

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

Date: 11/3/21

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 11/3/21 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.

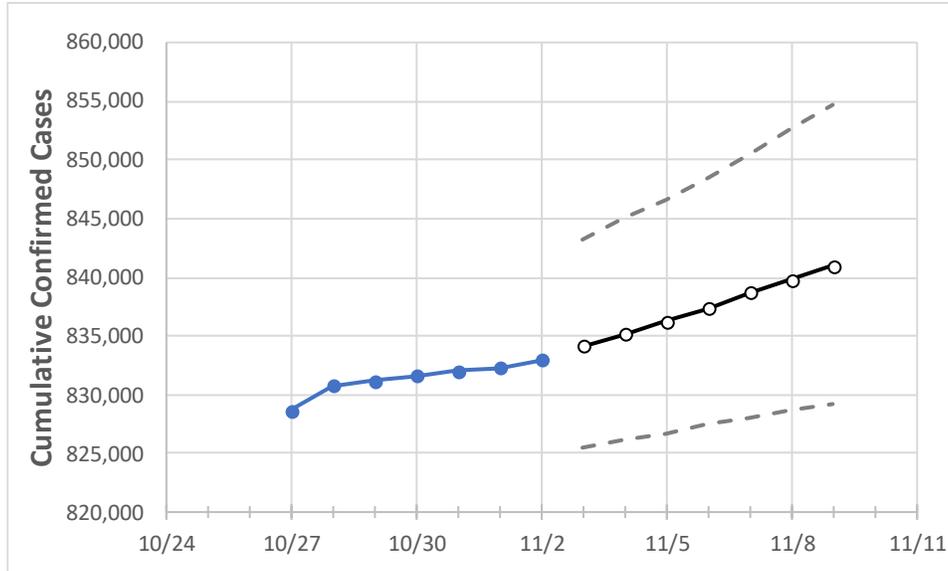
IEM's Modeling Lead

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:							
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9	
Alabama	831,653	832,047	832,264	833,009	834,170	835,194	836,249	837,341	838,676	839,779	840,951	

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:							
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9	
Jefferson	115,560	115,597	115,628	115,638	115,719	115,801	115,893	115,962	116,059	116,148	116,218	
Lee	25,254	25,283	25,284	25,308	25,345	25,378	25,407	25,440	25,482	25,517	25,549	
Madison	52,779	52,810	52,833	52,800	52,857	52,913	52,965	53,020	53,075	53,132	53,187	
Marshall	18,590	18,597	18,598	18,610	18,631	18,653	18,674	18,694	18,718	18,740	18,761	
Mobile	72,981	72,995	73,006	73,235	73,296	73,361	73,422	73,483	73,543	73,610	73,674	
Montgomery	34,261	34,272	34,281	34,291	34,310	34,329	34,348	34,366	34,384	34,403	34,421	
Shelby	37,867	37,885	37,905	37,914	37,945	37,976	38,004	38,034	38,063	38,092	38,119	
Tuscaloosa	35,295	35,327	35,337	35,362	35,386	35,410	35,433	35,457	35,480	35,502	35,524	

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:											
	10/30	10/31	11/1	11/2	11/4			11/6			11/8					
Jefferson	115,560	115,597	115,628	115,638	115,801	(23,160)	[5,558]	{2,779}	115,962	(23,192)	[5,566]	{2,783}	116,148	(23,230)	[5,575]	{2,788}
Lee	25,254	25,283	25,284	25,308	25,378	(5,076)	[1,218]	{609}	25,440	(5,088)	[1,221]	{611}	25,517	(5,103)	[1,225]	{612}
Madison	52,779	52,810	52,833	52,800	52,913	(10,583)	[2,540]	{1,270}	53,020	(10,604)	[2,545]	{1,272}	53,132	(10,626)	[2,550]	{1,275}
Marshall	18,590	18,597	18,598	18,610	18,653	(3,731)	[895]	{448}	18,694	(3,739)	[897]	{449}	18,740	(3,748)	[900]	{450}
Mobile	72,981	72,995	73,006	73,235	73,361	(14,672)	[3,521]	{1,761}	73,483	(14,697)	[3,527]	{1,764}	73,610	(14,722)	[3,533]	{1,767}
Montgomery	34,261	34,272	34,281	34,291	34,329	(6,866)	[1,648]	{824}	34,366	(6,873)	[1,650]	{825}	34,403	(6,881)	[1,651]	{826}
Shelby	37,867	37,885	37,905	37,914	37,976	(7,595)	[1,823]	{911}	38,034	(7,607)	[1,826]	{913}	38,092	(7,618)	[1,828]	{914}
Tuscaloosa	35,295	35,327	35,337	35,362	35,410	(7,082)	[1,700]	{850}	35,457	(7,091)	[1,702]	{851}	35,502	(7,100)	[1,704]	{852}

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.