IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/25/21

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 10/25/21 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
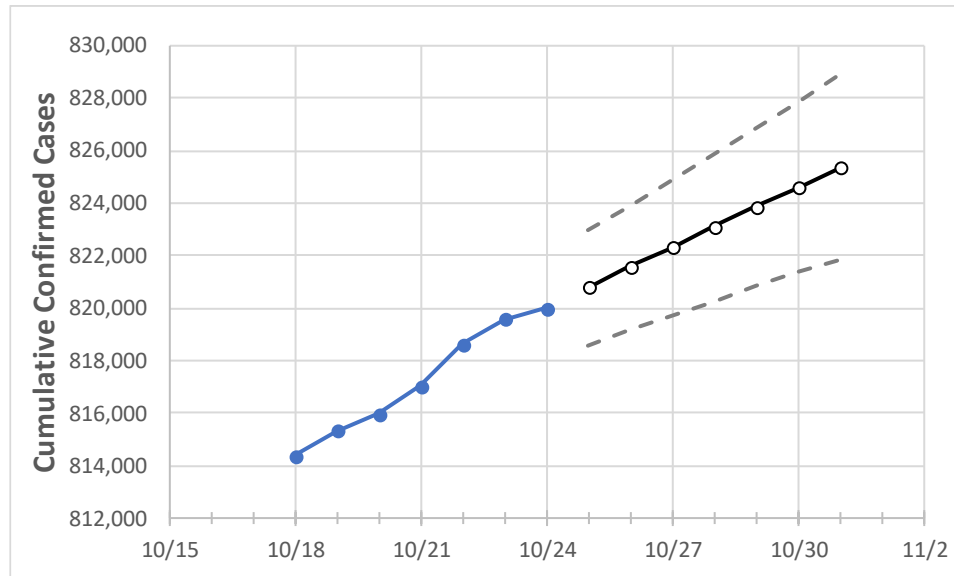
	Actual Confirmed Cases On:				Projected Cases For:						
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31
Alabama	817,054	818,652	819,597	820,011	820,782	821,594	822,315	823,099	823,859	824,610	825,347

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:						
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31
Jefferson	114,550	114,709	114,790	114,836	114,918	114,995	115,069	115,148	115,220	115,298	115,374
Lee	23,195	23,519	23,526	23,536	23,588	23,642	23,705	23,760	23,828	23,894	23,963
Madison	52,172	52,231	52,306	52,337	52,386	52,431	52,473	52,518	52,560	52,605	52,644
Marshall	18,317	18,338	18,361	18,372	18,385	18,396	18,407	18,418	18,429	18,441	18,451
Mobile	72,460	72,497	72,579	72,609	72,663	72,715	72,771	72,825	72,876	72,931	72,979
Montgomery	34,067	34,092	34,106	34,116	34,138	34,160	34,182	34,203	34,225	34,245	34,265
Shelby	37,533	37,575	37,597	37,622	37,661	37,700	37,730	37,769	37,806	37,842	37,879
Tuscaloosa	35,044	35,073	35,101	35,117	35,141	35,165	35,187	35,210	35,232	35,255	35,274

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: | | |
	10/21	10/22	10/23	10/24	10/26	10/28	10/30
Jefferson	114,550	114,709	114,790	114,836	114,995 (22,999) [5,520] {2,760}	115,148 (23,030) [5,527] {2,764}	115,298 (23,060) [5,534] {2,767}
Lee	23,195	23,519	23,526	23,536	23,642 (4,728) [1,135] {567}	23,760 (4,752) [1,140] {570}	23,894 (4,779) [1,147] {573}
Madison	52,172	52,231	52,306	52,337	52,431 (10,486) [2,517] {1,258}	52,518 (10,504) [2,521] {1,260}	52,605 (10,521) [2,525] {1,263}
Marshall	18,317	18,338	18,361	18,372	18,396 (3,679) [883] {441}	18,418 (3,684) [884] {442}	18,441 (3,688) [885] {443}
Mobile	72,460	72,497	72,579	72,609	72,715 (14,543) [3,490] {1,745}	72,825 (14,565) [3,496] {1,748}	72,931 (14,586) [3,501] {1,750}
Montgomery	34,067	34,092	34,106	34,116	34,160 (6,832) [1,640] {820}	34,203 (6,841) [1,642] {821}	34,245 (6,849) [1,644] {822}
Shelby	37,533	37,575	37,597	37,622	37,700 (7,540) [1,810] {905}	37,769 (7,554) [1,813] {906}	37,842 (7,568) [1,816] {908}
Tuscaloosa	35,044	35,073	35,101	35,117	35,165 (7,033) [1,688] {844}	35,210 (7,042) [1,690] {845}	35,255 (7,051) [1,692] {846}

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.