IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/20/21

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 <u>not</u> 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 10/20/21 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
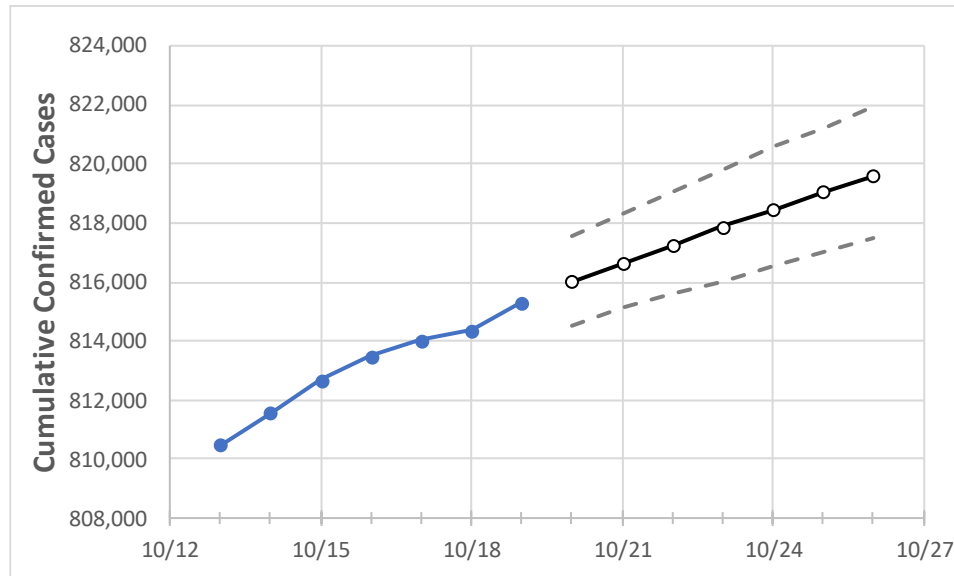
	Actual Confirmed Cases On:				Projected Cases For:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Alabama	813,481	814,025	814,363	815,324	816,012	816,641	817,252	817,893	818,470	819,052	819,597

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:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Jefferson	113,997	114,056	114,113	114,391	114,463	114,522	114,588	114,642	114,698	114,756	114,816
Lee	23,142	23,149	23,158	23,168	23,181	23,193	23,205	23,216	23,226	23,238	23,248
Madison	51,970	52,017	52,048	52,078	52,123	52,168	52,208	52,251	52,289	52,328	52,365
Marshall	18,245	18,254	18,258	18,265	18,273	18,280	18,287	18,294	18,301	18,307	18,313
Mobile	72,227	72,269	72,294	72,337	72,385	72,431	72,476	72,523	72,566	72,609	72,650
Montgomery	33,953	33,971	33,996	34,013	34,034	34,057	34,076	34,096	34,116	34,135	34,154
Shelby	37,279	37,304	37,315	37,458	37,490	37,519	37,547	37,576	37,601	37,634	37,657
Tuscaloosa	34,934	34,966	34,973	34,997	35,022	35,047	35,072	35,095	35,117	35,140	35,161

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:		
	10/16	10/17	10/18	10/19	10/21	10/23	10/25
Jefferson	113,997	114,056	114,113	114,391	114,522 (22,904) [5,497] {2,749}	114,642 (22,928) [5,503] {2,751}	114,756 (22,951) [5,508] {2,754}
Lee	23,142	23,149	23,158	23,168	23,193 (4,639) [1,113] {557}	23,216 (4,643) [1,114] {557}	23,238 (4,648) [1,115] {558}
Madison	51,970	52,017	52,048	52,078	52,168 (10,434) [2,504] {1,252}	52,251 (10,450) [2,508] {1,254}	52,328 (10,466) [2,512] {1,256}
Marshall	18,245	18,254	18,258	18,265	18,280 (3,656) [877] {439}	18,294 (3,659) [878] {439}	18,307 (3,661) [879] {439}
Mobile	72,227	72,269	72,294	72,337	72,431 (14,486) [3,477] {1,738}	72,523 (14,505) [3,481] {1,741}	72,609 (14,522) [3,485] {1,743}
Montgomery	33,953	33,971	33,996	34,013	34,057 (6,811) [1,635] {817}	34,096 (6,819) [1,637] {818}	34,135 (6,827) [1,638] {819}
Shelby	37,279	37,304	37,315	37,458	37,519 (7,504) [1,801] {900}	37,576 (7,515) [1,804] {902}	37,634 (7,527) [1,806] {903}
Tuscaloosa	34,934	34,966	34,973	34,997	35,047 (7,009) [1,682] {841}	35,095 (7,019) [1,685] {842}	35,140 (7,028) [1,687] {843}

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.