

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

Date: 6/29/21

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 6/29/21 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.

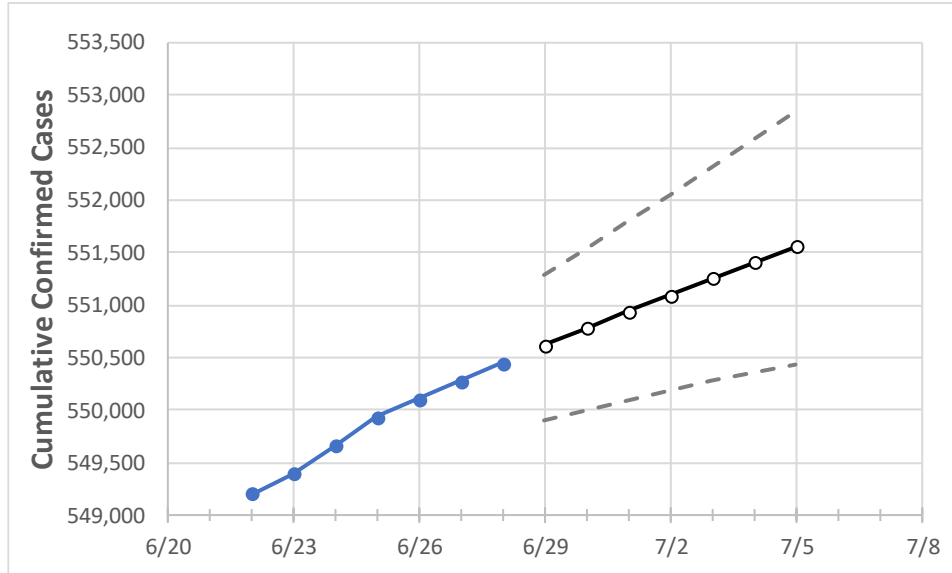
IEM's Modeling Lead

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Alabama	549,934	550,106	550,279	550,451	550,617	550,779	550,940	551,096	551,253	551,409	551,558

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Jefferson	81,151	81,173	81,194	81,216	81,234	81,253	81,271	81,289	81,306	81,323	81,340
Lee	16,317	16,318	16,318	16,319	16,323	16,326	16,330	16,333	16,336	16,339	16,342
Madison	35,779	35,795	35,810	35,826	35,840	35,854	35,867	35,881	35,894	35,907	35,921
Marshall	12,476	12,479	12,482	12,485	12,488	12,490	12,493	12,496	12,498	12,501	12,503
Mobile	42,241	42,271	42,301	42,331	42,356	42,381	42,406	42,432	42,457	42,483	42,508
Montgomery	25,101	25,104	25,107	25,110	25,112	25,114	25,116	25,118	25,120	25,121	25,123
Shelby	25,674	25,684	25,693	25,703	25,712	25,722	25,732	25,741	25,751	25,761	25,771
Tuscaloosa	26,216	26,220	26,224	26,228	26,233	26,238	26,242	26,247	26,252	26,257	26,262

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:											
	6/25	6/26	6/27	6/28	6/30			7/2			7/4					
Jefferson	81,151	81,173	81,194	81,216	81,253	(16,251)	[3,900]	{1,950}	81,289	(16,258)	[3,902]	{1,951}	81,323	(16,265)	[3,904]	{1,952}
Lee	16,317	16,318	16,318	16,319	16,326	(3,265)	[784]	{392}	16,333	(3,267)	[784]	{392}	16,339	(3,268)	[784]	{392}
Madison	35,779	35,795	35,810	35,826	35,854	(7,171)	[1,721]	{860}	35,881	(7,176)	[1,722]	{861}	35,907	(7,181)	[1,724]	{862}
Marshall	12,476	12,479	12,482	12,485	12,490	(2,498)	[600]	{300}	12,496	(2,499)	[600]	{300}	12,501	(2,500)	[600]	{300}
Mobile	42,241	42,271	42,301	42,331	42,381	(8,476)	[2,034]	{1,017}	42,432	(8,486)	[2,037]	{1,018}	42,483	(8,497)	[2,039]	{1,020}
Montgomery	25,101	25,104	25,107	25,110	25,114	(5,023)	[1,205]	{603}	25,118	(5,024)	[1,206]	{603}	25,121	(5,024)	[1,206]	{603}
Shelby	25,674	25,684	25,693	25,703	25,722	(5,144)	[1,235]	{617}	25,741	(5,148)	[1,236]	{618}	25,761	(5,152)	[1,237]	{618}
Tuscaloosa	26,216	26,220	26,224	26,228	26,238	(5,248)	[1,259]	{630}	26,247	(5,249)	[1,260]	{630}	26,257	(5,251)	[1,260]	{630}

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.