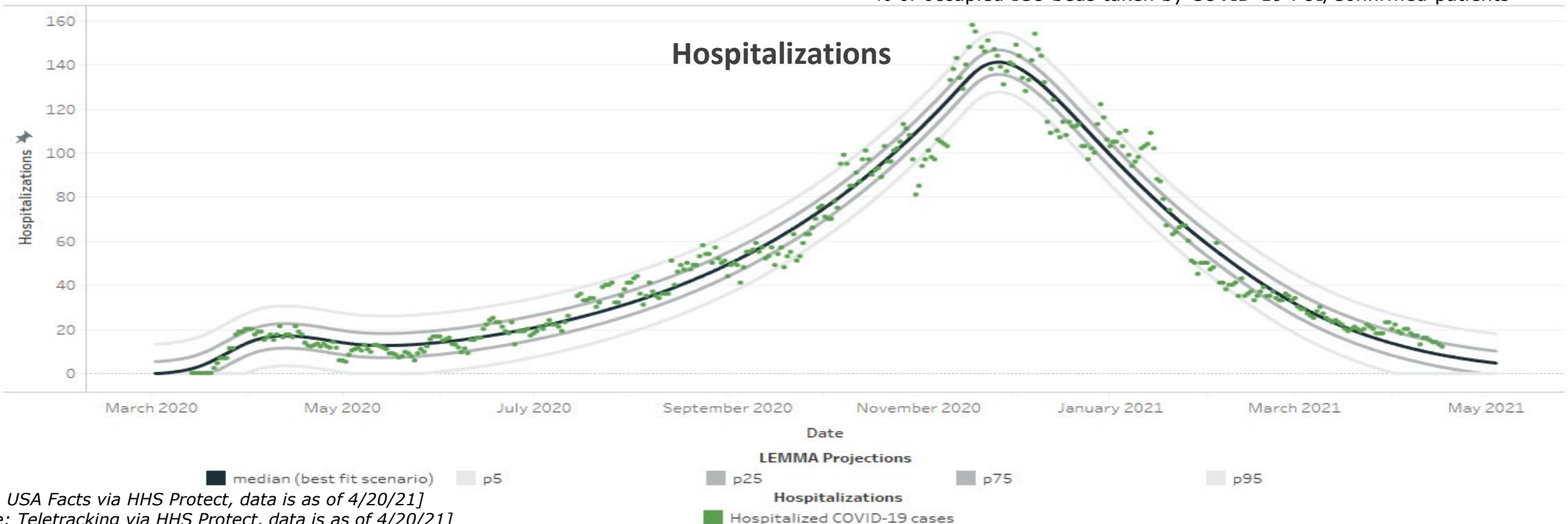
Southwest / Springfield (Regions D,G, I)

Overview	
Population	1,221,847
Cumulative Cases	111,968
Cumulative Deaths	1,849
7-day New Cases	-1,245
WoW % Case Change	-1.1%

Reproductive Rate	
Pre-intervention	2.36
Last Week	0.80
Current Week	0.74
WoW % Change	-7.3%

Bed / Ventilator Availability	
% ICU Beds Occupied	78%
% ICU Beds Occupied C19	5%
% ICU Beds Free	22%
% Ventilators in use	20%
% Ventilators available	80%

^% 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: May 4, 2021

Hospitalizations

LEMMA Projections

Legend: median (best fit scenario), p5, p25, p75, p95 — Hospitalizations; Hospitalized COVID-19 cases
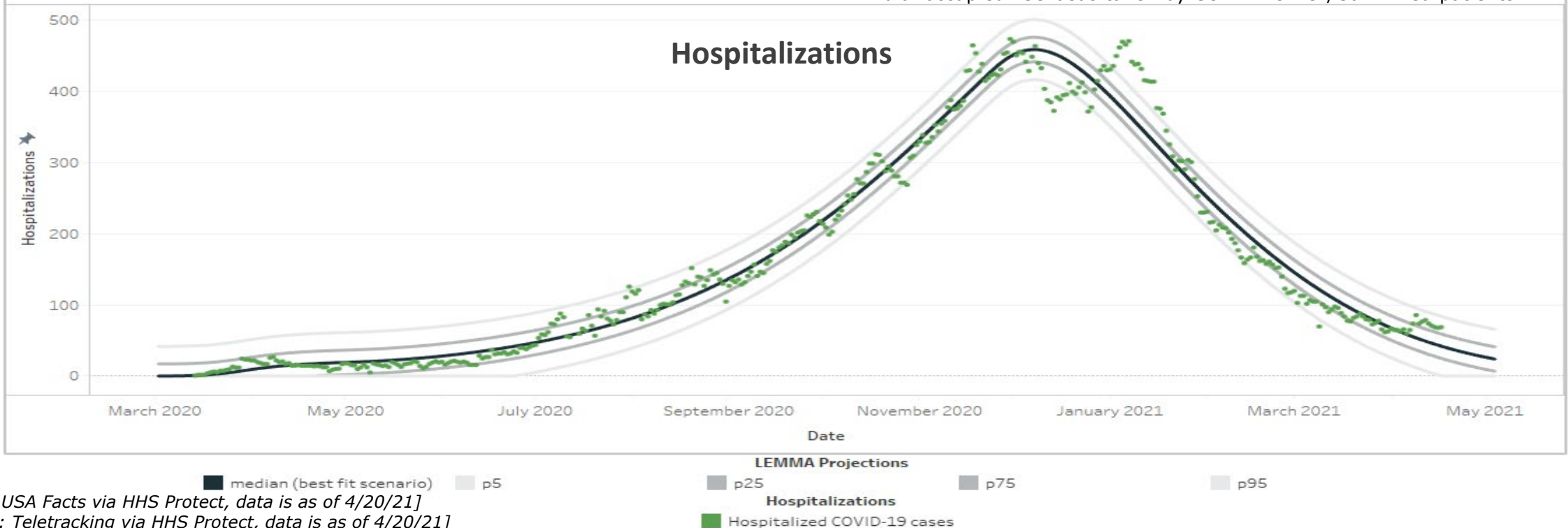
See FAQs for additional details

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)