

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

Date: 11/9/20

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 11/9/20 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.**

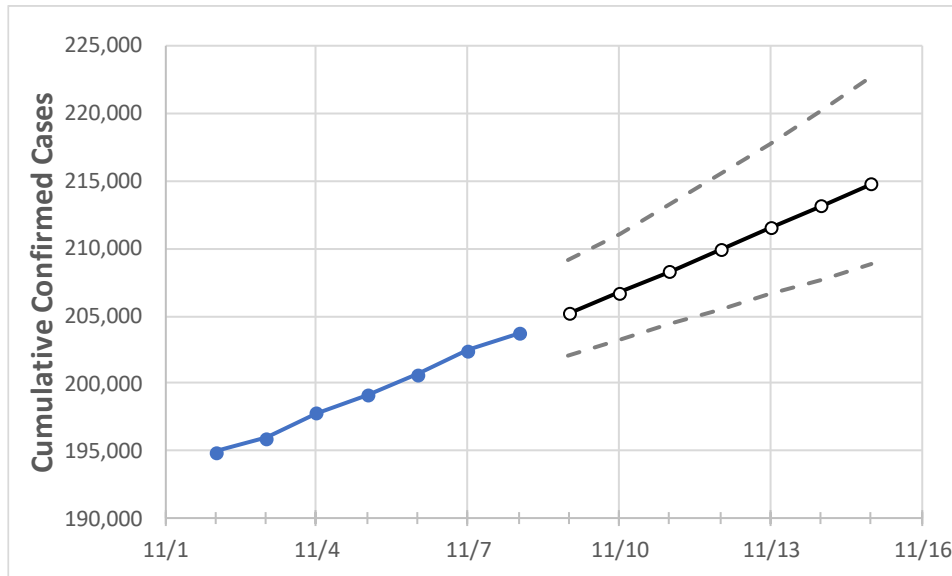
### IEM's Modeling Lead

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:							
	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	
Alabama	199,158	200,714	202,482	203,687	205,204	206,744	208,306	209,893	211,502	213,136	214,794	

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 20%, and are often within 10%, of actual confirmed cases.

Alabama Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	
Jefferson	25,159	25,370	25,627	25,827	26,046	26,270	26,501	26,738	26,982	27,232	27,489	
Lee	6,812	6,851	6,878	6,903	6,929	6,956	6,984	7,013	7,042	7,073	7,105	
Madison	10,078	10,150	10,284	10,358	10,444	10,533	10,626	10,721	10,820	10,922	11,028	
Marshall	4,727	4,769	4,809	4,852	4,903	4,959	5,018	5,081	5,149	5,222	5,300	
Mobile	17,591	17,667	17,729	17,782	17,858	17,938	18,020	18,105	18,192	18,284	18,378	
Montgomery	10,937	11,002	11,080	11,119	11,179	11,239	11,298	11,358	11,417	11,477	11,536	
Shelby	8,017	8,090	8,182	8,251	8,320	8,389	8,461	8,533	8,608	8,683	8,760	
Tuscaloosa	10,976	11,025	11,141	11,205	11,259	11,313	11,367	11,421	11,475	11,528	11,582	

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:											
	11/5	11/6	11/7	11/8	11/10				11/12				11/14			
Jefferson	25,159	25,370	25,627	25,827	26,270	(5,254)	[1,261]	{630}	26,738	(5,348)	[1,283]	{642}	27,232	(5,446)	[1,307]	{654}
Lee	6,812	6,851	6,878	6,903	6,956	(1,391)	[334]	{167}	7,013	(1,403)	[337]	{168}	7,073	(1,415)	[339]	{170}
Madison	10,078	10,150	10,284	10,358	10,533	(2,107)	[506]	{253}	10,721	(2,144)	[515]	{257}	10,922	(2,184)	[524]	{262}
Marshall	4,727	4,769	4,809	4,852	4,959	(992)	[238]	{119}	5,081	(1,016)	[244]	{122}	5,222	(1,044)	[251]	{125}
Mobile	17,591	17,667	17,729	17,782	17,938	(3,588)	[861]	{431}	18,105	(3,621)	[869]	{435}	18,284	(3,657)	[878]	{439}
Montgomery	10,937	11,002	11,080	11,119	11,239	(2,248)	[539]	{270}	11,358	(2,272)	[545]	{273}	11,477	(2,295)	[551]	{275}
Shelby	8,017	8,090	8,182	8,251	8,389	(1,678)	[403]	{201}	8,533	(1,707)	[410]	{205}	8,683	(1,737)	[417]	{208}
Tuscaloosa	10,976	11,025	11,141	11,205	11,313	(2,263)	[543]	{272}	11,421	(2,284)	[548]	{274}	11,528	(2,306)	[553]	{277}

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.