

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

**Date: 1/14/22**

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 1/14/22 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.**

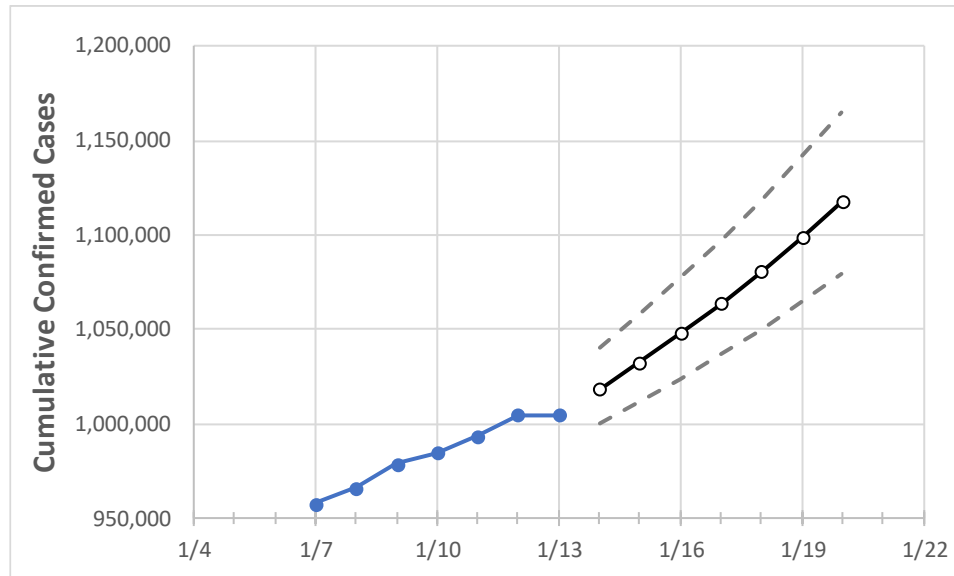
### **IEM's Modeling Lead**

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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
Alabama	984,882	993,418	1,004,622	1,004,622	1,018,554	1,032,764	1,047,910	1,063,856	1,080,713	1,098,747	1,117,617

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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
Jefferson	142,396	143,747	145,464	145,464	147,619	149,790	152,093	154,423	156,888	159,471	162,115
Lee	29,985	30,361	30,677	30,677	31,174	31,682	32,225	32,802	33,440	34,090	34,792
Madison	64,761	65,408	66,148	66,148	67,176	68,243	69,340	70,522	71,756	73,057	74,369
Marshall	20,681	20,806	20,951	20,951	21,132	21,324	21,532	21,741	21,973	22,218	22,461
Mobile	88,562	89,342	90,684	90,684	92,148	93,647	95,236	96,944	98,742	100,566	102,507
Montgomery	43,660	44,072	44,560	44,560	45,343	46,181	47,015	47,880	48,844	49,775	50,788
Shelby	45,367	45,723	46,249	46,249	46,824	47,394	48,009	48,629	49,277	49,952	50,659
Tuscaloosa	41,162	41,502	42,127	42,127	42,720	43,377	44,052	44,799	45,589	46,414	47,307

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:											
	1/10	1/11	1/12	1/13	1/15				1/17				1/19			
Jefferson	142,396	143,747	145,464	145,464	149,790	(29,958)	[7,190]	{3,595}	154,423	(30,885)	[7,412]	{3,706}	159,471	(31,894)	[7,655]	{3,827}
Lee	29,985	30,361	30,677	30,677	31,682	(6,336)	[1,521]	{760}	32,802	(6,560)	[1,575]	{787}	34,090	(6,818)	[1,636]	{818}
Madison	64,761	65,408	66,148	66,148	68,243	(13,649)	[3,276]	{1,638}	70,522	(14,104)	[3,385]	{1,693}	73,057	(14,611)	[3,507]	{1,753}
Marshall	20,681	20,806	20,951	20,951	21,324	(4,265)	[1,024]	{512}	21,741	(4,348)	[1,044]	{522}	22,218	(4,444)	[1,066]	{533}
Mobile	88,562	89,342	90,684	90,684	93,647	(18,729)	[4,495]	{2,248}	96,944	(19,389)	[4,653]	{2,327}	100,566	(20,113)	[4,827]	{2,414}
Montgomery	43,660	44,072	44,560	44,560	46,181	(9,236)	[2,217]	{1,108}	47,880	(9,576)	[2,298]	{1,149}	49,775	(9,955)	[2,389]	{1,195}
Shelby	45,367	45,723	46,249	46,249	47,394	(9,479)	[2,275]	{1,137}	48,629	(9,726)	[2,334]	{1,167}	49,952	(9,990)	[2,398]	{1,199}
Tuscaloosa	41,162	41,502	42,127	42,127	43,377	(8,675)	[2,082]	{1,041}	44,799	(8,960)	[2,150]	{1,075}	46,414	(9,283)	[2,228]	{1,114}

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.