

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

Date: 1/24/22

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 1/24/22 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.

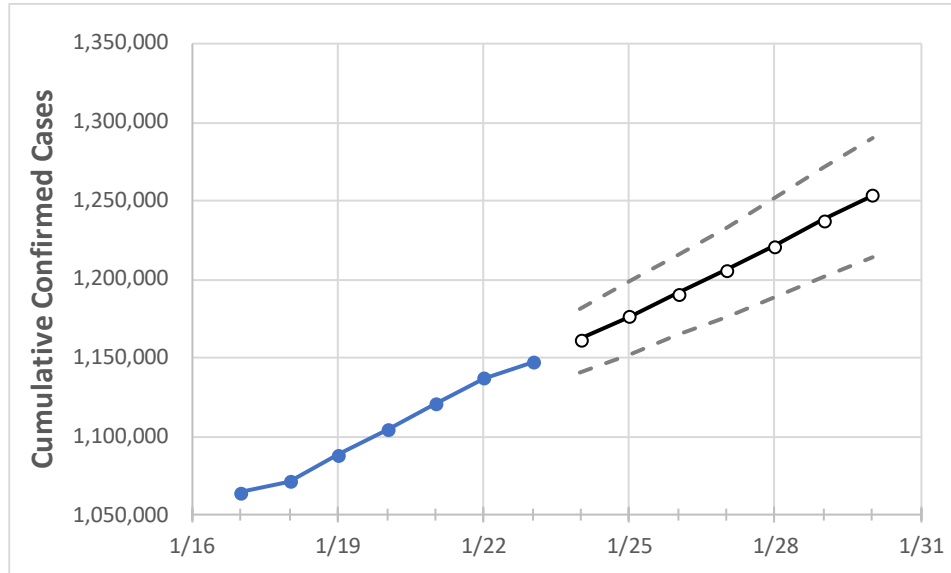
IEM's Modeling Lead

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:							
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	
Alabama	1,104,356	1,120,881	1,137,387	1,147,194	1,161,541	1,176,173	1,190,739	1,206,183	1,221,514	1,237,561	1,253,365	

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:							
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	
Jefferson	159,848	162,000	164,161	165,605	167,490	169,317	171,207	173,041	174,938	176,841	178,735	
Lee	33,346	33,787	34,226	34,476	34,836	35,195	35,552	35,921	36,290	36,651	37,037	
Madison	73,257	74,564	76,027	76,970	78,057	79,160	80,287	81,442	82,622	83,803	85,044	
Marshall	23,013	23,419	23,757	24,067	24,456	24,857	25,290	25,741	26,211	26,711	27,225	
Mobile	99,629	100,791	101,773	102,537	103,607	104,696	105,781	106,862	107,971	109,059	110,149	
Montgomery	47,558	47,998	48,337	48,533	48,847	49,146	49,444	49,728	50,018	50,304	50,574	
Shelby	50,904	51,659	52,479	52,906	53,585	54,259	54,967	55,666	56,391	57,138	57,887	
Tuscaloosa	47,148	48,029	48,816	49,312	50,080	50,904	51,730	52,553	53,449	54,354	55,315	

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:											
	1/20	1/21	1/22	1/23	1/25				1/27				1/29			
Jefferson	159,848	162,000	164,161	165,605	169,317	(33,863)	[8,127]	{4,064}	173,041	(34,608)	[8,306]	{4,153}	176,841	(35,368)	[8,488]	{4,244}
Lee	33,346	33,787	34,226	34,476	35,195	(7,039)	[1,689]	{845}	35,921	(7,184)	[1,724]	{862}	36,651	(7,330)	[1,759]	{880}
Madison	73,257	74,564	76,027	76,970	79,160	(15,832)	[3,800]	{1,900}	81,442	(16,288)	[3,909]	{1,955}	83,803	(16,761)	[4,023]	{2,011}
Marshall	23,013	23,419	23,757	24,067	24,857	(4,971)	[1,193]	{597}	25,741	(5,148)	[1,236]	{618}	26,711	(5,342)	[1,282]	{641}
Mobile	99,629	100,791	101,773	102,537	104,696	(20,939)	[5,025]	{2,513}	106,862	(21,372)	[5,129]	{2,565}	109,059	(21,812)	[5,235]	{2,617}
Montgomery	47,558	47,998	48,337	48,533	49,146	(9,829)	[2,359]	{1,179}	49,728	(9,946)	[2,387]	{1,193}	50,304	(10,061)	[2,415]	{1,207}
Shelby	50,904	51,659	52,479	52,906	54,259	(10,852)	[2,604]	{1,302}	55,666	(11,133)	[2,672]	{1,336}	57,138	(11,428)	[2,743]	{1,371}
Tuscaloosa	47,148	48,029	48,816	49,312	50,904	(10,181)	[2,443]	{1,222}	52,553	(10,511)	[2,523]	{1,261}	54,354	(10,871)	[2,609]	{1,304}

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.