IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/16/21

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 8/16/21 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
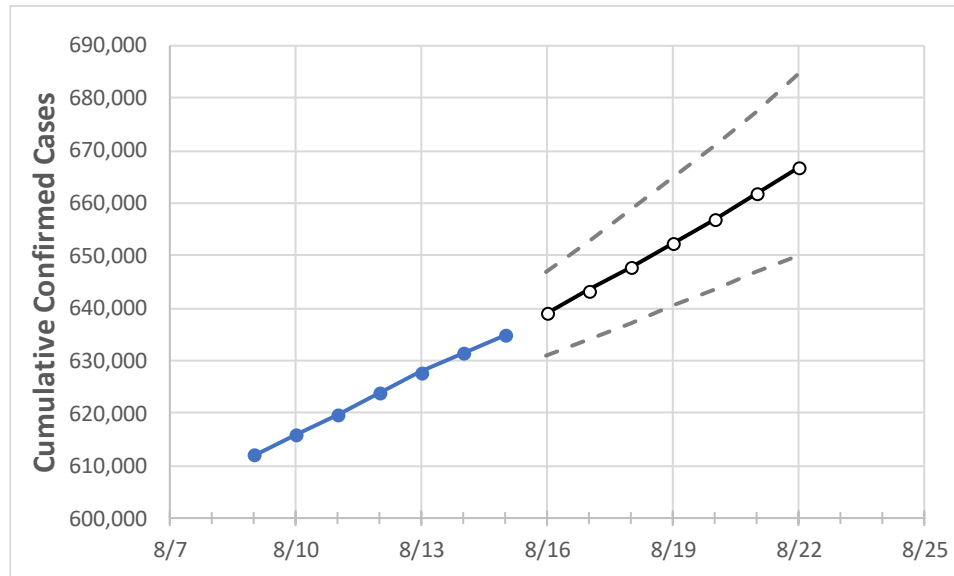
	Actual Confirmed Cases On:				Projected Cases For:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Alabama	623,919	627,905	631,401	634,897	639,048	643,332	647,709	652,255	656,907	661,800	666,711

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Jefferson	89,977	90,559	91,152	91,744	92,354	92,995	93,664	94,358	95,088	95,858	96,650
Lee	18,146	18,253	18,327	18,400	18,510	18,626	18,747	18,869	18,996	19,132	19,273
Madison	39,148	39,316	39,505	39,694	39,894	40,108	40,331	40,556	40,796	41,044	41,308
Marshall	13,859	13,937	13,987	14,036	14,121	14,212	14,308	14,404	14,503	14,607	14,717
Mobile	55,371	55,964	56,466	56,968	57,621	58,299	58,988	59,697	60,425	61,166	61,915
Montgomery	27,375	27,535	27,683	27,830	28,001	28,181	28,374	28,576	28,788	29,008	29,247
Shelby	28,764	28,898	29,091	29,284	29,462	29,645	29,835	30,030	30,233	30,443	30,660
Tuscaloosa	28,148	28,261	28,339	28,416	28,521	28,628	28,736	28,851	28,965	29,086	29,212

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:		
	8/12	8/13	8/14	8/15	8/17	8/19	8/21
Jefferson	89,977	90,559	91,152	91,744	92,995 (18,599) [4,464] {2,232}	94,358 (18,872) [4,529] {2,265}	95,858 (19,172) [4,601] {2,301}
Lee	18,146	18,253	18,327	18,400	18,626 (3,725) [894] {447}	18,869 (3,774) [906] {453}	19,132 (3,826) [918] {459}
Madison	39,148	39,316	39,505	39,694	40,108 (8,022) [1,925] {963}	40,556 (8,111) [1,947] {973}	41,044 (8,209) [1,970] {985}
Marshall	13,859	13,937	13,987	14,036	14,212 (2,842) [682] {341}	14,404 (2,881) [691] {346}	14,607 (2,921) [701] {351}
Mobile	55,371	55,964	56,466	56,968	58,299 (11,660) [2,798] {1,399}	59,697 (11,939) [2,865] {1,433}	61,166 (12,233) [2,936] {1,468}
Montgomery	27,375	27,535	27,683	27,830	28,181 (5,636) [1,353] {676}	28,576 (5,715) [1,372] {686}	29,008 (5,802) [1,392] {696}
Shelby	28,764	28,898	29,091	29,284	29,645 (5,929) [1,423] {711}	30,030 (6,006) [1,441] {721}	30,443 (6,089) [1,461] {731}
Tuscaloosa	28,148	28,261	28,339	28,416	28,628 (5,726) [1,374] {687}	28,851 (5,770) [1,385] {692}	29,086 (5,817) [1,396] {698}

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.