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What You Should Know COVID-19

State of Missouri COVID-19 analytics update

May 5th, 2020

Developed by the State of Missouri, Washington University in St. Louis, and the Missouri Hospital Association

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

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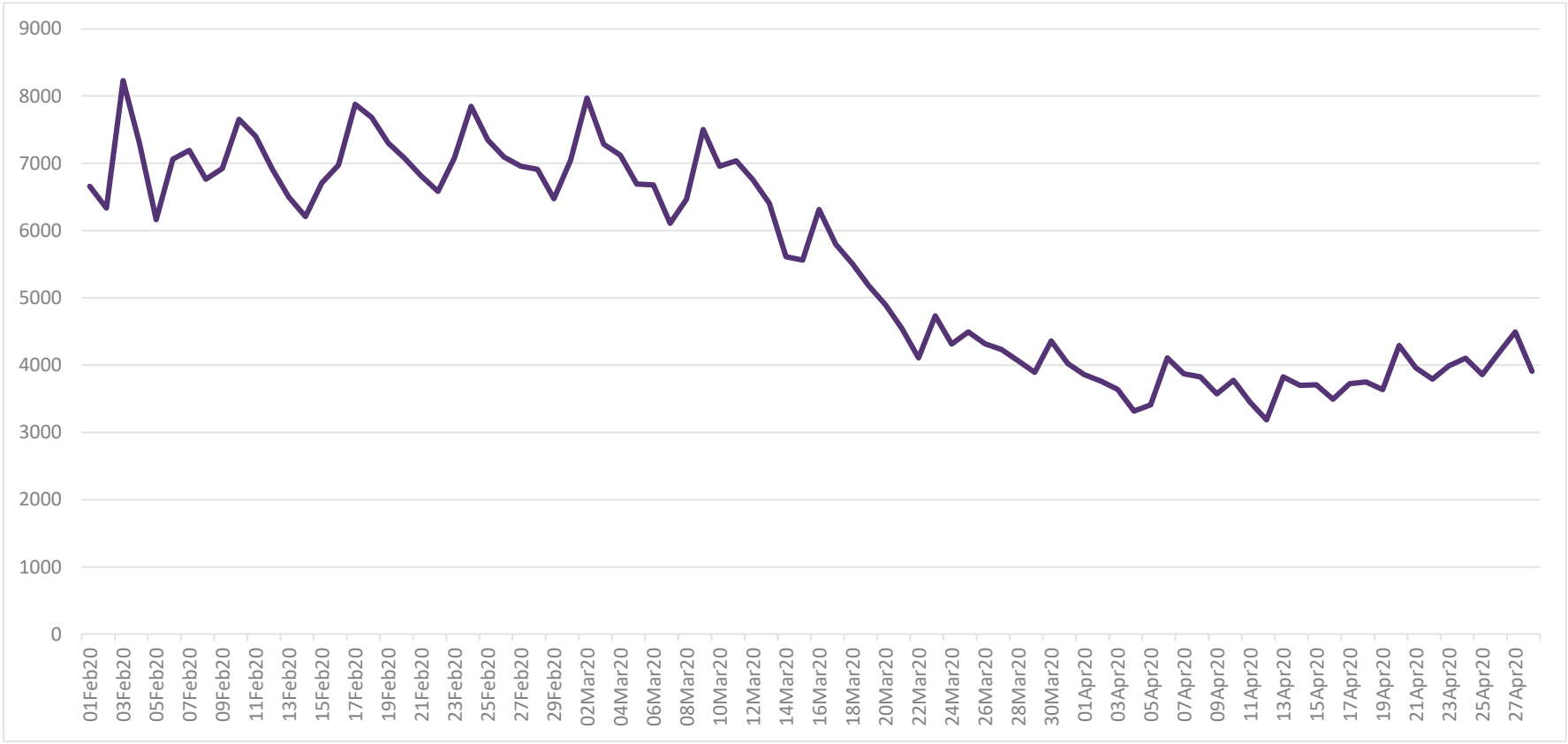
Syndromic surveillance: Total emergency department visits

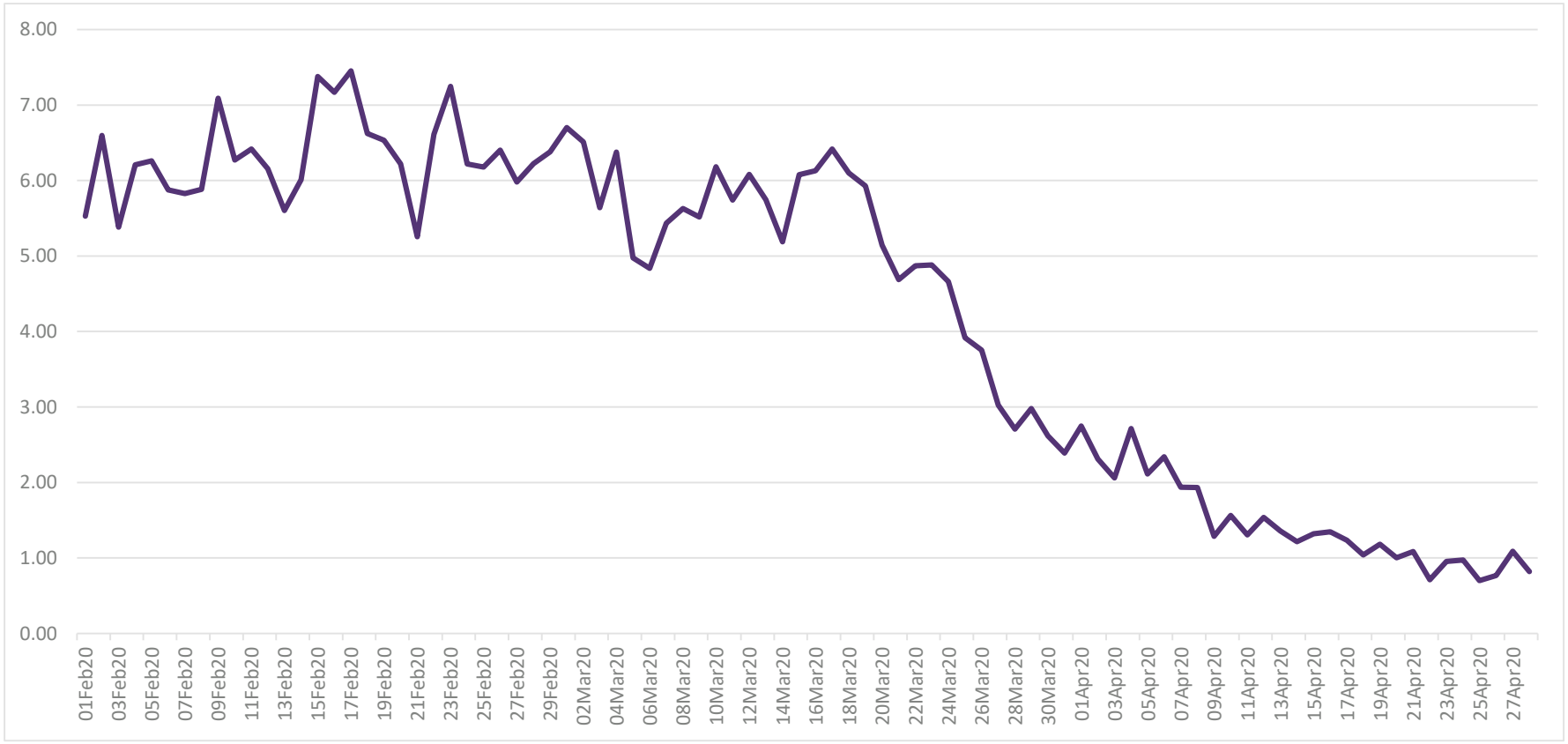
Daily Total ED visits in Missouri ESSENCE, February 1, 2020 – April 28, 2020



Source: Missouri Department of Health and Senior Services

Syndromic surveillance: ILI as a percentage of Total emergency department visits

Missouri Percentage of Emergency Department (ED) Visits for Influenza-like Illness (ILI in ESSENCE Participating Hospitals 02/01/2020 – 04/28/2020)

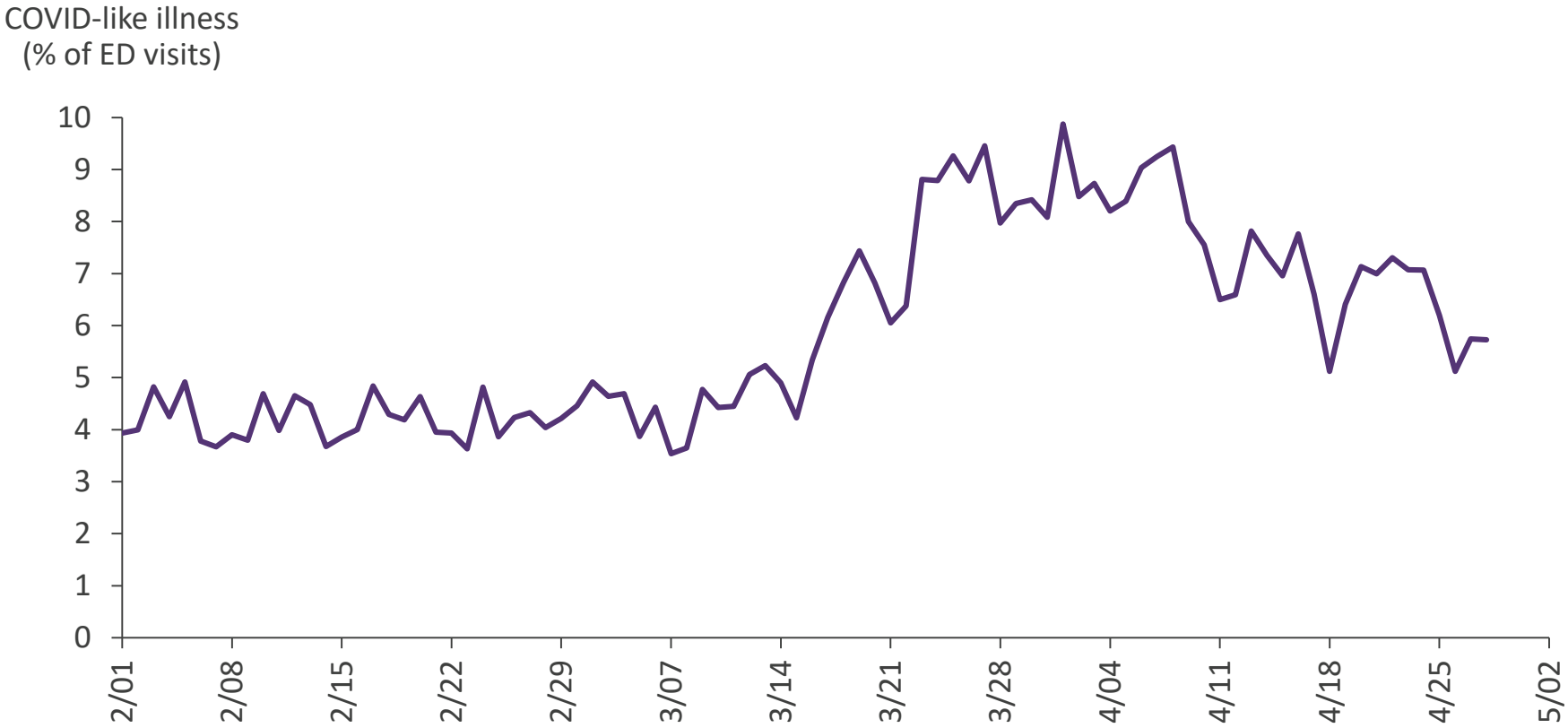


Note: Symptom-based query using key words: “fever”, “cough”, or “sore throat”

