

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/20/21**

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 5/20/21 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.

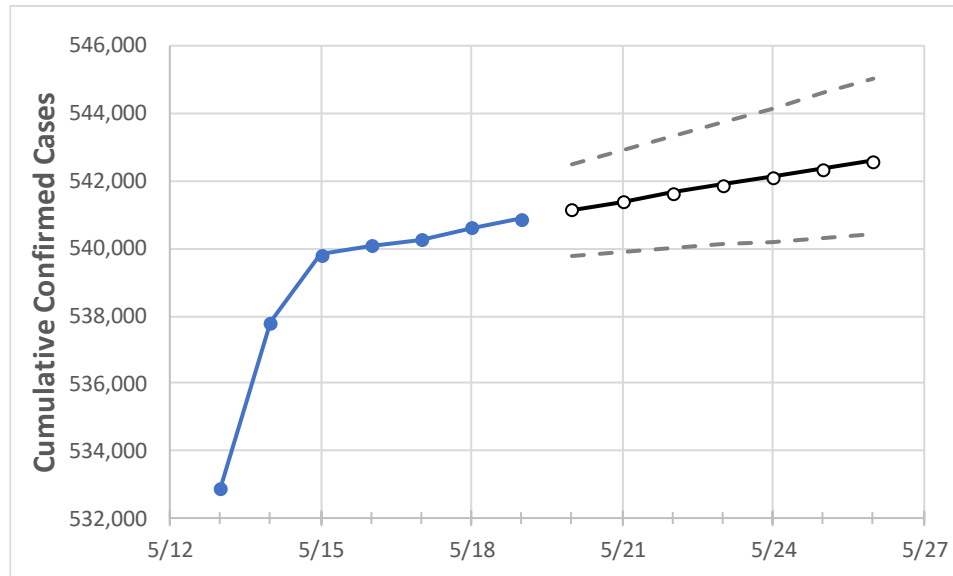
IEM's Modeling Lead

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:						
	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26
Alabama	540,083	540,267	540,603	540,891	541,152	541,395	541,643	541,887	542,130	542,360	542,600

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:						
	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26
Jefferson	79,848	79,879	79,916	79,964	79,997	80,030	80,061	80,093	80,125	80,156	80,187
Lee	15,993	15,997	16,005	16,011	16,017	16,023	16,029	16,035	16,040	16,045	16,050
Madison	35,157	35,175	35,191	35,193	35,209	35,225	35,240	35,255	35,269	35,283	35,297
Marshall	12,280	12,283	12,285	12,293	12,300	12,306	12,312	12,319	12,324	12,330	12,336
Mobile	41,283	41,295	41,331	41,337	41,371	41,406	41,440	41,473	41,507	41,541	41,577
Montgomery	24,723	24,736	24,747	24,763	24,772	24,782	24,791	24,800	24,809	24,818	24,826
Shelby	25,302	25,309	25,315	25,330	25,340	25,349	25,360	25,370	25,379	25,389	25,399
Tuscaloosa	25,925	25,932	25,943	25,947	25,955	25,962	25,969	25,976	25,983	25,990	25,996

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:											
	5/16	5/17	5/18	5/19	5/21				5/23				5/25			
Jefferson	79,848	79,879	79,916	79,964	80,030	(16,006)	[3,841]	{1,921}	80,093	(16,019)	[3,844]	{1,922}	80,156	(16,031)	[3,848]	{1,924}
Lee	15,993	15,997	16,005	16,011	16,023	(3,205)	[769]	{385}	16,035	(3,207)	[770]	{385}	16,045	(3,209)	[770]	{385}
Madison	35,157	35,175	35,191	35,193	35,225	(7,045)	[1,691]	{845}	35,255	(7,051)	[1,692]	{846}	35,283	(7,057)	[1,694]	{847}
Marshall	12,280	12,283	12,285	12,293	12,306	(2,461)	[591]	{295}	12,319	(2,464)	[591]	{296}	12,330	(2,466)	[592]	{296}
Mobile	41,283	41,295	41,331	41,337	41,406	(8,281)	[1,987]	{994}	41,473	(8,295)	[1,991]	{995}	41,541	(8,308)	[1,994]	{997}
Montgomery	24,723	24,736	24,747	24,763	24,782	(4,956)	[1,190]	{595}	24,800	(4,960)	[1,190]	{595}	24,818	(4,964)	[1,191]	{596}
Shelby	25,302	25,309	25,315	25,330	25,349	(5,070)	[1,217]	{608}	25,370	(5,074)	[1,218]	{609}	25,389	(5,078)	[1,219]	{609}
Tuscaloosa	25,925	25,932	25,943	25,947	25,962	(5,192)	[1,246]	{623}	25,976	(5,195)	[1,247]	{623}	25,990	(5,198)	[1,248]	{624}

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.