IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/22/21

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 9/22/21 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
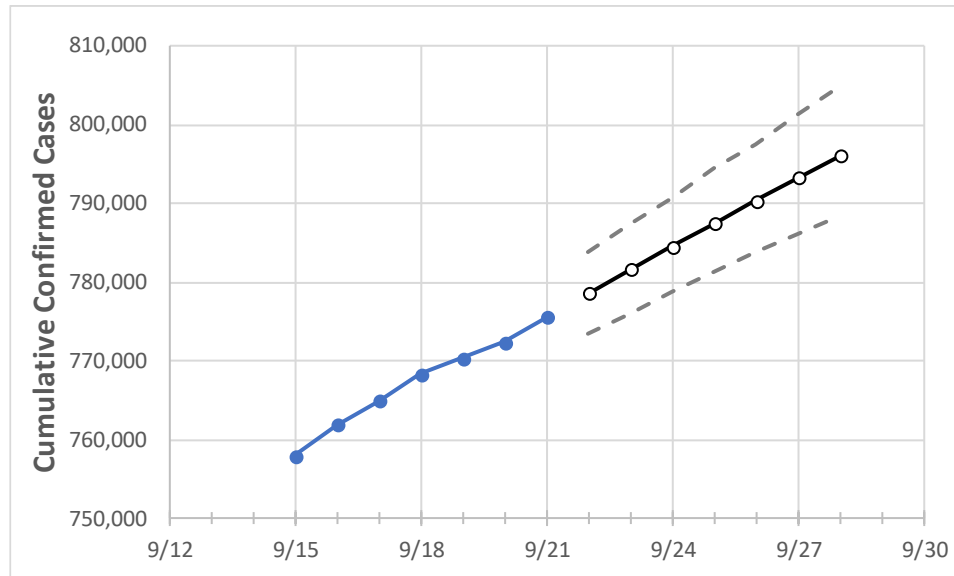
	Actual Confirmed Cases On:				Projected Cases For:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Alabama	768,301	770,391	772,311	775,531	778,592	781,565	784,493	787,452	790,338	793,303	796,080

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:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Jefferson	109,348	109,572	109,837	110,107	110,401	110,696	110,983	111,259	111,532	111,802	112,065
Lee	21,908	21,977	22,054	22,147	22,237	22,329	22,420	22,515	22,602	22,694	22,788
Madison	48,418	48,595	48,752	48,949	49,162	49,368	49,575	49,783	49,988	50,198	50,399
Marshall	17,272	17,302	17,349	17,414	17,483	17,554	17,623	17,685	17,757	17,827	17,887
Mobile	69,989	70,081	70,135	70,288	70,588	70,829	71,105	71,354	71,601	71,864	72,074
Montgomery	32,582	32,650	32,702	32,812	32,902	32,989	33,078	33,162	33,247	33,329	33,409
Shelby	35,193	35,304	35,392	35,560	35,691	35,822	35,948	36,076	36,201	36,324	36,450
Tuscaloosa	33,029	33,128	33,187	33,308	33,451	33,592	33,732	33,870	34,007	34,151	34,288

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: | | |
	9/18	9/19	9/20	9/21	9/23	9/25	9/27
Jefferson	109,348	109,572	109,837	110,107	110,696 (22,139) [5,313] {2,657}	111,259 (22,252) [5,340] {2,670}	111,802 (22,360) [5,366] {2,683}
Lee	21,908	21,977	22,054	22,147	22,329 (4,466) [1,072] {536}	22,515 (4,503) [1,081] {540}	22,694 (4,539) [1,089] {545}
Madison	48,418	48,595	48,752	48,949	49,368 (9,874) [2,370] {1,185}	49,783 (9,957) [2,390] {1,195}	50,198 (10,040) [2,410] {1,205}
Marshall	17,272	17,302	17,349	17,414	17,554 (3,511) [843] {421}	17,685 (3,537) [849] {424}	17,827 (3,565) [856] {428}
Mobile	69,989	70,081	70,135	70,288	70,829 (14,166) [3,400] {1,700}	71,354 (14,271) [3,425] {1,712}	71,864 (14,373) [3,449] {1,725}
Montgomery	32,582	32,650	32,702	32,812	32,989 (6,598) [1,583] {792}	33,162 (6,632) [1,592] {796}	33,329 (6,666) [1,600] {800}
Shelby	35,193	35,304	35,392	35,560	35,822 (7,164) [1,719] {860}	36,076 (7,215) [1,732] {866}	36,324 (7,265) [1,744] {872}
Tuscaloosa	33,029	33,128	33,187	33,308	33,592 (6,718) [1,612] {806}	33,870 (6,774) [1,626] {813}	34,151 (6,830) [1,639] {820}

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.