IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/20/21

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 8/20/21 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
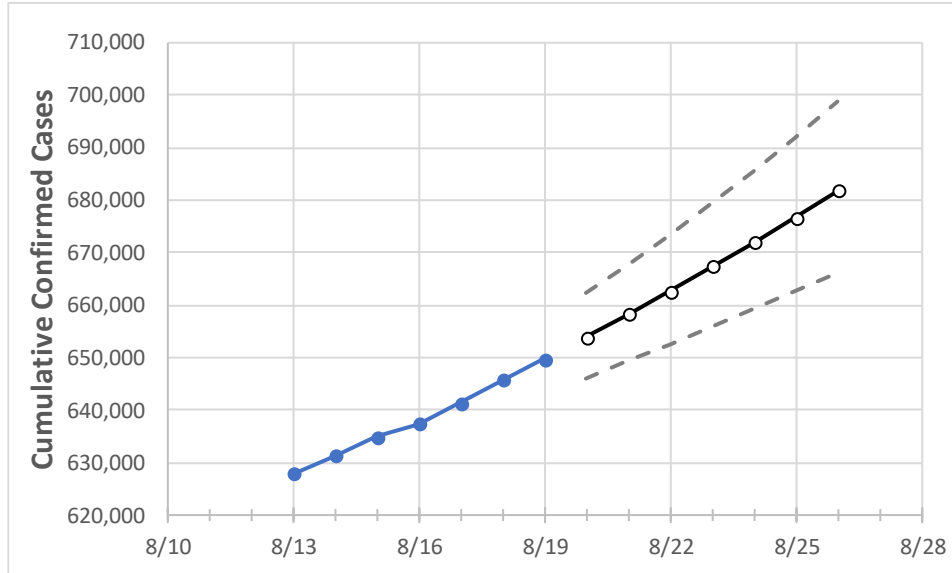
	Actual Confirmed Cases On:				Projected Cases For:						
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26
Alabama	637,363	641,386	645,851	649,741	653,961	658,312	662,714	667,330	672,005	676,786	681,791

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:						
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26
Jefferson	92,177	92,736	93,288	93,764	94,378	95,003	95,650	96,327	97,017	97,739	98,475
Lee	18,461	18,623	18,759	18,875	19,005	19,142	19,283	19,432	19,584	19,745	19,910
Madison	39,852	40,001	40,198	40,459	40,686	40,919	41,162	41,418	41,682	41,952	42,238
Marshall	14,060	14,163	14,258	14,351	14,440	14,533	14,628	14,732	14,837	14,946	15,060
Mobile	57,253	57,593	58,187	58,624	59,169	59,706	60,233	60,770	61,297	61,830	62,356
Montgomery	27,968	28,092	28,279	28,412	28,592	28,779	28,977	29,183	29,396	29,620	29,853
Shelby	29,401	29,561	29,718	29,850	30,022	30,198	30,378	30,562	30,750	30,941	31,137
Tuscaloosa	28,454	28,597	28,691	28,778	28,881	28,984	29,091	29,198	29,310	29,428	29,550

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:**		
	8/16	8/17	8/18	8/19	8/21	8/23	8/25
Jefferson	92,177	92,736	93,288	93,764	95,003 (19,001) [4,560] {2,280}	96,327 (19,265) [4,624] {2,312}	97,739 (19,548) [4,691] {2,346}
Lee	18,461	18,623	18,759	18,875	19,142 (3,828) [919] {459}	19,432 (3,886) [933] {466}	19,745 (3,949) [948] {474}
Madison	39,852	40,001	40,198	40,459	40,919 (8,184) [1,964] {982}	41,418 (8,284) [1,988] {994}	41,952 (8,390) [2,014] {1,007}
Marshall	14,060	14,163	14,258	14,351	14,533 (2,907) [698] {349}	14,732 (2,946) [707] {354}	14,946 (2,989) [717] {359}
Mobile	57,253	57,593	58,187	58,624	59,706 (11,941) [2,866] {1,433}	60,770 (12,154) [2,917] {1,458}	61,830 (12,366) [2,968] {1,484}
Montgomery	27,968	28,092	28,279	28,412	28,779 (5,756) [1,381] {691}	29,183 (5,837) [1,401] {700}	29,620 (5,924) [1,422] {711}
Shelby	29,401	29,561	29,718	29,850	30,198 (6,040) [1,450] {725}	30,562 (6,112) [1,467] {733}	30,941 (6,188) [1,485] {743}
Tuscaloosa	28,454	28,597	28,691	28,778	28,984 (5,797) [1,391] {696}	29,198 (5,840) [1,402] {701}	29,428 (5,886) [1,413] {706}

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.