IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/1/21

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 6/1/21 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.

Mississippi State Projections
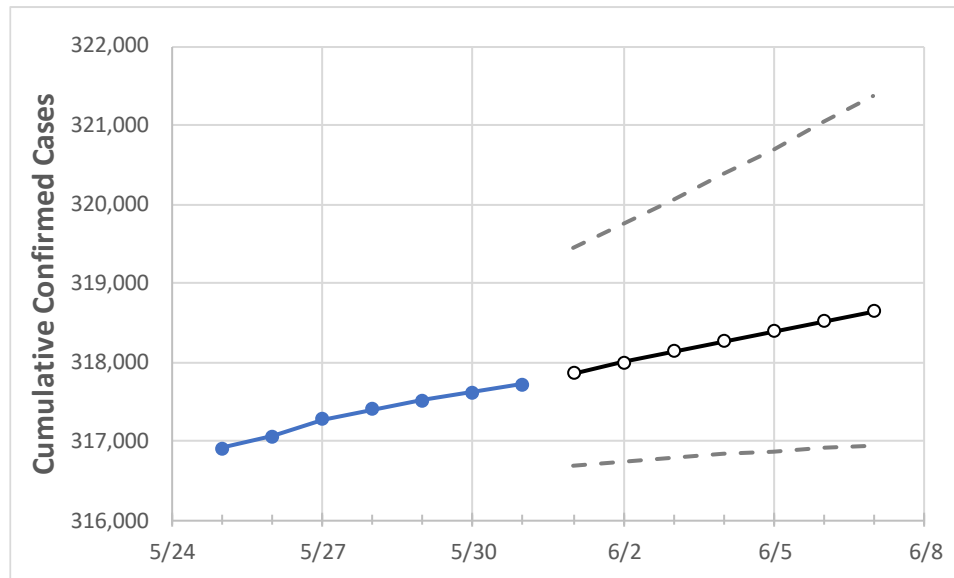
	Actual Confirmed Cases On:				Projected Cases For:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Mississippi	317,407	317,509	317,611	317,713	317,855	317,993	318,132	318,266	318,394	318,520	318,646

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.

Mississippi Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
DeSoto	22,098	22,108	22,119	22,129	22,143	22,158	22,171	22,184	22,198	22,210	22,223
Harrison	18,147	18,159	18,172	18,184	18,197	18,210	18,223	18,236	18,249	18,261	18,273
Hinds	20,479	20,488	20,496	20,505	20,512	20,520	20,527	20,534	20,542	20,549	20,556
Jackson	13,549	13,554	13,559	13,564	13,571	13,578	13,585	13,593	13,600	13,607	13,614
Lauderdale	7,226	7,229	7,232	7,235	7,237	7,240	7,242	7,244	7,246	7,248	7,250
Madison	10,184	10,185	10,185	10,186	10,189	10,192	10,195	10,197	10,200	10,202	10,204
Rankin	13,787	13,789	13,791	13,793	13,802	13,811	13,819	13,828	13,837	13,845	13,854

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.*

Mississippi Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	5/28	5/29	5/30	5/31	6/2	6/4	6/6
DeSoto	22,098	22,108	22,119	22,129	22,158 (4,432) [1,064] {532}	22,184 (4,437) [1,065] {532}	22,210 (4,442) [1,066] {533}
Harrison	18,147	18,159	18,172	18,184	18,210 (3,642) [874] {437}	18,236 (3,647) [875] {438}	18,261 (3,652) [877] {438}
Hinds	20,479	20,488	20,496	20,505	20,520 (4,104) [985] {492}	20,534 (4,107) [986] {493}	20,549 (4,110) [986] {493}
Jackson	13,549	13,554	13,559	13,564	13,578 (2,716) [652] {326}	13,593 (2,719) [652] {326}	13,607 (2,721) [653] {327}
Lauderdale	7,226	7,229	7,232	7,235	7,240 (1,448) [347] {174}	7,244 (1,449) [348] {174}	7,248 (1,450) [348] {174}
Madison	10,184	10,185	10,185	10,186	10,192 (2,038) [489] {245}	10,197 (2,039) [489] {245}	10,202 (2,040) [490] {245}
Rankin	13,787	13,789	13,791	13,793	13,811 (2,762) [663] {331}	13,828 (2,766) [664] {332}	13,845 (2,769) [665] {332}

For additional information from IEM, please contact Jon Mabry, Vice President of Disaster Recovery at 601-953-4562 or jon.mabry@iem.com or Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966.