Source: Missouri Department of Health and Senior Services

Syndromic surveillance: COVID-like illness as a percentage of Total emergency department visits

Missouri Percentage of Emergency Department (ED) Visits for COVID-like Illness in (ESSENCE Participating Hospitals 02/01/2020 – 04/28/2020)



Note: Symptom-based query using key words: “fever” and “cough” or “shortness of breath” or “difficulty breathing”

Source: Missouri Department of Health and Senior Services

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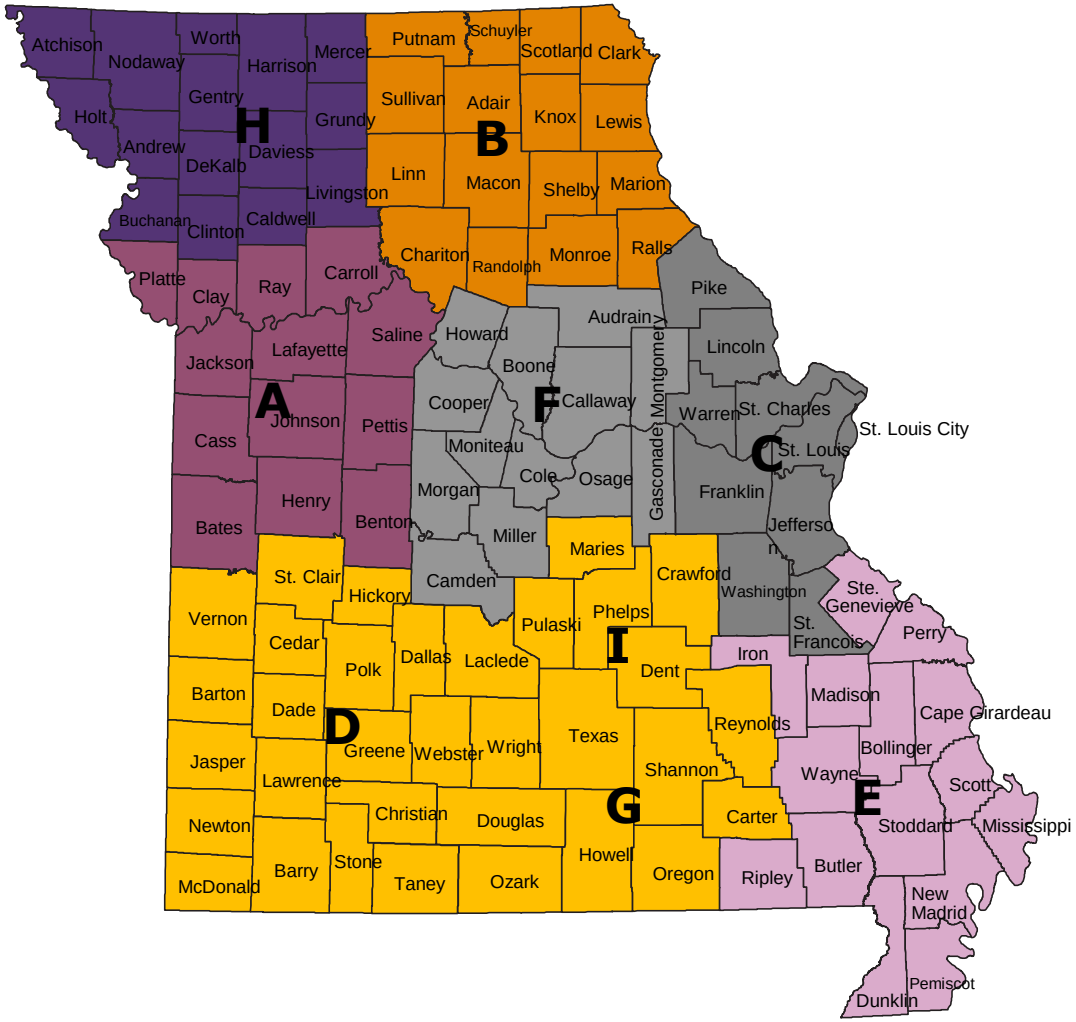
Healthcare system data is analyzed by region



- **Based on Missouri's Highway Patrol Troop and Healthcare Coalition boundaries**, historically used for healthcare preparedness and response planning
- **Regions D, G, and I are combined into one Southwest region** to reflect patient referral and EMS patterns, and their engagement with the Southwest Healthcare Coalition
- While **Perry County and Ste. Genevieve County** reside in Highway Patrol Troop C, their data is reported through the **Southeast Region** due to their engagement with the Southeast Healthcare Coalition

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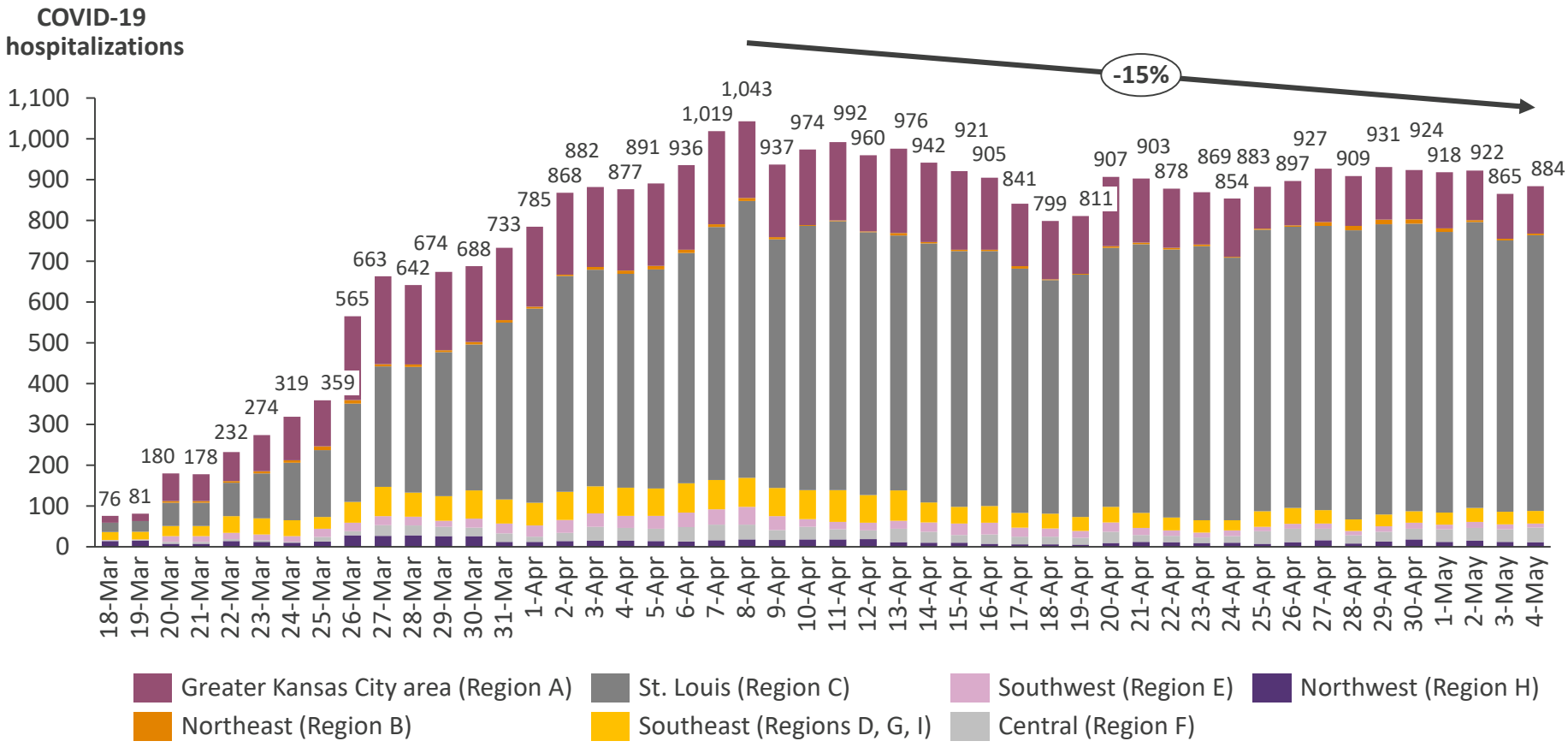
COVID-19 positive and PUI hospitalized cases by region



Note: # of hospitals reporting varies from day-to-day and may alter data on COVID-19 hospitalizations. Greater Kansas City Area does not include the health care facilities on the Kansas side of the Kansas City metro (e.g. Saint Luke's, University of Kansas).

Source: Missouri Hospital Association, National Healthcare Safety Network, WUSTL analysis

