IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/12/21

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 7/12/21 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
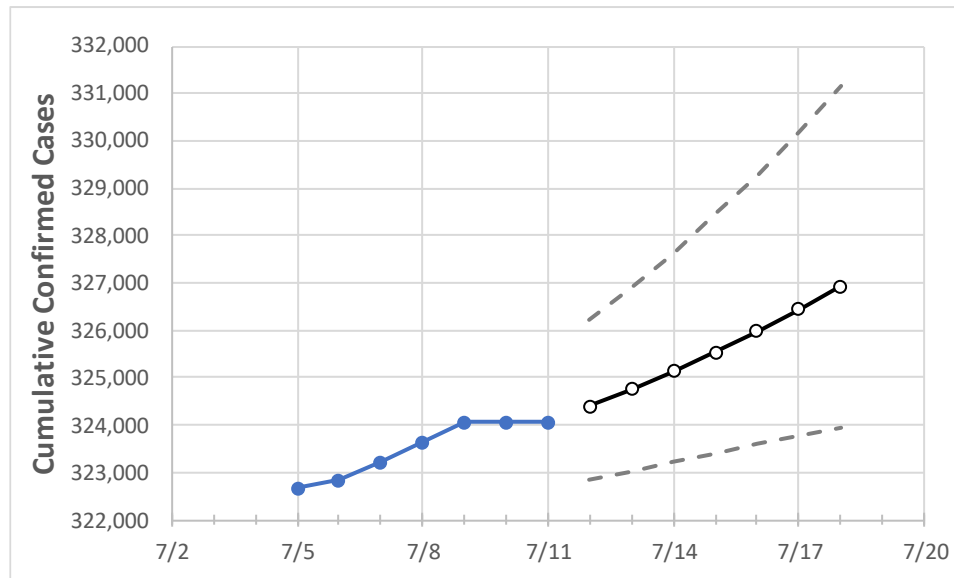
	Actual Confirmed Cases On:				Projected Cases For:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
Mississippi	323,641	324,057	324,057	324,057	324,400	324,760	325,146	325,538	325,976	326,437	326,920

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:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
DeSoto	22,474	22,509	22,509	22,509	22,527	22,546	22,565	22,586	22,609	22,631	22,654
Harrison	18,749	18,790	18,790	18,790	18,823	18,859	18,895	18,935	18,977	19,019	19,064
Hinds	21,273	21,363	21,363	21,363	21,424	21,494	21,566	21,643	21,728	21,819	21,915
Jackson	13,896	13,908	13,908	13,908	13,918	13,929	13,939	13,949	13,959	13,970	13,981
Lauderdale	7,286	7,286	7,286	7,286	7,288	7,291	7,294	7,297	7,300	7,304	7,308
Madison	10,382	10,391	10,391	10,391	10,401	10,412	10,423	10,434	10,446	10,457	10,470
Rankin	14,193	14,226	14,226	14,226	14,260	14,296	14,336	14,378	14,423	14,470	14,523

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:		
	7/8	7/9	7/10	7/11	7/13	7/15	7/17
DeSoto	22,474	22,509	22,509	22,509	22,546 (4,509) [1,082] {541}	22,586 (4,517) [1,084] {542}	22,631 (4,526) [1,086] {543}
Harrison	18,749	18,790	18,790	18,790	18,859 (3,772) [905] {453}	18,935 (3,787) [909] {454}	19,019 (3,804) [913] {456}
Hinds	21,273	21,363	21,363	21,363	21,494 (4,299) [1,032] {516}	21,643 (4,329) [1,039] {519}	21,819 (4,364) [1,047] {524}
Jackson	13,896	13,908	13,908	13,908	13,929 (2,786) [669] {334}	13,949 (2,790) [670] {335}	13,970 (2,794) [671] {335}
Lauderdale	7,286	7,286	7,286	7,286	7,291 (1,458) [350] {175}	7,297 (1,459) [350] {175}	7,304 (1,461) [351] {175}
Madison	10,382	10,391	10,391	10,391	10,412 (2,082) [500] {250}	10,434 (2,087) [501] {250}	10,457 (2,091) [502] {251}
Rankin	14,193	14,226	14,226	14,226	14,296 (2,859) [686] {343}	14,378 (2,876) [690] {345}	14,470 (2,894) [695] {347}

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.