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

Date: 5/7/21

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 5/7/21 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.

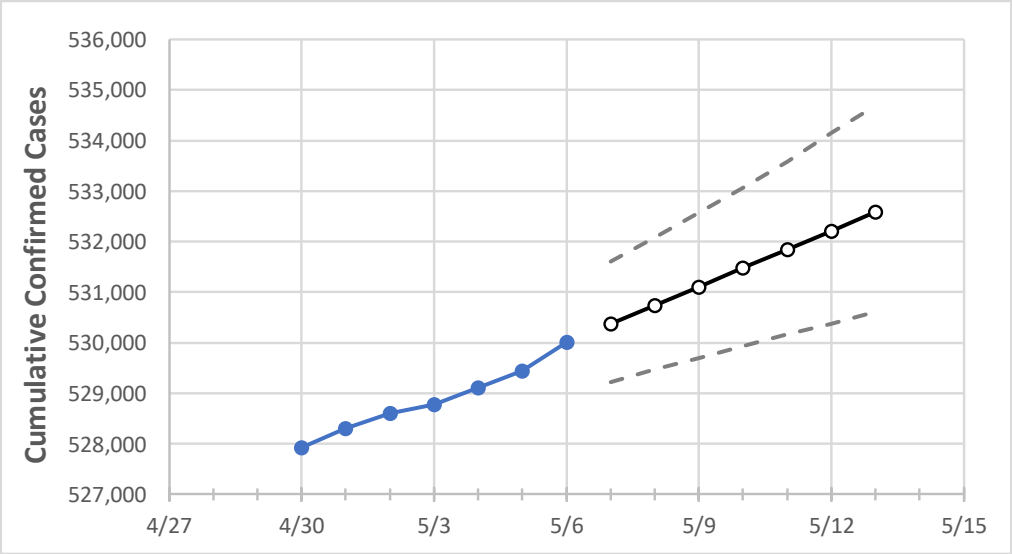
IEM's Modeling Lead

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:						
	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13
Alabama	528,784	529,115	529,446	530,011	530,374	530,743	531,098	531,475	531,848	532,215	532,580

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:						
	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13
Jefferson	76,225	76,264	76,303	76,359	76,399	76,440	76,480	76,520	76,558	76,599	76,639
Lee	15,800	15,811	15,822	15,844	15,854	15,865	15,875	15,885	15,896	15,906	15,916
Madison	34,569	34,596	34,622	34,676	34,709	34,742	34,774	34,808	34,840	34,873	34,906
Marshall	12,166	12,176	12,185	12,203	12,215	12,227	12,239	12,252	12,264	12,277	12,290
Mobile	40,864	40,857	40,850	40,875	40,910	40,947	40,984	41,020	41,057	41,094	41,133
Montgomery	24,264	24,277	24,289	24,308	24,321	24,334	24,348	24,361	24,374	24,387	24,400
Shelby	23,355	23,361	23,367	23,389	23,399	23,408	23,418	23,427	23,437	23,446	23,455
Tuscaloosa	25,646	25,674	25,701	25,717	25,736	25,756	25,775	25,794	25,813	25,833	25,852

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:		
	5/3	5/4	5/5	5/6	5/8	5/10	5/12
Jefferson	76,225	76,264	76,303	76,359	76,440 (15,288) [3,669] {1,835}	76,520 (15,304) [3,673] {1,836}	76,599 (15,320) [3,677] {1,838}
Lee	15,800	15,811	15,822	15,844	15,865 (3,173) [762] {381}	15,885 (3,177) [763] {381}	15,906 (3,181) [764] {382}
Madison	34,569	34,596	34,622	34,676	34,742 (6,948) [1,668] {834}	34,808 (6,962) [1,671] {835}	34,873 (6,975) [1,674] {837}
Marshall	12,166	12,176	12,185	12,203	12,227 (2,445) [587] {293}	12,252 (2,450) [588] {294}	12,277 (2,455) [589] {295}
Mobile	40,864	40,857	40,850	40,875	40,947 (8,189) [1,965] {983}	41,020 (8,204) [1,969] {984}	41,094 (8,219) [1,973] {986}
Montgomery	24,264	24,277	24,289	24,308	24,334 (4,867) [1,168] {584}	24,361 (4,872) [1,169] {585}	24,387 (4,877) [1,171] {585}
Shelby	23,355	23,361	23,367	23,389	23,408 (4,682) [1,124] {562}	23,427 (4,685) [1,125] {562}	23,446 (4,689) [1,125] {563}
Tuscaloosa	25,646	25,674	25,701	25,717	25,756 (5,151) [1,236] {618}	25,794 (5,159) [1,238] {619}	25,833 (5,167) [1,240] {620}

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.