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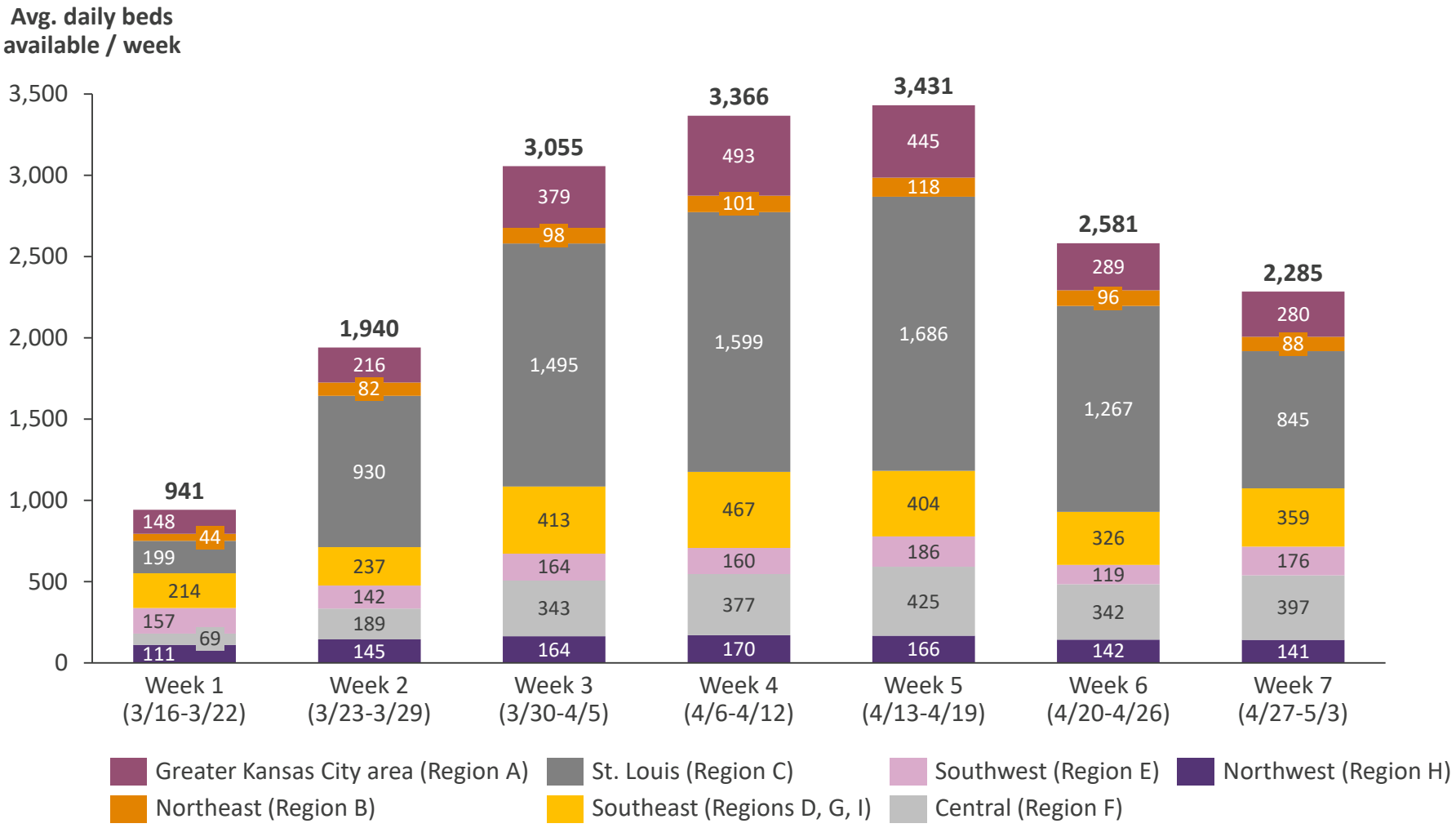
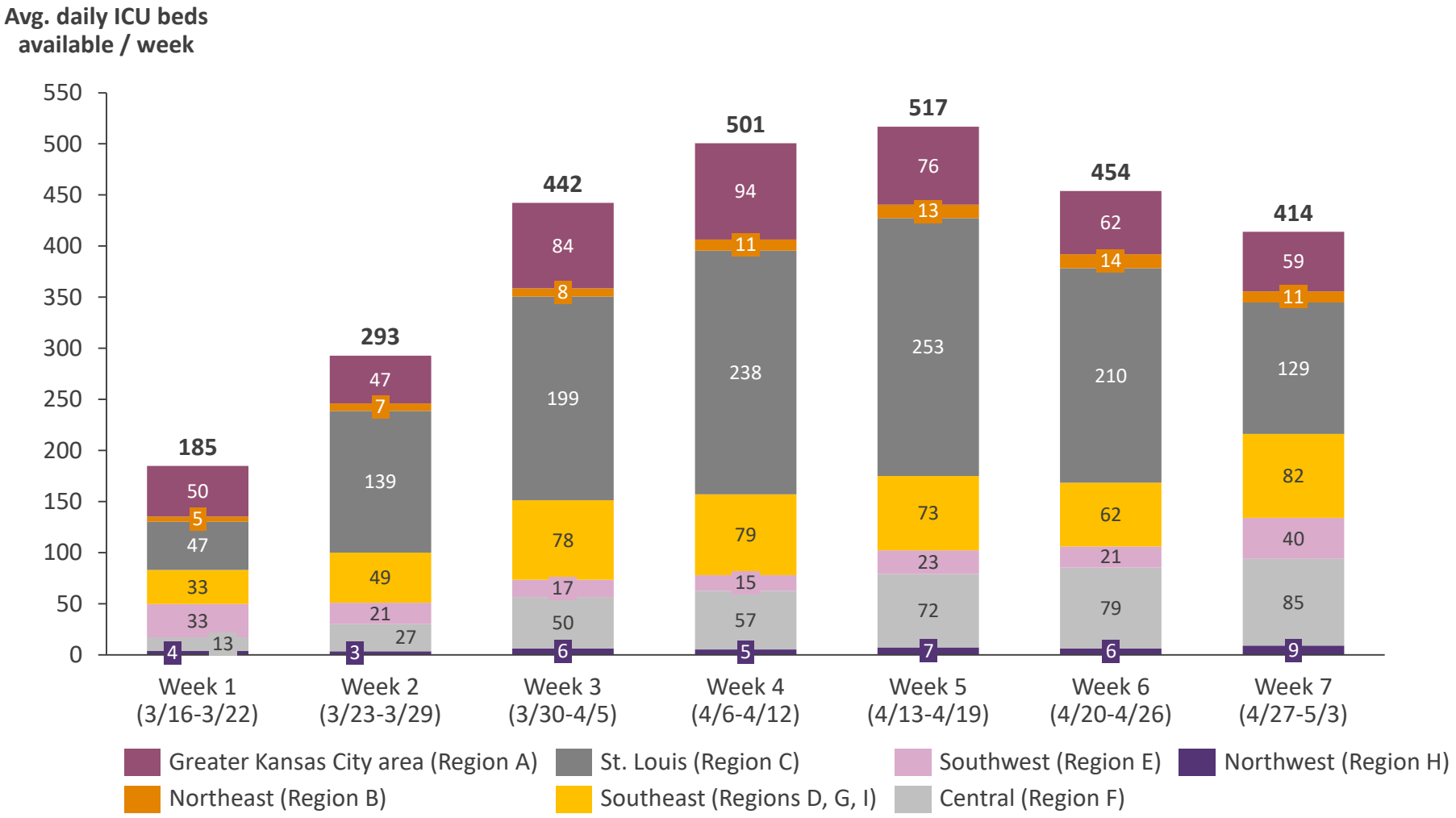
Medical and surgical bed availability by region



Note: # of hospitals reporting varies from day-to-day and may alter data on bed availability. Greater Kansas City Area does not include health care facilities on the Kansas side of the Kansas City metro.

Source: Missouri Hospital Association

ICU bed availability by region



Note: # of hospitals reporting varies from day-to-day and may alter data on bed availability. Greater Kansas City Area does not include health care facilities on the Kansas side of the Kansas City metro.

Source: Missouri Hospital Association

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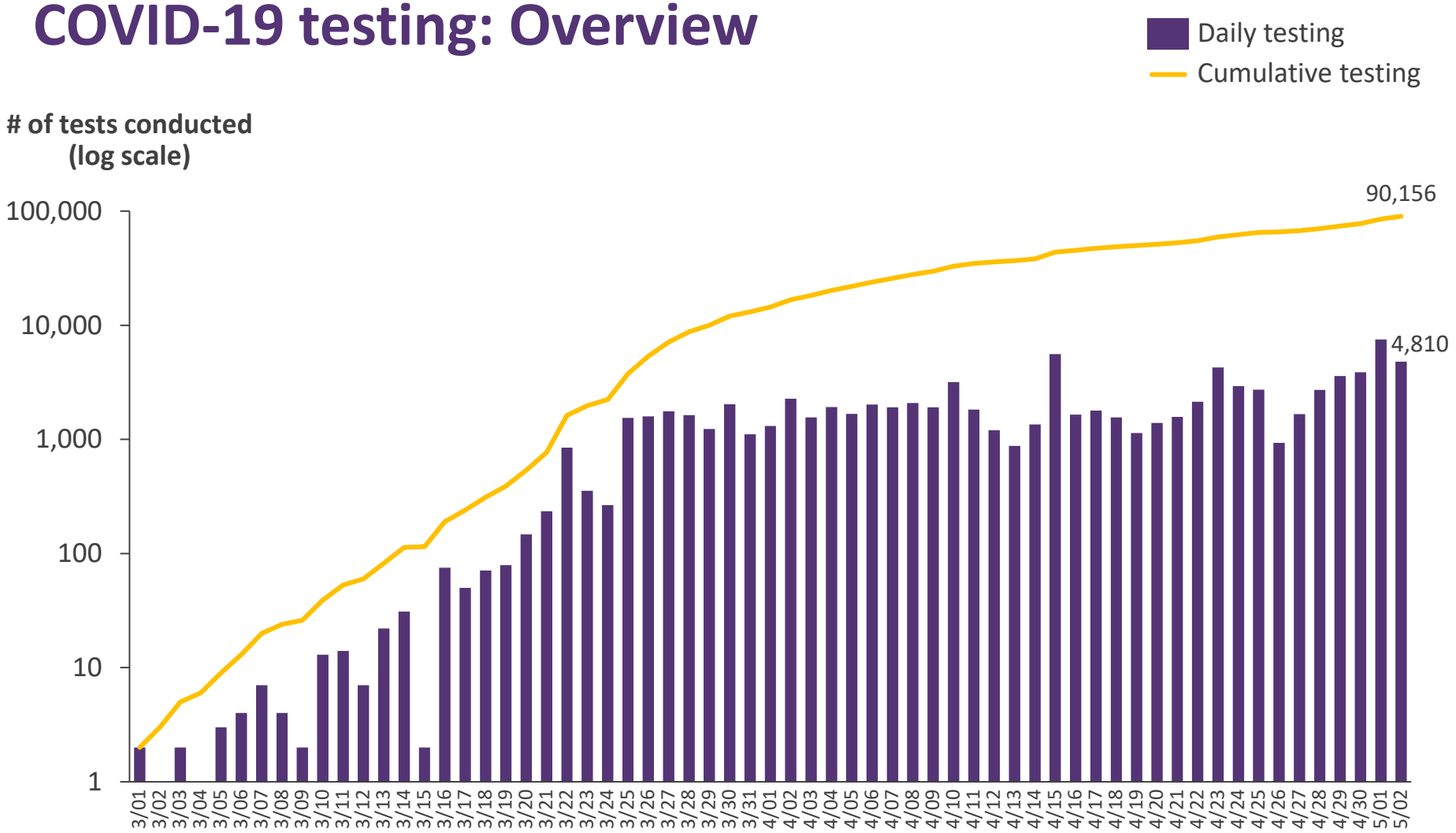
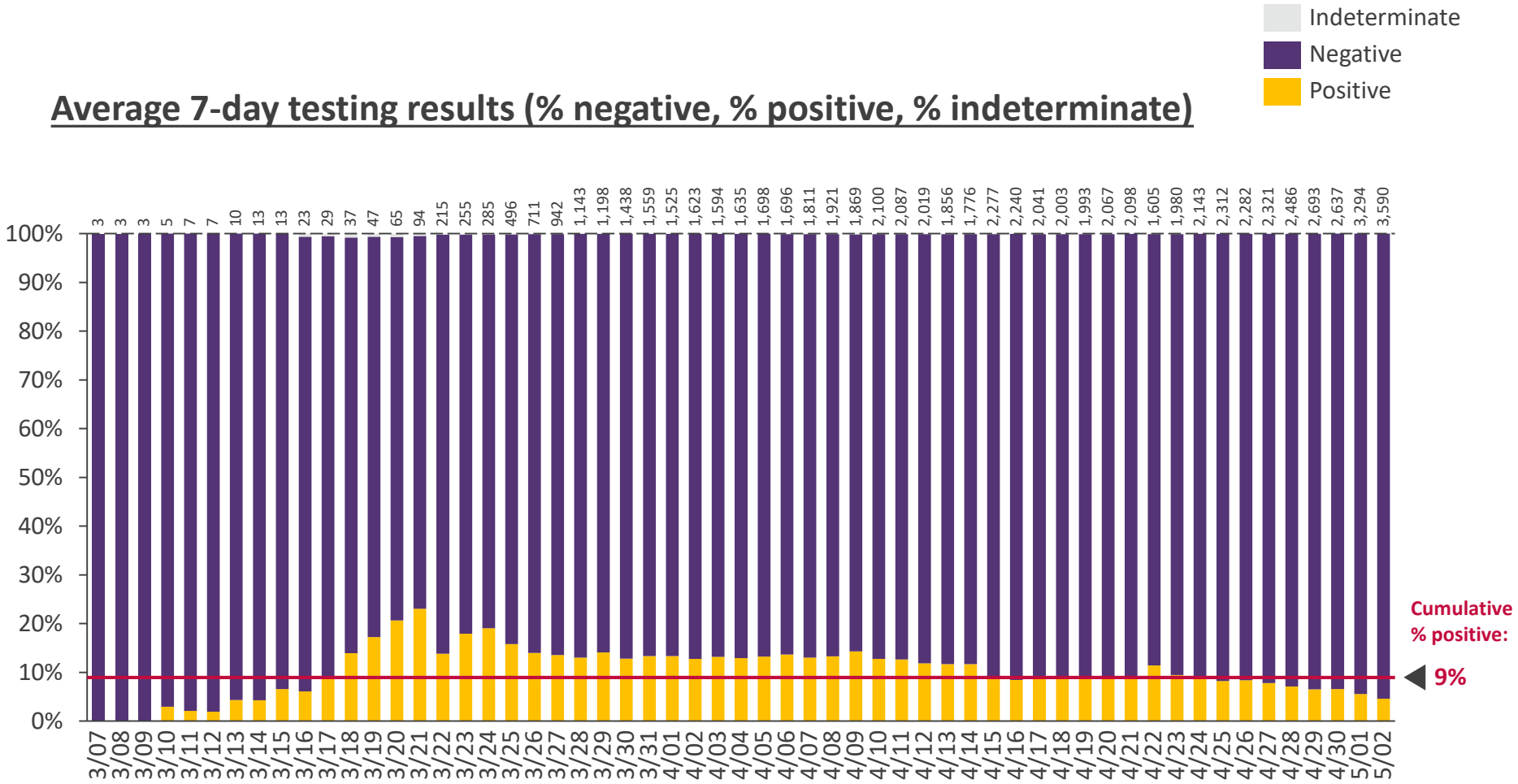
COVID-19 testing: Overview



