IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/12/21

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 7/12/21 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
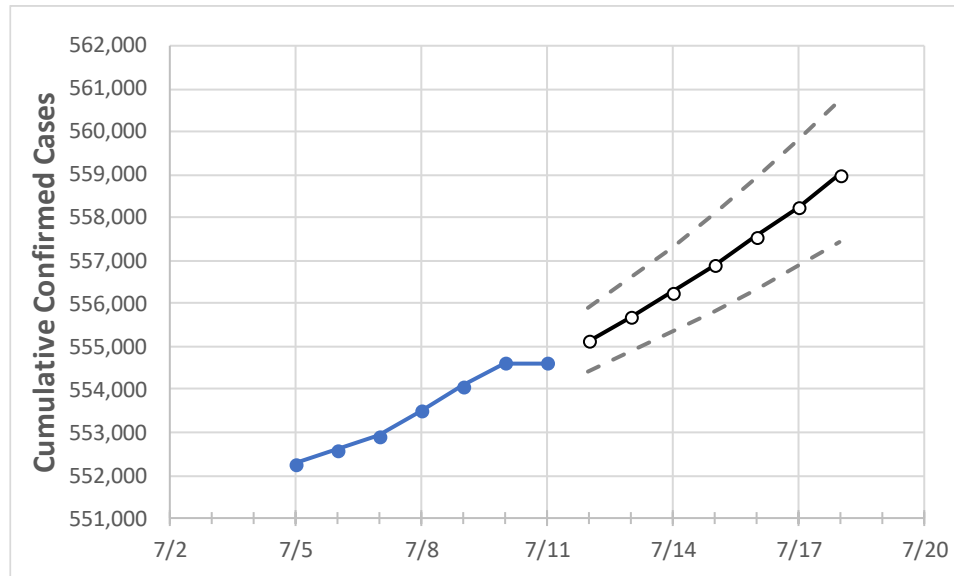
	Actual Confirmed Cases On:				Projected Cases For:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
Alabama	553,491	554,071	554,605	554,605	555,128	555,679	556,269	556,897	557,556	558,241	558,989

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:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
Jefferson	81,564	81,621	81,656	81,656	81,697	81,740	81,783	81,828	81,875	81,921	81,970
Lee	16,406	16,422	16,448	16,448	16,459	16,470	16,482	16,495	16,508	16,522	16,536
Madison	35,963	35,985	36,017	36,017	36,034	36,052	36,070	36,088	36,107	36,125	36,144
Marshall	12,538	12,548	12,564	12,564	12,572	12,581	12,591	12,601	12,611	12,622	12,634
Mobile	42,839	42,951	43,015	43,015	43,092	43,173	43,258	43,347	43,443	43,541	43,646
Montgomery	25,211	25,239	25,250	25,250	25,267	25,285	25,305	25,325	25,346	25,369	25,394
Shelby	25,877	25,907	25,923	25,923	25,949	25,976	26,006	26,037	26,069	26,103	26,137
Tuscaloosa	26,312	26,323	26,332	26,332	26,344	26,357	26,370	26,383	26,398	26,414	26,429

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: | | |
	7/8	7/9	7/10	7/11	7/13	7/15	7/17
Jefferson	81,564	81,621	81,656	81,656	81,740 (16,348) [3,924] {1,962}	81,828 (16,366) [3,928] {1,964}	81,921 (16,384) [3,932] {1,966}
Lee	16,406	16,422	16,448	16,448	16,470 (3,294) [791] {395}	16,495 (3,299) [792] {396}	16,522 (3,304) [793] {397}
Madison	35,963	35,985	36,017	36,017	36,052 (7,210) [1,730] {865}	36,088 (7,218) [1,732] {866}	36,125 (7,225) [1,734] {867}
Marshall	12,538	12,548	12,564	12,564	12,581 (2,516) [604] {302}	12,601 (2,520) [605] {302}	12,622 (2,524) [606] {303}
Mobile	42,839	42,951	43,015	43,015	43,173 (8,635) [2,072] {1,036}	43,347 (8,669) [2,081] {1,040}	43,541 (8,708) [2,090] {1,045}
Montgomery	25,211	25,239	25,250	25,250	25,285 (5,057) [1,214] {607}	25,325 (5,065) [1,216] {608}	25,369 (5,074) [1,218] {609}
Shelby	25,877	25,907	25,923	25,923	25,976 (5,195) [1,247] {623}	26,037 (5,207) [1,250] {625}	26,103 (5,221) [1,253] {626}
Tuscaloosa	26,312	26,323	26,332	26,332	26,357 (5,271) [1,265] {633}	26,383 (5,277) [1,266] {633}	26,414 (5,283) [1,268] {634}

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.