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

Date: 6/11/21

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 6/11/21 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.

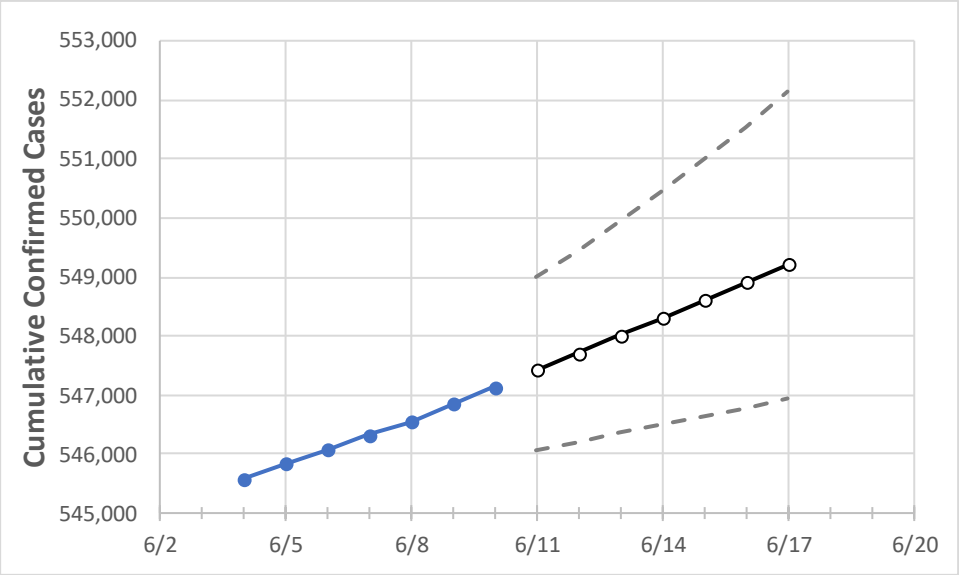
IEM's Modeling Lead

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Alabama	546,324	546,540	546,845	547,135	547,427	547,720	548,008	548,310	548,609	548,908	549,207

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Jefferson	80,681	80,705	80,715	80,745	80,776	80,807	80,837	80,870	80,903	80,935	80,967
Lee	16,201	16,203	16,211	16,227	16,235	16,243	16,252	16,260	16,269	16,278	16,286
Madison	35,514	35,520	35,596	35,604	35,626	35,648	35,670	35,693	35,717	35,741	35,765
Marshall	12,397	12,407	12,417	12,439	12,448	12,457	12,466	12,476	12,487	12,497	12,508
Mobile	41,808	41,854	41,871	41,913	41,943	41,975	42,007	42,040	42,074	42,106	42,141
Montgomery	25,057	25,061	25,063	25,065	25,074	25,083	25,092	25,100	25,109	25,118	25,126
Shelby	25,528	25,533	25,544	25,554	25,567	25,580	25,593	25,606	25,620	25,635	25,649
Tuscaloosa	26,100	26,105	26,110	26,119	26,124	26,130	26,135	26,141	26,146	26,151	26,156

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:		
	6/7	6/8	6/9	6/10	6/12	6/14	6/16
Jefferson	80,681	80,705	80,715	80,745	80,807 (16,161) [3,879] {1,939}	80,870 (16,174) [3,882] {1,941}	80,935 (16,187) [3,885] {1,942}
Lee	16,201	16,203	16,211	16,227	16,243 (3,249) [780] {390}	16,260 (3,252) [780] {390}	16,278 (3,256) [781] {391}
Madison	35,514	35,520	35,596	35,604	35,648 (7,130) [1,711] {856}	35,693 (7,139) [1,713] {857}	35,741 (7,148) [1,716] {858}
Marshall	12,397	12,407	12,417	12,439	12,457 (2,491) [598] {299}	12,476 (2,495) [599] {299}	12,497 (2,499) [600] {300}
Mobile	41,808	41,854	41,871	41,913	41,975 (8,395) [2,015] {1,007}	42,040 (8,408) [2,018] {1,009}	42,106 (8,421) [2,021] {1,011}
Montgomery	25,057	25,061	25,063	25,065	25,083 (5,017) [1,204] {602}	25,100 (5,020) [1,205] {602}	25,118 (5,024) [1,206] {603}
Shelby	25,528	25,533	25,544	25,554	25,580 (5,116) [1,228] {614}	25,606 (5,121) [1,229] {615}	25,635 (5,127) [1,230] {615}
Tuscaloosa	26,100	26,105	26,110	26,119	26,130 (5,226) [1,254] {627}	26,141 (5,228) [1,255] {627}	26,151 (5,230) [1,255] {628}

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.