

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

Date: 3/8/21

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 3/8/21 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.

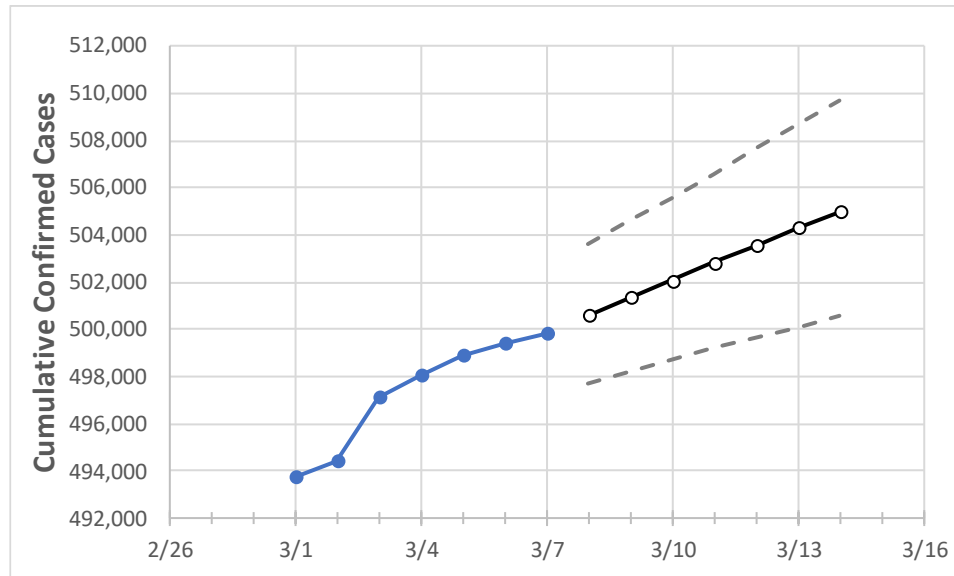
IEM's Modeling Lead

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Alabama	498,076	498,887	499,411	499,819	500,582	501,336	502,072	502,817	503,552	504,291	504,975

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Jefferson	71,671	71,912	71,995	72,033	72,142	72,249	72,357	72,464	72,573	72,679	72,792
Lee	15,039	15,057	15,070	15,083	15,098	15,111	15,124	15,137	15,150	15,161	15,172
Madison	32,616	32,639	32,674	32,708	32,745	32,781	32,815	32,846	32,879	32,910	32,939
Marshall	11,448	11,452	11,458	11,460	11,482	11,504	11,527	11,550	11,574	11,598	11,622
Mobile	36,294	36,328	36,396	36,423	36,480	36,532	36,584	36,633	36,681	36,728	36,773
Montgomery	22,739	22,765	22,789	22,805	22,834	22,861	22,888	22,913	22,938	22,963	22,987
Shelby	22,174	22,231	22,250	22,276	22,316	22,356	22,394	22,433	22,470	22,507	22,545
Tuscaloosa	24,340	24,372	24,391	24,457	24,500	24,540	24,580	24,622	24,662	24,702	24,740

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:											
	3/4	3/5	3/6	3/7	3/9			3/11			3/13					
Jefferson	71,671	71,912	71,995	72,033	72,249	(14,450)	[3,468]	{1,734}	72,464	(14,493)	[3,478]	{1,739}	72,679	(14,536)	[3,489]	{1,744}
Lee	15,039	15,057	15,070	15,083	15,111	(3,022)	[725]	{363}	15,137	(3,027)	[727]	{363}	15,161	(3,032)	[728]	{364}
Madison	32,616	32,639	32,674	32,708	32,781	(6,556)	[1,573]	{787}	32,846	(6,569)	[1,577]	{788}	32,910	(6,582)	[1,580]	{790}
Marshall	11,448	11,452	11,458	11,460	11,504	(2,301)	[552]	{276}	11,550	(2,310)	[554]	{277}	11,598	(2,320)	[557]	{278}
Mobile	36,294	36,328	36,396	36,423	36,532	(7,306)	[1,754]	{877}	36,633	(7,327)	[1,758]	{879}	36,728	(7,346)	[1,763]	{881}
Montgomery	22,739	22,765	22,789	22,805	22,861	(4,572)	[1,097]	{549}	22,913	(4,583)	[1,100]	{550}	22,963	(4,593)	[1,102]	{551}
Shelby	22,174	22,231	22,250	22,276	22,356	(4,471)	[1,073]	{537}	22,433	(4,487)	[1,077]	{538}	22,507	(4,501)	[1,080]	{540}
Tuscaloosa	24,340	24,372	24,391	24,457	24,540	(4,908)	[1,178]	{589}	24,622	(4,924)	[1,182]	{591}	24,702	(4,940)	[1,186]	{593}

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.