

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 6/11/21**

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 6/11/21 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.

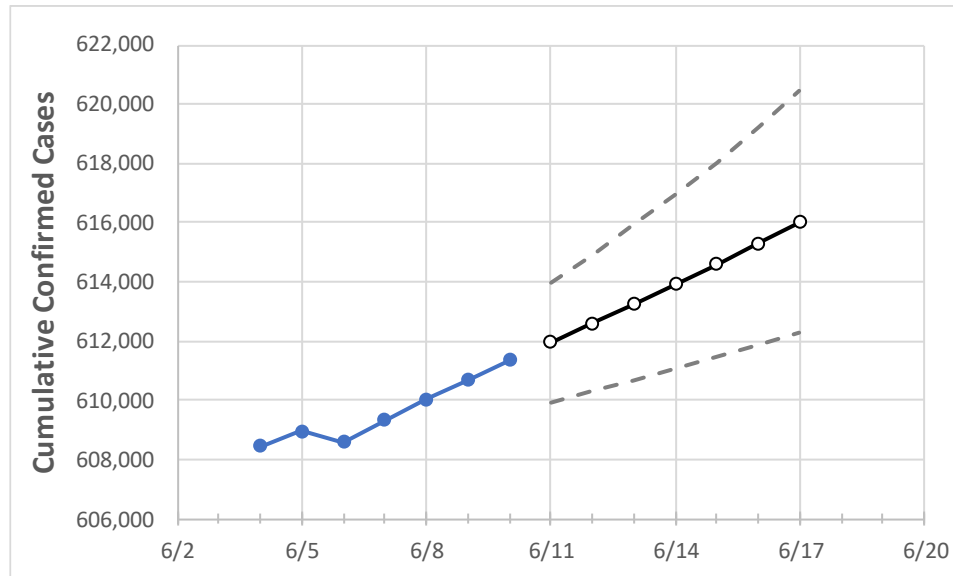
IEM's Modeling Lead

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Missouri	609,329	610,053	610,677	611,352	611,964	612,596	613,254	613,924	614,607	615,298	616,019

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Boone	18,132	18,136	18,143	18,147	18,153	18,159	18,164	18,171	18,177	18,183	18,189
City of St. Louis	25,094	25,119	25,128	25,149	25,163	25,177	25,190	25,204	25,216	25,229	25,242
Greene	29,049	29,159	29,248	29,323	29,398	29,476	29,557	29,643	29,735	29,831	29,933
Jackson (& KC)	83,699	83,774	83,836	83,892	83,936	83,978	84,020	84,058	84,097	84,137	84,177
St. Charles	43,153	43,174	43,202	43,219	43,239	43,259	43,279	43,300	43,320	43,340	43,360
St. Louis	100,357	100,437	100,484	100,522	100,556	100,590	100,623	100,656	100,687	100,719	100,748

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:											
	6/7	6/8	6/9	6/10	6/12				6/14				6/16			
Boone	18,132	18,136	18,143	18,147	18,159	(3,632)	[872]	{436}	18,171	(3,634)	[872]	{436}	18,183	(3,637)	[873]	{436}
City of St. Louis	25,094	25,119	25,128	25,149	25,177	(5,035)	[1,208]	{604}	25,204	(5,041)	[1,210]	{605}	25,229	(5,046)	[1,211]	{605}
Greene	29,049	29,159	29,248	29,323	29,476	(5,895)	[1,415]	{707}	29,643	(5,929)	[1,423]	{711}	29,831	(5,966)	[1,432]	{716}
Jackson (& KC)	83,699	83,774	83,836	83,892	83,978	(16,796)	[4,031]	{2,015}	84,058	(16,812)	[4,035]	{2,017}	84,137	(16,827)	[4,039]	{2,019}
St. Charles	43,153	43,174	43,202	43,219	43,259	(8,652)	[2,076]	{1,038}	43,300	(8,660)	[2,078]	{1,039}	43,340	(8,668)	[2,080]	{1,040}
St. Louis	100,357	100,437	100,484	100,522	100,590	(20,118)	[4,828]	{2,414}	100,656	(20,131)	[4,831]	{2,416}	100,719	(20,144)	[4,835]	{2,417}

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.