Source: Missouri Department of Health and Senior Services

COVID-19 testing: Positivity rate

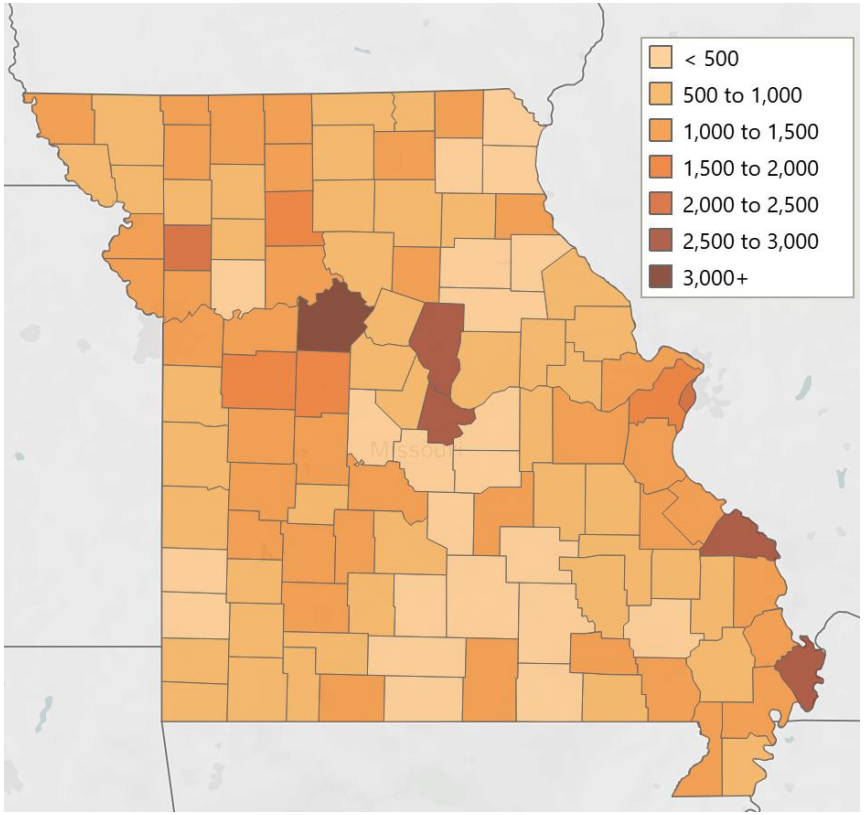
Average 7-day testing results (% negative, % positive, % indeterminate)



Source: Missouri Department of Health and Senior Services

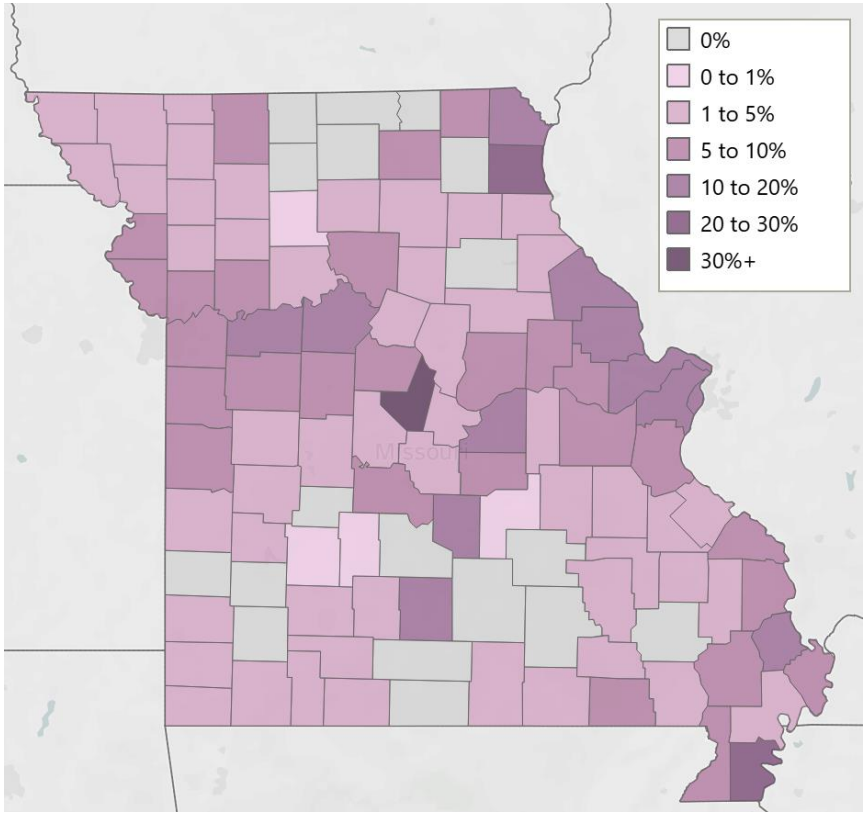
COVID-19 testing: Volume and positivity rate by county

Tests conducted / 100k population: 1,469



Highest # of tests conducted / 100k population in Saline (7,657) , Mississippi (3,404), and Buchanan (3,177)

Positive tests (% of total): 9%



Highest % positivity in Lewis (30%), Pemiscot (23%), and Moniteau (20%)

Note: County of provider or county of lab is used for tests where the county of patient is not available, as per CDC recommendations.

Source: Missouri Department of Health and Senior Services

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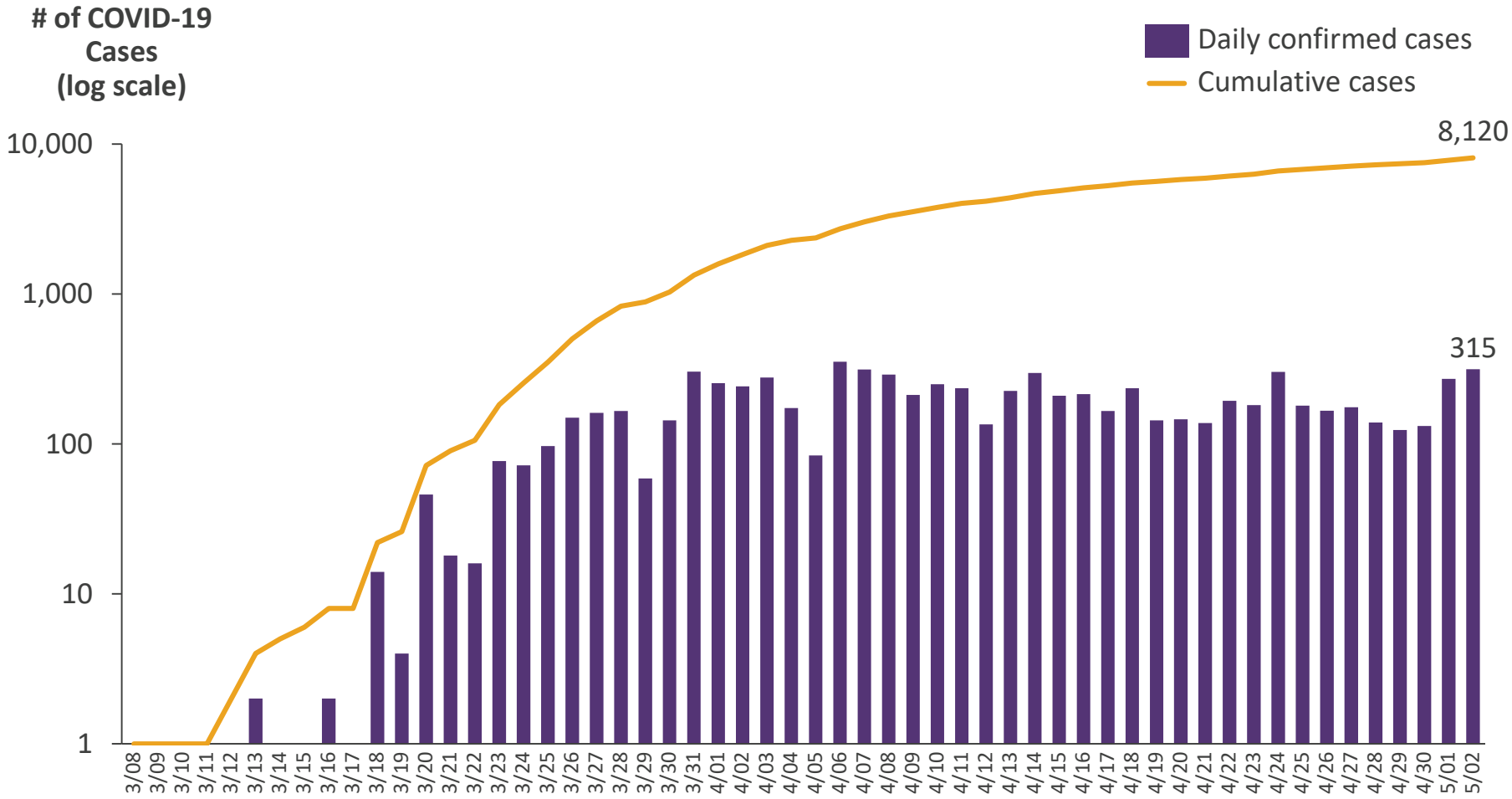
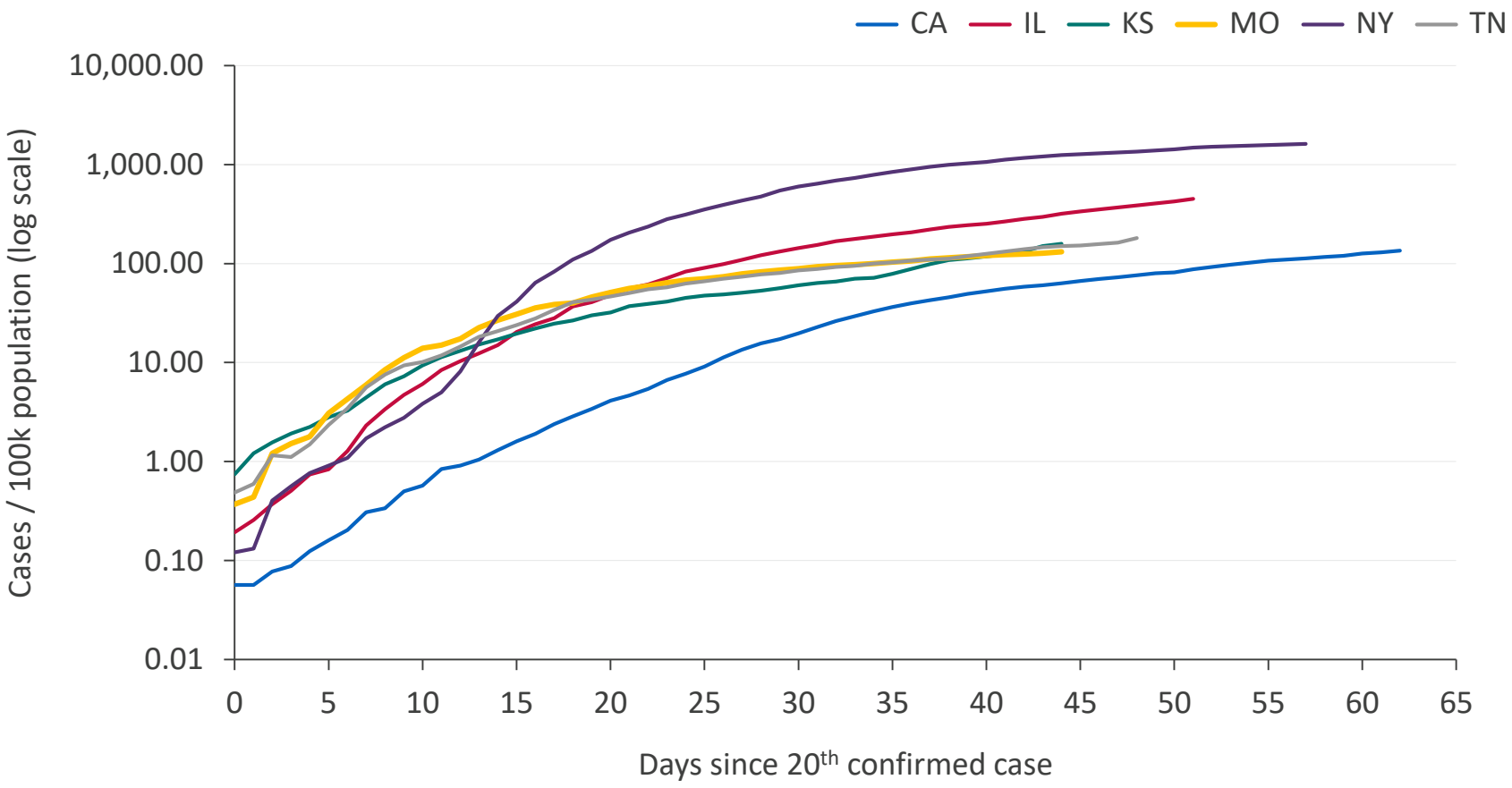
COVID-19 cases: Overview



