

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/18/22**

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 3/18/22 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.

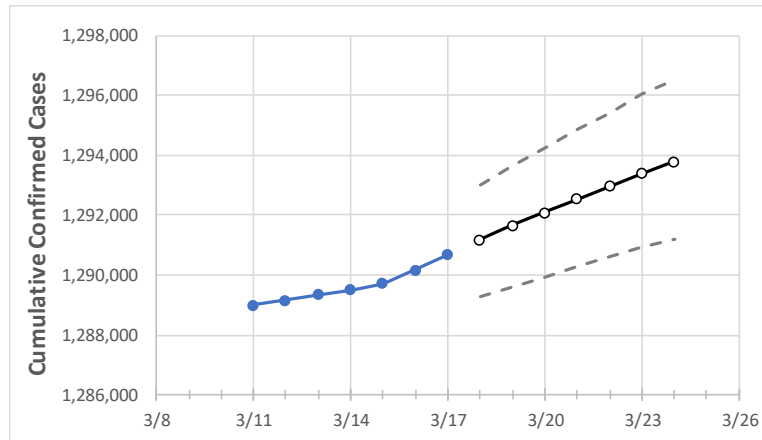
IEM's Modeling Lead

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Alabama	1,289,510	1,289,727	1,290,165	1,290,692	1,291,188	1,291,655	1,292,104	1,292,539	1,292,961	1,293,389	1,293,797

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Jefferson	183,834	183,863	183,897	184,021	184,137	184,235	184,332	184,432	184,536	184,650	184,750
Lee	37,578	37,583	37,588	37,588	37,591	37,593	37,596	37,598	37,601	37,603	37,606
Madison	88,782	88,788	88,823	88,863	88,888	88,913	88,937	88,961	88,985	89,007	89,026
Marshall	27,270	27,299	27,298	27,301	27,316	27,329	27,343	27,358	27,372	27,387	27,402
Mobile	112,931	112,950	112,978	112,985	112,998	113,010	113,020	113,031	113,041	113,050	113,058
Montgomery	54,559	54,563	54,575	54,587	54,594	54,602	54,609	54,616	54,623	54,629	54,635
Shelby	60,073	60,088	60,112	60,268	60,350	60,441	60,511	60,598	60,670	60,747	60,827
Tuscaloosa	55,440	55,458	55,544	55,596	55,644	55,690	55,735	55,777	55,822	55,867	55,917

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:											
	3/14	3/15	3/16	3/17	3/19				3/21				3/23			
Jefferson	183,834	183,863	183,897	184,021	184,235	(36,847)	[8,843]	{4,422}	184,432	(36,886)	[8,853]	{4,426}	184,650	(36,930)	[8,863]	{4,432}
Lee	37,578	37,583	37,588	37,588	37,593	(7,519)	[1,804]	{902}	37,598	(7,520)	[1,805]	{902}	37,603	(7,521)	[1,805]	{902}
Madison	88,782	88,788	88,823	88,863	88,913	(17,783)	[4,268]	{2,134}	88,961	(17,792)	[4,270]	{2,135}	89,007	(17,801)	[4,272]	{2,136}
Marshall	27,270	27,299	27,298	27,301	27,329	(5,466)	[1,312]	{656}	27,358	(5,472)	[1,313]	{657}	27,387	(5,477)	[1,315]	{657}
Mobile	112,931	112,950	112,978	112,985	113,010	(22,602)	[5,424]	{2,712}	113,031	(22,606)	[5,425]	{2,713}	113,050	(22,610)	[5,426]	{2,713}
Montgomery	54,559	54,563	54,575	54,587	54,602	(10,920)	[2,621]	{1,310}	54,616	(10,923)	[2,622]	{1,311}	54,629	(10,926)	[2,622]	{1,311}
Shelby	60,073	60,088	60,112	60,268	60,441	(12,088)	[2,901]	{1,451}	60,598	(12,120)	[2,909]	{1,454}	60,747	(12,149)	[2,916]	{1,458}
Tuscaloosa	55,440	55,458	55,544	55,596	55,690	(11,138)	[2,673]	{1,337}	55,777	(11,155)	[2,677]	{1,339}	55,867	(11,173)	[2,682]	{1,341}

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.