

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

Date: 12/22/21

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 12/22/21 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.**

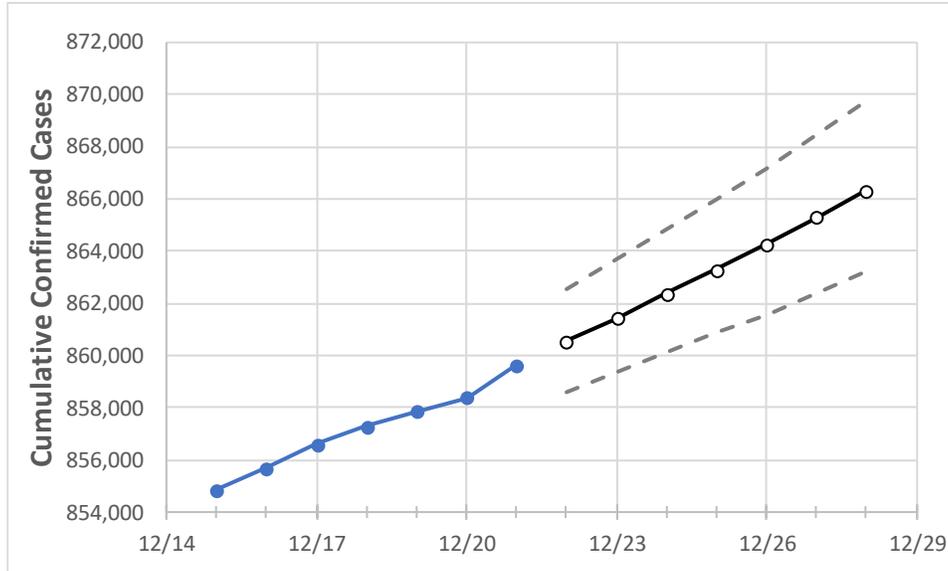
### IEM's Modeling Lead

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:					
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	
Alabama	857,292	857,844	858,396	859,650	860,563	861,446	862,367	863,298	864,282	865,294	866,324	

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:					
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	
Jefferson	117,421	117,532	117,647	117,886	118,043	118,201	118,372	118,545	118,734	118,938	119,146	
Lee	25,912	25,924	25,939	25,964	25,987	26,010	26,034	26,057	26,082	26,105	26,131	
Madison	54,377	54,436	54,488	54,600	54,694	54,785	54,882	54,985	55,091	55,200	55,313	
Marshall	19,062	19,071	19,080	19,116	19,138	19,160	19,185	19,208	19,233	19,259	19,286	
Mobile	74,869	74,899	74,920	75,014	75,058	75,101	75,144	75,187	75,234	75,282	75,328	
Montgomery	34,946	34,971	35,009	35,080	35,131	35,184	35,241	35,299	35,360	35,429	35,496	
Shelby	38,889	38,921	38,982	39,051	39,106	39,162	39,220	39,281	39,346	39,414	39,484	
Tuscaloosa	36,535	36,542	36,553	36,591	36,619	36,648	36,675	36,704	36,733	36,762	36,792	

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:											
	12/18	12/19	12/20	12/21	12/23			12/25			12/27					
Jefferson	117,421	117,532	117,647	117,886	118,201	(23,640)	[5,674]	{2,837}	118,545	(23,709)	[5,690]	{2,845}	118,938	(23,788)	[5,709]	{2,855}
Lee	25,912	25,924	25,939	25,964	26,010	(5,202)	[1,248]	{624}	26,057	(5,211)	[1,251]	{625}	26,105	(5,221)	[1,253]	{627}
Madison	54,377	54,436	54,488	54,600	54,785	(10,957)	[2,630]	{1,315}	54,985	(10,997)	[2,639]	{1,320}	55,200	(11,040)	[2,650]	{1,325}
Marshall	19,062	19,071	19,080	19,116	19,160	(3,832)	[920]	{460}	19,208	(3,842)	[922]	{461}	19,259	(3,852)	[924]	{462}
Mobile	74,869	74,899	74,920	75,014	75,101	(15,020)	[3,605]	{1,802}	75,187	(15,037)	[3,609]	{1,804}	75,282	(15,056)	[3,614]	{1,807}
Montgomery	34,946	34,971	35,009	35,080	35,184	(7,037)	[1,689]	{844}	35,299	(7,060)	[1,694]	{847}	35,429	(7,086)	[1,701]	{850}
Shelby	38,889	38,921	38,982	39,051	39,162	(7,832)	[1,880]	{940}	39,281	(7,856)	[1,885]	{943}	39,414	(7,883)	[1,892]	{946}
Tuscaloosa	36,535	36,542	36,553	36,591	36,648	(7,330)	[1,759]	{880}	36,704	(7,341)	[1,762]	{881}	36,762	(7,352)	[1,765]	{882}

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.