

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

Date: 6/7/21

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 6/7/21 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.

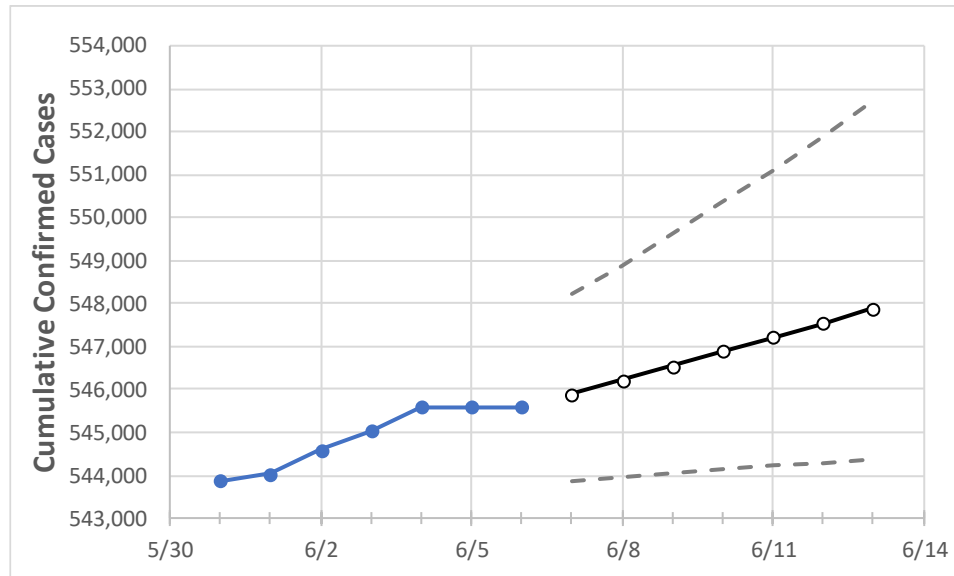
IEM's Modeling Lead

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:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
Alabama	545,028	545,585	545,585	545,585	545,901	546,223	546,545	546,886	547,217	547,549	547,889

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:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
Jefferson	80,522	80,586	80,586	80,586	80,655	80,724	80,798	80,876	80,957	81,044	81,135
Lee	16,171	16,190	16,190	16,190	16,206	16,222	16,239	16,256	16,273	16,292	16,312
Madison	35,406	35,449	35,449	35,449	35,460	35,470	35,481	35,491	35,501	35,511	35,520
Marshall	12,365	12,379	12,379	12,379	12,383	12,387	12,391	12,395	12,399	12,403	12,407
Mobile	41,671	41,763	41,763	41,763	41,798	41,835	41,874	41,914	41,961	42,003	42,048
Montgomery	24,984	25,015	25,015	25,015	25,036	25,059	25,084	25,108	25,135	25,162	25,190
Shelby	25,466	25,485	25,485	25,485	25,499	25,514	25,528	25,544	25,559	25,576	25,594
Tuscaloosa	26,076	26,085	26,085	26,085	26,091	26,098	26,104	26,111	26,117	26,123	26,129

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:											
	6/3	6/4	6/5	6/6	6/8			6/10			6/12					
Jefferson	80,522	80,586	80,586	80,586	80,724	(16,145)	[3,875]	{1,937}	80,876	(16,175)	[3,882]	{1,941}	81,044	(16,209)	[3,890]	{1,945}
Lee	16,171	16,190	16,190	16,190	16,222	(3,244)	[779]	{389}	16,256	(3,251)	[780]	{390}	16,292	(3,258)	[782]	{391}
Madison	35,406	35,449	35,449	35,449	35,470	(7,094)	[1,703]	{851}	35,491	(7,098)	[1,704]	{852}	35,511	(7,102)	[1,705]	{852}
Marshall	12,365	12,379	12,379	12,379	12,387	(2,477)	[595]	{297}	12,395	(2,479)	[595]	{297}	12,403	(2,481)	[595]	{298}
Mobile	41,671	41,763	41,763	41,763	41,835	(8,367)	[2,008]	{1,004}	41,914	(8,383)	[2,012]	{1,006}	42,003	(8,401)	[2,016]	{1,008}
Montgomery	24,984	25,015	25,015	25,015	25,059	(5,012)	[1,203]	{601}	25,108	(5,022)	[1,205]	{603}	25,162	(5,032)	[1,208]	{604}
Shelby	25,466	25,485	25,485	25,485	25,514	(5,103)	[1,225]	{612}	25,544	(5,109)	[1,226]	{613}	25,576	(5,115)	[1,228]	{614}
Tuscaloosa	26,076	26,085	26,085	26,085	26,098	(5,220)	[1,253]	{626}	26,111	(5,222)	[1,253]	{627}	26,123	(5,225)	[1,254]	{627}

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.