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

Date: 7/26/21

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 7/26/21 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.

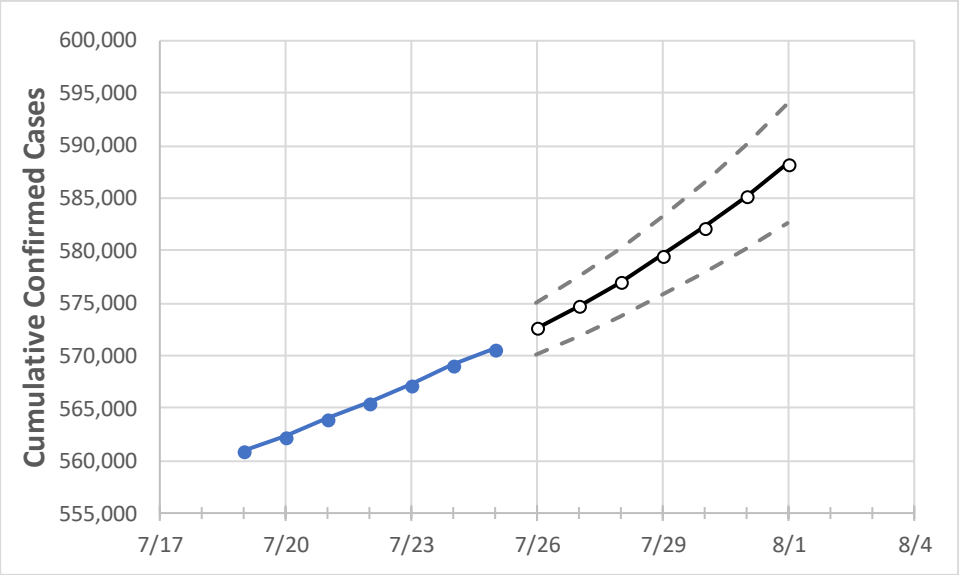
IEM's Modeling Lead

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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Alabama	565,510	567,243	569,131	570,667	572,612	574,733	577,033	579,525	582,237	585,184	588,341

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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Jefferson	82,806	83,039	83,188	83,482	83,722	83,988	84,277	84,599	84,951	85,333	85,754
Lee	16,691	16,722	16,753	16,801	16,842	16,886	16,934	16,984	17,038	17,095	17,158
Madison	36,534	36,604	36,714	36,785	36,872	36,966	37,067	37,177	37,295	37,423	37,558
Marshall	12,723	12,751	12,786	12,806	12,836	12,867	12,901	12,938	12,977	13,020	13,066
Mobile	44,938	45,238	45,534	45,819	46,183	46,581	47,014	47,487	48,003	48,559	49,172
Montgomery	25,598	25,640	25,707	25,739	25,795	25,856	25,922	25,992	26,069	26,149	26,238
Shelby	26,409	26,461	26,527	26,612	26,691	26,776	26,866	26,963	27,066	27,180	27,301
Tuscaloosa	26,589	26,667	26,717	26,757	26,803	26,852	26,905	26,963	27,025	27,094	27,168

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:		
	7/22	7/23	7/24	7/25	7/27	7/29	7/31
Jefferson	82,806	83,039	83,188	83,482	83,988 (16,798) [4,031] {2,016}	84,599 (16,920) [4,061] {2,030}	85,333 (17,067) [4,096] {2,048}
Lee	16,691	16,722	16,753	16,801	16,886 (3,377) [811] {405}	16,984 (3,397) [815] {408}	17,095 (3,419) [821] {410}
Madison	36,534	36,604	36,714	36,785	36,966 (7,393) [1,774] {887}	37,177 (7,435) [1,784] {892}	37,423 (7,485) [1,796] {898}
Marshall	12,723	12,751	12,786	12,806	12,867 (2,573) [618] {309}	12,938 (2,588) [621] {311}	13,020 (2,604) [625] {312}
Mobile	44,938	45,238	45,534	45,819	46,581 (9,316) [2,236] {1,118}	47,487 (9,497) [2,279] {1,140}	48,559 (9,712) [2,331] {1,165}
Montgomery	25,598	25,640	25,707	25,739	25,856 (5,171) [1,241] {621}	25,992 (5,198) [1,248] {624}	26,149 (5,230) [1,255] {628}
Shelby	26,409	26,461	26,527	26,612	26,776 (5,355) [1,285] {643}	26,963 (5,393) [1,294] {647}	27,180 (5,436) [1,305] {652}
Tuscaloosa	26,589	26,667	26,717	26,757	26,852 (5,370) [1,289] {644}	26,963 (5,393) [1,294] {647}	27,094 (5,419) [1,300] {650}

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.