IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/27/21

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 <u>not</u> 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 8/27/21 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
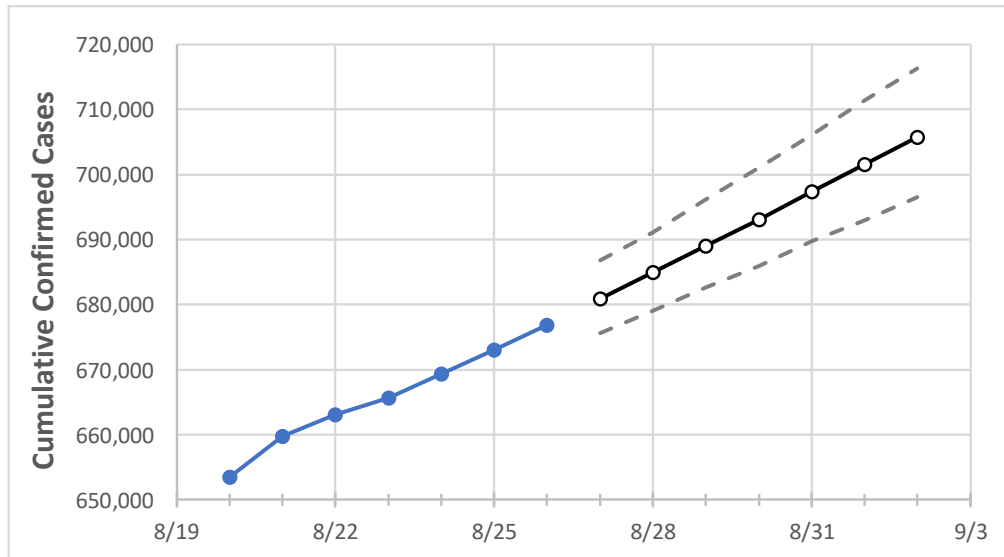
	Actual Confirmed Cases On:				Projected Cases For:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Alabama	665,653	669,367	673,081	676,795	680,874	684,927	688,974	693,141	697,375	701,577	705,803

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Jefferson	96,037	96,591	97,146	97,700	98,300	98,899	99,515	100,130	100,757	101,406	102,053
Lee	19,342	19,420	19,499	19,577	19,693	19,809	19,924	20,044	20,162	20,289	20,414
Madison	41,524	41,784	42,044	42,304	42,597	42,902	43,215	43,540	43,878	44,226	44,586
Marshall	14,712	14,824	14,935	15,047	15,151	15,255	15,359	15,469	15,579	15,694	15,811
Mobile	60,277	60,732	61,186	61,641	62,034	62,434	62,811	63,203	63,578	63,964	64,319
Montgomery	28,949	29,112	29,275	29,438	29,602	29,767	29,931	30,098	30,270	30,447	30,621
Shelby	30,521	30,680	30,840	30,999	31,167	31,336	31,511	31,684	31,862	32,043	32,220
Tuscaloosa	29,142	29,244	29,345	29,447	29,543	29,642	29,739	29,836	29,939	30,039	30,140

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:		
	8/23	8/24	8/25	8/26	8/28	8/30	9/1
Jefferson	96,037	96,591	97,146	97,700	98,899 (19,780) [4,747] {2,374}	100,130 (20,026) [4,806] {2,403}	101,406 (20,281) [4,867] {2,434}
Lee	19,342	19,420	19,499	19,577	19,809 (3,962) [951] {475}	20,044 (4,009) [962] {481}	20,289 (4,058) [974] {487}
Madison	41,524	41,784	42,044	42,304	42,902 (8,580) [2,059] {1,030}	43,540 (8,708) [2,090] {1,045}	44,226 (8,845) [2,123] {1,061}
Marshall	14,712	14,824	14,935	15,047	15,255 (3,051) [732] {366}	15,469 (3,094) [743] {371}	15,694 (3,139) [753] {377}
Mobile	60,277	60,732	61,186	61,641	62,434 (12,487) [2,997] {1,498}	63,203 (12,641) [3,034] {1,517}	63,964 (12,793) [3,070] {1,535}
Montgomery	28,949	29,112	29,275	29,438	29,767 (5,953) [1,429] {714}	30,098 (6,020) [1,445] {722}	30,447 (6,089) [1,461] {731}
Shelby	30,521	30,680	30,840	30,999	31,336 (6,267) [1,504] {752}	31,684 (6,337) [1,521] {760}	32,043 (6,409) [1,538] {769}
Tuscaloosa	29,142	29,244	29,345	29,447	29,642 (5,928) [1,423] {711}	29,836 (5,967) [1,432] {716}	30,039 (6,008) [1,442] {721}

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.