

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/15/21**

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 3/15/21 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.

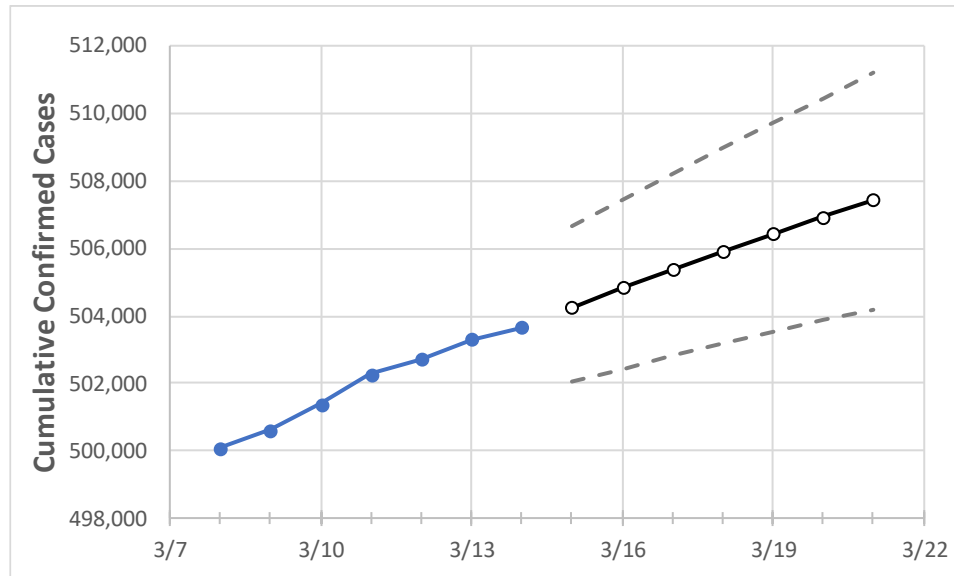
IEM's Modeling Lead

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
Alabama	502,263	502,711	503,305	503,673	504,258	504,830	505,377	505,901	506,441	506,948	507,453

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
Jefferson	72,484	72,571	72,676	72,740	72,856	72,975	73,094	73,210	73,327	73,447	73,567
Lee	15,117	15,122	15,138	15,147	15,156	15,165	15,174	15,182	15,190	15,198	15,205
Madison	32,818	32,850	32,892	32,922	32,950	32,976	33,002	33,026	33,049	33,072	33,094
Marshall	11,488	11,491	11,510	11,514	11,528	11,543	11,557	11,572	11,586	11,598	11,612
Mobile	36,598	36,629	36,694	36,717	36,748	36,778	36,806	36,835	36,861	36,886	36,910
Montgomery	22,926	22,951	22,975	23,013	23,039	23,064	23,088	23,112	23,136	23,159	23,181
Shelby	22,417	22,465	22,499	22,519	22,554	22,590	22,625	22,658	22,691	22,723	22,755
Tuscaloosa	24,532	24,529	24,547	24,560	24,585	24,610	24,633	24,656	24,678	24,700	24,722

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:											
	3/11	3/12	3/13	3/14	3/16			3/18			3/20					
Jefferson	72,484	72,571	72,676	72,740	72,975	(14,595)	[3,503]	{1,751}	73,210	(14,642)	[3,514]	{1,757}	73,447	(14,689)	[3,525]	{1,763}
Lee	15,117	15,122	15,138	15,147	15,165	(3,033)	[728]	{364}	15,182	(3,036)	[729]	{364}	15,198	(3,040)	[730]	{365}
Madison	32,818	32,850	32,892	32,922	32,976	(6,595)	[1,583]	{791}	33,026	(6,605)	[1,585]	{793}	33,072	(6,614)	[1,587]	{794}
Marshall	11,488	11,491	11,510	11,514	11,543	(2,309)	[554]	{277}	11,572	(2,314)	[555]	{278}	11,598	(2,320)	[557]	{278}
Mobile	36,598	36,629	36,694	36,717	36,778	(7,356)	[1,765]	{883}	36,835	(7,367)	[1,768]	{884}	36,886	(7,377)	[1,771]	{885}
Montgomery	22,926	22,951	22,975	23,013	23,064	(4,613)	[1,107]	{554}	23,112	(4,622)	[1,109]	{555}	23,159	(4,632)	[1,112]	{556}
Shelby	22,417	22,465	22,499	22,519	22,590	(4,518)	[1,084]	{542}	22,658	(4,532)	[1,088]	{544}	22,723	(4,545)	[1,091]	{545}
Tuscaloosa	24,532	24,529	24,547	24,560	24,610	(4,922)	[1,181]	{591}	24,656	(4,931)	[1,183]	{592}	24,700	(4,940)	[1,186]	{593}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.