Source: USA Facts database

COVID-19 cases: Missouri compared to other states (cases / 100k population)



Note: X-axis denotes days since 20th case in each State, so each State line may vary in length

Source: USA Facts database

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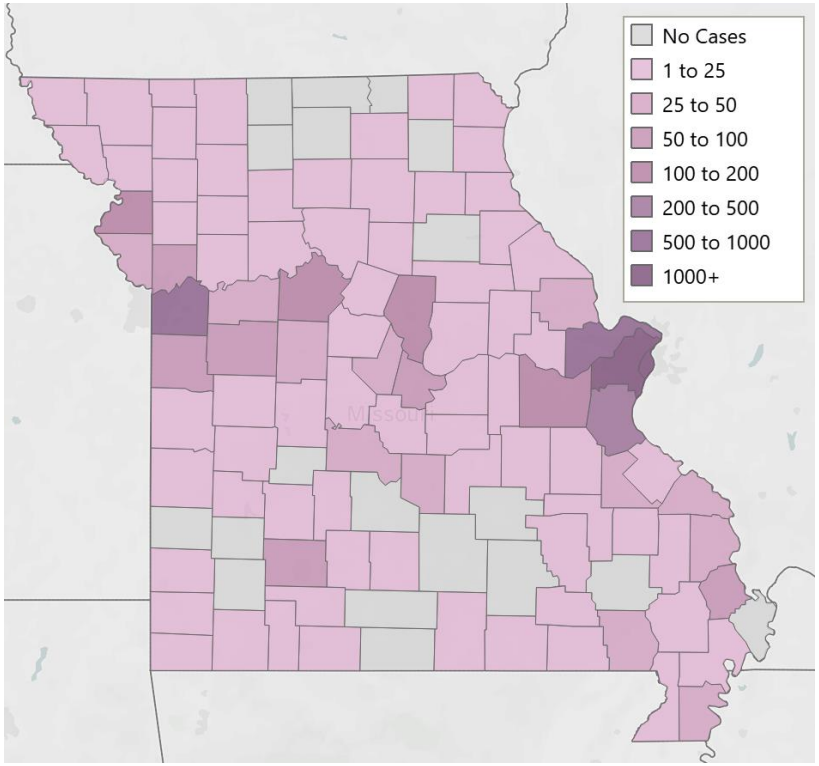
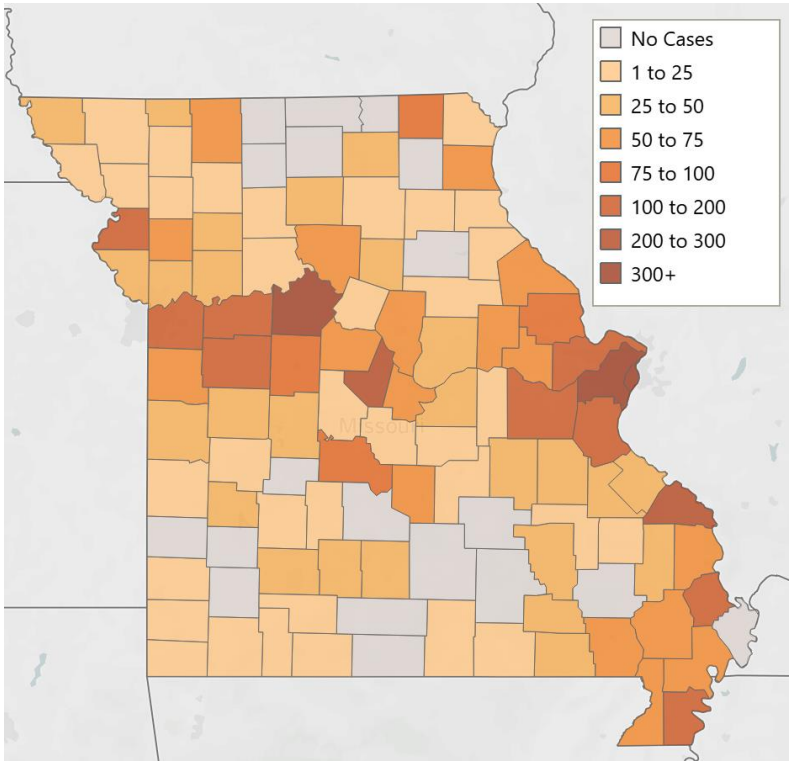
COVID-19 cases: Cumulative by county

Total cases: 8,353



Cases / 100k population: 141

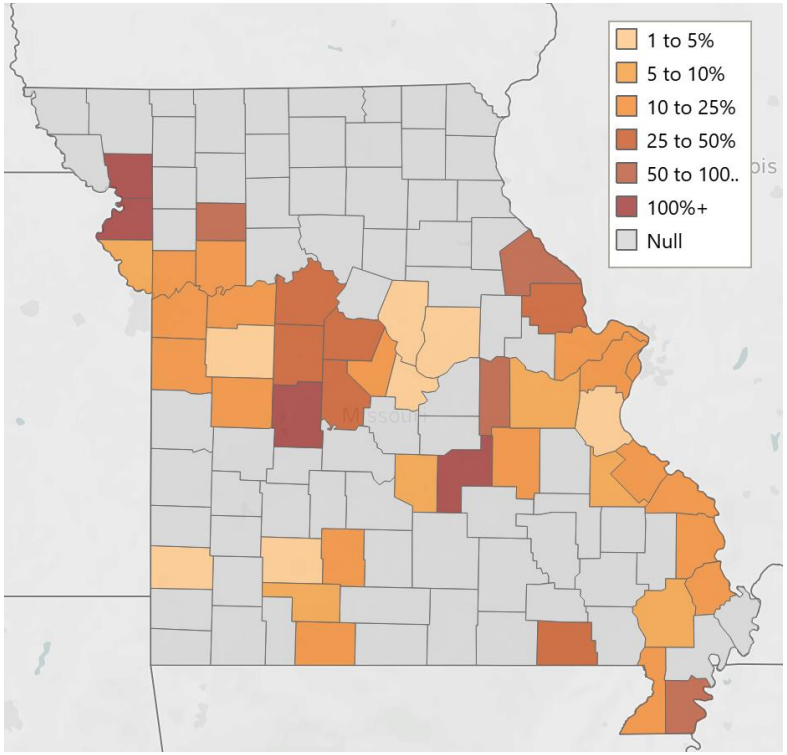


- 98 counties have more than 1 case of COVID-19
- Total cases concentrated in St. Louis and Kansas City area
- Highest case count / 100k in Saline county (869), followed by St. Louis City (410) and County (334)

Source: USA Facts, State of Missouri analysis

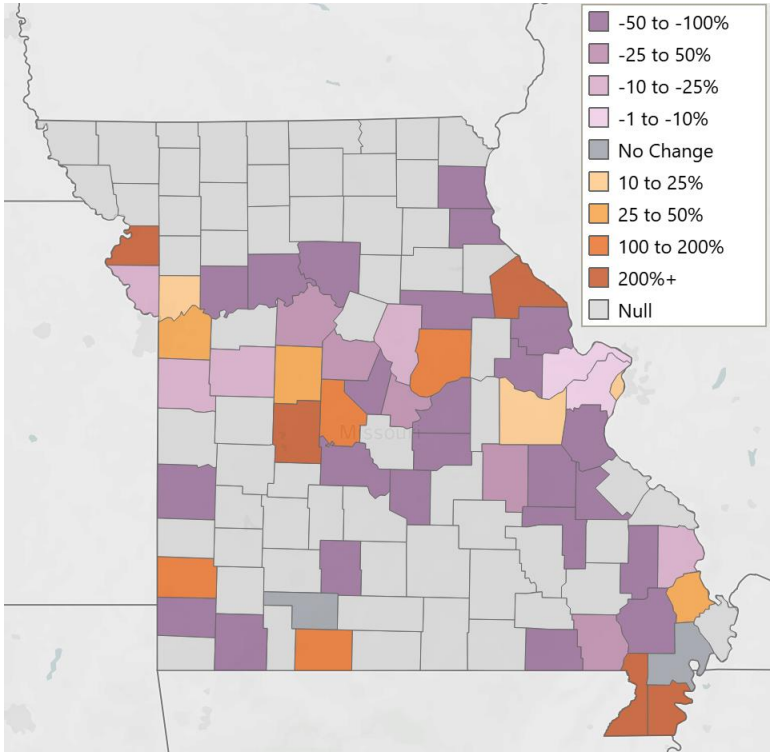
COVID-19 cases: New case growth

7-day % increase in case count: 19%



Fastest case growth in Andrew (+400%), Buchanan (+302%), and Benton (+100%)

