IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/20/21

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 10/20/21 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
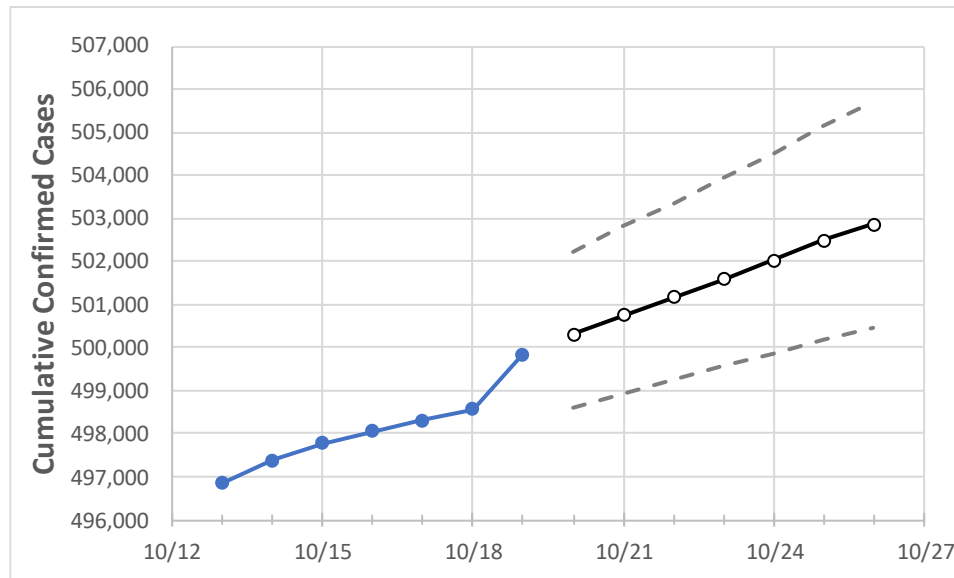
	Actual Confirmed Cases On:				Projected Cases For:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Mississippi	498,047	498,303	498,560	499,838	500,306	500,754	501,178	501,591	502,024	502,480	502,860

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:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
DeSoto	31,865	31,890	31,916	32,000	32,036	32,073	32,106	32,141	32,174	32,207	32,237
Harrison	34,118	34,134	34,150	34,258	34,289	34,319	34,350	34,379	34,410	34,439	34,466
Hinds	31,851	31,864	31,878	31,898	31,917	31,937	31,954	31,971	31,991	32,009	32,025
Jackson	24,327	24,339	24,352	24,452	24,475	24,498	24,518	24,539	24,561	24,583	24,602
Lauderdale	11,939	11,942	11,944	11,981	11,993	12,004	12,014	12,025	12,035	12,045	12,057
Madison	14,532	14,540	14,547	14,558	14,566	14,574	14,582	14,589	14,596	14,604	14,610
Rankin	21,897	21,912	21,928	21,953	21,968	21,983	21,997	22,011	22,025	22,039	22,053

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:		
	10/16	10/17	10/18	10/19	10/21	10/23	10/25
DeSoto	31,865	31,890	31,916	32,000	32,073 (6,415) [1,540] {770}	32,141 (6,428) [1,543] {771}	32,207 (6,441) [1,546] {773}
Harrison	34,118	34,134	34,150	34,258	34,319 (6,864) [1,647] {824}	34,379 (6,876) [1,650] {825}	34,439 (6,888) [1,653] {827}
Hinds	31,851	31,864	31,878	31,898	31,937 (6,387) [1,533] {766}	31,971 (6,394) [1,535] {767}	32,009 (6,402) [1,536] {768}
Jackson	24,327	24,339	24,352	24,452	24,498 (4,900) [1,176] {588}	24,539 (4,908) [1,178] {589}	24,583 (4,917) [1,180] {590}
Lauderdale	11,939	11,942	11,944	11,981	12,004 (2,401) [576] {288}	12,025 (2,405) [577] {289}	12,045 (2,409) [578] {289}
Madison	14,532	14,540	14,547	14,558	14,574 (2,915) [700] {350}	14,589 (2,918) [700] {350}	14,604 (2,921) [701] {351}
Rankin	21,897	21,912	21,928	21,953	21,983 (4,397) [1,055] {528}	22,011 (4,402) [1,057] {528}	22,039 (4,408) [1,058] {529}

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.