

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

Date: 6/24/21

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 6/24/21 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.**

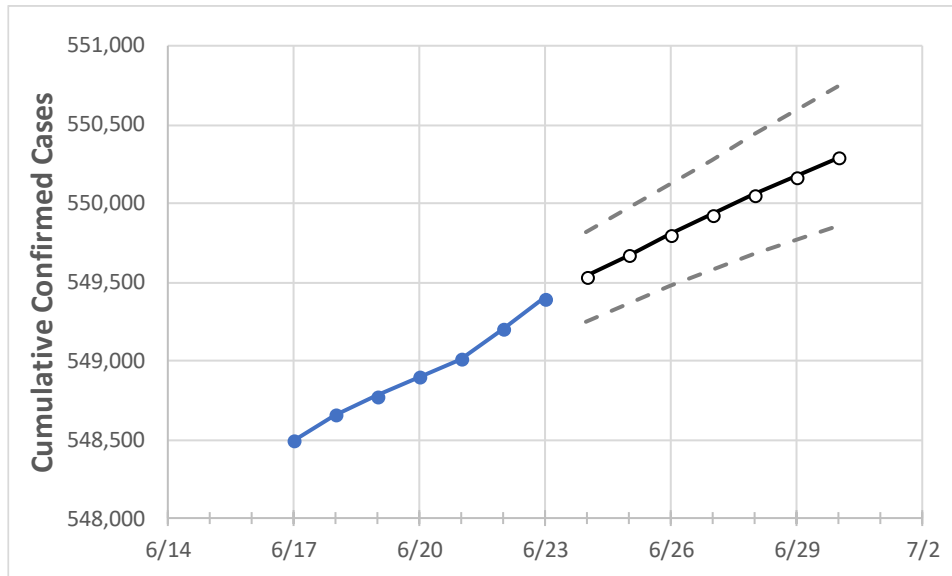
### IEM's Modeling Lead

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:							
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	
Alabama	548,894	549,013	549,204	549,394	549,534	549,669	549,801	549,931	550,052	550,172	550,288	

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:							
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	
Jefferson	81,032	81,046	81,066	81,085	81,105	81,125	81,146	81,165	81,182	81,201	81,218	
Lee	16,284	16,287	16,294	16,301	16,306	16,311	16,316	16,321	16,326	16,331	16,335	
Madison	35,709	35,718	35,726	35,733	35,742	35,752	35,761	35,770	35,778	35,787	35,796	
Marshall	12,454	12,454	12,460	12,465	12,467	12,469	12,471	12,473	12,475	12,477	12,478	
Mobile	42,132	42,145	42,163	42,180	42,199	42,217	42,236	42,254	42,272	42,289	42,307	
Montgomery	25,087	25,089	25,096	25,103	25,105	25,107	25,108	25,110	25,111	25,113	25,114	
Shelby	25,620	25,626	25,632	25,638	25,643	25,649	25,654	25,659	25,664	25,669	25,674	
Tuscaloosa	26,177	26,179	26,183	26,186	26,190	26,195	26,199	26,203	26,207	26,211	26,215	

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:											
	6/20	6/21	6/22	6/23	6/25			6/27			6/29					
Jefferson	81,032	81,046	81,066	81,085	81,125	(16,225)	[3,894]	{1,947}	81,165	(16,233)	[3,896]	{1,948}	81,201	(16,240)	[3,898]	{1,949}
Lee	16,284	16,287	16,294	16,301	16,311	(3,262)	[783]	{391}	16,321	(3,264)	[783]	{392}	16,331	(3,266)	[784]	{392}
Madison	35,709	35,718	35,726	35,733	35,752	(7,150)	[1,716]	{858}	35,770	(7,154)	[1,717]	{858}	35,787	(7,157)	[1,718]	{859}
Marshall	12,454	12,454	12,460	12,465	12,469	(2,494)	[599]	{299}	12,473	(2,495)	[599]	{299}	12,477	(2,495)	[599]	{299}
Mobile	42,132	42,145	42,163	42,180	42,217	(8,443)	[2,026]	{1,013}	42,254	(8,451)	[2,028]	{1,014}	42,289	(8,458)	[2,030]	{1,015}
Montgomery	25,087	25,089	25,096	25,103	25,107	(5,021)	[1,205]	{603}	25,110	(5,022)	[1,205]	{603}	25,113	(5,023)	[1,205]	{603}
Shelby	25,620	25,626	25,632	25,638	25,649	(5,130)	[1,231]	{616}	25,659	(5,132)	[1,232]	{616}	25,669	(5,134)	[1,232]	{616}
Tuscaloosa	26,177	26,179	26,183	26,186	26,195	(5,239)	[1,257]	{629}	26,203	(5,241)	[1,258]	{629}	26,211	(5,242)	[1,258]	{629}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.