IEM's AI Modeling: Short-term COVID-19 Projections
Date: 11/5/21

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 11/5/21 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
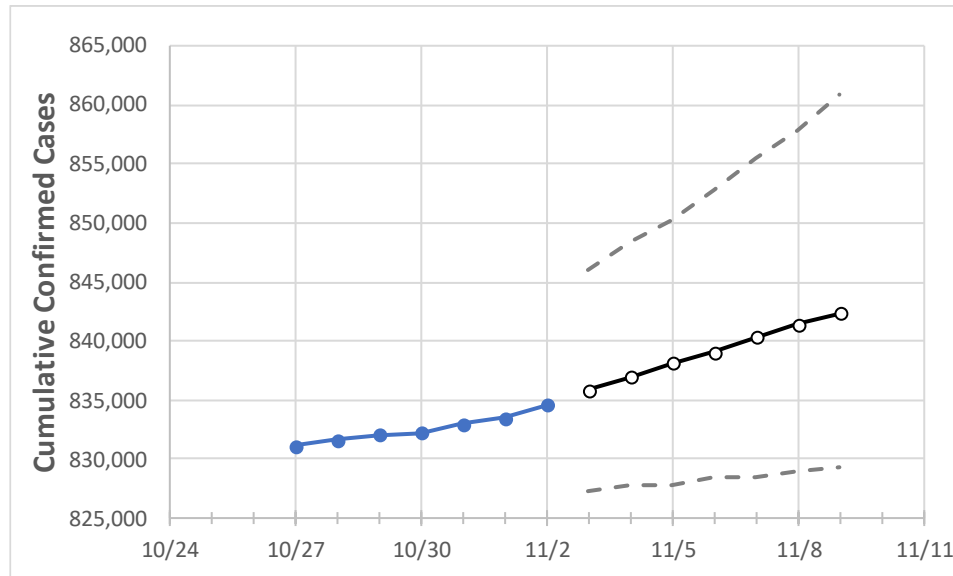
	Actual Confirmed Cases On:				Projected Cases For:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Alabama	832,264	833,009	833,493	834,582	835,847	836,963	838,097	839,105	840,320	841,463	842,378

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:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Jefferson	115,628	115,638	115,645	115,643	115,735	115,802	115,873	115,944	116,028	116,108	116,177
Lee	25,284	25,308	25,314	25,320	25,344	25,372	25,395	25,409	25,437	25,466	25,486
Madison	52,833	52,800	52,817	52,915	52,975	53,045	53,108	53,170	53,242	53,310	53,369
Marshall	18,598	18,610	18,618	18,633	18,655	18,674	18,696	18,718	18,741	18,761	18,782
Mobile	73,006	73,235	73,246	73,467	73,547	73,638	73,724	73,812	73,908	73,999	74,104
Montgomery	34,281	34,291	34,290	34,289	34,308	34,327	34,345	34,361	34,380	34,399	34,416
Shelby	37,905	37,914	37,929	37,956	37,981	38,005	38,027	38,053	38,076	38,100	38,124
Tuscaloosa	35,337	35,362	35,420	35,452	35,483	35,514	35,544	35,575	35,606	35,639	35,670

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:		
	10/30	10/31	11/1	11/2	11/4	11/6	11/8
Jefferson	115,628	115,638	115,645	115,643	115,802 (23,160) [5,558] {2,779}	115,944 (23,189) [5,565] {2,783}	116,108 (23,222) [5,573] {2,787}
Lee	25,284	25,308	25,314	25,320	25,372 (5,074) [1,218] {609}	25,409 (5,082) [1,220] {610}	25,466 (5,093) [1,222] {611}
Madison	52,833	52,800	52,817	52,915	53,045 (10,609) [2,546] {1,273}	53,170 (10,634) [2,552] {1,276}	53,310 (10,662) [2,559] {1,279}
Marshall	18,598	18,610	18,618	18,633	18,674 (3,735) [896] {448}	18,718 (3,744) [898] {449}	18,761 (3,752) [901] {450}
Mobile	73,006	73,235	73,246	73,467	73,638 (14,728) [3,535] {1,767}	73,812 (14,762) [3,543] {1,771}	73,999 (14,800) [3,552] {1,776}
Montgomery	34,281	34,291	34,290	34,289	34,327 (6,865) [1,648] {824}	34,361 (6,872) [1,649] {825}	34,399 (6,880) [1,651] {826}
Shelby	37,905	37,914	37,929	37,956	38,005 (7,601) [1,824] {912}	38,053 (7,611) [1,827] {913}	38,100 (7,620) [1,829] {914}
Tuscaloosa	35,337	35,362	35,420	35,452	35,514 (7,103) [1,705] {852}	35,575 (7,115) [1,708] {854}	35,639 (7,128) [1,711] {855}

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.