IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/29/22

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 3/29/22 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
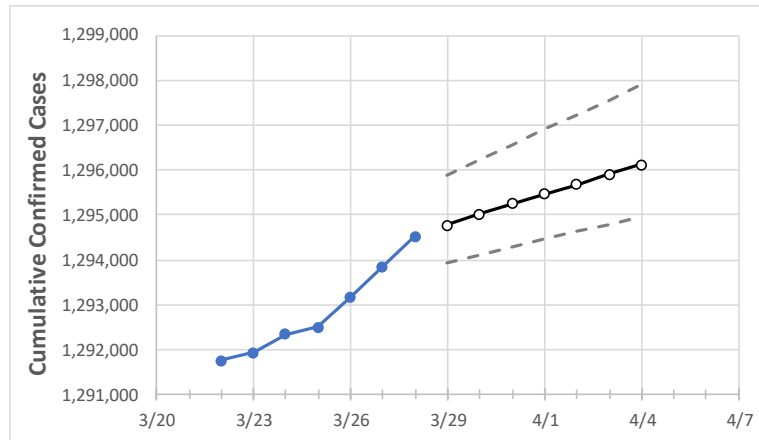
	Actual Confirmed Cases On:				Projected Cases For:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Alabama	1,292,508	1,293,183	1,293,857	1,294,532	1,294,785	1,295,020	1,295,253	1,295,466	1,295,690	1,295,913	1,296,127

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Jefferson	184,302	184,315	184,327	184,340	184,364	184,388	184,412	184,432	184,452	184,476	184,492
Lee	37,611	37,613	37,616	37,618	37,620	37,623	37,625	37,627	37,629	37,631	37,633
Madison	88,960	88,969	88,979	88,988	88,998	89,008	89,017	89,026	89,035	89,043	89,051
Marshall	27,324	27,326	27,327	27,328	27,333	27,337	27,340	27,344	27,348	27,351	27,355
Mobile	113,046	113,054	113,062	113,070	113,076	113,082	113,088	113,092	113,098	113,103	113,107
Montgomery	54,653	54,657	54,660	54,664	54,670	54,675	54,680	54,685	54,690	54,695	54,699
Shelby	60,410	60,426	60,442	60,458	60,477	60,493	60,513	60,526	60,542	60,560	60,572
Tuscaloosa	55,736	55,738	55,739	55,741	55,756	55,767	55,779	55,792	55,802	55,812	55,823

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:		
	3/25	3/26	3/27	3/28	3/30	4/1	4/3
Jefferson	184,302	184,315	184,327	184,340	184,388 (36,878) [8,851] {4,425}	184,432 (36,886) [8,853] {4,426}	184,476 (36,895) [8,855] {4,427}
Lee	37,611	37,613	37,616	37,618	37,623 (7,525) [1,806] {903}	37,627 (7,525) [1,806] {903}	37,631 (7,526) [1,806] {903}
Madison	88,960	88,969	88,979	88,988	89,008 (17,802) [4,272] {2,136}	89,026 (17,805) [4,273] {2,137}	89,043 (17,809) [4,274] {2,137}
Marshall	27,324	27,326	27,327	27,328	27,337 (5,467) [1,312] {656}	27,344 (5,469) [1,313] {656}	27,351 (5,470) [1,313] {656}
Mobile	113,046	113,054	113,062	113,070	113,082 (22,616) [5,428] {2,714}	113,092 (22,618) [5,428] {2,714}	113,103 (22,621) [5,429] {2,714}
Montgomery	54,653	54,657	54,660	54,664	54,675 (10,935) [2,624] {1,312}	54,685 (10,937) [2,625] {1,312}	54,695 (10,939) [2,625] {1,313}
Shelby	60,410	60,426	60,442	60,458	60,493 (12,099) [2,904] {1,452}	60,526 (12,105) [2,905] {1,453}	60,560 (12,112) [2,907] {1,453}
Tuscaloosa	55,736	55,738	55,739	55,741	55,767 (11,153) [2,677] {1,338}	55,792 (11,158) [2,678] {1,339}	55,812 (11,162) [2,679] {1,339}

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.