IEM's AI Modeling: Short-term COVID-19 Projections
Date: 11/3/21

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 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 11/3/21 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
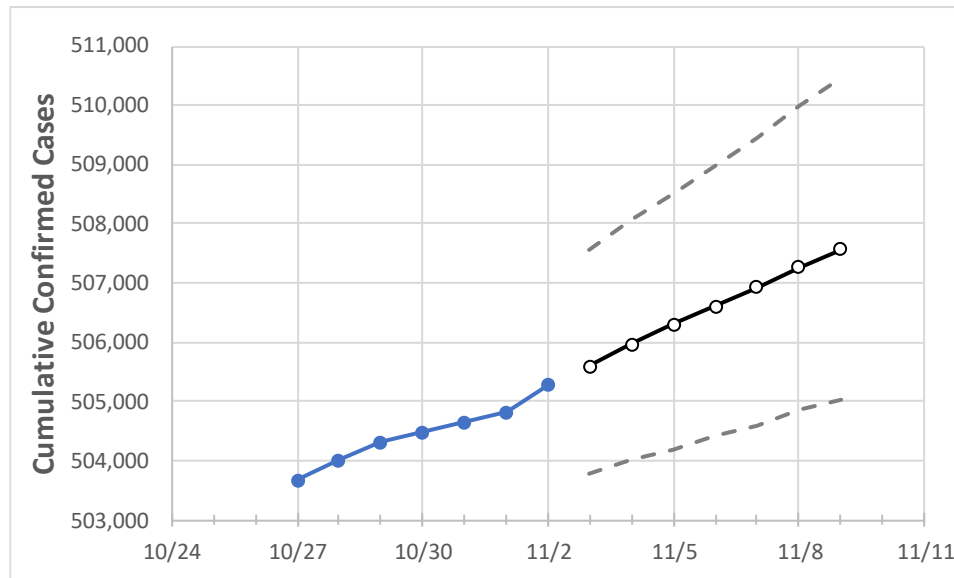
	Actual Confirmed Cases On:				Projected Cases For:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Mississippi	504,482	504,647	504,811	505,266	505,598	505,959	506,299	506,607	506,935	507,269	507,574

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:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
DeSoto	32,407	32,419	32,432	32,462	32,491	32,520	32,544	32,572	32,598	32,627	32,650
Harrison	34,452	34,459	34,465	34,485	34,498	34,511	34,525	34,539	34,551	34,563	34,575
Hinds	32,139	32,147	32,155	32,171	32,190	32,208	32,224	32,241	32,258	32,275	32,293
Jackson	24,589	24,595	24,602	24,627	24,637	24,649	24,660	24,671	24,681	24,691	24,701
Lauderdale	12,051	12,053	12,056	12,064	12,070	12,075	12,079	12,084	12,089	12,094	12,098
Madison	14,684	14,689	14,693	14,699	14,708	14,716	14,724	14,731	14,740	14,748	14,755
Rankin	22,145	22,154	22,162	22,178	22,193	22,208	22,222	22,238	22,252	22,266	22,281

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:		
	10/30	10/31	11/1	11/2	11/4	11/6	11/8
DeSoto	32,407	32,419	32,432	32,462	32,520 (6,504) [1,561] {780}	32,572 (6,514) [1,563] {782}	32,627 (6,525) [1,566] {783}
Harrison	34,452	34,459	34,465	34,485	34,511 (6,902) [1,657] {828}	34,539 (6,908) [1,658] {829}	34,563 (6,913) [1,659] {830}
Hinds	32,139	32,147	32,155	32,171	32,208 (6,442) [1,546] {773}	32,241 (6,448) [1,548] {774}	32,275 (6,455) [1,549] {775}
Jackson	24,589	24,595	24,602	24,627	24,649 (4,930) [1,183] {592}	24,671 (4,934) [1,184] {592}	24,691 (4,938) [1,185] {593}
Lauderdale	12,051	12,053	12,056	12,064	12,075 (2,415) [580] {290}	12,084 (2,417) [580] {290}	12,094 (2,419) [581] {290}
Madison	14,684	14,689	14,693	14,699	14,716 (2,943) [706] {353}	14,731 (2,946) [707] {354}	14,748 (2,950) [708] {354}
Rankin	22,145	22,154	22,162	22,178	22,208 (4,442) [1,066] {533}	22,238 (4,448) [1,067] {534}	22,266 (4,453) [1,069] {534}

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.