

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

Date: 7/2/21

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 7/2/21 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.

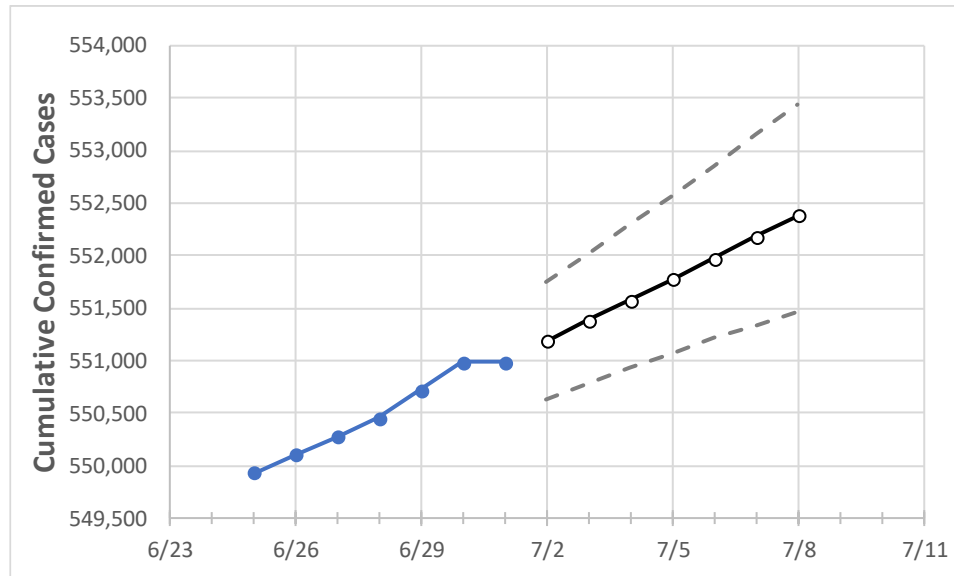
IEM's Modeling Lead

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:							
	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7	7/8	
Alabama	550,451	550,717	550,983	550,983	551,183	551,383	551,574	551,775	551,975	552,179	552,386	

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:							
	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7	7/8	
Jefferson	81,216	81,253	81,290	81,290	81,314	81,338	81,362	81,386	81,411	81,435	81,460	
Lee	16,319	16,326	16,332	16,332	16,336	16,340	16,344	16,348	16,351	16,355	16,359	
Madison	35,826	35,836	35,846	35,846	35,859	35,873	35,886	35,898	35,912	35,925	35,938	
Marshall	12,485	12,489	12,493	12,493	12,496	12,499	12,502	12,506	12,509	12,512	12,515	
Mobile	42,331	42,362	42,393	42,393	42,427	42,462	42,499	42,538	42,578	42,620	42,663	
Montgomery	25,110	25,117	25,124	25,124	25,127	25,131	25,134	25,137	25,140	25,143	25,146	
Shelby	25,703	25,714	25,725	25,725	25,735	25,746	25,756	25,766	25,778	25,788	25,800	
Tuscaloosa	26,228	26,229	26,229	26,229	26,233	26,237	26,241	26,245	26,249	26,253	26,257	

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:											
	6/28	6/29	6/30	7/1	7/3				7/5				7/7			
Jefferson	81,216	81,253	81,290	81,290	81,338	(16,268)	[3,904]	{1,952}	81,386	(16,277)	[3,907]	{1,953}	81,435	(16,287)	[3,909]	{1,954}
Lee	16,319	16,326	16,332	16,332	16,340	(3,268)	[784]	{392}	16,348	(3,270)	[785]	{392}	16,355	(3,271)	[785]	{393}
Madison	35,826	35,836	35,846	35,846	35,873	(7,175)	[1,722]	{861}	35,898	(7,180)	[1,723]	{862}	35,925	(7,185)	[1,724]	{862}
Marshall	12,485	12,489	12,493	12,493	12,499	(2,500)	[600]	{300}	12,506	(2,501)	[600]	{300}	12,512	(2,502)	[601]	{300}
Mobile	42,331	42,362	42,393	42,393	42,462	(8,492)	[2,038]	{1,019}	42,538	(8,508)	[2,042]	{1,021}	42,620	(8,524)	[2,046]	{1,023}
Montgomery	25,110	25,117	25,124	25,124	25,131	(5,026)	[1,206]	{603}	25,137	(5,027)	[1,207]	{603}	25,143	(5,029)	[1,207]	{603}
Shelby	25,703	25,714	25,725	25,725	25,746	(5,149)	[1,236]	{618}	25,766	(5,153)	[1,237]	{618}	25,788	(5,158)	[1,238]	{619}
Tuscaloosa	26,228	26,229	26,229	26,229	26,237	(5,247)	[1,259]	{630}	26,245	(5,249)	[1,260]	{630}	26,253	(5,251)	[1,260]	{630}

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.