

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

Date: 6/10/21

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 6/10/21 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.

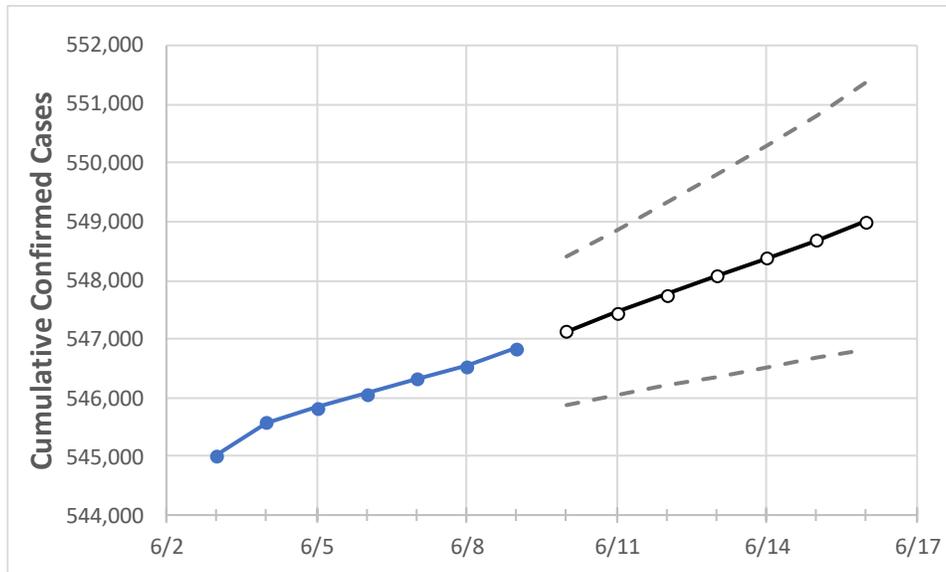
IEM's Modeling Lead

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:					
	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16
Alabama	546,078	546,324	546,540	546,845	547,142	547,453	547,760	548,072	548,379	548,689	549,004

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:					
	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16
Jefferson	80,649	80,681	80,705	80,715	80,745	80,776	80,806	80,837	80,868	80,900	80,932
Lee	16,197	16,201	16,203	16,211	16,219	16,227	16,235	16,243	16,251	16,259	16,267
Madison	35,492	35,514	35,520	35,596	35,615	35,635	35,656	35,676	35,697	35,718	35,740
Marshall	12,391	12,397	12,407	12,417	12,423	12,430	12,436	12,443	12,449	12,456	12,463
Mobile	41,793	41,808	41,854	41,871	41,899	41,927	41,957	41,987	42,016	42,047	42,077
Montgomery	25,043	25,057	25,061	25,063	25,074	25,084	25,094	25,105	25,116	25,127	25,137
Shelby	25,514	25,528	25,533	25,544	25,557	25,571	25,585	25,599	25,613	25,627	25,643
Tuscaloosa	26,095	26,100	26,105	26,110	26,115	26,120	26,125	26,130	26,134	26,139	26,143

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:											
	6/6	6/7	6/8	6/9	6/11			6/13			6/15					
Jefferson	80,649	80,681	80,705	80,715	80,776	(16,155)	[3,877]	{1,939}	80,837	(16,167)	[3,880]	{1,940}	80,900	(16,180)	[3,883]	{1,942}
Lee	16,197	16,201	16,203	16,211	16,227	(3,245)	[779]	{389}	16,243	(3,249)	[780]	{390}	16,259	(3,252)	[780]	{390}
Madison	35,492	35,514	35,520	35,596	35,635	(7,127)	[1,710]	{855}	35,676	(7,135)	[1,712]	{856}	35,718	(7,144)	[1,714]	{857}
Marshall	12,391	12,397	12,407	12,417	12,430	(2,486)	[597]	{298}	12,443	(2,489)	[597]	{299}	12,456	(2,491)	[598]	{299}
Mobile	41,793	41,808	41,854	41,871	41,927	(8,385)	[2,013]	{1,006}	41,987	(8,397)	[2,015]	{1,008}	42,047	(8,409)	[2,018]	{1,009}
Montgomery	25,043	25,057	25,061	25,063	25,084	(5,017)	[1,204]	{602}	25,105	(5,021)	[1,205]	{603}	25,127	(5,025)	[1,206]	{603}
Shelby	25,514	25,528	25,533	25,544	25,571	(5,114)	[1,227]	{614}	25,599	(5,120)	[1,229]	{614}	25,627	(5,125)	[1,230]	{615}
Tuscaloosa	26,095	26,100	26,105	26,110	26,120	(5,224)	[1,254]	{627}	26,130	(5,226)	[1,254]	{627}	26,139	(5,228)	[1,255]	{627}

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.