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

Date: 7/19/21

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 7/19/21 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.

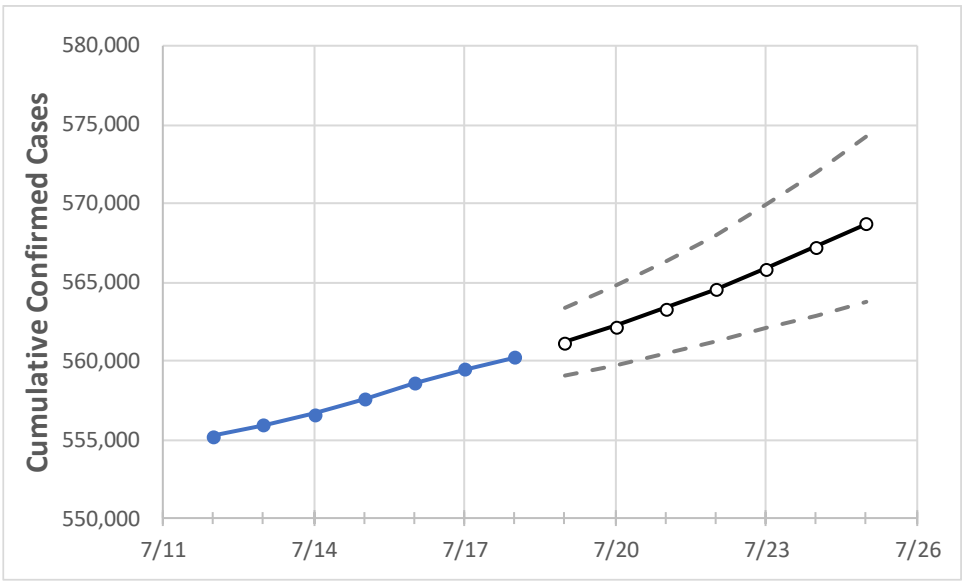
IEM's Modeling Lead

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:						
	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25
Alabama	557,578	558,577	559,478	560,202	561,166	562,212	563,327	564,538	565,842	567,239	568,729

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:						
	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25
Jefferson	81,957	82,048	82,150	82,231	82,327	82,429	82,537	82,652	82,778	82,912	83,054
Lee	16,513	16,541	16,561	16,574	16,595	16,616	16,639	16,664	16,690	16,716	16,746
Madison	36,171	36,217	36,265	36,309	36,358	36,411	36,467	36,528	36,594	36,663	36,738
Marshall	12,609	12,630	12,639	12,655	12,671	12,688	12,706	12,726	12,748	12,771	12,794
Mobile	43,476	43,645	43,793	43,941	44,111	44,297	44,494	44,706	44,938	45,194	45,472
Montgomery	25,364	25,402	25,431	25,453	25,489	25,530	25,574	25,622	25,675	25,733	25,797
Shelby	26,060	26,122	26,159	26,194	26,240	26,288	26,340	26,395	26,454	26,518	26,585
Tuscaloosa	26,389	26,403	26,419	26,433	26,448	26,464	26,481	26,498	26,516	26,534	26,553

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:		
	7/15	7/16	7/17	7/18	7/20	7/22	7/24
Jefferson	81,957	82,048	82,150	82,231	82,429 (16,486) [3,957] {1,978}	82,652 (16,530) [3,967] {1,984}	82,912 (16,582) [3,980] {1,990}
Lee	16,513	16,541	16,561	16,574	16,616 (3,323) [798] {399}	16,664 (3,333) [800] {400}	16,716 (3,343) [802] {401}
Madison	36,171	36,217	36,265	36,309	36,411 (7,282) [1,748] {874}	36,528 (7,306) [1,753] {877}	36,663 (7,333) [1,760] {880}
Marshall	12,609	12,630	12,639	12,655	12,688 (2,538) [609] {305}	12,726 (2,545) [611] {305}	12,771 (2,554) [613] {306}
Mobile	43,476	43,645	43,793	43,941	44,297 (8,859) [2,126] {1,063}	44,706 (8,941) [2,146] {1,073}	45,194 (9,039) [2,169] {1,085}
Montgomery	25,364	25,402	25,431	25,453	25,530 (5,106) [1,225] {613}	25,622 (5,124) [1,230] {615}	25,733 (5,147) [1,235] {618}
Shelby	26,060	26,122	26,159	26,194	26,288 (5,258) [1,262] {631}	26,395 (5,279) [1,267] {633}	26,518 (5,304) [1,273] {636}
Tuscaloosa	26,389	26,403	26,419	26,433	26,464 (5,293) [1,270] {635}	26,498 (5,300) [1,272] {636}	26,534 (5,307) [1,274] {637}

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.