

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

Date: 9/8/21

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 9/8/21 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.

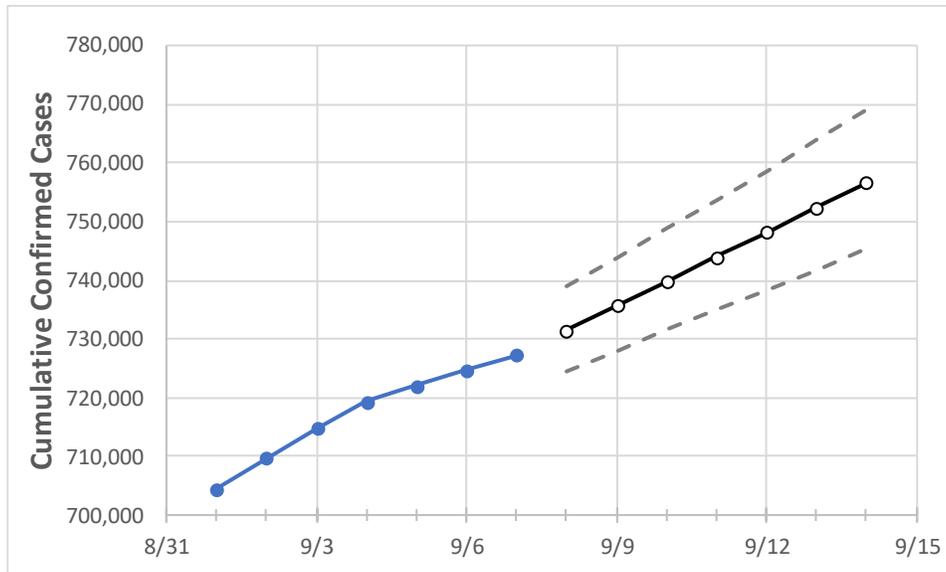
IEM's Modeling Lead

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:							
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Alabama	719,280	722,122	724,688	727,360	731,577	735,687	739,790	744,080	748,255	752,453	756,622	

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:							
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Jefferson	103,817	104,173	104,567	104,955	105,563	106,175	106,761	107,367	107,975	108,605	109,198	
Lee	20,592	20,678	20,735	20,827	20,923	21,020	21,118	21,214	21,311	21,407	21,505	
Madison	45,103	45,350	45,548	45,695	46,003	46,310	46,621	46,937	47,256	47,585	47,903	
Marshall	16,122	16,154	16,232	16,291	16,397	16,509	16,618	16,728	16,838	16,954	17,062	
Mobile	65,113	65,363	65,549	65,716	66,030	66,340	66,632	66,925	67,229	67,517	67,795	
Montgomery	31,017	31,131	31,257	31,331	31,487	31,646	31,805	31,960	32,122	32,284	32,439	
Shelby	33,044	33,200	33,355	33,473	33,683	33,889	34,110	34,321	34,537	34,762	34,991	
Tuscaloosa	30,983	31,105	31,169	31,248	31,417	31,587	31,763	31,944	32,127	32,324	32,510	

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:											
	9/4	9/5	9/6	9/7	9/9			9/11			9/13					
Jefferson	103,817	104,173	104,567	104,955	106,175	(21,235)	[5,096]	{2,548}	107,367	(21,473)	[5,154]	{2,577}	108,605	(21,721)	[5,213]	{2,607}
Lee	20,592	20,678	20,735	20,827	21,020	(4,204)	[1,009]	{504}	21,214	(4,243)	[1,018]	{509}	21,407	(4,281)	[1,028]	{514}
Madison	45,103	45,350	45,548	45,695	46,310	(9,262)	[2,223]	{1,111}	46,937	(9,387)	[2,253]	{1,126}	47,585	(9,517)	[2,284]	{1,142}
Marshall	16,122	16,154	16,232	16,291	16,509	(3,302)	[792]	{396}	16,728	(3,346)	[803]	{401}	16,954	(3,391)	[814]	{407}
Mobile	65,113	65,363	65,549	65,716	66,340	(13,268)	[3,184]	{1,592}	66,925	(13,385)	[3,212]	{1,606}	67,517	(13,503)	[3,241]	{1,620}
Montgomery	31,017	31,131	31,257	31,331	31,646	(6,329)	[1,519]	{760}	31,960	(6,392)	[1,534]	{767}	32,284	(6,457)	[1,550]	{775}
Shelby	33,044	33,200	33,355	33,473	33,889	(6,778)	[1,627]	{813}	34,321	(6,864)	[1,647]	{824}	34,762	(6,952)	[1,669]	{834}
Tuscaloosa	30,983	31,105	31,169	31,248	31,587	(6,317)	[1,516]	{758}	31,944	(6,389)	[1,533]	{767}	32,324	(6,465)	[1,552]	{776}

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.