

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

Date: 1/28/22

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 1/28/22 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.

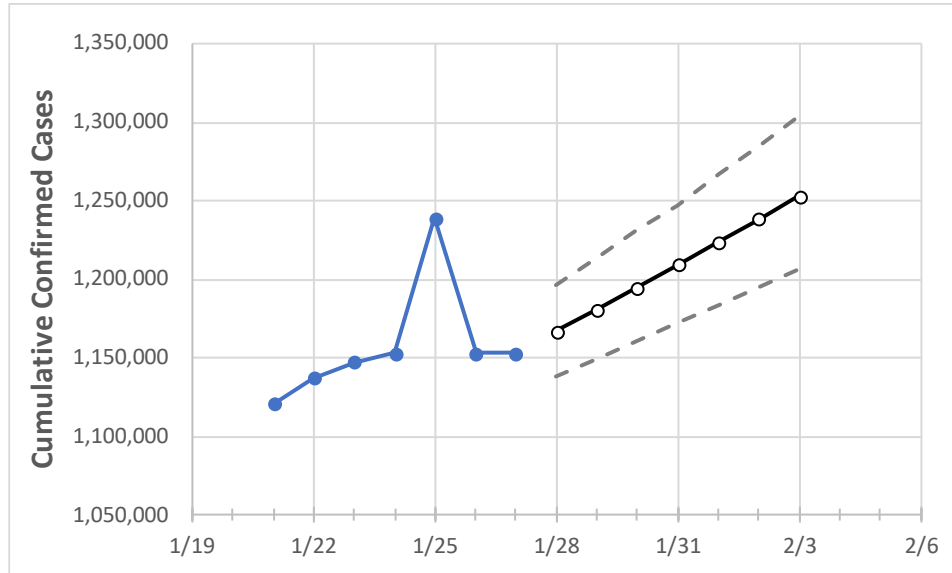
IEM's Modeling Lead

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:					
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	
Alabama	1,153,149	1,238,957	1,153,149	1,153,149	1,166,915	1,181,041	1,194,826	1,209,553	1,223,646	1,238,591	1,253,276	

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
Jefferson	166,471	167,656	166,471	166,471	168,133	169,790	171,371	173,051	174,640	176,328	177,854
Lee	34,631	34,851	34,631	34,631	34,957	35,271	35,592	35,920	36,234	36,571	36,889
Madison	77,389	78,086	77,389	77,389	78,387	79,423	80,408	81,424	82,513	83,543	84,604
Marshall	24,157	24,301	24,157	24,157	24,522	24,876	25,262	25,647	26,051	26,479	26,893
Mobile	103,122	103,794	103,122	103,122	104,070	105,011	105,917	106,836	107,728	108,651	109,545
Montgomery	48,723	48,956	48,723	48,723	48,985	49,239	49,490	49,738	49,969	50,209	50,453
Shelby	53,229	53,647	53,229	53,229	53,857	54,485	55,106	55,759	56,407	57,075	57,726
Tuscaloosa	49,533	49,943	49,533	49,533	50,253	51,010	51,745	52,516	53,294	54,102	54,886

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:											
	1/24	1/25	1/26	1/27	1/29				1/31				2/2			
Jefferson	166,471	167,656	166,471	166,471	169,790	(33,958)	[8,150]	{4,075}	173,051	(34,610)	[8,306]	{4,153}	176,328	(35,266)	[8,464]	{4,232}
Lee	34,631	34,851	34,631	34,631	35,271	(7,054)	[1,693]	{846}	35,920	(7,184)	[1,724]	{862}	36,571	(7,314)	[1,755]	{878}
Madison	77,389	78,086	77,389	77,389	79,423	(15,885)	[3,812]	{1,906}	81,424	(16,285)	[3,908]	{1,954}	83,543	(16,709)	[4,010]	{2,005}
Marshall	24,157	24,301	24,157	24,157	24,876	(4,975)	[1,194]	{597}	25,647	(5,129)	[1,231]	{616}	26,479	(5,296)	[1,271]	{635}
Mobile	103,122	103,794	103,122	103,122	105,011	(21,002)	[5,041]	{2,520}	106,836	(21,367)	[5,128]	{2,564}	108,651	(21,730)	[5,215]	{2,608}
Montgomery	48,723	48,956	48,723	48,723	49,239	(9,848)	[2,363]	{1,182}	49,738	(9,948)	[2,387]	{1,194}	50,209	(10,042)	[2,410]	{1,205}
Shelby	53,229	53,647	53,229	53,229	54,485	(10,897)	[2,615]	{1,308}	55,759	(11,152)	[2,676]	{1,338}	57,075	(11,415)	[2,740]	{1,370}
Tuscaloosa	49,533	49,943	49,533	49,533	51,010	(10,202)	[2,448]	{1,224}	52,516	(10,503)	[2,521]	{1,260}	54,102	(10,820)	[2,597]	{1,298}

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.