IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/25/22

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 2/25/22 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
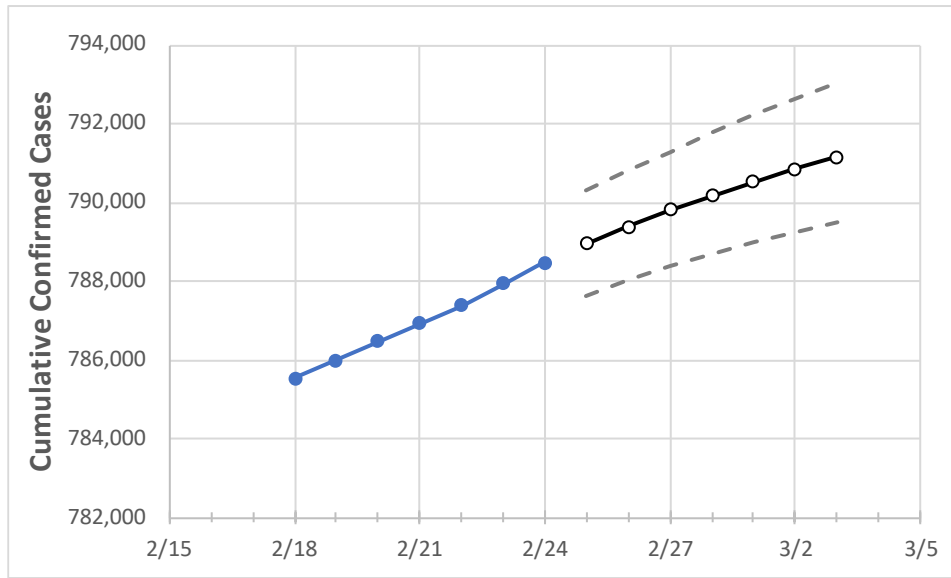
	Actual Confirmed Cases On:				Projected Cases For:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Mississippi	786,929	787,396	787,938	788,479	788,962	789,393	789,803	790,170	790,523	790,844	791,163

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
DeSoto	49,638	49,668	49,706	49,724	49,762	49,797	49,827	49,858	49,887	49,916	49,941
Harrison	52,931	52,963	53,005	53,062	53,104	53,142	53,178	53,207	53,239	53,270	53,295
Hinds	51,753	51,771	51,791	51,808	51,834	51,856	51,880	51,901	51,917	51,939	51,956
Jackson	36,613	36,636	36,657	36,672	36,690	36,709	36,725	36,741	36,756	36,771	36,781
Lauderdale	18,614	18,635	18,658	18,670	18,689	18,707	18,724	18,741	18,756	18,772	18,785
Madison	23,787	23,796	23,803	23,819	23,839	23,856	23,872	23,887	23,902	23,918	23,930
Rankin	36,189	36,205	36,232	36,251	36,280	36,308	36,335	36,355	36,377	36,404	36,422

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:		
	2/21	2/22	2/23	2/24	2/26	2/28	3/2
DeSoto	49,638	49,668	49,706	49,724	49,797 (9,959) [2,390] {1,195}	49,858 (9,972) [2,393] {1,197}	49,916 (9,983) [2,396] {1,198}
Harrison	52,931	52,963	53,005	53,062	53,142 (10,628) [2,551] {1,275}	53,207 (10,641) [2,554] {1,277}	53,270 (10,654) [2,557] {1,278}
Hinds	51,753	51,771	51,791	51,808	51,856 (10,371) [2,489] {1,245}	51,901 (10,380) [2,491] {1,246}	51,939 (10,388) [2,493] {1,247}
Jackson	36,613	36,636	36,657	36,672	36,709 (7,342) [1,762] {881}	36,741 (7,348) [1,764] {882}	36,771 (7,354) [1,765] {882}
Lauderdale	18,614	18,635	18,658	18,670	18,707 (3,741) [898] {449}	18,741 (3,748) [900] {450}	18,772 (3,754) [901] {451}
Madison	23,787	23,796	23,803	23,819	23,856 (4,771) [1,145] {573}	23,887 (4,777) [1,147] {573}	23,918 (4,784) [1,148] {574}
Rankin	36,189	36,205	36,232	36,251	36,308 (7,262) [1,743] {871}	36,355 (7,271) [1,745] {873}	36,404 (7,281) [1,747] {874}

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.