

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/1/21**

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 9/1/21 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.

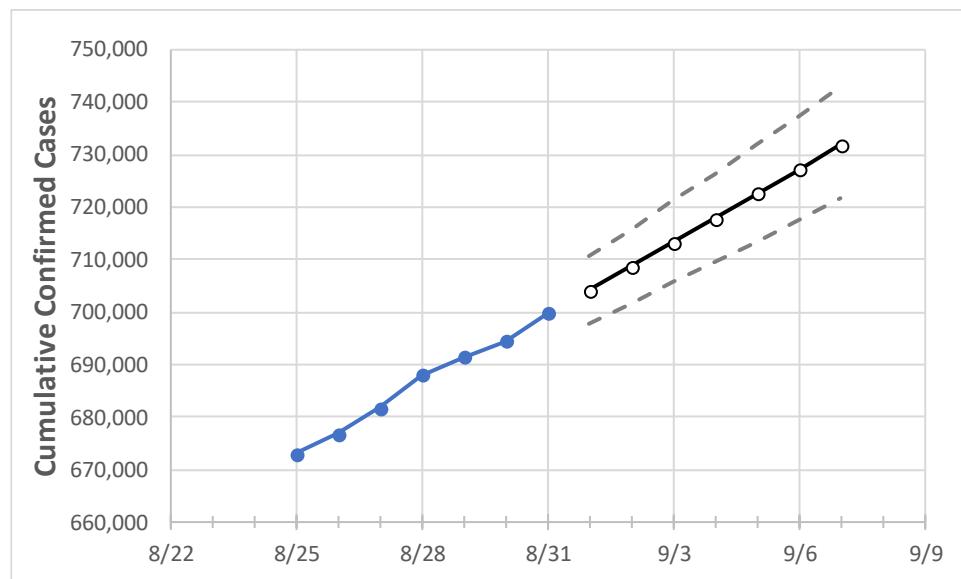
IEM's Modeling Lead

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:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Alabama	688,018	691,451	694,523	699,729	704,157	708,770	713,252	717,850	722,521	727,147	731,987

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:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Jefferson	99,379	99,807	100,345	101,002	101,667	102,346	103,012	103,696	104,391	105,118	105,817
Lee	19,854	19,938	20,020	20,152	20,268	20,384	20,506	20,624	20,751	20,878	21,000
Madison	43,062	43,453	43,644	43,897	44,241	44,588	44,942	45,311	45,688	46,081	46,479
Marshall	15,328	15,411	15,447	15,572	15,686	15,802	15,920	16,041	16,165	16,286	16,416
Mobile	62,617	62,959	63,157	63,554	63,939	64,303	64,669	65,035	65,392	65,749	66,102
Montgomery	29,889	29,989	30,152	30,330	30,507	30,688	30,870	31,055	31,243	31,434	31,627
Shelby	31,616	31,769	31,907	32,121	32,318	32,532	32,734	32,959	33,169	33,387	33,609
Tuscaloosa	29,801	29,912	30,023	30,178	30,306	30,438	30,571	30,710	30,847	30,988	31,134

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:					
	8/28	8/29	8/30	8/31	9/2	9/4	9/6			
Jefferson	99,379	99,807	100,345	101,002	102,346 (20,469) [4,913] {2,456}	103,696 (20,739) [4,977] {2,489}	105,118 (21,024) [5,046] {2,523}			
Lee	19,854	19,938	20,020	20,152	20,384 (4,077) [978] {489}	20,624 (4,125) [990] {495}	20,878 (4,176) [1,002] {501}			
Madison	43,062	43,453	43,644	43,897	44,588 (8,918) [2,140] {1,070}	45,311 (9,062) [2,175] {1,087}	46,081 (9,216) [2,212] {1,106}			
Marshall	15,328	15,411	15,447	15,572	15,802 (3,160) [758] {379}	16,041 (3,208) [770] {385}	16,286 (3,257) [782] {391}			
Mobile	62,617	62,959	63,157	63,554	64,303 (12,861) [3,087] {1,543}	65,035 (13,007) [3,122] {1,561}	65,749 (13,150) [3,156] {1,578}			
Montgomery	29,889	29,989	30,152	30,330	30,688 (6,138) [1,473] {737}	31,055 (6,211) [1,491] {745}	31,434 (6,287) [1,509] {754}			
Shelby	31,616	31,769	31,907	32,121	32,532 (6,506) [1,562] {781}	32,959 (6,592) [1,582] {791}	33,387 (6,677) [1,603] {801}			
Tuscaloosa	29,801	29,912	30,023	30,178	30,438 (6,088) [1,461] {731}	30,710 (6,142) [1,474] {737}	30,988 (6,198) [1,487] {744}			

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.