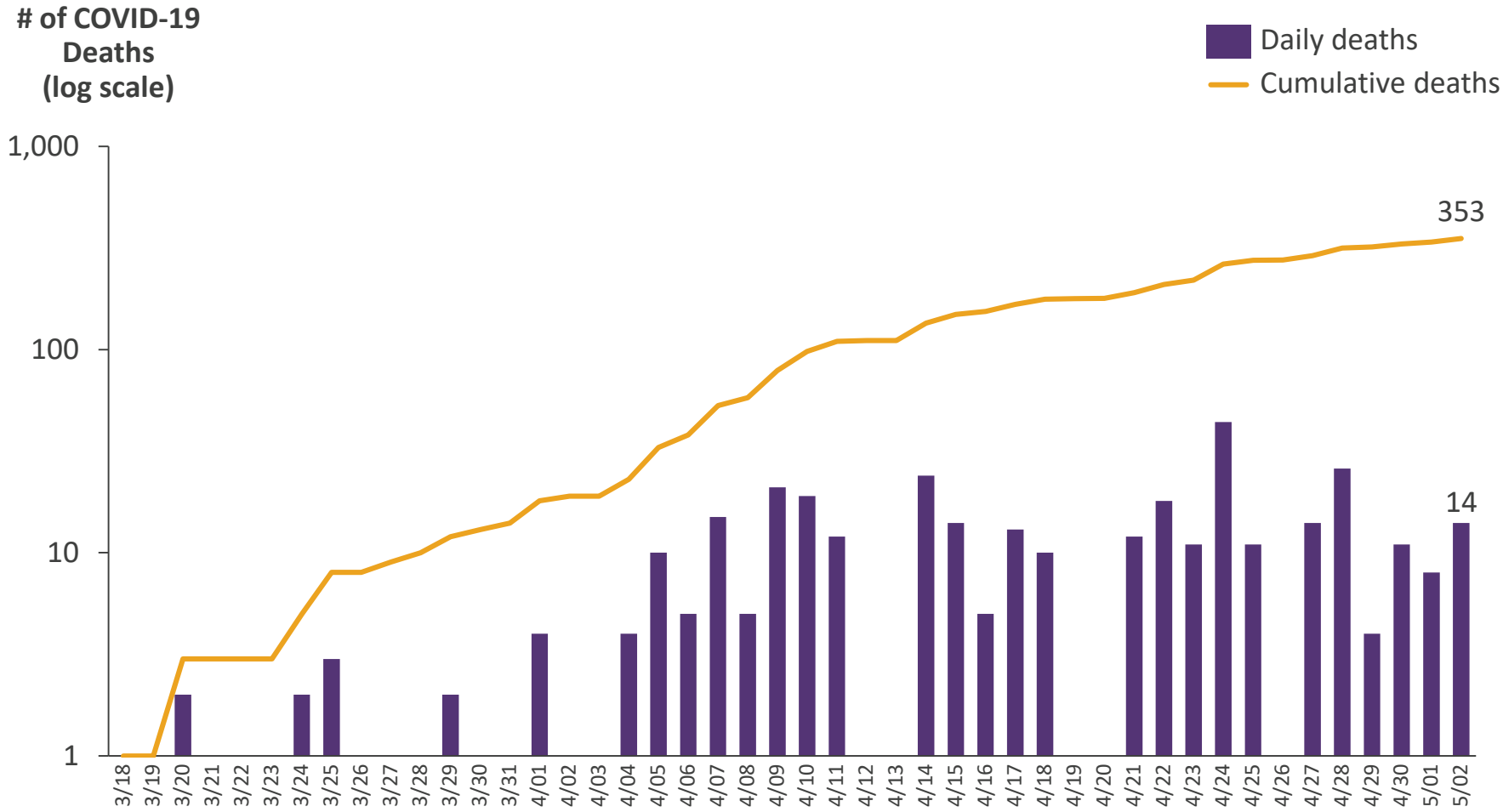
New cases over current 7-day period compared to prior 7-day period: 3%



Case growth is accelerating in Buchanan (+661%), Benton (+300%), and Pike (+300%). Case growth is decelerating in Newton (-100%), Warren (-100%), and Camden (-100%).

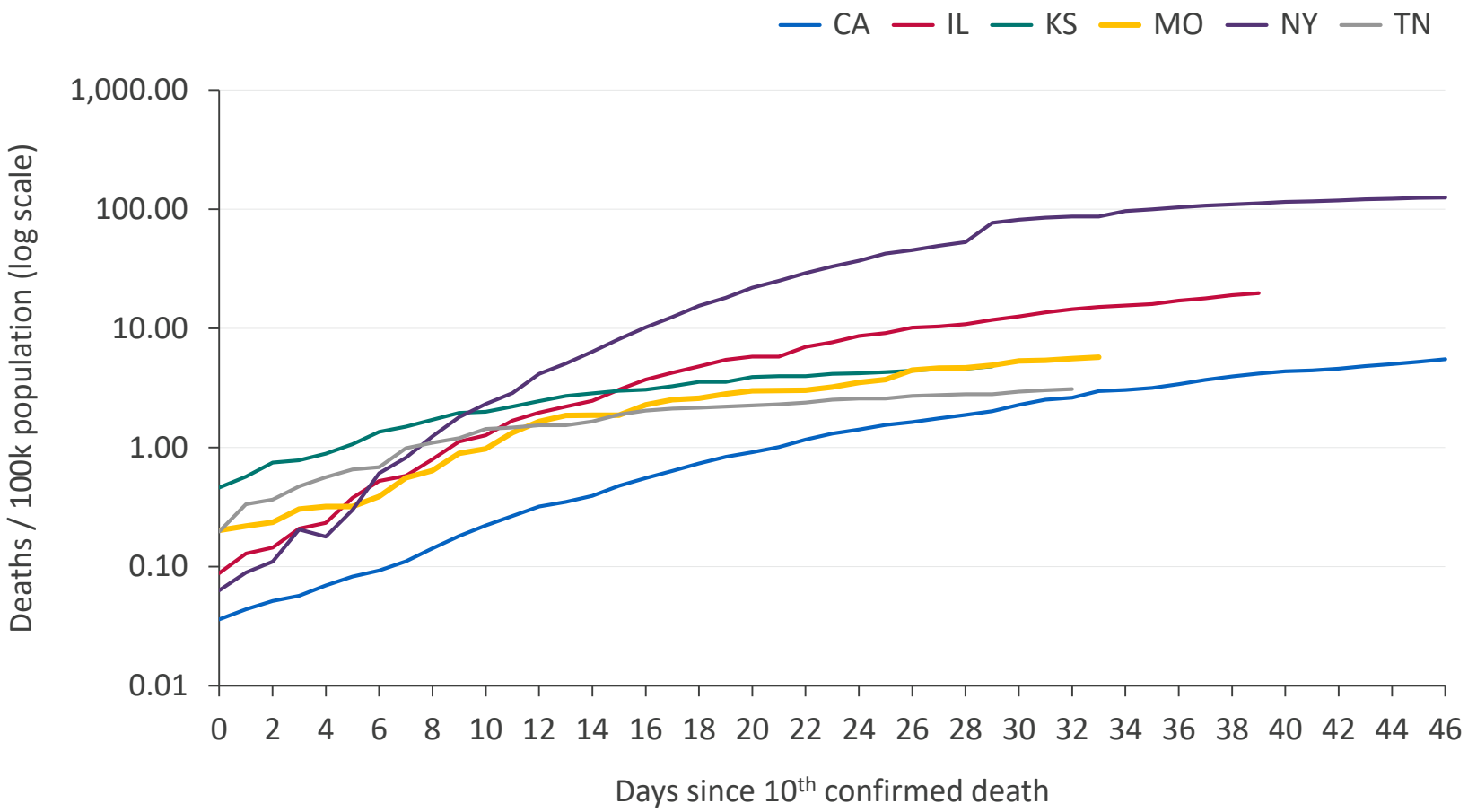
Source: USA Facts, State of Missouri analysis

COVID-19 deaths: Overview



Source: USA Facts database

COVID-19 deaths: Missouri compared to other states (deaths / 100k population)



Note: X-axis denotes days since 10th confirmed COVID-19 death in each State, so each State line may vary in length

Source: USA Facts database

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- **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.

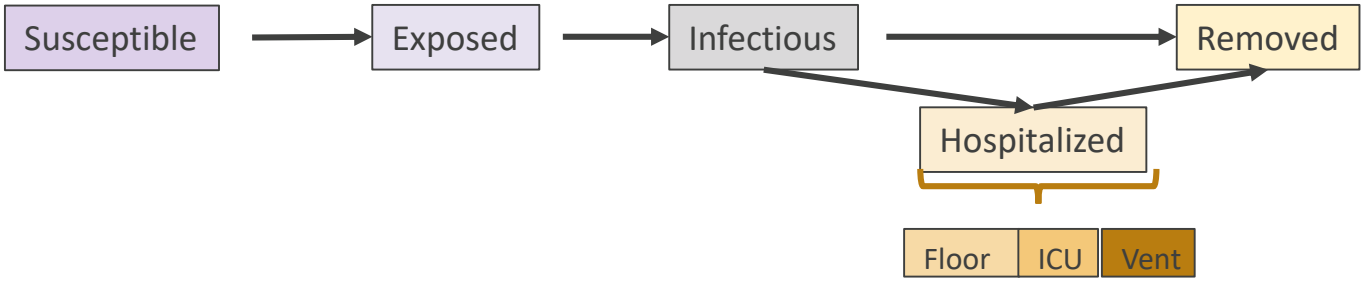
Regional COVID-19 transmission models help inform local policy, public health, and business decisions

- 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

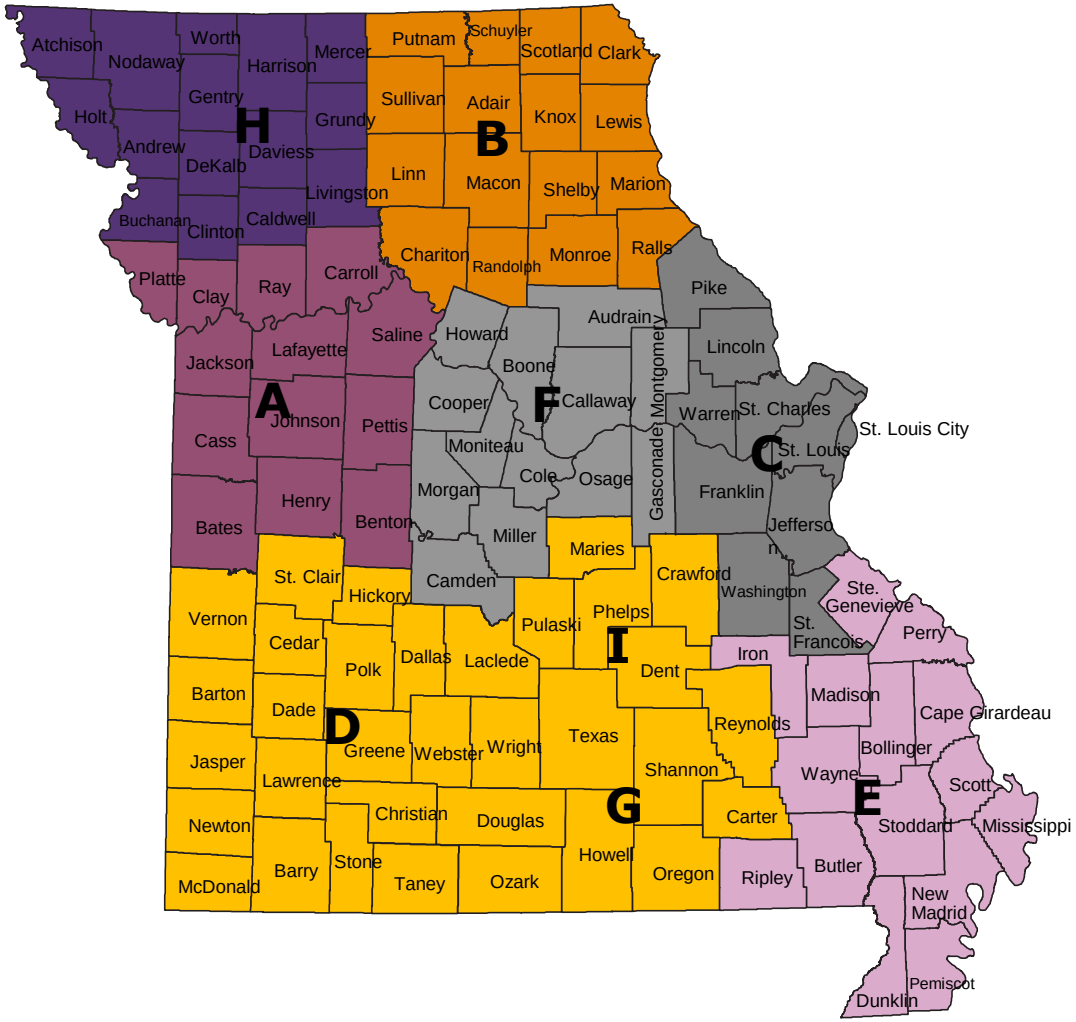
State of MO, WUSTL, and MHA have developed a regional model of hospitalized COVID-19 cases

