IEM's AI Modeling: Short-term COVID-19 Projections

Date: 11/19/21

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 11/19/21 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.

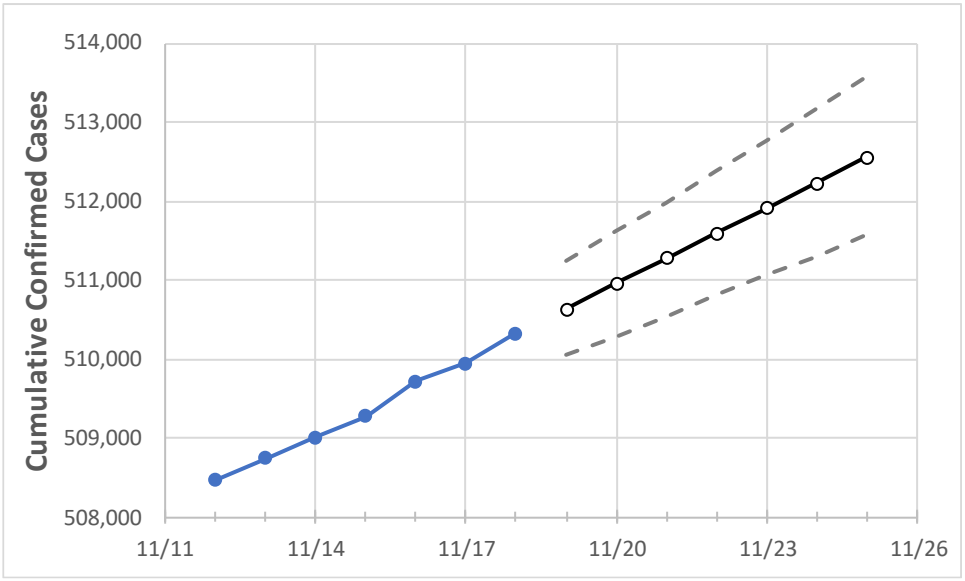
IEM's Modeling Lead

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Mississippi	509,275	509,717	509,942	510,322	510,633	510,954	511,269	511,589	511,905	512,225	512,560

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
DeSoto	32,830	32,875	32,889	32,966	33,001	33,035	33,072	33,107	33,145	33,181	33,220
Harrison	34,667	34,679	34,694	34,724	34,737	34,751	34,764	34,776	34,790	34,804	34,816
Hinds	32,411	32,433	32,454	32,470	32,489	32,506	32,525	32,543	32,562	32,581	32,600
Jackson	24,757	24,766	24,778	24,784	24,794	24,804	24,813	24,823	24,833	24,843	24,853
Lauderdale	12,155	12,168	12,174	12,188	12,197	12,205	12,214	12,223	12,233	12,242	12,252
Madison	14,820	14,825	14,832	14,840	14,847	14,854	14,861	14,868	14,875	14,882	14,889
Rankin	22,360	22,367	22,374	22,375	22,383	22,392	22,400	22,408	22,415	22,423	22,430

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:		
	11/15	11/16	11/17	11/18	11/20	11/22	11/24
DeSoto	32,830	32,875	32,889	32,966	33,035 (6,607) [1,586] {793}	33,107 (6,621) [1,589] {795}	33,181 (6,636) [1,593] {796}
Harrison	34,667	34,679	34,694	34,724	34,751 (6,950) [1,668] {834}	34,776 (6,955) [1,669] {835}	34,804 (6,961) [1,671] {835}
Hinds	32,411	32,433	32,454	32,470	32,506 (6,501) [1,560] {780}	32,543 (6,509) [1,562] {781}	32,581 (6,516) [1,564] {782}
Jackson	24,757	24,766	24,778	24,784	24,804 (4,961) [1,191] {595}	24,823 (4,965) [1,192] {596}	24,843 (4,969) [1,192] {596}
Lauderdale	12,155	12,168	12,174	12,188	12,205 (2,441) [586] {293}	12,223 (2,445) [587] {293}	12,242 (2,448) [588] {294}
Madison	14,820	14,825	14,832	14,840	14,854 (2,971) [713] {357}	14,868 (2,974) [714] {357}	14,882 (2,976) [714] {357}
Rankin	22,360	22,367	22,374	22,375	22,392 (4,478) [1,075] {537}	22,408 (4,482) [1,076] {538}	22,423 (4,485) [1,076] {538}

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.