IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/13/21

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 8/13/21 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
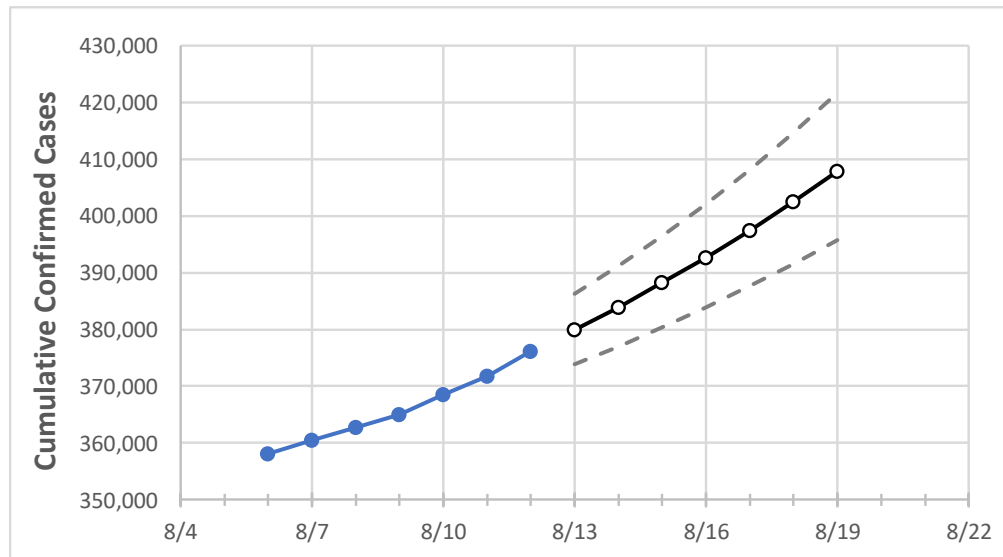
	Actual Confirmed Cases On:				Projected Cases For:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Mississippi	365,061	368,549	371,712	376,124	379,867	383,937	388,188	392,581	397,417	402,491	407,871

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
DeSoto	24,090	24,216	24,294	24,447	24,575	24,712	24,857	25,010	25,169	25,340	25,517
Harrison	22,765	23,161	23,382	23,811	24,200	24,616	25,062	25,541	26,048	26,588	27,164
Hinds	25,501	25,616	25,781	25,992	26,171	26,351	26,532	26,717	26,902	27,094	27,284
Jackson	16,819	17,086	17,294	17,579	17,854	18,140	18,448	18,772	19,115	19,481	19,870
Lauderdale	8,688	8,811	8,888	9,043	9,182	9,333	9,492	9,667	9,855	10,052	10,262
Madison	11,512	11,559	11,620	11,711	11,788	11,870	11,954	12,043	12,134	12,230	12,331
Rankin	16,447	16,575	16,676	16,834	16,970	17,109	17,254	17,404	17,557	17,718	17,882

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:		
	8/9	8/10	8/11	8/12	8/14	8/16	8/18
DeSoto	24,090	24,216	24,294	24,447	24,712 (4,942) [1,186] {593}	25,010 (5,002) [1,200] {600}	25,340 (5,068) [1,216] {608}
Harrison	22,765	23,161	23,382	23,811	24,616 (4,923) [1,182] {591}	25,541 (5,108) [1,226] {613}	26,588 (5,318) [1,276] {638}
Hinds	25,501	25,616	25,781	25,992	26,351 (5,270) [1,265] {632}	26,717 (5,343) [1,282] {641}	27,094 (5,419) [1,301] {650}
Jackson	16,819	17,086	17,294	17,579	18,140 (3,628) [871] {435}	18,772 (3,754) [901] {451}	19,481 (3,896) [935] {468}
Lauderdale	8,688	8,811	8,888	9,043	9,333 (1,867) [448] {224}	9,667 (1,933) [464] {232}	10,052 (2,010) [482] {241}
Madison	11,512	11,559	11,620	11,711	11,870 (2,374) [570] {285}	12,043 (2,409) [578] {289}	12,230 (2,446) [587] {294}
Rankin	16,447	16,575	16,676	16,834	17,109 (3,422) [821] {411}	17,404 (3,481) [835] {418}	17,718 (3,544) [850] {425}

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.