

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/27/21**

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 10/27/21 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.

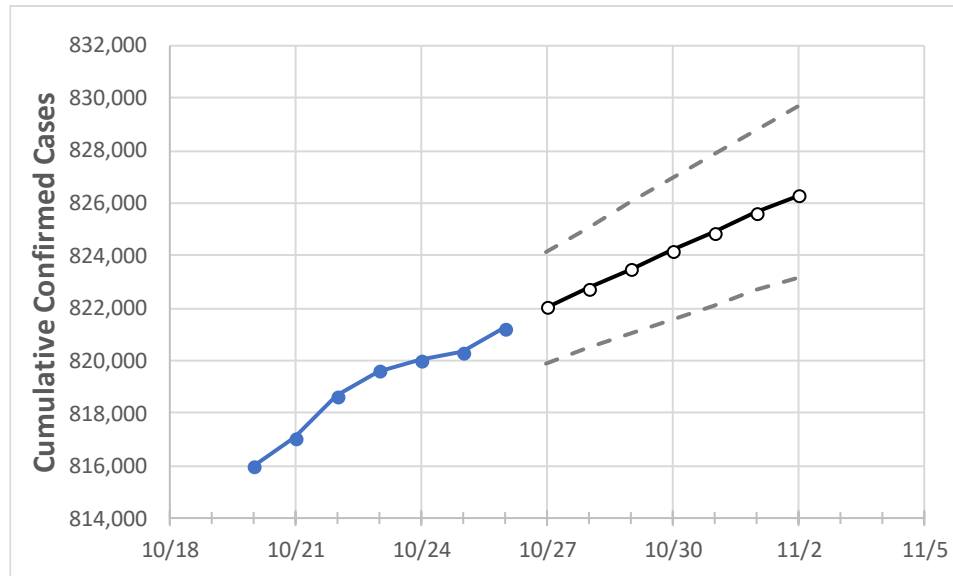
IEM's Modeling Lead

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:						
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2
Alabama	819,597	820,011	820,312	821,255	822,022	822,748	823,474	824,205	824,886	825,633	826,300

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:							
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	
Jefferson	114,790	114,836	114,873	114,905	114,972	115,041	115,104	115,167	115,232	115,300	115,354	
Lee	23,526	23,536	23,540	23,556	23,597	23,645	23,684	23,732	23,783	23,828	23,882	
Madison	52,306	52,337	52,362	52,400	52,444	52,485	52,524	52,563	52,602	52,640	52,677	
Marshall	18,361	18,372	18,381	18,390	18,402	18,414	18,425	18,434	18,447	18,458	18,469	
Mobile	72,579	72,609	72,622	72,665	72,714	72,760	72,805	72,852	72,899	72,944	72,993	
Montgomery	34,106	34,116	34,123	34,130	34,148	34,166	34,183	34,201	34,216	34,234	34,251	
Shelby	37,597	37,622	37,640	37,685	37,722	37,757	37,791	37,825	37,860	37,896	37,928	
Tuscaloosa	35,101	35,117	35,120	35,147	35,168	35,189	35,209	35,229	35,249	35,269	35,286	

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:											
	10/23	10/24	10/25	10/26	10/28			10/30			11/1					
Jefferson	114,790	114,836	114,873	114,905	115,041	(23,008)	{5,522}	{2,761}	115,167	(23,033)	{5,528}	{2,764}	115,300	(23,060)	{5,534}	{2,767}
Lee	23,526	23,536	23,540	23,556	23,645	(4,729)	{1,135}	{567}	23,732	(4,746)	{1,139}	{570}	23,828	(4,766)	{1,144}	{572}
Madison	52,306	52,337	52,362	52,400	52,485	(10,497)	{2,519}	{1,260}	52,563	(10,513)	{2,523}	{1,262}	52,640	(10,528)	{2,527}	{1,263}
Marshall	18,361	18,372	18,381	18,390	18,414	(3,683)	{884}	{442}	18,434	(3,687)	{885}	{442}	18,458	(3,692)	{886}	{443}
Mobile	72,579	72,609	72,622	72,665	72,760	(14,552)	{3,492}	{1,746}	72,852	(14,570)	{3,497}	{1,748}	72,944	(14,589)	{3,501}	{1,751}
Montgomery	34,106	34,116	34,123	34,130	34,166	(6,833)	{1,640}	{820}	34,201	(6,840)	{1,642}	{821}	34,234	(6,847)	{1,643}	{822}
Shelby	37,597	37,622	37,640	37,685	37,757	(7,551)	{1,812}	{906}	37,825	(7,565)	{1,816}	{908}	37,896	(7,579)	{1,819}	{910}
Tuscaloosa	35,101	35,117	35,120	35,147	35,189	(7,038)	{1,689}	{845}	35,229	(7,046)	{1,691}	{845}	35,269	(7,054)	{1,693}	{846}

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.