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

Date: 5/25/21

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 5/25/21 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.

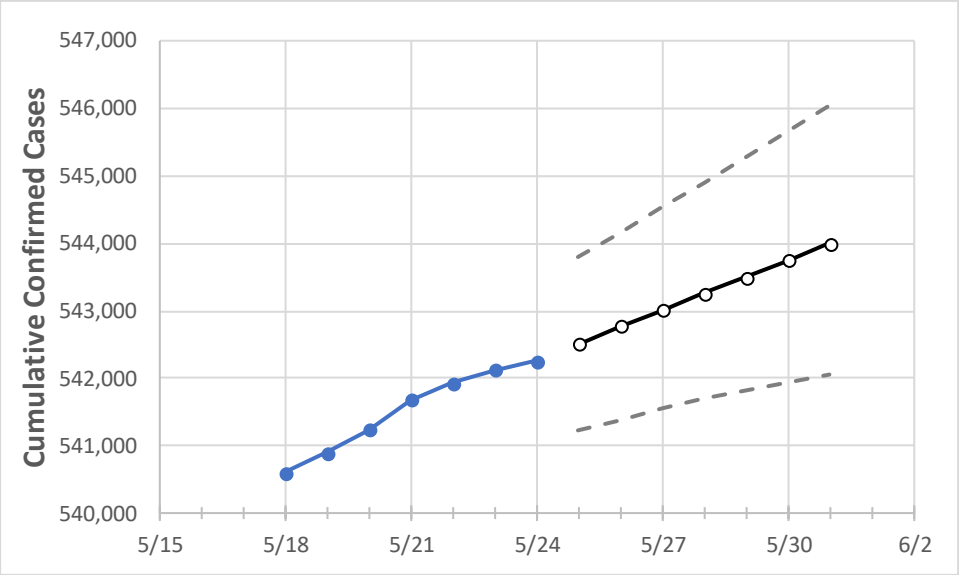
IEM's Modeling Lead

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Alabama	541,673	541,928	542,124	542,256	542,511	542,771	543,010	543,256	543,502	543,751	543,999

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Jefferson	80,020	80,041	80,061	80,099	80,126	80,151	80,177	80,203	80,229	80,254	80,278
Lee	16,034	16,040	16,049	16,049	16,056	16,063	16,070	16,077	16,084	16,092	16,099
Madison	35,244	35,266	35,284	35,299	35,316	35,332	35,349	35,365	35,381	35,396	35,411
Marshall	12,319	12,323	12,325	12,326	12,332	12,338	12,345	12,350	12,357	12,362	12,368
Mobile	41,392	41,408	41,423	41,432	41,457	41,481	41,506	41,532	41,555	41,579	41,603
Montgomery	24,807	24,820	24,832	24,840	24,854	24,869	24,884	24,900	24,916	24,932	24,948
Shelby	25,330	25,347	25,352	25,361	25,371	25,380	25,389	25,398	25,407	25,416	25,425
Tuscaloosa	25,975	25,984	25,989	25,992	25,999	26,006	26,013	26,020	26,026	26,032	26,038

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:		
	5/21	5/22	5/23	5/24	5/26	5/28	5/30
Jefferson	80,020	80,041	80,061	80,099	80,151 (16,030) [3,847] {1,924}	80,203 (16,041) [3,850] {1,925}	80,254 (16,051) [3,852] {1,926}
Lee	16,034	16,040	16,049	16,049	16,063 (3,213) [771] {386}	16,077 (3,215) [772] {386}	16,092 (3,218) [772] {386}
Madison	35,244	35,266	35,284	35,299	35,332 (7,066) [1,696] {848}	35,365 (7,073) [1,698] {849}	35,396 (7,079) [1,699] {850}
Marshall	12,319	12,323	12,325	12,326	12,338 (2,468) [592] {296}	12,350 (2,470) [593] {296}	12,362 (2,472) [593] {297}
Mobile	41,392	41,408	41,423	41,432	41,481 (8,296) [1,991] {996}	41,532 (8,306) [1,994] {997}	41,579 (8,316) [1,996] {998}
Montgomery	24,807	24,820	24,832	24,840	24,869 (4,974) [1,194] {597}	24,900 (4,980) [1,195] {598}	24,932 (4,986) [1,197] {598}
Shelby	25,330	25,347	25,352	25,361	25,380 (5,076) [1,218] {609}	25,398 (5,080) [1,219] {610}	25,416 (5,083) [1,220] {610}
Tuscaloosa	25,975	25,984	25,989	25,992	26,006 (5,201) [1,248] {624}	26,020 (5,204) [1,249] {624}	26,032 (5,206) [1,250] {625}

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.