

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

Date: 4/27/21

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 4/27/21 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.**

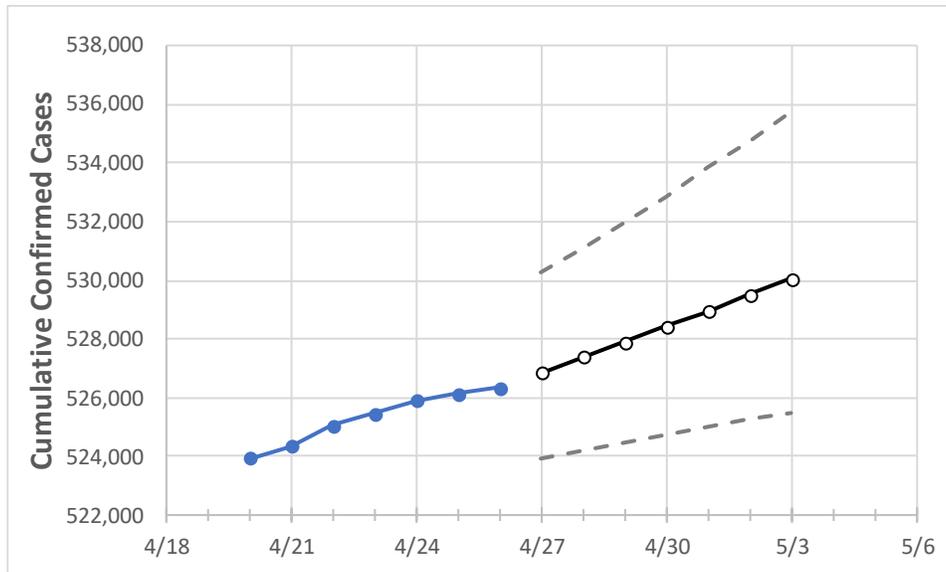
### IEM's Modeling Lead

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:						
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3
Alabama	525,477	525,898	526,131	526,348	526,864	527,380	527,907	528,421	528,952	529,500	530,051

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:						
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3
Jefferson	75,792	75,882	75,909	75,948	75,993	76,036	76,080	76,124	76,168	76,211	76,253
Lee	15,709	15,722	15,723	15,731	15,745	15,759	15,773	15,787	15,802	15,816	15,832
Madison	34,249	34,321	34,348	34,367	34,402	34,438	34,473	34,509	34,545	34,583	34,621
Marshall	12,064	12,077	12,082	12,085	12,093	12,102	12,110	12,118	12,127	12,135	12,143
Mobile	40,535	40,582	40,605	40,621	40,678	40,736	40,797	40,861	40,927	40,996	41,065
Montgomery	24,113	24,135	24,139	24,151	24,163	24,173	24,185	24,196	24,206	24,217	24,228
Shelby	23,258	23,255	23,261	23,278	23,288	23,297	23,307	23,316	23,324	23,334	23,343
Tuscaloosa	25,481	25,506	25,532	25,533	25,549	25,564	25,580	25,596	25,611	25,626	25,641

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:											
	4/23	4/24	4/25	4/26	4/28			4/30			5/2					
Jefferson	75,792	75,882	75,909	75,948	76,036	(15,207)	[3,650]	{1,825}	76,124	(15,225)	[3,654]	{1,827}	76,211	(15,242)	[3,658]	{1,829}
Lee	15,709	15,722	15,723	15,731	15,759	(3,152)	[756]	{378}	15,787	(3,157)	[758]	{379}	15,816	(3,163)	[759]	{380}
Madison	34,249	34,321	34,348	34,367	34,438	(6,888)	[1,653]	{827}	34,509	(6,902)	[1,656]	{828}	34,583	(6,917)	[1,660]	{830}
Marshall	12,064	12,077	12,082	12,085	12,102	(2,420)	[581]	{290}	12,118	(2,424)	[582]	{291}	12,135	(2,427)	[582]	{291}
Mobile	40,535	40,582	40,605	40,621	40,736	(8,147)	[1,955]	{978}	40,861	(8,172)	[1,961]	{981}	40,996	(8,199)	[1,968]	{984}
Montgomery	24,113	24,135	24,139	24,151	24,173	(4,835)	[1,160]	{580}	24,196	(4,839)	[1,161]	{581}	24,217	(4,843)	[1,162]	{581}
Shelby	23,258	23,255	23,261	23,278	23,297	(4,659)	[1,118]	{559}	23,316	(4,663)	[1,119]	{560}	23,334	(4,667)	[1,120]	{560}
Tuscaloosa	25,481	25,506	25,532	25,533	25,564	(5,113)	[1,227]	{614}	25,596	(5,119)	[1,229]	{614}	25,626	(5,125)	[1,230]	{615}

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.