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

Date: 8/9/21

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 8/9/21 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.

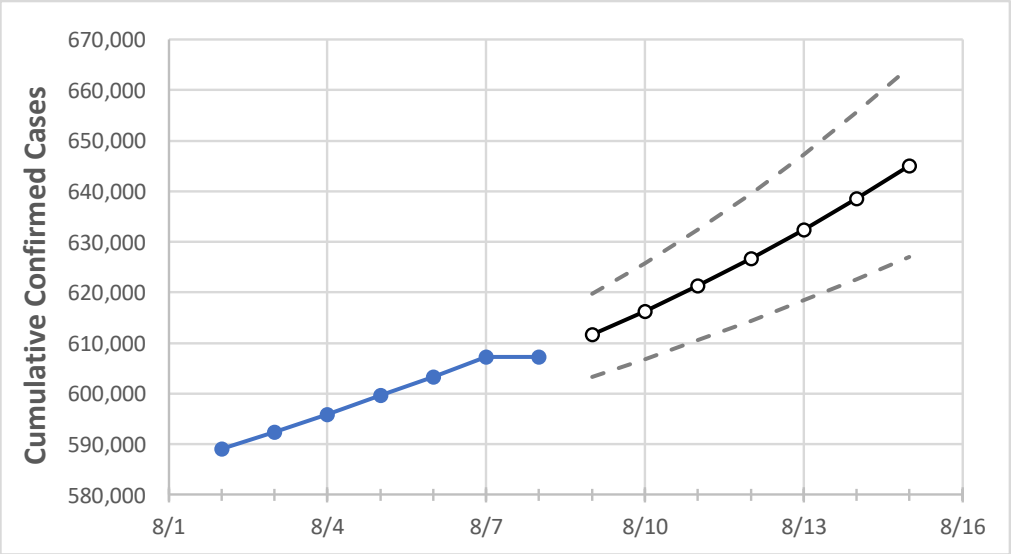
IEM's Modeling Lead

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Alabama	599,633	603,318	607,209	607,209	611,616	616,324	621,384	626,771	632,457	638,559	644,980

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Jefferson	87,039	87,414	87,843	87,843	88,389	88,973	89,607	90,277	90,989	91,748	92,556
Lee	17,504	17,584	17,682	17,682	17,795	17,915	18,043	18,184	18,333	18,492	18,667
Madison	38,134	38,232	38,351	38,351	38,526	38,716	38,913	39,123	39,345	39,576	39,826
Marshall	13,333	13,417	13,491	13,491	13,578	13,669	13,764	13,867	13,984	14,105	14,241
Mobile	50,991	51,837	52,660	52,660	53,476	54,338	55,258	56,216	57,236	58,339	59,484
Montgomery	26,557	26,654	26,769	26,769	26,883	27,007	27,137	27,271	27,419	27,576	27,748
Shelby	27,810	27,961	28,122	28,122	28,307	28,505	28,717	28,940	29,178	29,433	29,704
Tuscaloosa	27,540	27,630	27,714	27,714	27,825	27,945	28,077	28,218	28,368	28,528	28,699

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:		
	8/5	8/6	8/7	8/8	8/10	8/12	8/14
Jefferson	87,039	87,414	87,843	87,843	88,973 (17,795) [4,271] {2,135}	90,277 (18,055) [4,333] {2,167}	91,748 (18,350) [4,404] {2,202}
Lee	17,504	17,584	17,682	17,682	17,915 (3,583) [860] {430}	18,184 (3,637) [873] {436}	18,492 (3,698) [888] {444}
Madison	38,134	38,232	38,351	38,351	38,716 (7,743) [1,858] {929}	39,123 (7,825) [1,878] {939}	39,576 (7,915) [1,900] {950}
Marshall	13,333	13,417	13,491	13,491	13,669 (2,734) [656] {328}	13,867 (2,773) [666] {333}	14,105 (2,821) [677] {339}
Mobile	50,991	51,837	52,660	52,660	54,338 (10,868) [2,608] {1,304}	56,216 (11,243) [2,698] {1,349}	58,339 (11,668) [2,800] {1,400}
Montgomery	26,557	26,654	26,769	26,769	27,007 (5,401) [1,296] {648}	27,271 (5,454) [1,309] {655}	27,576 (5,515) [1,324] {662}
Shelby	27,810	27,961	28,122	28,122	28,505 (5,701) [1,368] {684}	28,940 (5,788) [1,389] {695}	29,433 (5,887) [1,413] {706}
Tuscaloosa	27,540	27,630	27,714	27,714	27,945 (5,589) [1,341] {671}	28,218 (5,644) [1,354] {677}	28,528 (5,706) [1,369] {685}

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.