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

Date: 8/13/21

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 8/13/21 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.

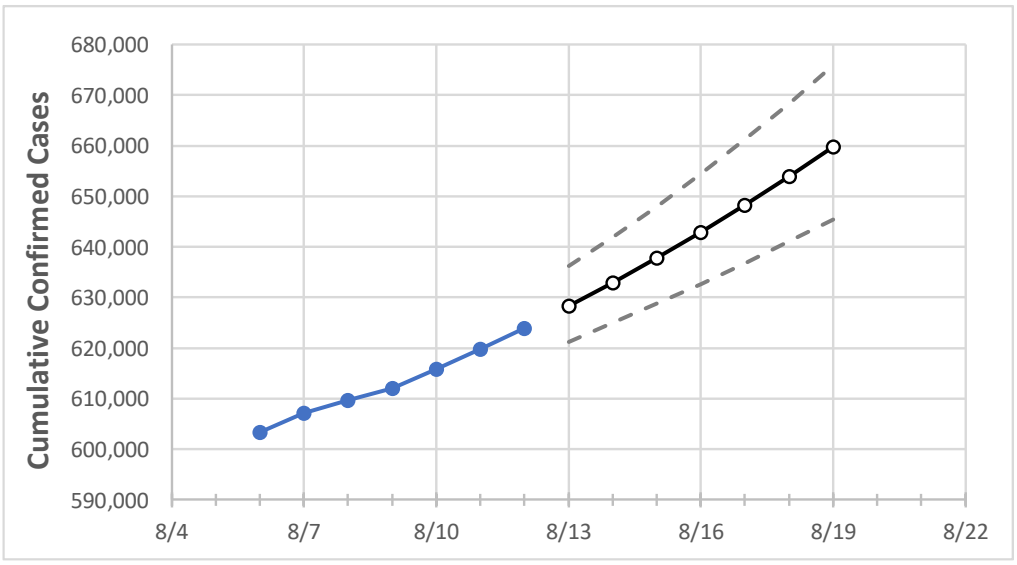
IEM's Modeling Lead

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Alabama	612,086	615,901	619,752	623,919	628,285	632,883	637,748	642,839	648,227	653,872	659,793

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Jefferson	88,521	89,043	89,507	89,977	90,543	91,143	91,781	92,436	93,148	93,884	94,666
Lee	17,797	17,908	18,034	18,146	18,266	18,393	18,530	18,677	18,831	18,996	19,171
Madison	38,537	38,817	38,939	39,148	39,344	39,549	39,768	39,990	40,225	40,473	40,736
Marshall	13,582	13,653	13,738	13,859	13,961	14,069	14,184	14,308	14,440	14,578	14,731
Mobile	53,527	54,087	54,736	55,371	56,142	56,941	57,770	58,649	59,545	60,515	61,513
Montgomery	26,953	27,102	27,235	27,375	27,525	27,685	27,854	28,030	28,224	28,424	28,638
Shelby	28,336	28,472	28,595	28,764	28,938	29,121	29,312	29,509	29,719	29,938	30,161
Tuscaloosa	27,853	27,943	28,048	28,148	28,266	28,395	28,527	28,668	28,813	28,964	29,124

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:		
	8/9	8/10	8/11	8/12	8/14	8/16	8/18
Jefferson	88,521	89,043	89,507	89,977	91,143 (18,229) [4,375] {2,187}	92,436 (18,487) [4,437] {2,218}	93,884 (18,777) [4,506] {2,253}
Lee	17,797	17,908	18,034	18,146	18,393 (3,679) [883] {441}	18,677 (3,735) [896] {448}	18,996 (3,799) [912] {456}
Madison	38,537	38,817	38,939	39,148	39,549 (7,910) [1,898] {949}	39,990 (7,998) [1,920] {960}	40,473 (8,095) [1,943] {971}
Marshall	13,582	13,653	13,738	13,859	14,069 (2,814) [675] {338}	14,308 (2,862) [687] {343}	14,578 (2,916) [700] {350}
Mobile	53,527	54,087	54,736	55,371	56,941 (11,388) [2,733] {1,367}	58,649 (11,730) [2,815] {1,408}	60,515 (12,103) [2,905] {1,452}
Montgomery	26,953	27,102	27,235	27,375	27,685 (5,537) [1,329] {664}	28,030 (5,606) [1,345] {673}	28,424 (5,685) [1,364] {682}
Shelby	28,336	28,472	28,595	28,764	29,121 (5,824) [1,398] {699}	29,509 (5,902) [1,416] {708}	29,938 (5,988) [1,437] {719}
Tuscaloosa	27,853	27,943	28,048	28,148	28,395 (5,679) [1,363] {681}	28,668 (5,734) [1,376] {688}	28,964 (5,793) [1,390] {695}

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.