

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

Date: 8/2/21

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 8/2/21 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.

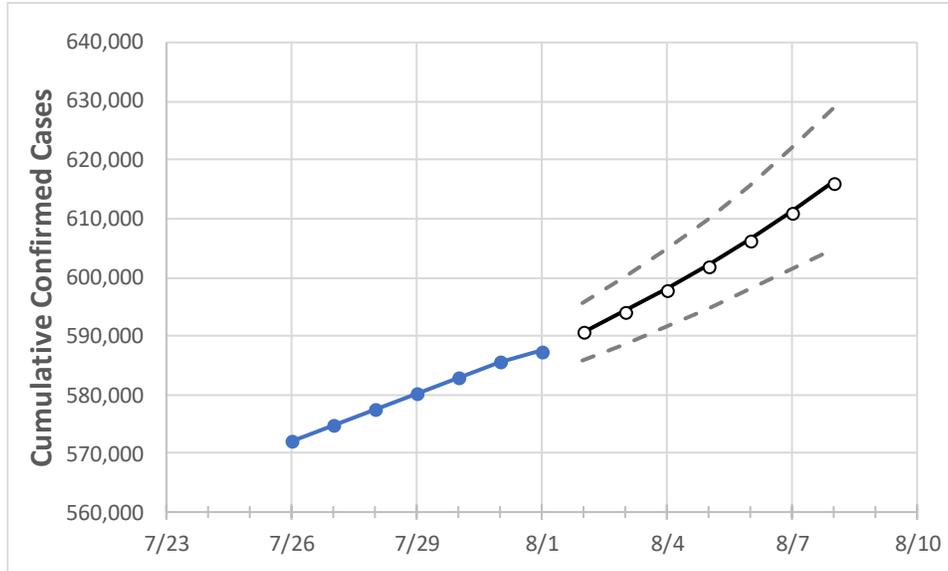
IEM's Modeling Lead

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:							
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	
Alabama	580,178	582,892	585,607	587,405	590,642	594,128	597,867	601,942	606,329	611,118	616,206	

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:							
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	
Jefferson	84,513	84,828	85,143	85,385	85,770	86,189	86,640	87,137	87,670	88,255	88,879	
Lee	17,027	17,106	17,184	17,224	17,303	17,389	17,480	17,581	17,689	17,805	17,932	
Madison	37,168	37,290	37,411	37,517	37,659	37,812	37,976	38,151	38,342	38,546	38,759	
Marshall	12,982	13,030	13,079	13,116	13,177	13,242	13,311	13,391	13,475	13,567	13,668	
Mobile	47,642	48,113	48,584	48,932	49,536	50,186	50,889	51,654	52,474	53,353	54,303	
Montgomery	25,985	26,052	26,119	26,172	26,252	26,338	26,429	26,525	26,628	26,737	26,854	
Shelby	26,979	27,086	27,192	27,280	27,404	27,537	27,677	27,827	27,987	28,157	28,341	
Tuscaloosa	26,992	27,068	27,145	27,171	27,258	27,354	27,460	27,575	27,702	27,841	27,995	

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:											
	7/29	7/30	7/31	8/1	8/3				8/5				8/7			
Jefferson	84,513	84,828	85,143	85,385	86,189	(17,238)	[4,137]	{2,069}	87,137	(17,427)	[4,183]	{2,091}	88,255	(17,651)	[4,236]	{2,118}
Lee	17,027	17,106	17,184	17,224	17,389	(3,478)	[835]	{417}	17,581	(3,516)	[844]	{422}	17,805	(3,561)	[855]	{427}
Madison	37,168	37,290	37,411	37,517	37,812	(7,562)	[1,815]	{907}	38,151	(7,630)	[1,831]	{916}	38,546	(7,709)	[1,850]	{925}
Marshall	12,982	13,030	13,079	13,116	13,242	(2,648)	[636]	{318}	13,391	(2,678)	[643]	{321}	13,567	(2,713)	[651]	{326}
Mobile	47,642	48,113	48,584	48,932	50,186	(10,037)	[2,409]	{1,204}	51,654	(10,331)	[2,479]	{1,240}	53,353	(10,671)	[2,561]	{1,280}
Montgomery	25,985	26,052	26,119	26,172	26,338	(5,268)	[1,264]	{632}	26,525	(5,305)	[1,273]	{637}	26,737	(5,347)	[1,283]	{642}
Shelby	26,979	27,086	27,192	27,280	27,537	(5,507)	[1,322]	{661}	27,827	(5,565)	[1,336]	{668}	28,157	(5,631)	[1,352]	{676}
Tuscaloosa	26,992	27,068	27,145	27,171	27,354	(5,471)	[1,313]	{656}	27,575	(5,515)	[1,324]	{662}	27,841	(5,568)	[1,336]	{668}

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.