IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/22/22

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 3/22/22 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
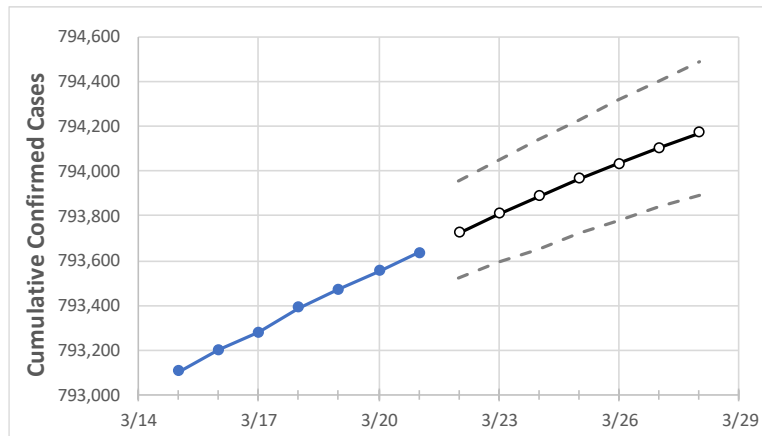
	Actual Confirmed Cases On:				Projected Cases For:						
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28
Mississippi	793,390	793,472	793,553	793,635	793,725	793,808	793,886	793,964	794,032	794,105	794,172

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:						
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28
DeSoto	49,965	49,970	49,976	49,981	49,986	49,991	49,996	50,000	50,005	50,010	50,015
Harrison	53,448	53,456	53,464	53,472	53,479	53,486	53,492	53,498	53,504	53,510	53,515
Hinds	52,040	52,044	52,048	52,052	52,056	52,059	52,063	52,066	52,069	52,072	52,075
Jackson	36,814	36,817	36,820	36,823	36,826	36,829	36,832	36,834	36,837	36,839	36,841
Lauderdale	18,742	18,743	18,745	18,746	18,747	18,749	18,750	18,751	18,752	18,753	18,754
Madison	23,941	23,944	23,947	23,950	23,952	23,955	23,957	23,959	23,961	23,963	23,965
Rankin	36,435	36,440	36,446	36,451	36,456	36,461	36,465	36,470	36,474	36,479	36,483

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:		
	3/18	3/19	3/20	3/21	3/23	3/25	3/27
DeSoto	49,965	49,970	49,976	49,981	49,991 (9,998) [2,400] {1,200}	50,000 (10,000) [2,400] {1,200}	50,010 (10,002) [2,400] {1,200}
Harrison	53,448	53,456	53,464	53,472	53,486 (10,697) [2,567] {1,284}	53,498 (10,700) [2,568] {1,284}	53,510 (10,702) [2,568] {1,284}
Hinds	52,040	52,044	52,048	52,052	52,059 (10,412) [2,499] {1,249}	52,066 (10,413) [2,499] {1,250}	52,072 (10,414) [2,499] {1,250}
Jackson	36,814	36,817	36,820	36,823	36,829 (7,366) [1,768] {884}	36,834 (7,367) [1,768] {884}	36,839 (7,368) [1,768] {884}
Lauderdale	18,742	18,743	18,745	18,746	18,749 (3,750) [900] {450}	18,751 (3,750) [900] {450}	18,753 (3,751) [900] {450}
Madison	23,941	23,944	23,947	23,950	23,955 (4,791) [1,150] {575}	23,959 (4,792) [1,150] {575}	23,963 (4,793) [1,150] {575}
Rankin	36,435	36,440	36,446	36,451	36,461 (7,292) [1,750] {875}	36,470 (7,294) [1,751] {875}	36,479 (7,296) [1,751] {875}

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.