

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

Date: 1/21/21

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 1/21/21 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.**

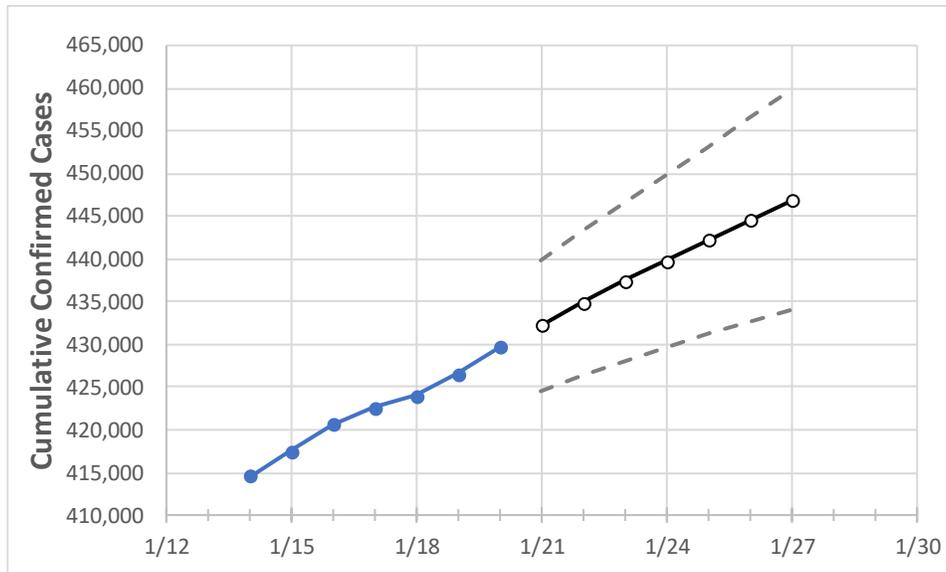
### IEM's Modeling Lead

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:						
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27
Alabama	422,598	424,028	426,543	429,655	432,287	434,888	437,447	439,813	442,234	444,539	446,817

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:						
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27
Jefferson	62,039	62,258	62,752	63,040	63,419	63,774	64,128	64,467	64,780	65,098	65,401
Lee	12,465	12,515	12,603	12,749	12,880	13,004	13,128	13,257	13,380	13,506	13,632
Madison	27,052	27,160	27,303	27,486	27,676	27,864	28,041	28,215	28,388	28,562	28,736
Marshall	10,191	10,199	10,236	10,290	10,333	10,377	10,418	10,460	10,500	10,540	10,579
Mobile	30,225	30,381	30,551	30,794	31,013	31,230	31,445	31,655	31,858	32,062	32,265
Montgomery	18,978	19,049	19,192	19,352	19,481	19,607	19,731	19,851	19,970	20,085	20,202
Shelby	18,504	18,572	18,693	18,833	18,956	19,075	19,190	19,302	19,413	19,522	19,627
Tuscaloosa	20,728	20,779	20,835	20,996	21,074	21,148	21,219	21,289	21,352	21,415	21,475

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:											
	1/17	1/18	1/19	1/20	1/22			1/24			1/26					
Jefferson	62,039	62,258	62,752	63,040	63,774	(12,755)	[3,061]	{1,531}	64,467	(12,893)	[3,094]	{1,547}	65,098	(13,020)	[3,125]	{1,562}
Lee	12,465	12,515	12,603	12,749	13,004	(2,601)	[624]	{312}	13,257	(2,651)	[636]	{318}	13,506	(2,701)	[648]	{324}
Madison	27,052	27,160	27,303	27,486	27,864	(5,573)	[1,337]	{669}	28,215	(5,643)	[1,354]	{677}	28,562	(5,712)	[1,371]	{685}
Marshall	10,191	10,199	10,236	10,290	10,377	(2,075)	[498]	{249}	10,460	(2,092)	[502]	{251}	10,540	(2,108)	[506]	{253}
Mobile	30,225	30,381	30,551	30,794	31,230	(6,246)	[1,499]	{750}	31,655	(6,331)	[1,519]	{760}	32,062	(6,412)	[1,539]	{769}
Montgomery	18,978	19,049	19,192	19,352	19,607	(3,921)	[941]	{471}	19,851	(3,970)	[953]	{476}	20,085	(4,017)	[964]	{482}
Shelby	18,504	18,572	18,693	18,833	19,075	(3,815)	[916]	{458}	19,302	(3,860)	[926]	{463}	19,522	(3,904)	[937]	{469}
Tuscaloosa	20,728	20,779	20,835	20,996	21,148	(4,230)	[1,015]	{508}	21,289	(4,258)	[1,022]	{511}	21,415	(4,283)	[1,028]	{514}

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.