

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

Date: 11/8/21

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 11/8/21 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.

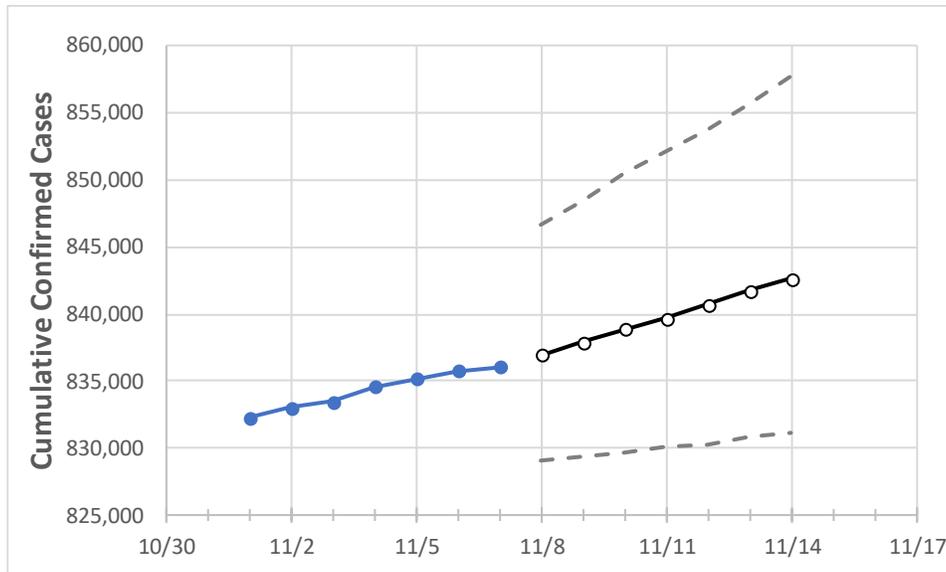
IEM's Modeling Lead

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:						
	11/4	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14
Alabama	834,582	835,157	835,740	836,032	836,959	837,881	838,886	839,698	840,708	841,757	842,593

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:						
	11/4	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14
Jefferson	115,643	115,649	115,693	115,726	115,793	115,846	115,899	115,962	116,028	116,081	116,120
Lee	25,320	25,327	25,332	25,335	25,347	25,359	25,368	25,378	25,389	25,400	25,409
Madison	52,915	52,890	52,853	52,874	52,931	52,992	53,045	53,101	53,167	53,223	53,287
Marshall	18,633	18,641	18,640	18,646	18,666	18,683	18,702	18,719	18,740	18,757	18,775
Mobile	73,467	73,514	73,538	73,551	73,620	73,696	73,761	73,828	73,907	73,971	74,053
Montgomery	34,289	34,290	34,299	34,304	34,319	34,332	34,344	34,359	34,372	34,386	34,399
Shelby	37,956	37,978	37,972	37,995	38,019	38,044	38,069	38,093	38,114	38,139	38,160
Tuscaloosa	35,452	35,488	35,535	35,544	35,576	35,607	35,639	35,671	35,703	35,737	35,767

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:											
	11/4	11/5	11/6	11/7	11/9			11/11			11/13					
Jefferson	115,643	115,649	115,693	115,726	115,846	(23,169)	[5,561]	{2,780}	115,962	(23,192)	[5,566]	{2,783}	116,081	(23,216)	[5,572]	{2,786}
Lee	25,320	25,327	25,332	25,335	25,359	(5,072)	[1,217]	{609}	25,378	(5,076)	[1,218]	{609}	25,400	(5,080)	[1,219]	{610}
Madison	52,915	52,890	52,853	52,874	52,992	(10,598)	[2,544]	{1,272}	53,101	(10,620)	[2,549]	{1,274}	53,223	(10,645)	[2,555]	{1,277}
Marshall	18,633	18,641	18,640	18,646	18,683	(3,737)	[897]	{448}	18,719	(3,744)	[899]	{449}	18,757	(3,751)	[900]	{450}
Mobile	73,467	73,514	73,538	73,551	73,696	(14,739)	[3,537]	{1,769}	73,828	(14,766)	[3,544]	{1,772}	73,971	(14,794)	[3,551]	{1,775}
Montgomery	34,289	34,290	34,299	34,304	34,332	(6,866)	[1,648]	{824}	34,359	(6,872)	[1,649]	{825}	34,386	(6,877)	[1,651]	{825}
Shelby	37,956	37,978	37,972	37,995	38,044	(7,609)	[1,826]	{913}	38,093	(7,619)	[1,828]	{914}	38,139	(7,628)	[1,831]	{915}
Tuscaloosa	35,452	35,488	35,535	35,544	35,607	(7,121)	[1,709]	{855}	35,671	(7,134)	[1,712]	{856}	35,737	(7,147)	[1,715]	{858}

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.