IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/29/21

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 10/29/21 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
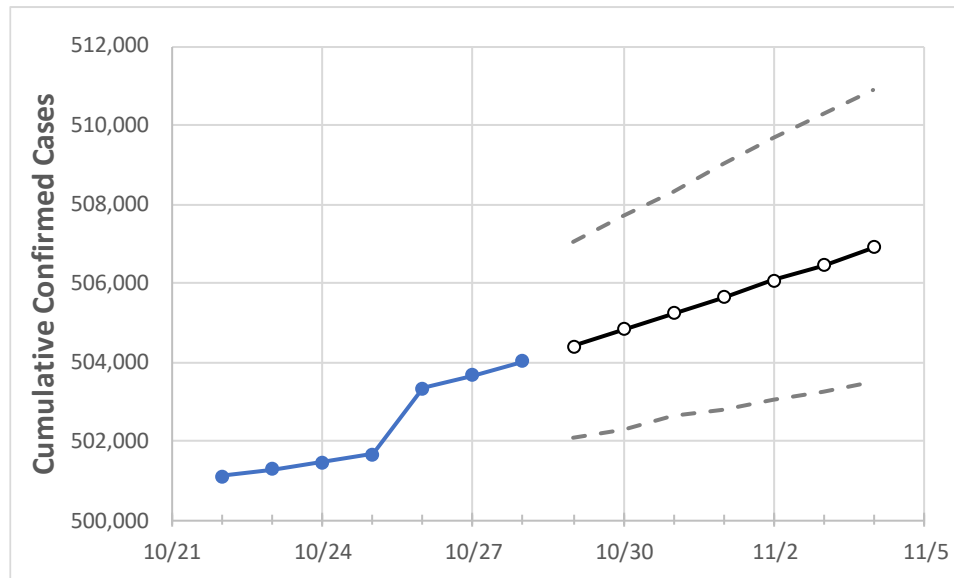
	Actual Confirmed Cases On:				Projected Cases For:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Mississippi	501,652	503,322	503,666	504,009	504,398	504,837	505,220	505,646	506,057	506,460	506,898

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
DeSoto	32,162	32,318	32,343	32,375	32,410	32,445	32,476	32,510	32,541	32,578	32,610
Harrison	34,353	34,400	34,423	34,445	34,468	34,488	34,509	34,529	34,551	34,572	34,592
Hinds	31,977	32,074	32,087	32,114	32,135	32,157	32,178	32,199	32,220	32,239	32,261
Jackson	24,508	24,551	24,557	24,569	24,587	24,601	24,616	24,630	24,643	24,659	24,674
Lauderdale	11,998	12,037	12,038	12,040	12,047	12,053	12,059	12,065	12,072	12,077	12,082
Madison	14,597	14,662	14,668	14,677	14,688	14,698	14,708	14,721	14,732	14,744	14,756
Rankin	22,015	22,103	22,110	22,117	22,136	22,151	22,166	22,183	22,199	22,216	22,234

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:		
	10/25	10/26	10/27	10/28	10/30	11/1	11/3
DeSoto	32,162	32,318	32,343	32,375	32,445 (6,489) [1,557] {779}	32,510 (6,502) [1,561] {780}	32,578 (6,516) [1,564] {782}
Harrison	34,353	34,400	34,423	34,445	34,488 (6,898) [1,655] {828}	34,529 (6,906) [1,657] {829}	34,572 (6,914) [1,659] {830}
Hinds	31,977	32,074	32,087	32,114	32,157 (6,431) [1,544] {772}	32,199 (6,440) [1,546] {773}	32,239 (6,448) [1,547] {774}
Jackson	24,508	24,551	24,557	24,569	24,601 (4,920) [1,181] {590}	24,630 (4,926) [1,182] {591}	24,659 (4,932) [1,184] {592}
Lauderdale	11,998	12,037	12,038	12,040	12,053 (2,411) [579] {289}	12,065 (2,413) [579] {290}	12,077 (2,415) [580] {290}
Madison	14,597	14,662	14,668	14,677	14,698 (2,940) [706] {353}	14,721 (2,944) [707] {353}	14,744 (2,949) [708] {354}
Rankin	22,015	22,103	22,110	22,117	22,151 (4,430) [1,063] {532}	22,183 (4,437) [1,065] {532}	22,216 (4,443) [1,066] {533}

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.