IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/23/22

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 2/23/22 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
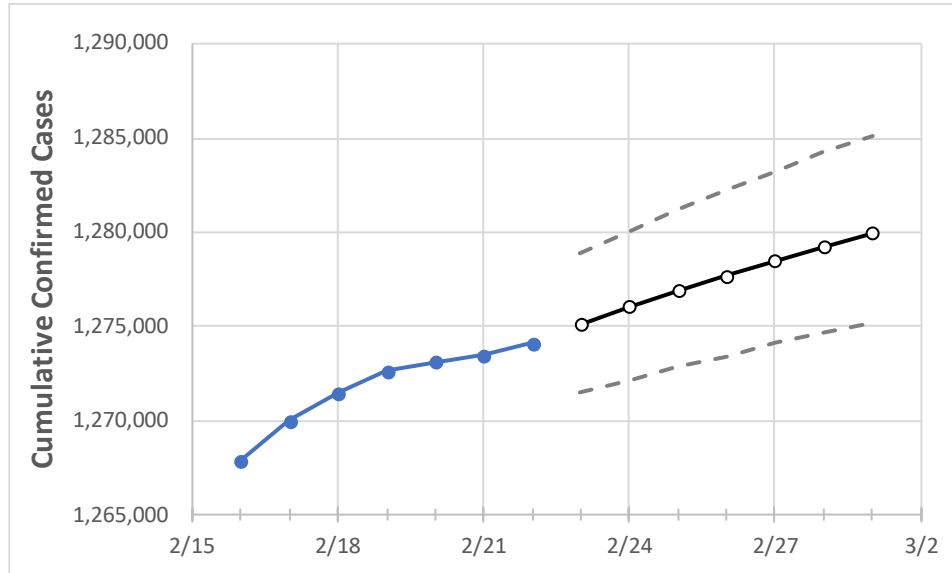
	Actual Confirmed Cases On:				Projected Cases For:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Alabama	1,272,608	1,273,092	1,273,484	1,274,123	1,275,120	1,276,056	1,276,928	1,277,716	1,278,512	1,279,223	1,279,959

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:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Jefferson	181,259	181,313	181,366	181,455	181,557	181,652	181,734	181,814	181,893	181,967	182,032
Lee	37,434	37,444	37,447	37,454	37,475	37,495	37,512	37,532	37,551	37,568	37,582
Madison	87,550	87,604	87,650	87,672	87,758	87,846	87,924	87,996	88,064	88,137	88,196
Marshall	27,029	27,039	27,047	27,053	27,067	27,078	27,089	27,100	27,110	27,120	27,127
Mobile	111,295	111,327	111,383	111,461	111,532	111,598	111,660	111,721	111,775	111,830	111,882
Montgomery	54,123	54,137	54,150	54,204	54,235	54,262	54,289	54,313	54,337	54,360	54,380
Shelby	58,489	58,509	58,531	58,556	58,593	58,627	58,661	58,692	58,724	58,749	58,774
Tuscaloosa	54,129	54,143	54,149	54,165	54,239	54,305	54,369	54,432	54,496	54,546	54,611

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:		
	2/19	2/20	2/21	2/22	2/24	2/26	2/28
Jefferson	181,259	181,313	181,366	181,455	181,652 (36,330) [8,719] {4,360}	181,814 (36,363) [8,727] {4,364}	181,967 (36,393) [8,734] {4,367}
Lee	37,434	37,444	37,447	37,454	37,495 (7,499) [1,800] {900}	37,532 (7,506) [1,802] {901}	37,568 (7,514) [1,803] {902}
Madison	87,550	87,604	87,650	87,672	87,846 (17,569) [4,217] {2,108}	87,996 (17,599) [4,224] {2,112}	88,137 (17,627) [4,231] {2,115}
Marshall	27,029	27,039	27,047	27,053	27,078 (5,416) [1,300] {650}	27,100 (5,420) [1,301] {650}	27,120 (5,424) [1,302] {651}
Mobile	111,295	111,327	111,383	111,461	111,598 (22,320) [5,357] {2,678}	111,721 (22,344) [5,363] {2,681}	111,830 (22,366) [5,368] {2,684}
Montgomery	54,123	54,137	54,150	54,204	54,262 (10,852) [2,605] {1,302}	54,313 (10,863) [2,607] {1,304}	54,360 (10,872) [2,609] {1,305}
Shelby	58,489	58,509	58,531	58,556	58,627 (11,725) [2,814] {1,407}	58,692 (11,738) [2,817] {1,409}	58,749 (11,750) [2,820] {1,410}
Tuscaloosa	54,129	54,143	54,149	54,165	54,305 (10,861) [2,607] {1,303}	54,432 (10,886) [2,613] {1,306}	54,546 (10,909) [2,618] {1,309}

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.