

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

Date: 8/4/21

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 8/4/21 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.**

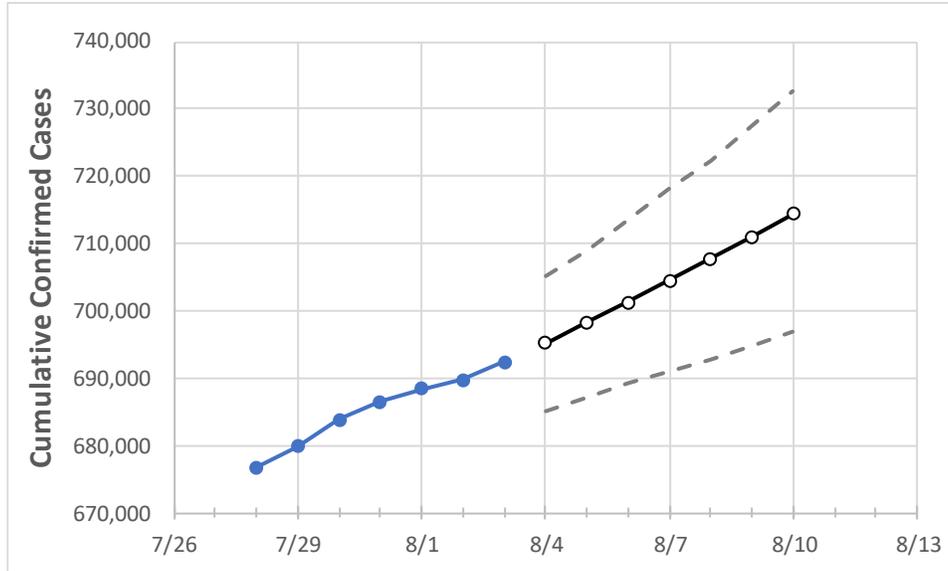
### IEM's Modeling Lead

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:							
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	
Missouri	686,547	688,472	689,673	692,340	695,262	698,273	701,316	704,483	707,744	710,959	714,451	

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:							
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	
Boone	20,462	20,513	20,556	20,616	20,696	20,778	20,859	20,940	21,020	21,104	21,187	
City of St. Louis	26,877	26,949	27,059	27,059	27,140	27,221	27,308	27,396	27,488	27,585	27,684	
Greene	37,155	37,262	37,323	37,474	37,645	37,819	37,990	38,156	38,319	38,486	38,643	
Jackson (& KC)	93,046	93,359	93,545	94,073	94,600	95,148	95,709	96,292	96,914	97,565	98,232	
St. Charles	46,125	46,228	46,296	46,411	46,565	46,727	46,894	47,065	47,244	47,427	47,618	
St. Louis	108,225	108,487	108,592	108,899	109,248	109,611	109,975	110,370	110,765	111,175	111,606	

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:											
	7/31	8/1	8/2	8/3	8/5			8/7			8/9					
Boone	20,462	20,513	20,556	20,616	20,778	(4,156)	[997]	{499}	20,940	(4,188)	[1,005]	{503}	21,104	(4,221)	[1,013]	{506}
City of St. Louis	26,877	26,949	27,059	27,059	27,221	(5,444)	[1,307]	{653}	27,396	(5,479)	[1,315]	{658}	27,585	(5,517)	[1,324]	{662}
Greene	37,155	37,262	37,323	37,474	37,819	(7,564)	[1,815]	{908}	38,156	(7,631)	[1,831]	{916}	38,486	(7,697)	[1,847]	{924}
Jackson (& KC)	93,046	93,359	93,545	94,073	95,148	(19,030)	[4,567]	{2,284}	96,292	(19,258)	[4,622]	{2,311}	97,565	(19,513)	[4,683]	{2,342}
St. Charles	46,125	46,228	46,296	46,411	46,727	(9,345)	[2,243]	{1,121}	47,065	(9,413)	[2,259]	{1,130}	47,427	(9,485)	[2,276]	{1,138}
St. Louis	108,225	108,487	108,592	108,899	109,611	(21,922)	[5,261]	{2,631}	110,370	(22,074)	[5,298]	{2,649}	111,175	(22,235)	[5,336]	{2,668}

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.