

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

Date: 6/17/21

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 6/17/21 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.

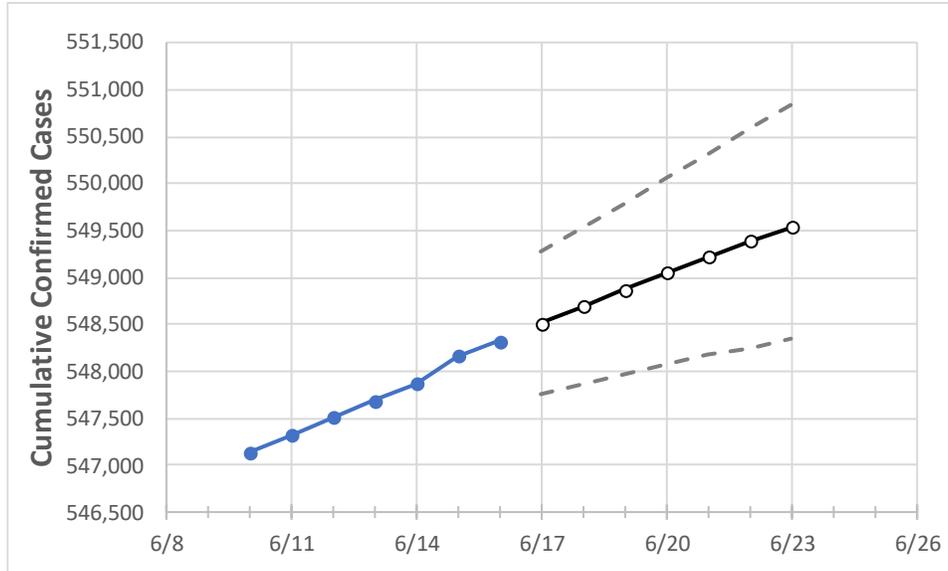
IEM's Modeling Lead

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:							
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23	
Alabama	547,690	547,873	548,163	548,323	548,513	548,695	548,874	549,052	549,215	549,382	549,535	

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:							
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23	
Jefferson	80,877	80,914	80,937	80,953	80,981	81,009	81,038	81,066	81,093	81,120	81,146	
Lee	16,243	16,248	16,259	16,265	16,271	16,276	16,281	16,286	16,291	16,296	16,300	
Madison	35,619	35,629	35,654	35,663	35,681	35,698	35,716	35,733	35,749	35,766	35,782	
Marshall	12,445	12,446	12,447	12,449	12,453	12,458	12,463	12,467	12,471	12,475	12,479	
Mobile	41,964	41,984	42,040	42,066	42,093	42,119	42,145	42,171	42,197	42,224	42,249	
Montgomery	25,072	25,075	25,080	25,081	25,084	25,087	25,090	25,092	25,095	25,097	25,099	
Shelby	25,574	25,580	25,588	25,595	25,602	25,608	25,614	25,620	25,626	25,632	25,637	
Tuscaloosa	26,143	26,147	26,161	26,162	26,168	26,173	26,178	26,184	26,189	26,194	26,199	

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:											
	6/13	6/14	6/15	6/16	6/18			6/20			6/22					
Jefferson	80,877	80,914	80,937	80,953	81,009	(16,202)	[3,888]	{1,944}	81,066	(16,213)	[3,891]	{1,946}	81,120	(16,224)	[3,894]	{1,947}
Lee	16,243	16,248	16,259	16,265	16,276	(3,255)	[781]	{391}	16,286	(3,257)	[782]	{391}	16,296	(3,259)	[782]	{391}
Madison	35,619	35,629	35,654	35,663	35,698	(7,140)	[1,713]	{857}	35,733	(7,147)	[1,715]	{858}	35,766	(7,153)	[1,717]	{858}
Marshall	12,445	12,446	12,447	12,449	12,458	(2,492)	[598]	{299}	12,467	(2,493)	[598]	{299}	12,475	(2,495)	[599]	{299}
Mobile	41,964	41,984	42,040	42,066	42,119	(8,424)	[2,022]	{1,011}	42,171	(8,434)	[2,024]	{1,012}	42,224	(8,445)	[2,027]	{1,013}
Montgomery	25,072	25,075	25,080	25,081	25,087	(5,017)	[1,204]	{602}	25,092	(5,018)	[1,204]	{602}	25,097	(5,019)	[1,205]	{602}
Shelby	25,574	25,580	25,588	25,595	25,608	(5,122)	[1,229]	{615}	25,620	(5,124)	[1,230]	{615}	25,632	(5,126)	[1,230]	{615}
Tuscaloosa	26,143	26,147	26,161	26,162	26,173	(5,235)	[1,256]	{628}	26,184	(5,237)	[1,257]	{628}	26,194	(5,239)	[1,257]	{629}

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.