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

Date: 6/25/21

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 6/25/21 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.

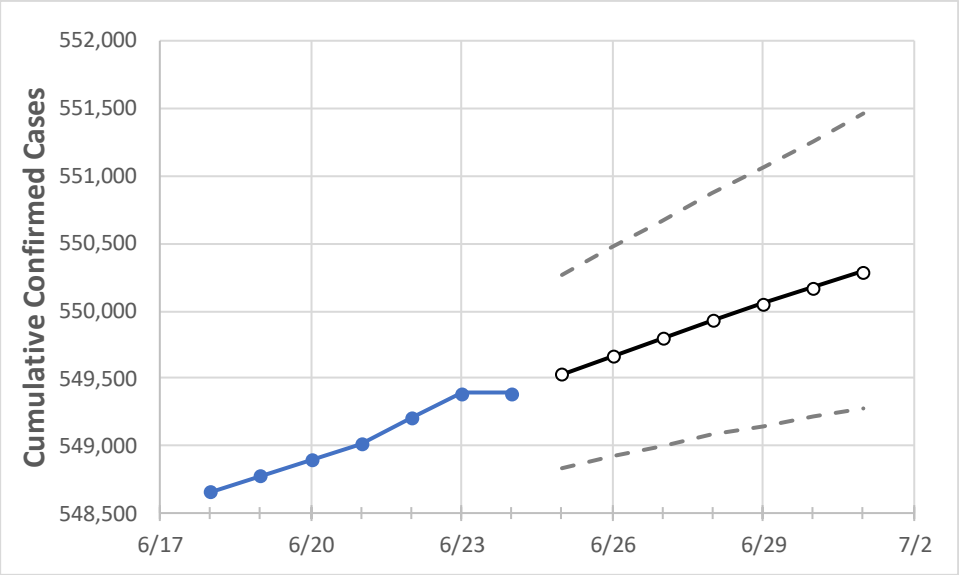
IEM's Modeling Lead

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:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Alabama	549,013	549,204	549,394	549,394	549,533	549,668	549,801	549,933	550,055	550,175	550,290

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:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Jefferson	81,046	81,066	81,085	81,085	81,105	81,125	81,144	81,162	81,181	81,199	81,217
Lee	16,287	16,294	16,301	16,301	16,306	16,310	16,315	16,320	16,324	16,329	16,333
Madison	35,718	35,726	35,733	35,733	35,742	35,751	35,760	35,768	35,777	35,786	35,794
Marshall	12,454	12,460	12,465	12,465	12,467	12,468	12,470	12,471	12,473	12,474	12,476
Mobile	42,145	42,163	42,180	42,180	42,199	42,217	42,235	42,253	42,270	42,288	42,305
Montgomery	25,089	25,096	25,103	25,103	25,105	25,107	25,109	25,110	25,112	25,113	25,114
Shelby	25,626	25,632	25,638	25,638	25,643	25,649	25,654	25,659	25,664	25,668	25,673
Tuscaloosa	26,179	26,183	26,186	26,186	26,190	26,194	26,198	26,202	26,206	26,210	26,214

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:		
	6/21	6/22	6/23	6/24	6/26	6/28	6/30
Jefferson	81,046	81,066	81,085	81,085	81,125 (16,225) [3,894] {1,947}	81,162 (16,232) [3,896] {1,948}	81,199 (16,240) [3,898] {1,949}
Lee	16,287	16,294	16,301	16,301	16,310 (3,262) [783] {391}	16,320 (3,264) [783] {392}	16,329 (3,266) [784] {392}
Madison	35,718	35,726	35,733	35,733	35,751 (7,150) [1,716] {858}	35,768 (7,154) [1,717] {858}	35,786 (7,157) [1,718] {859}
Marshall	12,454	12,460	12,465	12,465	12,468 (2,494) [598] {299}	12,471 (2,494) [599] {299}	12,474 (2,495) [599] {299}
Mobile	42,145	42,163	42,180	42,180	42,217 (8,443) [2,026] {1,013}	42,253 (8,451) [2,028] {1,014}	42,288 (8,458) [2,030] {1,015}
Montgomery	25,089	25,096	25,103	25,103	25,107 (5,021) [1,205] {603}	25,110 (5,022) [1,205] {603}	25,113 (5,023) [1,205] {603}
Shelby	25,626	25,632	25,638	25,638	25,649 (5,130) [1,231] {616}	25,659 (5,132) [1,232] {616}	25,668 (5,134) [1,232] {616}
Tuscaloosa	26,179	26,183	26,186	26,186	26,194 (5,239) [1,257] {629}	26,202 (5,240) [1,258] {629}	26,210 (5,242) [1,258] {629}

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.