

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/10/21**

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 5/10/21 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.

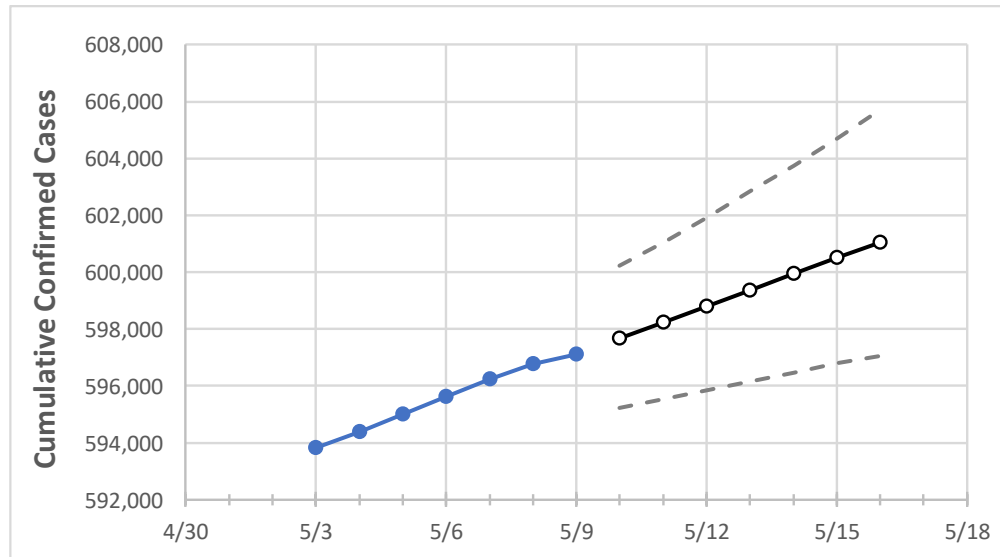
IEM's Modeling Lead

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:						
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16
Missouri	595,629	596,224	596,758	597,097	597,655	598,224	598,783	599,365	599,947	600,503	601,042

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:						
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16
Boone	17,897	17,907	17,915	17,925	17,933	17,940	17,948	17,955	17,961	17,968	17,975
City of St. Louis	24,327	24,362	24,400	24,427	24,464	24,500	24,536	24,571	24,606	24,639	24,673
Greene	28,140	28,161	28,177	28,196	28,223	28,249	28,277	28,305	28,333	28,362	28,391
Jackson (& KC)	81,525	81,651	81,769	81,858	81,983	82,106	82,227	82,355	82,479	82,605	82,733
St. Charles	42,556	42,592	42,607	42,627	42,665	42,702	42,740	42,774	42,810	42,845	42,879
St. Louis	98,339	98,436	98,544	98,598	98,709	98,819	98,929	99,033	99,138	99,243	99,344

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:											
	5/6	5/7	5/8	5/9	5/11				5/13				5/15			
Boone	17,897	17,907	17,915	17,925	17,940	(3,588)	[861]	{431}	17,955	(3,591)	[862]	{431}	17,968	(3,594)	[862]	{431}
City of St. Louis	24,327	24,362	24,400	24,427	24,500	(4,900)	[1,176]	{588}	24,571	(4,914)	[1,179]	{590}	24,639	(4,928)	[1,183]	{591}
Greene	28,140	28,161	28,177	28,196	28,249	(5,650)	[1,356]	{678}	28,305	(5,661)	[1,359]	{679}	28,362	(5,672)	[1,361]	{681}
Jackson (& KC)	81,525	81,651	81,769	81,858	82,106	(16,421)	[3,941]	{1,971}	82,355	(16,471)	[3,953]	{1,977}	82,605	(16,521)	[3,965]	{1,983}
St. Charles	42,556	42,592	42,607	42,627	42,702	(8,540)	[2,050]	{1,025}	42,774	(8,555)	[2,053]	{1,027}	42,845	(8,569)	[2,057]	{1,028}
St. Louis	98,339	98,436	98,544	98,598	98,819	(19,764)	[4,743]	{2,372}	99,033	(19,807)	[4,754]	{2,377}	99,243	(19,849)	[4,764]	{2,382}

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