

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

Date: 9/22/21

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 9/22/21 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.**

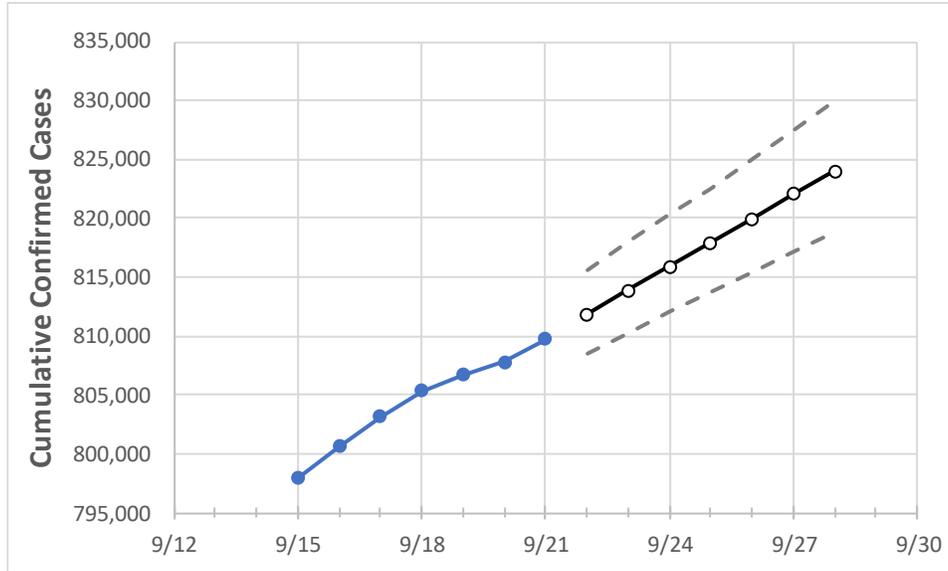
### IEM's Modeling Lead

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:							
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	
Missouri	805,334	806,720	807,762	809,769	811,834	813,899	815,917	817,920	819,991	822,040	824,003	

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:							
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	
Boone	23,536	23,585	23,605	23,642	23,698	23,754	23,808	23,866	23,921	23,977	24,032	
City of St. Louis	30,050	30,080	30,155	30,155	30,216	30,275	30,335	30,393	30,454	30,517	30,577	
Greene	41,651	41,688	41,719	41,789	41,844	41,899	41,952	42,007	42,061	42,116	42,167	
Jackson (& KC)	112,228	112,480	112,632	112,886	113,161	113,438	113,706	113,976	114,243	114,517	114,772	
St. Charles	52,553	52,646	52,719	52,831	52,945	53,058	53,172	53,284	53,399	53,512	53,624	
St. Louis	122,155	122,333	122,509	122,825	123,088	123,355	123,615	123,877	124,147	124,421	124,692	

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:											
	9/18	9/19	9/20	9/21	9/23				9/25				9/27			
Boone	23,536	23,585	23,605	23,642	23,754	(4,751)	[1,140]	{570}	23,866	(4,773)	[1,146]	{573}	23,977	(4,795)	[1,151]	{575}
City of St. Louis	30,050	30,080	30,155	30,155	30,275	(6,055)	[1,453]	{727}	30,393	(6,079)	[1,459]	{729}	30,517	(6,103)	[1,465]	{732}
Greene	41,651	41,688	41,719	41,789	41,899	(8,380)	[2,011]	{1,006}	42,007	(8,401)	[2,016]	{1,008}	42,116	(8,423)	[2,022]	{1,011}
Jackson (& KC)	112,228	112,480	112,632	112,886	113,438	(22,688)	[5,445]	{2,723}	113,976	(22,795)	[5,471]	{2,735}	114,517	(22,903)	[5,497]	{2,748}
St. Charles	52,553	52,646	52,719	52,831	53,058	(10,612)	[2,547]	{1,273}	53,284	(10,657)	[2,558]	{1,279}	53,512	(10,702)	[2,569]	{1,284}
St. Louis	122,155	122,333	122,509	122,825	123,355	(24,671)	[5,921]	{2,961}	123,877	(24,775)	[5,946]	{2,973}	124,421	(24,884)	[5,972]	{2,986}

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.