IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/2/22

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 3/2/22 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
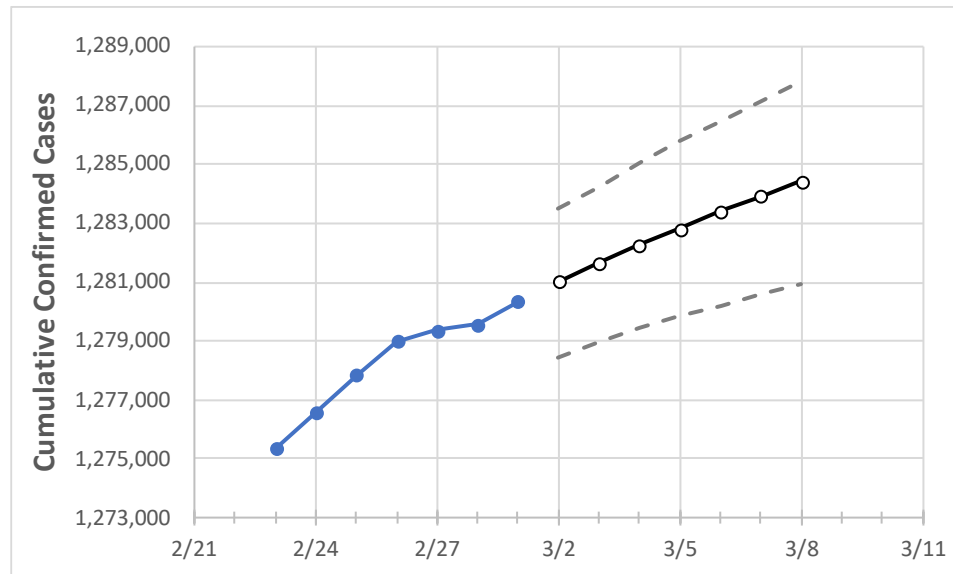
	Actual Confirmed Cases On:				Projected Cases For:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
Alabama	1,279,006	1,279,364	1,279,565	1,280,351	1,281,032	1,281,672	1,282,257	1,282,822	1,283,434	1,283,924	1,284,441

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:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
Jefferson	181,731	181,790	181,836	181,887	181,935	181,980	182,021	182,062	182,097	182,133	182,166
Lee	37,508	37,512	37,520	37,525	37,534	37,543	37,550	37,558	37,565	37,572	37,578
Madison	88,156	88,192	88,219	88,260	88,322	88,381	88,436	88,489	88,533	88,584	88,631
Marshall	27,093	27,099	27,102	27,107	27,113	27,119	27,124	27,129	27,134	27,138	27,142
Mobile	112,072	112,093	112,116	112,171	112,243	112,311	112,374	112,435	112,490	112,552	112,605
Montgomery	54,322	54,348	54,355	54,384	54,404	54,423	54,439	54,457	54,472	54,489	54,503
Shelby	58,731	58,742	58,756	58,791	58,817	58,841	58,865	58,888	58,907	58,928	58,947
Tuscaloosa	54,588	54,605	54,609	54,630	54,691	54,744	54,803	54,851	54,909	54,963	55,011

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:		
	2/26	2/27	2/28	3/1	3/3	3/5	3/7
Jefferson	181,731	181,790	181,836	181,887	181,980 (36,396) [8,735] {4,368}	182,062 (36,412) [8,739] {4,369}	182,133 (36,427) [8,742] {4,371}
Lee	37,508	37,512	37,520	37,525	37,543 (7,509) [1,802] {901}	37,558 (7,512) [1,803] {901}	37,572 (7,514) [1,803] {902}
Madison	88,156	88,192	88,219	88,260	88,381 (17,676) [4,242] {2,121}	88,489 (17,698) [4,247] {2,124}	88,584 (17,717) [4,252] {2,126}
Marshall	27,093	27,099	27,102	27,107	27,119 (5,424) [1,302] {651}	27,129 (5,426) [1,302] {651}	27,138 (5,428) [1,303] {651}
Mobile	112,072	112,093	112,116	112,171	112,311 (22,462) [5,391] {2,695}	112,435 (22,487) [5,397] {2,698}	112,552 (22,510) [5,402] {2,701}
Montgomery	54,322	54,348	54,355	54,384	54,423 (10,885) [2,612] {1,306}	54,457 (10,891) [2,614] {1,307}	54,489 (10,898) [2,615] {1,308}
Shelby	58,731	58,742	58,756	58,791	58,841 (11,768) [2,824] {1,412}	58,888 (11,778) [2,827] {1,413}	58,928 (11,786) [2,829] {1,414}
Tuscaloosa	54,588	54,605	54,609	54,630	54,744 (10,949) [2,628] {1,314}	54,851 (10,970) [2,633] {1,316}	54,963 (10,993) [2,638] {1,319}

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.