

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 4/22/21**

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 4/22/21 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.

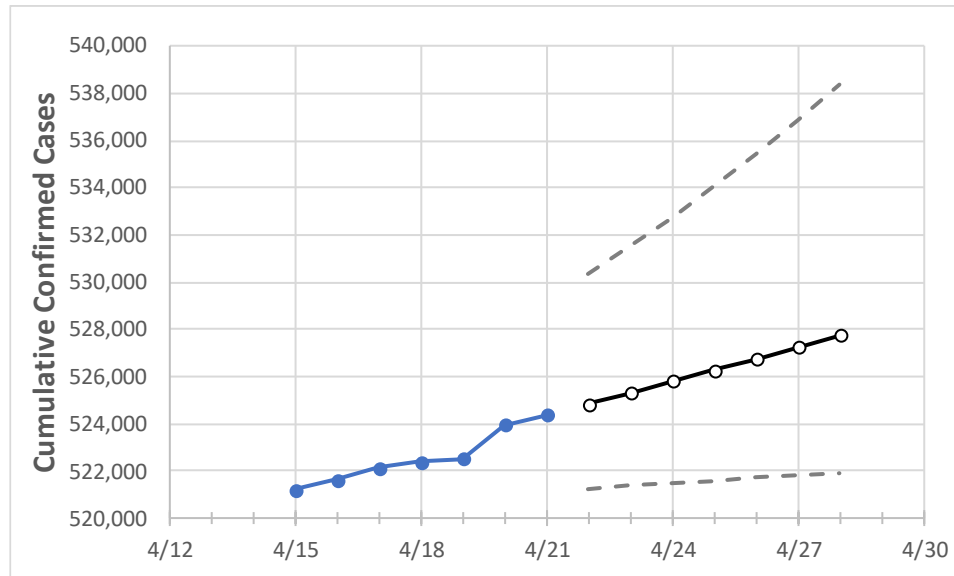
IEM's Modeling Lead

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:						
	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28
Alabama	522,401	522,512	523,955	524,367	524,824	525,301	525,793	526,256	526,736	527,239	527,744

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:						
	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28
Jefferson	75,517	75,537	75,582	75,651	75,688	75,725	75,761	75,797	75,830	75,864	75,897
Lee	15,631	15,638	15,642	15,670	15,685	15,700	15,716	15,732	15,748	15,764	15,781
Madison	34,109	34,124	34,153	34,165	34,197	34,228	34,259	34,291	34,321	34,353	34,384
Marshall	12,009	12,012	12,015	12,022	12,028	12,034	12,040	12,046	12,051	12,057	12,062
Mobile	39,126	39,129	40,234	40,258	40,286	40,314	40,342	40,370	40,399	40,429	40,460
Montgomery	24,058	24,059	24,084	24,089	24,102	24,115	24,128	24,140	24,153	24,165	24,177
Shelby	23,221	23,225	23,241	23,250	23,261	23,271	23,282	23,292	23,302	23,312	23,321
Tuscaloosa	25,405	25,408	25,423	25,448	25,464	25,480	25,495	25,511	25,526	25,541	25,556

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:											
	4/18	4/19	4/20	4/21	4/23				4/25				4/27			
Jefferson	75,517	75,537	75,582	75,651	75,725	(15,145)	[3,635]	{1,817}	75,797	(15,159)	[3,638]	{1,819}	75,864	(15,173)	[3,641]	{1,821}
Lee	15,631	15,638	15,642	15,670	15,700	(3,140)	[754]	{377}	15,732	(3,146)	[755]	{378}	15,764	(3,153)	[757]	{378}
Madison	34,109	34,124	34,153	34,165	34,228	(6,846)	[1,643]	{821}	34,291	(6,858)	[1,646]	{823}	34,353	(6,871)	[1,649]	{824}
Marshall	12,009	12,012	12,015	12,022	12,034	(2,407)	[578]	{289}	12,046	(2,409)	[578]	{289}	12,057	(2,411)	[579]	{289}
Mobile	39,126	39,129	40,234	40,258	40,314	(8,063)	[1,935]	{968}	40,370	(8,074)	[1,938]	{969}	40,429	(8,086)	[1,941]	{970}
Montgomery	24,058	24,059	24,084	24,089	24,115	(4,823)	[1,158]	{579}	24,140	(4,828)	[1,159]	{579}	24,165	(4,833)	[1,160]	{580}
Shelby	23,221	23,225	23,241	23,250	23,271	(4,654)	[1,117]	{559}	23,292	(4,658)	[1,118]	{559}	23,312	(4,662)	[1,119]	{559}
Tuscaloosa	25,405	25,408	25,423	25,448	25,480	(5,096)	[1,223]	{612}	25,511	(5,102)	[1,225]	{612}	25,541	(5,108)	[1,226]	{613}

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.