

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

Date: 2/16/22

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 2/16/22 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.**

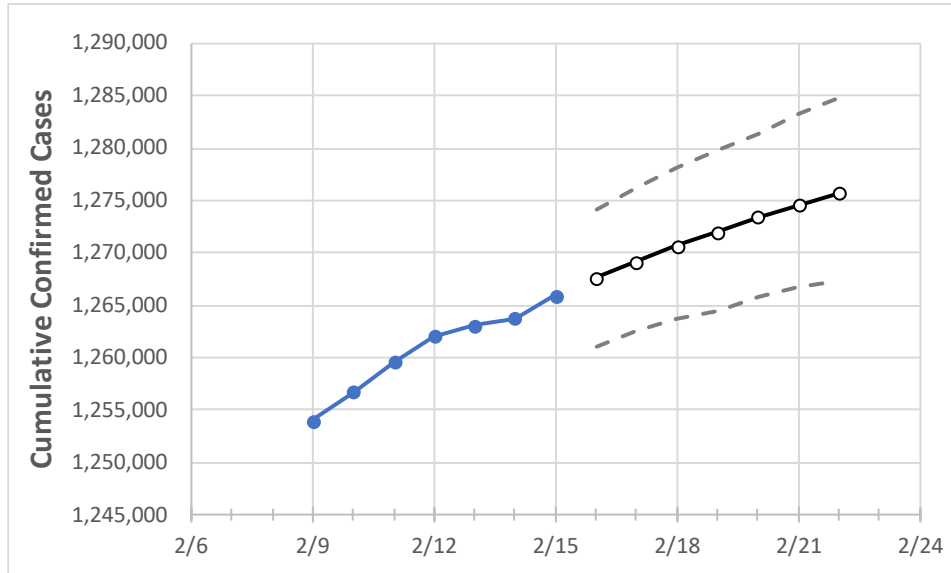
### IEM's Modeling Lead

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Alabama	1,262,018	1,263,072	1,263,796	1,265,932	1,267,621	1,269,179	1,270,669	1,272,001	1,273,427	1,274,619	1,275,777	

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Jefferson	180,392	180,496	180,590	180,738	180,928	181,106	181,268	181,426	181,566	181,715	181,822	
Lee	37,243	37,267	37,282	37,319	37,359	37,394	37,427	37,459	37,489	37,519	37,545	
Madison	86,601	86,721	86,794	87,011	87,174	87,337	87,475	87,613	87,747	87,879	87,992	
Marshall	26,886	26,902	26,915	26,953	26,988	27,022	27,053	27,082	27,111	27,136	27,161	
Mobile	110,510	110,593	110,677	110,790	110,916	111,029	111,142	111,240	111,347	111,444	111,535	
Montgomery	53,829	53,853	53,903	53,969	54,029	54,083	54,129	54,180	54,226	54,269	54,311	
Shelby	58,078	58,120	58,153	58,211	58,275	58,332	58,382	58,430	58,478	58,525	58,561	
Tuscaloosa	53,329	53,361	53,376	53,493	53,560	53,624	53,684	53,738	53,794	53,845	53,894	

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:											
	2/12	2/13	2/14	2/15	2/17			2/19			2/21					
Jefferson	180,392	180,496	180,590	180,738	181,106	(36,221)	[8,693]	{4,347}	181,426	(36,285)	[8,708]	{4,354}	181,715	(36,343)	[8,722]	{4,361}
Lee	37,243	37,267	37,282	37,319	37,394	(7,479)	[1,795]	{897}	37,459	(7,492)	[1,798]	{899}	37,519	(7,504)	[1,801]	{900}
Madison	86,601	86,721	86,794	87,011	87,337	(17,467)	[4,192]	{2,096}	87,613	(17,523)	[4,205]	{2,103}	87,879	(17,576)	[4,218]	{2,109}
Marshall	26,886	26,902	26,915	26,953	27,022	(5,404)	[1,297]	{649}	27,082	(5,416)	[1,300]	{650}	27,136	(5,427)	[1,303]	{651}
Mobile	110,510	110,593	110,677	110,790	111,029	(22,206)	[5,329]	{2,665}	111,240	(22,248)	[5,340]	{2,670}	111,444	(22,289)	[5,349]	{2,675}
Montgomery	53,829	53,853	53,903	53,969	54,083	(10,817)	[2,596]	{1,298}	54,180	(10,836)	[2,601]	{1,300}	54,269	(10,854)	[2,605]	{1,302}
Shelby	58,078	58,120	58,153	58,211	58,332	(11,666)	[2,800]	{1,400}	58,430	(11,686)	[2,805]	{1,402}	58,525	(11,705)	[2,809]	{1,405}
Tuscaloosa	53,329	53,361	53,376	53,493	53,624	(10,725)	[2,574]	{1,287}	53,738	(10,748)	[2,579]	{1,290}	53,845	(10,769)	[2,585]	{1,292}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.