

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

Date: 8/25/21

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 8/25/21 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.

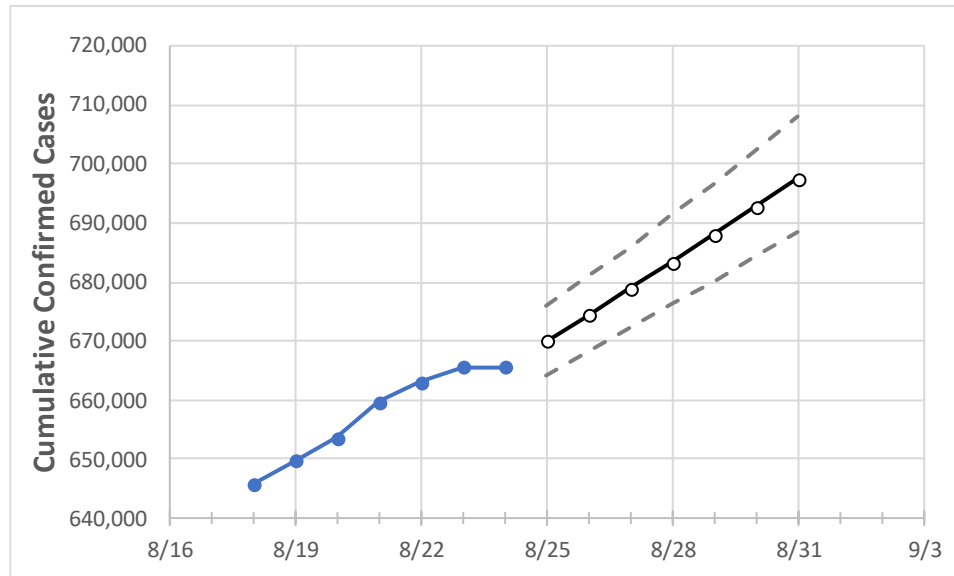
IEM's Modeling Lead

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
Alabama	659,750	663,065	665,653	665,653	669,990	674,420	678,867	683,407	688,033	692,742	697,516

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
Jefferson	95,077	95,624	96,037	96,037	96,676	97,324	98,005	98,683	99,374	100,090	100,814
Lee	19,198	19,291	19,342	19,342	19,477	19,612	19,751	19,898	20,044	20,199	20,354
Madison	40,988	41,260	41,524	41,524	41,808	42,100	42,404	42,723	43,049	43,386	43,732
Marshall	14,603	14,638	14,712	14,712	14,807	14,908	15,011	15,114	15,223	15,335	15,444
Mobile	59,597	59,976	60,277	60,277	60,744	61,206	61,673	62,133	62,583	63,052	63,504
Montgomery	28,753	28,879	28,949	28,949	29,128	29,314	29,505	29,699	29,894	30,102	30,315
Shelby	30,267	30,403	30,521	30,521	30,697	30,881	31,067	31,257	31,447	31,647	31,842
Tuscaloosa	29,020	29,099	29,142	29,142	29,245	29,349	29,454	29,558	29,667	29,776	29,888

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:											
	8/21	8/22	8/23	8/24	8/26			8/28			8/30					
Jefferson	95,077	95,624	96,037	96,037	97,324	(19,465)	[4,672]	{2,336}	98,683	(19,737)	[4,737]	{2,368}	100,090	(20,018)	[4,804]	{2,402}
Lee	19,198	19,291	19,342	19,342	19,612	(3,922)	[941]	{471}	19,898	(3,980)	[955]	{478}	20,199	(4,040)	[970]	{485}
Madison	40,988	41,260	41,524	41,524	42,100	(8,420)	[2,021]	{1,010}	42,723	(8,545)	[2,051]	{1,025}	43,386	(8,677)	[2,083]	{1,041}
Marshall	14,603	14,638	14,712	14,712	14,908	(2,982)	[716]	{358}	15,114	(3,023)	[725]	{363}	15,335	(3,067)	[736]	{368}
Mobile	59,597	59,976	60,277	60,277	61,206	(12,241)	[2,938]	{1,469}	62,133	(12,427)	[2,982]	{1,491}	63,052	(12,610)	[3,026]	{1,513}
Montgomery	28,753	28,879	28,949	28,949	29,314	(5,863)	[1,407]	{704}	29,699	(5,940)	[1,426]	{713}	30,102	(6,020)	[1,445]	{722}
Shelby	30,267	30,403	30,521	30,521	30,881	(6,176)	[1,482]	{741}	31,257	(6,251)	[1,500]	{750}	31,647	(6,329)	[1,519]	{760}
Tuscaloosa	29,020	29,099	29,142	29,142	29,349	(5,870)	[1,409]	{704}	29,558	(5,912)	[1,419]	{709}	29,776	(5,955)	[1,429]	{715}

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.