

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

Date: 4/29/21

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 4/29/21 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.

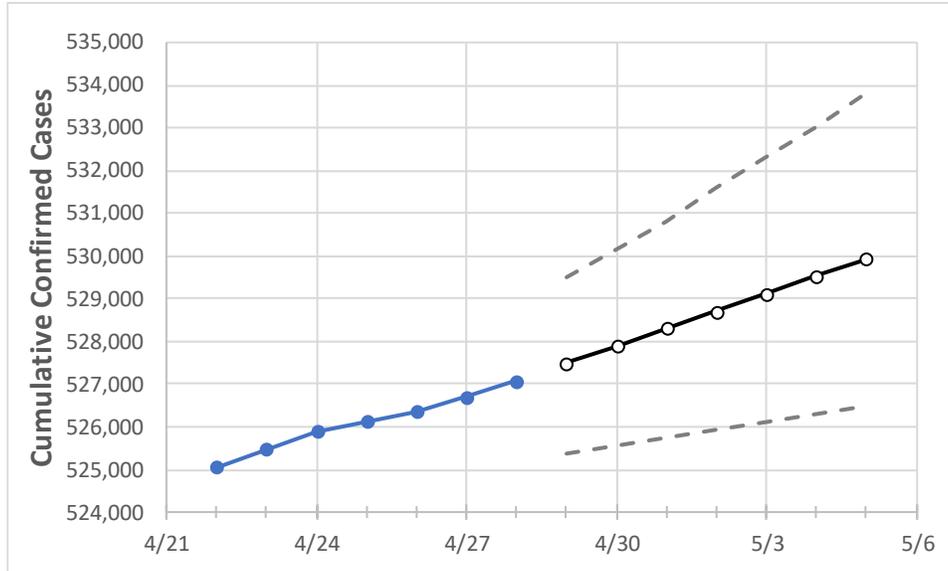
IEM's Modeling Lead

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:							
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5	
Alabama	526,131	526,348	526,707	527,083	527,493	527,900	528,306	528,711	529,133	529,536	529,942	

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:							
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5	
Jefferson	75,909	75,948	75,991	76,023	76,070	76,117	76,167	76,213	76,262	76,312	76,359	
Lee	15,723	15,731	15,742	15,761	15,776	15,790	15,804	15,819	15,833	15,849	15,864	
Madison	34,348	34,367	34,392	34,423	34,456	34,488	34,521	34,554	34,586	34,619	34,652	
Marshall	12,082	12,085	12,094	12,112	12,123	12,135	12,147	12,159	12,172	12,185	12,198	
Mobile	40,605	40,621	40,641	40,669	40,722	40,775	40,831	40,888	40,946	41,003	41,064	
Montgomery	24,139	24,151	24,164	24,182	24,193	24,205	24,215	24,226	24,236	24,246	24,256	
Shelby	23,261	23,278	23,296	23,312	23,323	23,334	23,345	23,355	23,366	23,376	23,386	
Tuscaloosa	25,532	25,533	25,544	25,563	25,579	25,595	25,610	25,626	25,641	25,657	25,672	

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:											
	4/25	4/26	4/27	4/28	4/30			5/2			5/4					
Jefferson	75,909	75,948	75,991	76,023	76,117	(15,223)	[3,654]	{1,827}	76,213	(15,243)	[3,658]	{1,829}	76,312	(15,262)	[3,663]	{1,831}
Lee	15,723	15,731	15,742	15,761	15,790	(3,158)	[758]	{379}	15,819	(3,164)	[759]	{380}	15,849	(3,170)	[761]	{380}
Madison	34,348	34,367	34,392	34,423	34,488	(6,898)	[1,655]	{828}	34,554	(6,911)	[1,659]	{829}	34,619	(6,924)	[1,662]	{831}
Marshall	12,082	12,085	12,094	12,112	12,135	(2,427)	[582]	{291}	12,159	(2,432)	[584]	{292}	12,185	(2,437)	[585]	{292}
Mobile	40,605	40,621	40,641	40,669	40,775	(8,155)	[1,957]	{979}	40,888	(8,178)	[1,963]	{981}	41,003	(8,201)	[1,968]	{984}
Montgomery	24,139	24,151	24,164	24,182	24,205	(4,841)	[1,162]	{581}	24,226	(4,845)	[1,163]	{581}	24,246	(4,849)	[1,164]	{582}
Shelby	23,261	23,278	23,296	23,312	23,334	(4,667)	[1,120]	{560}	23,355	(4,671)	[1,121]	{561}	23,376	(4,675)	[1,122]	{561}
Tuscaloosa	25,532	25,533	25,544	25,563	25,595	(5,119)	[1,229]	{614}	25,626	(5,125)	[1,230]	{615}	25,657	(5,131)	[1,232]	{616}

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.