

## **IEM's AI Modeling: Short-term COVID-19 Projections**

**Date: 9/1/21**

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

**We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.**

### **AI-based Model Background**

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 9/1/21 9 a.m.

**Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.**

**Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.**

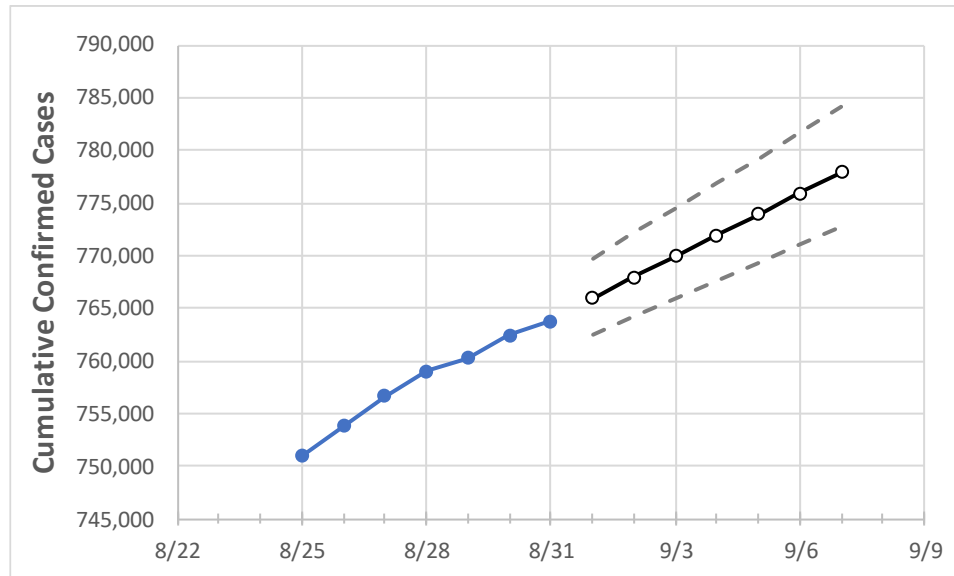
### **IEM's Modeling Lead**

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

## Missouri State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Missouri	759,065	760,234	762,397	763,799	765,906	767,946	769,953	771,955	773,935	775,957	777,927

*Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.*

## Missouri Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Boone	22,292	22,309	22,384	22,405	22,451	22,496	22,541	22,584	22,627	22,672	22,713
City of St. Louis	28,764	28,778	28,833	28,903	28,955	29,009	29,057	29,107	29,157	29,206	29,255
Greene	40,299	40,358	40,434	40,479	40,546	40,619	40,686	40,752	40,820	40,883	40,949
Jackson (& KC)	105,609	105,883	106,289	106,337	106,680	107,013	107,355	107,678	108,004	108,331	108,641
St. Charles	50,024	50,082	50,221	50,277	50,390	50,507	50,619	50,732	50,840	50,957	51,063
St. Louis	116,424	116,439	116,813	117,110	117,366	117,619	117,868	118,128	118,384	118,637	118,902

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

#### Missouri Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	8/28	8/29	8/30	8/31	9/2				9/4				9/6			
Boone	22,292	22,309	22,384	22,405	22,496	(4,499)	[1,080]	{540}	22,584	(4,517)	[1,084]	{542}	22,672	(4,534)	[1,088]	{544}
City of St. Louis	28,764	28,778	28,833	28,903	29,009	(5,802)	[1,392]	{696}	29,107	(5,821)	[1,397]	{699}	29,206	(5,841)	[1,402]	{701}
Greene	40,299	40,358	40,434	40,479	40,619	(8,124)	[1,950]	{975}	40,752	(8,150)	[1,956]	{978}	40,883	(8,177)	[1,962]	{981}
Jackson (& KC)	105,609	105,883	106,289	106,337	107,013	(21,403)	[5,137]	{2,568}	107,678	(21,536)	[5,169]	{2,584}	108,331	(21,666)	[5,200]	{2,600}
St. Charles	50,024	50,082	50,221	50,277	50,507	(10,101)	[2,424]	{1,212}	50,732	(10,146)	[2,435]	{1,218}	50,957	(10,191)	[2,446]	{1,223}
St. Louis	116,424	116,439	116,813	117,110	117,619	(23,524)	[5,646]	{2,823}	118,128	(23,626)	[5,670]	{2,835}	118,637	(23,727)	[5,695]	{2,847}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.