IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/2/21

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 3/2/21 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
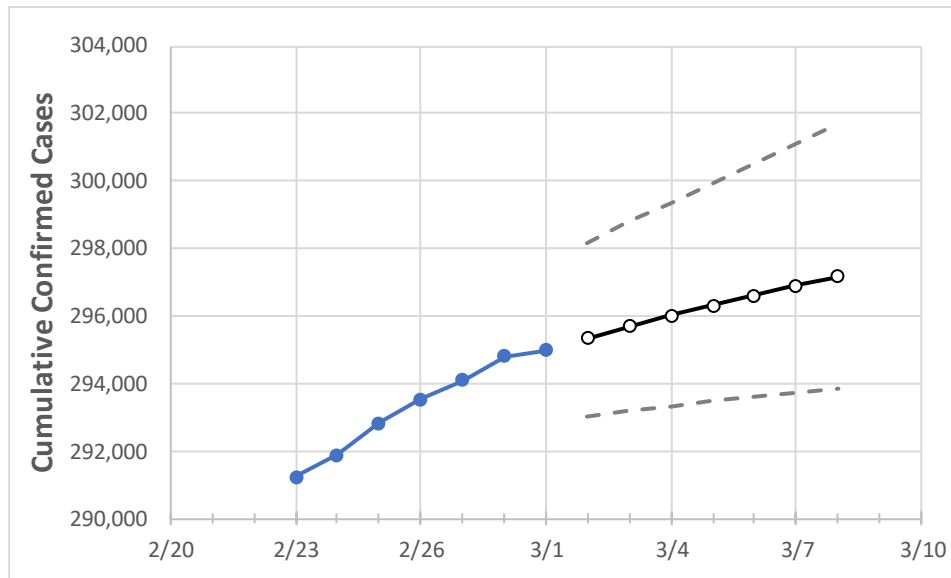
	Actual Confirmed Cases On:				Projected Cases For:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
Mississippi	293,542	294,091	294,795	294,994	295,338	295,676	296,003	296,317	296,615	296,892	297,167

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:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
DeSoto	19,601	19,626	19,660	19,672	19,693	19,713	19,732	19,752	19,769	19,786	19,801
Harrison	16,569	16,618	16,679	16,710	16,743	16,776	16,809	16,840	16,871	16,902	16,929
Hinds	18,712	18,745	18,785	18,799	18,815	18,830	18,844	18,858	18,870	18,883	18,896
Jackson	12,483	12,509	12,575	12,592	12,610	12,626	12,642	12,657	12,671	12,686	12,700
Lauderdale	6,798	6,813	6,833	6,833	6,844	6,854	6,863	6,873	6,882	6,891	6,900
Madison	9,420	9,432	9,448	9,457	9,466	9,473	9,482	9,489	9,496	9,503	9,510
Rankin	12,637	12,662	12,675	12,685	12,699	12,711	12,724	12,736	12,748	12,757	12,768

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:		
	2/26	2/27	2/28	3/1	3/3	3/5	3/7
DeSoto	19,601	19,626	19,660	19,672	19,713 (3,943) [946] {473}	19,752 (3,950) [948] {474}	19,786 (3,957) [950] {475}
Harrison	16,569	16,618	16,679	16,710	16,776 (3,355) [805] {403}	16,840 (3,368) [808] {404}	16,902 (3,380) [811] {406}
Hinds	18,712	18,745	18,785	18,799	18,830 (3,766) [904] {452}	18,858 (3,772) [905] {453}	18,883 (3,777) [906] {453}
Jackson	12,483	12,509	12,575	12,592	12,626 (2,525) [606] {303}	12,657 (2,531) [608] {304}	12,686 (2,537) [609] {304}
Lauderdale	6,798	6,813	6,833	6,833	6,854 (1,371) [329] {164}	6,873 (1,375) [330] {165}	6,891 (1,378) [331] {165}
Madison	9,420	9,432	9,448	9,457	9,473 (1,895) [455] {227}	9,489 (1,898) [455] {228}	9,503 (1,901) [456] {228}
Rankin	12,637	12,662	12,675	12,685	12,711 (2,542) [610] {305}	12,736 (2,547) [611] {306}	12,757 (2,551) [612] {306}

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.