

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/10/21**

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 11/10/21 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.

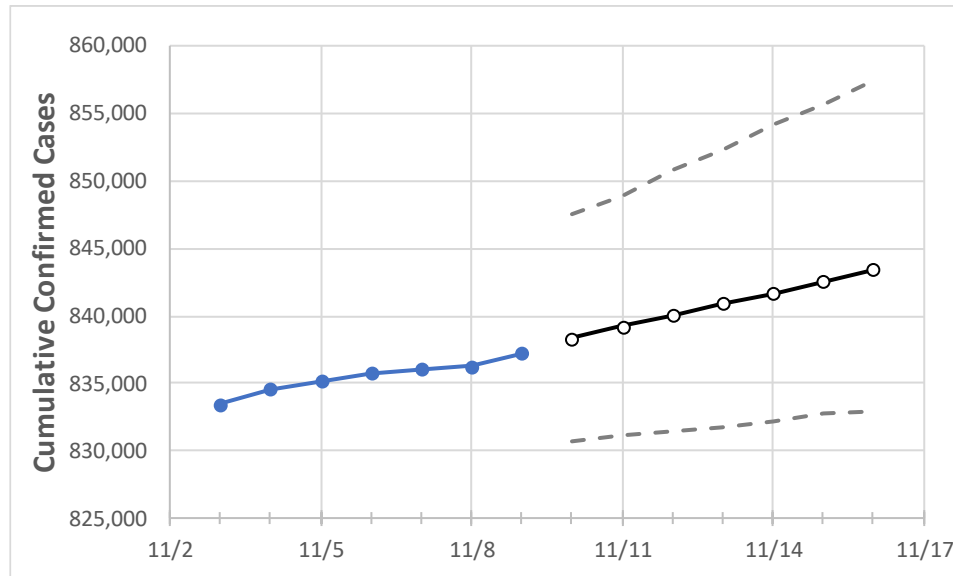
IEM's Modeling Lead

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Alabama	835,740	836,032	836,255	837,250	838,333	839,193	840,018	840,903	841,663	842,537	843,417

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Jefferson	115,693	115,726	115,760	115,843	115,897	115,950	115,998	116,046	116,112	116,163	116,218
Lee	25,332	25,335	25,343	25,373	25,386	25,397	25,408	25,420	25,432	25,443	25,453
Madison	52,853	52,874	52,896	52,876	52,935	52,981	53,035	53,091	53,146	53,200	53,245
Marshall	18,640	18,646	18,647	18,655	18,672	18,690	18,703	18,717	18,731	18,747	18,765
Mobile	73,538	73,551	73,555	73,593	73,651	73,713	73,770	73,835	73,894	73,961	74,022
Montgomery	34,299	34,304	34,305	34,306	34,316	34,328	34,340	34,351	34,363	34,376	34,387
Shelby	37,972	37,995	38,006	38,045	38,068	38,091	38,112	38,135	38,157	38,179	38,201
Tuscaloosa	35,535	35,544	35,554	35,573	35,602	35,631	35,660	35,689	35,718	35,748	35,778

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:											
	11/6	11/7	11/8	11/9	11/11				11/13				11/15			
Jefferson	115,693	115,726	115,760	115,843	115,950	(23,190)	[5,566]	{2,783}	116,046	(23,209)	[5,570]	{2,785}	116,163	(23,233)	[5,576]	{2,788}
Lee	25,332	25,335	25,343	25,373	25,397	(5,079)	[1,219]	{610}	25,420	(5,084)	[1,220]	{610}	25,443	(5,089)	[1,221]	{611}
Madison	52,853	52,874	52,896	52,876	52,981	(10,596)	[2,543]	{1,272}	53,091	(10,618)	[2,548]	{1,274}	53,200	(10,640)	[2,554]	{1,277}
Marshall	18,640	18,646	18,647	18,655	18,690	(3,738)	[897]	{449}	18,717	(3,743)	[898]	{449}	18,747	(3,749)	[900]	{450}
Mobile	73,538	73,551	73,555	73,593	73,713	(14,743)	[3,538]	{1,769}	73,835	(14,767)	[3,544]	{1,772}	73,961	(14,792)	[3,550]	{1,775}
Montgomery	34,299	34,304	34,305	34,306	34,328	(6,866)	[1,648]	{824}	34,351	(6,870)	[1,649]	{824}	34,376	(6,875)	[1,650]	{825}
Shelby	37,972	37,995	38,006	38,045	38,091	(7,618)	[1,828]	{914}	38,135	(7,627)	[1,830]	{915}	38,179	(7,636)	[1,833]	{916}
Tuscaloosa	35,535	35,544	35,554	35,573	35,631	(7,126)	[1,710]	{855}	35,689	(7,138)	[1,713]	{857}	35,748	(7,150)	[1,716]	{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.