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

Date: 3/1/21

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 3/1/21 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.

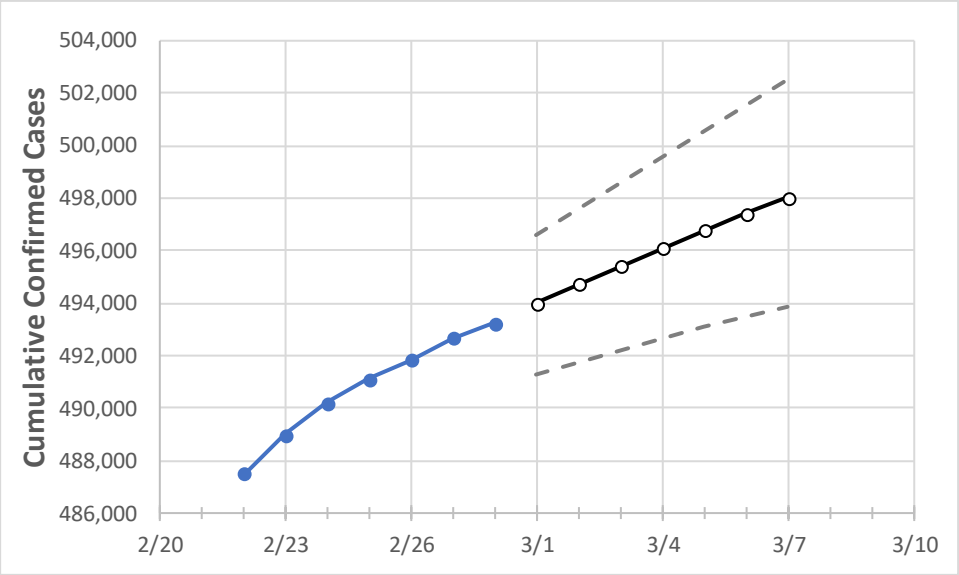
IEM's Modeling Lead

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:						
	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7
Alabama	491,110	491,849	492,683	493,252	493,998	494,711	495,408	496,092	496,759	497,415	498,034

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:						
	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7
Jefferson	70,629	70,764	70,906	70,986	71,075	71,161	71,248	71,330	71,412	71,490	71,570
Lee	14,900	14,926	14,950	14,961	14,978	14,995	15,011	15,026	15,041	15,055	15,069
Madison	32,255	32,307	32,355	32,405	32,445	32,486	32,523	32,560	32,595	32,626	32,656
Marshall	11,226	11,243	11,250	11,261	11,270	11,280	11,289	11,298	11,306	11,315	11,323
Mobile	35,894	35,937	36,044	36,108	36,192	36,275	36,358	36,441	36,525	36,607	36,687
Montgomery	22,462	22,502	22,536	22,565	22,597	22,628	22,658	22,685	22,711	22,737	22,762
Shelby	21,820	21,848	21,892	21,929	21,967	22,004	22,040	22,074	22,108	22,141	22,173
Tuscaloosa	23,996	24,024	24,093	24,110	24,147	24,187	24,224	24,262	24,297	24,332	24,366

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:		
	2/25	2/26	2/27	2/28	3/2	3/4	3/6
Jefferson	70,629	70,764	70,906	70,986	71,161 (14,232) [3,416] {1,708}	71,330 (14,266) [3,424] {1,712}	71,490 (14,298) [3,432] {1,716}
Lee	14,900	14,926	14,950	14,961	14,995 (2,999) [720] {360}	15,026 (3,005) [721] {361}	15,055 (3,011) [723] {361}
Madison	32,255	32,307	32,355	32,405	32,486 (6,497) [1,559] {780}	32,560 (6,512) [1,563] {781}	32,626 (6,525) [1,566] {783}
Marshall	11,226	11,243	11,250	11,261	11,280 (2,256) [541] {271}	11,298 (2,260) [542] {271}	11,315 (2,263) [543] {272}
Mobile	35,894	35,937	36,044	36,108	36,275 (7,255) [1,741] {871}	36,441 (7,288) [1,749] {875}	36,607 (7,321) [1,757] {879}
Montgomery	22,462	22,502	22,536	22,565	22,628 (4,526) [1,086] {543}	22,685 (4,537) [1,089] {544}	22,737 (4,547) [1,091] {546}
Shelby	21,820	21,848	21,892	21,929	22,004 (4,401) [1,056] {528}	22,074 (4,415) [1,060] {530}	22,141 (4,428) [1,063] {531}
Tuscaloosa	23,996	24,024	24,093	24,110	24,187 (4,837) [1,161] {580}	24,262 (4,852) [1,165] {582}	24,332 (4,866) [1,168] {584}

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.