

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.

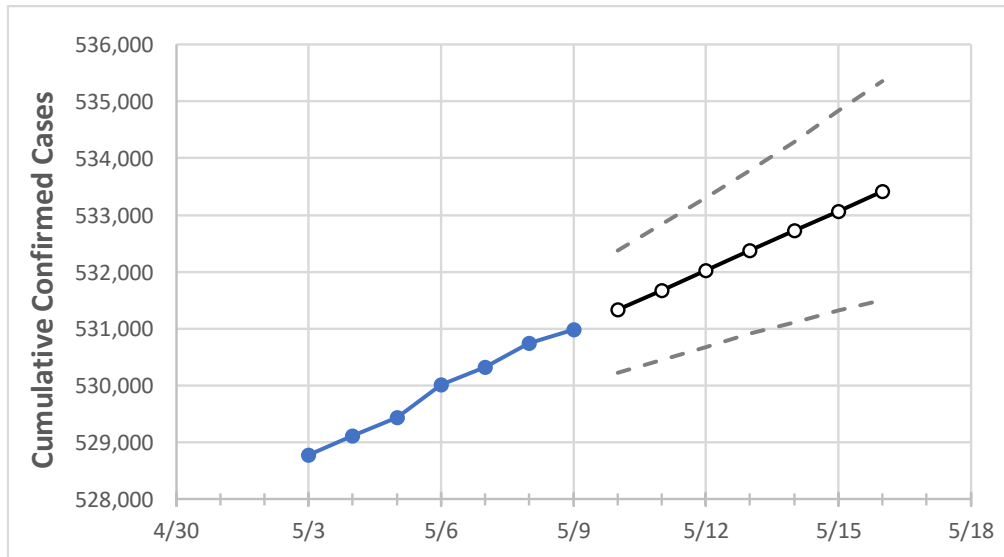
IEM's Modeling Lead

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.

Alabama 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
Alabama	530,011	530,325	530,744	530,988	531,336	531,672	532,024	532,370	532,724	533,068	533,413

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.

Alabama 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
Jefferson	76,359	76,397	76,493	76,529	76,575	76,623	76,670	76,718	76,766	76,813	76,860
Lee	15,844	15,856	15,873	15,884	15,895	15,906	15,917	15,928	15,939	15,950	15,961
Madison	34,676	34,717	34,735	34,751	34,779	34,807	34,835	34,862	34,889	34,916	34,943
Marshall	12,203	12,210	12,213	12,222	12,231	12,239	12,248	12,257	12,265	12,274	12,282
Mobile	40,875	40,908	40,959	40,971	40,994	41,019	41,042	41,065	41,087	41,110	41,131
Montgomery	24,308	24,314	24,327	24,329	24,341	24,353	24,365	24,376	24,387	24,398	24,409
Shelby	23,389	23,401	23,425	23,431	23,443	23,455	23,467	23,479	23,491	23,503	23,515
Tuscaloosa	25,717	25,730	25,749	25,775	25,796	25,817	25,838	25,859	25,882	25,904	25,926

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.

Alabama 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			
Jefferson	76,359	76,397	76,493	76,529	76,623	(15,325)	[3,678]	{1,839}	76,718	(15,344)	[3,682]	{1,841}	76,813	(15,363)	[3,687]	{1,844}
Lee	15,844	15,856	15,873	15,884	15,906	(3,181)	[764]	{382}	15,928	(3,186)	[765]	{382}	15,950	(3,190)	[766]	{383}
Madison	34,676	34,717	34,735	34,751	34,807	(6,961)	[1,671]	{835}	34,862	(6,972)	[1,673]	{837}	34,916	(6,983)	[1,676]	{838}
Marshall	12,203	12,210	12,213	12,222	12,239	(2,448)	[587]	{294}	12,257	(2,451)	[588]	{294}	12,274	(2,455)	[589]	{295}
Mobile	40,875	40,908	40,959	40,971	41,019	(8,204)	[1,969]	{984}	41,065	(8,213)	[1,971]	{986}	41,110	(8,222)	[1,973]	{987}
Montgomery	24,308	24,314	24,327	24,329	24,353	(4,871)	[1,169]	{584}	24,376	(4,875)	[1,170]	{585}	24,398	(4,880)	[1,171]	{586}
Shelby	23,389	23,401	23,425	23,431	23,455	(4,691)	[1,126]	{563}	23,479	(4,696)	[1,127]	{563}	23,503	(4,701)	[1,128]	{564}
Tuscaloosa	25,717	25,730	25,749	25,775	25,817	(5,163)	[1,239]	{620}	25,859	(5,172)	[1,241]	{621}	25,904	(5,181)	[1,243]	{622}

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.