

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

**Date: 3/9/21**

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 3/9/21 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.**

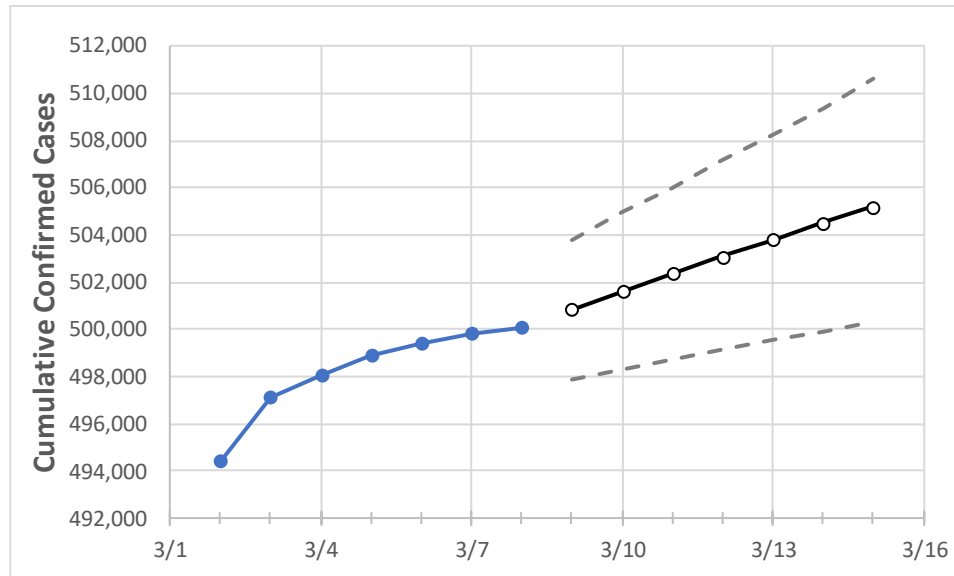
### **IEM's Modeling Lead**

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:							
	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	
Alabama	498,887	499,411	499,819	500,092	500,838	501,604	502,354	503,076	503,794	504,502	505,185	

*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:							
	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	
Jefferson	71,912	71,995	72,033	72,082	72,212	72,342	72,473	72,610	72,745	72,880	73,017	
Lee	15,057	15,070	15,083	15,084	15,096	15,108	15,119	15,130	15,141	15,151	15,160	
Madison	32,639	32,674	32,708	32,722	32,754	32,784	32,815	32,844	32,873	32,899	32,925	
Marshall	11,452	11,458	11,460	11,460	11,489	11,519	11,550	11,583	11,617	11,652	11,690	
Mobile	36,328	36,396	36,423	36,436	36,472	36,505	36,536	36,564	36,591	36,616	36,641	
Montgomery	22,765	22,789	22,805	22,826	22,855	22,883	22,910	22,936	22,961	22,985	23,009	
Shelby	22,231	22,250	22,276	22,301	22,342	22,383	22,423	22,462	22,503	22,542	22,582	
Tuscaloosa	24,372	24,391	24,457	24,465	24,501	24,537	24,572	24,607	24,641	24,674	24,706	

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:											
	3/5	3/6	3/7	3/8	3/10				3/12				3/14			
Jefferson	71,912	71,995	72,033	72,082	72,342	(14,468)	[3,472]	{1,736}	72,610	(14,522)	[3,485]	{1,743}	72,880	(14,576)	[3,498]	{1,749}
Lee	15,057	15,070	15,083	15,084	15,108	(3,022)	[725]	{363}	15,130	(3,026)	[726]	{363}	15,151	(3,030)	[727]	{364}
Madison	32,639	32,674	32,708	32,722	32,784	(6,557)	[1,574]	{787}	32,844	(6,569)	[1,576]	{788}	32,899	(6,580)	[1,579]	{790}
Marshall	11,452	11,458	11,460	11,460	11,519	(2,304)	[553]	{276}	11,583	(2,317)	[556]	{278}	11,652	(2,330)	[559]	{280}
Mobile	36,328	36,396	36,423	36,436	36,505	(7,301)	[1,752]	{876}	36,564	(7,313)	[1,755]	{878}	36,616	(7,323)	[1,758]	{879}
Montgomery	22,765	22,789	22,805	22,826	22,883	(4,577)	[1,098]	{549}	22,936	(4,587)	[1,101]	{550}	22,985	(4,597)	[1,103]	{552}
Shelby	22,231	22,250	22,276	22,301	22,383	(4,477)	[1,074]	{537}	22,462	(4,492)	[1,078]	{539}	22,542	(4,508)	[1,082]	{541}
Tuscaloosa	24,372	24,391	24,457	24,465	24,537	(4,907)	[1,178]	{589}	24,607	(4,921)	[1,181]	{591}	24,674	(4,935)	[1,184]	{592}

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.