- **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)



Projections were made for each Emergency Response region with sufficient data



- **Low levels of daily COVID-19 hospitalizations in the Northeast and Northwest regions** limit the ability to generate projections for these regions
  - Northeast: Average daily hospitalizations of 5
  - Northwest: Average daily hospitalizations of 13
- **Projections were made for all other regions**

Greater Kansas City area (Region A)

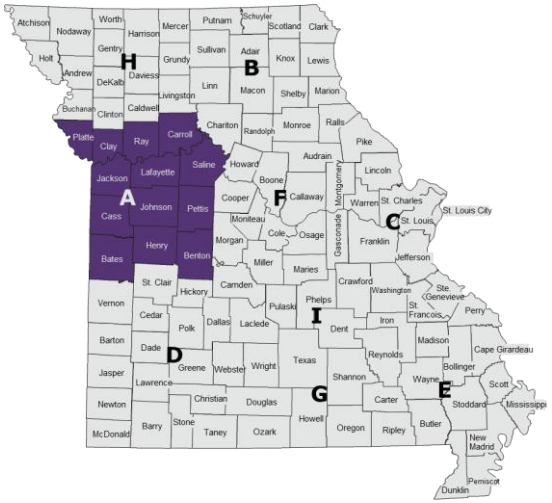
- Confirmed COVID-19 hospitalizations
- Projection Based on Initial Assumptions
- Median Derived Best Fit Projection
- Confidence Intervals of Projections

Overview

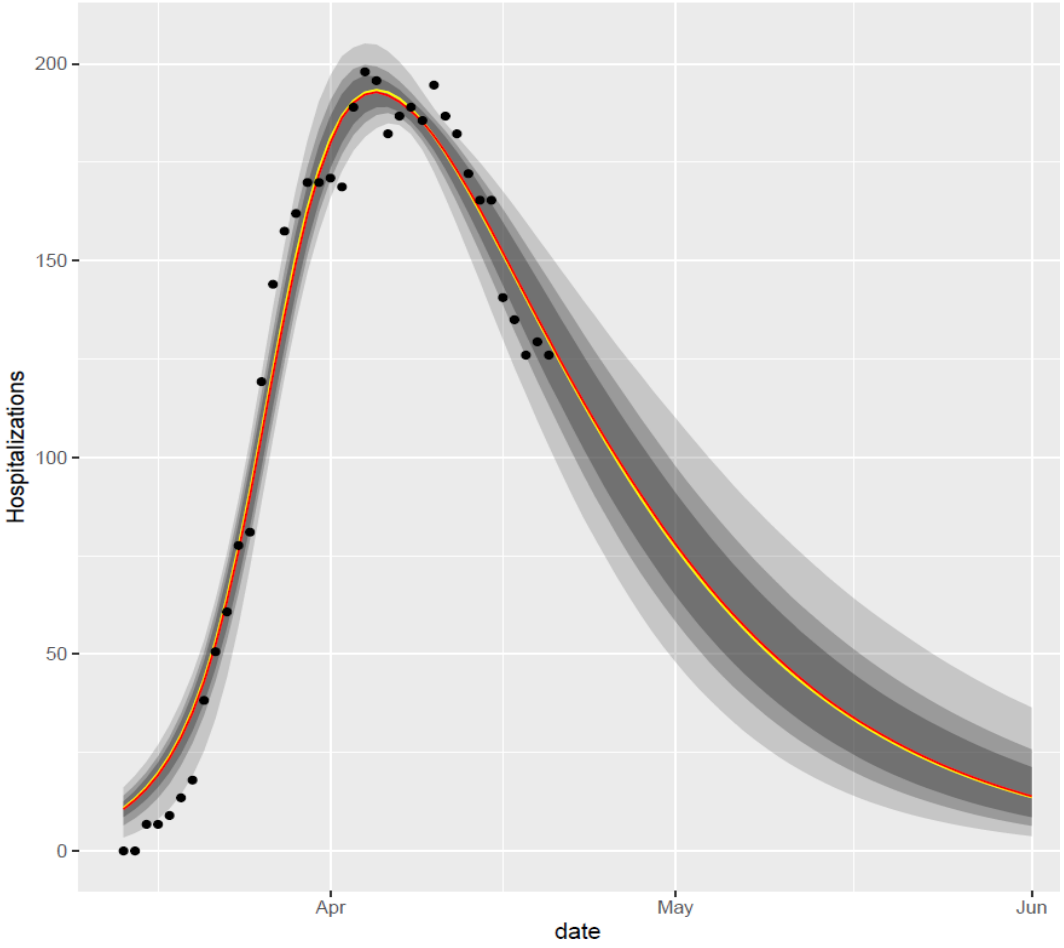
Population: 1,395,314
# of COVID-19 cases: 1,500
# of COVID-19 deaths: 39
ICU Bed Availability*: 59
Medical / Surgical Bed Availability*: 280

Reproductive rate

Pre-intervention: 2.7
Today: 0.68



Projected COVID-19 hospitalizations



(*) Daily average during week of 4/27 – 5/3

Source: State of MO, MHA, WUSTL analysis

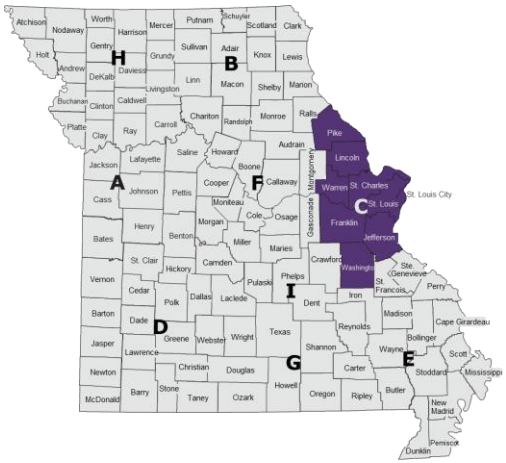
Greater St. Louis area (Region C)

Overview

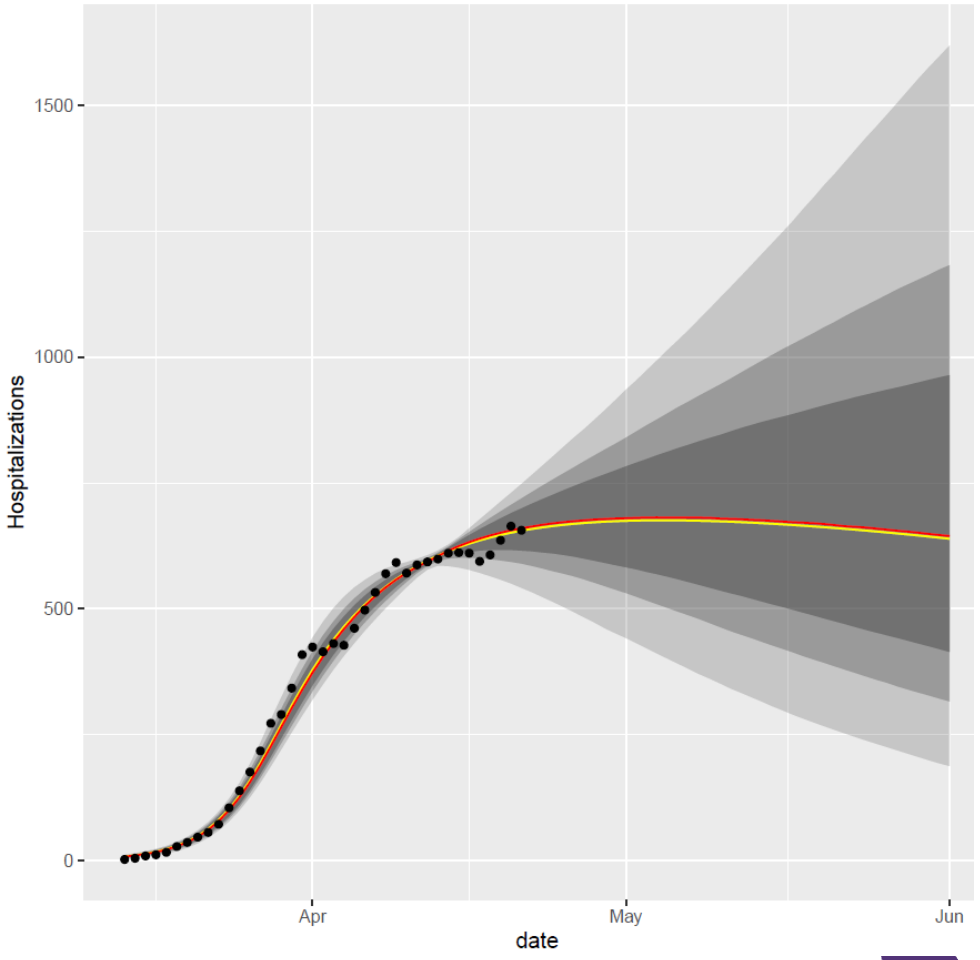
Population: 2,229,518
# of COVID-19 cases: 5,678
# of COVID-19 deaths: 287
ICU Bed Availability*: 129
Medical / Surgical Bed Availability*: 845

Reproductive rate

Pre-intervention: 3.4
Today: 0.99



Projected COVID-19 hospitalizations



(*) Daily average during week of 4/27 – 5/3

Source: State of MO, MHA, WUSTL analysis

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Southwest / Springfield (Regions D,G, I)

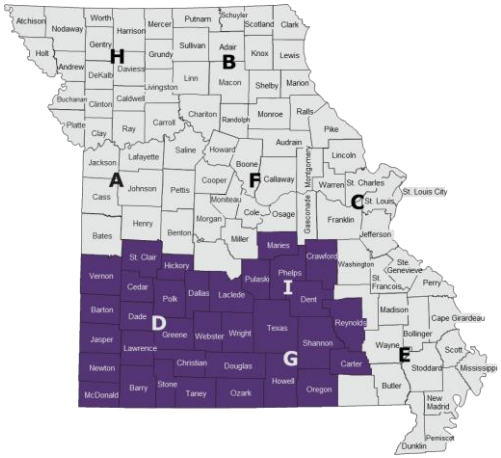
- Confirmed COVID-19 hospitalizations
- Projection Based on Initial Assumptions
- Median Derived Best Fit Projection
- Confidence Intervals of Projections

Overview

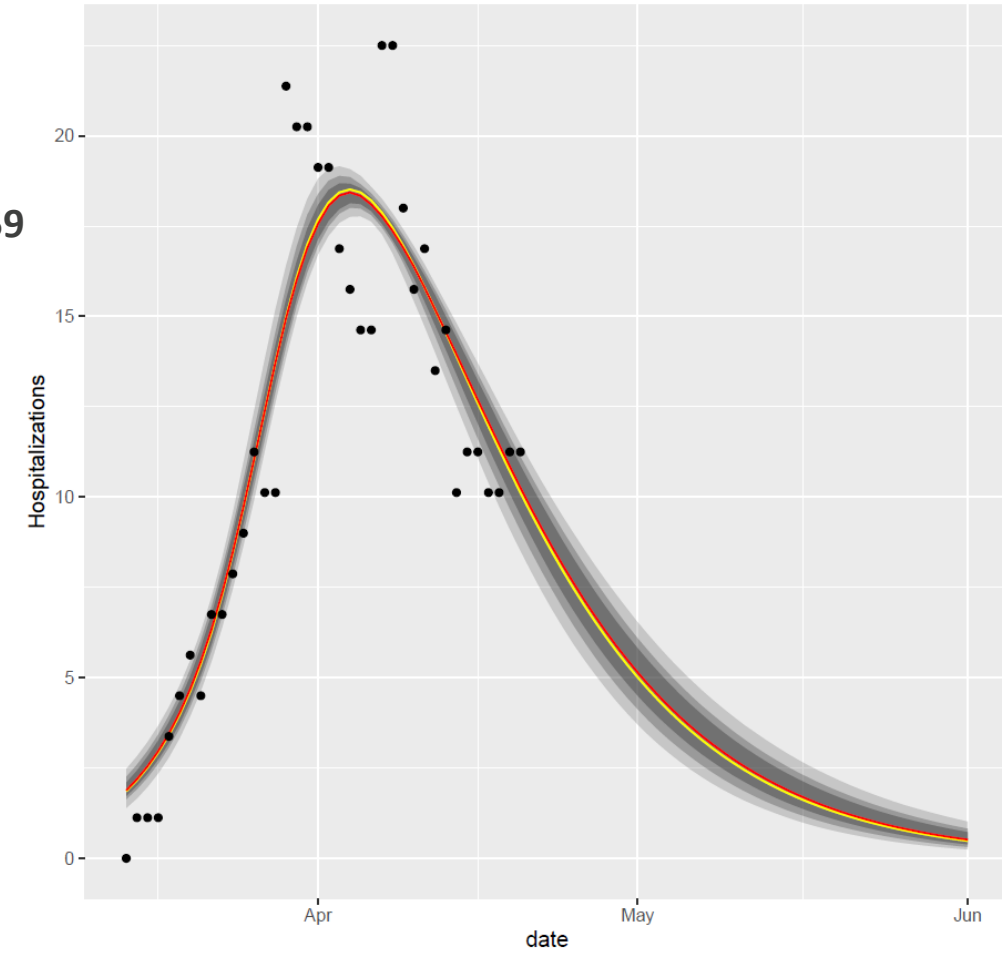
Population: 1,221,847
# of COVID-19 cases: 267
# of COVID-19 deaths: 12
ICU Bed Availability*: 82
Medical / Surgical Bed Availability: 359**

Reproductive rate

Pre-intervention: 2.2
Today: 0.55



Projected COVID-19 hospitalizations



(*) Daily average during week of 4/27 – 5/3

Source: State of MO, MHA, WUSTL analysis

Southeast / Cape Girardeau (Region E)

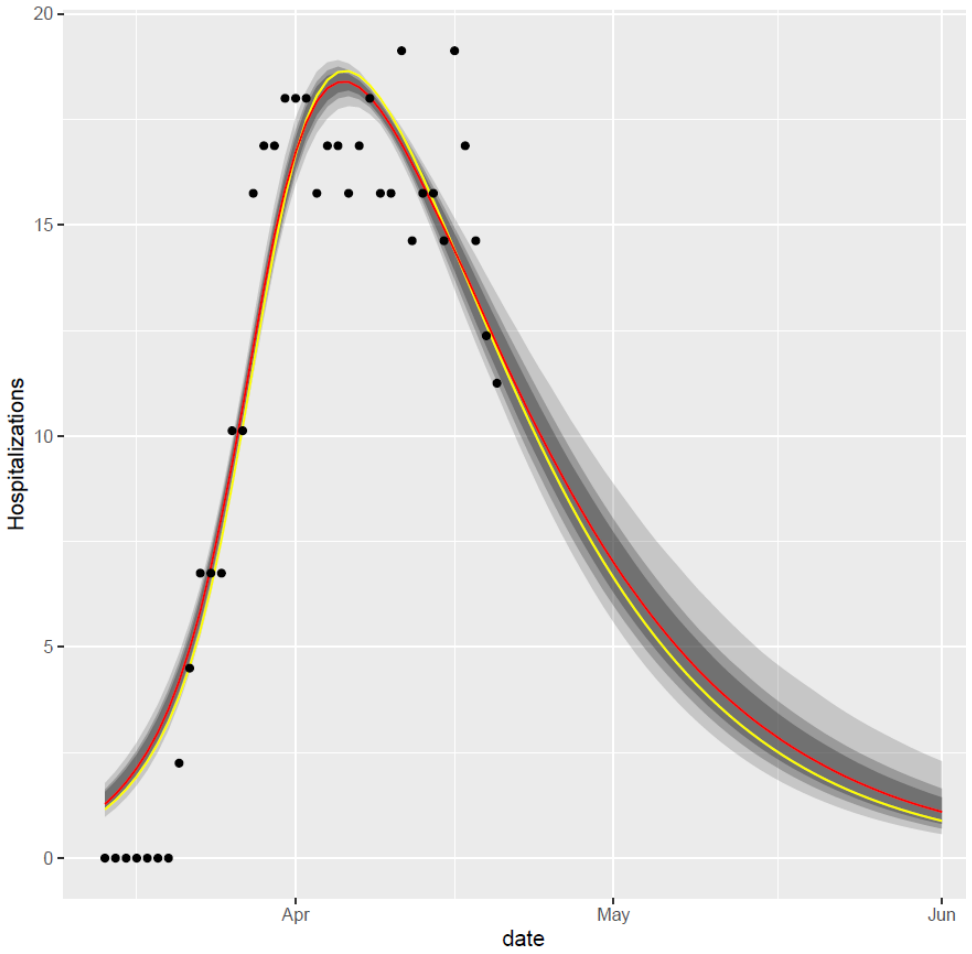
Overview

Population: 363,478
# of COVID-19 cases: 298
# of COVID-19 deaths: 7
ICU Bed Availability*: 40
Medical / Surgical Bed Availability*: 176

Reproductive rate

Pre-intervention: 2.4
Today: 0.61

Projected COVID-19 hospitalizations



(*) Daily average during week of 4/27 – 5/3

Source: State of MO, MHA, WUSTL analysis

Central (Region F)

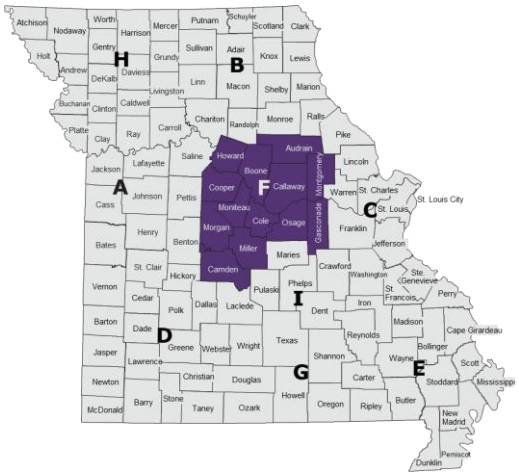
Confirmed COVID-19 hospitalizations
Projection Based on Initial Assumptions
Median Derived Best Fit Projection
Confidence Intervals of Projections

Overview

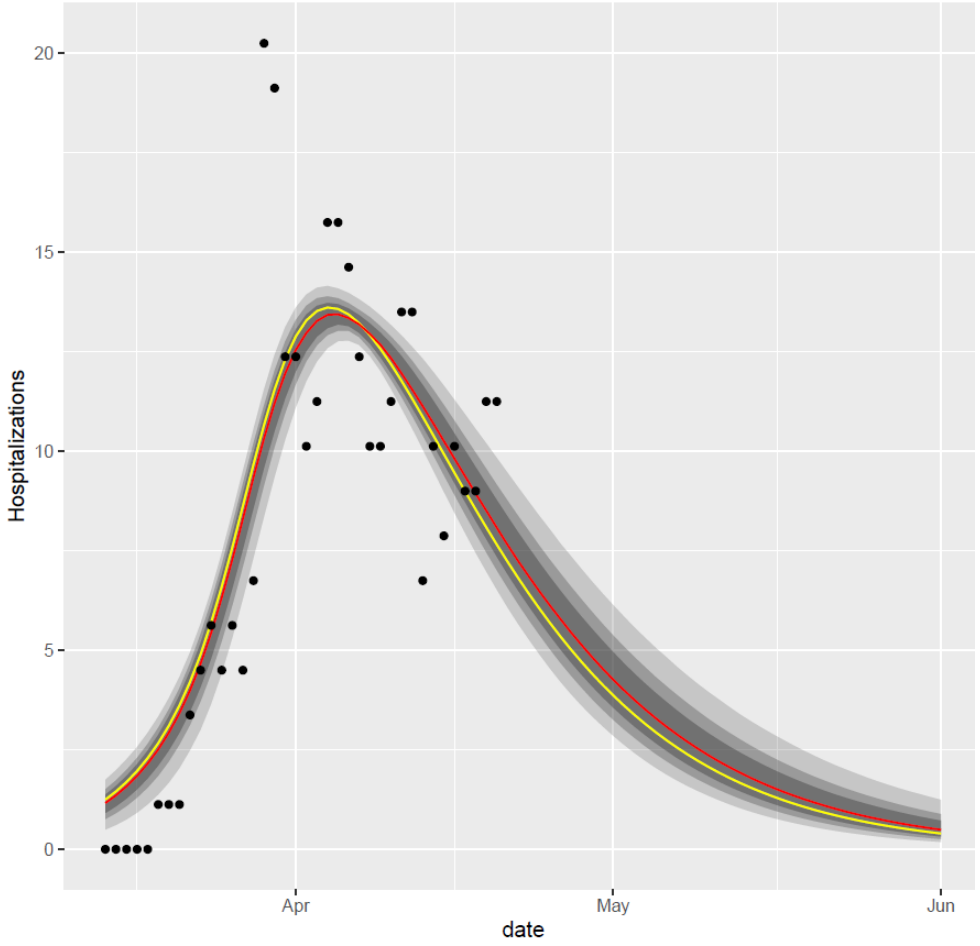
Population: 736,847
# of COVID-19 cases: 560
# of COVID-19 deaths: 5
ICU Bed Availability*: 85
Medical / Surgical Bed Availability*: 397

Reproductive rate

Pre-intervention: 2.2
Today: 0.55



Projected COVID-19 hospitalizations



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