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

Date: 11/10/21

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 11/10/21 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.

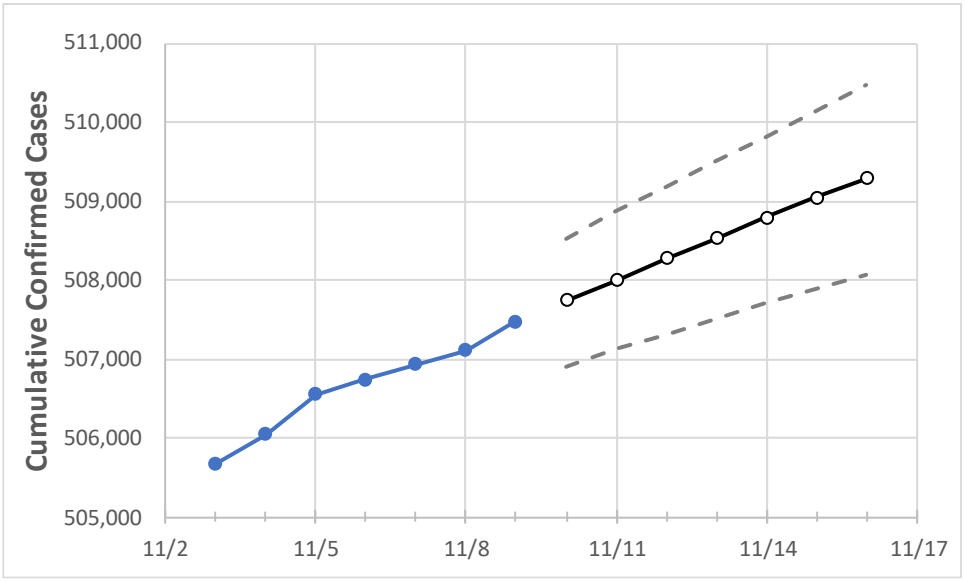
IEM's Modeling Lead

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Mississippi	506,743	506,929	507,116	507,476	507,742	508,002	508,274	508,533	508,798	509,043	509,287

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
DeSoto	32,586	32,606	32,625	32,652	32,674	32,696	32,718	32,739	32,760	32,783	32,803
Harrison	34,569	34,576	34,582	34,599	34,611	34,621	34,632	34,642	34,654	34,665	34,673
Hinds	32,268	32,280	32,293	32,308	32,325	32,340	32,356	32,372	32,388	32,404	32,420
Jackson	24,664	24,669	24,675	24,693	24,702	24,710	24,718	24,727	24,735	24,744	24,751
Lauderdale	12,100	12,103	12,107	12,121	12,127	12,133	12,139	12,145	12,151	12,158	12,164
Madison	14,761	14,766	14,771	14,778	14,787	14,796	14,804	14,813	14,822	14,830	14,839
Rankin	22,277	22,284	22,290	22,294	22,308	22,321	22,335	22,347	22,360	22,374	22,388

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:		
	11/6	11/7	11/8	11/9	11/11	11/13	11/15
DeSoto	32,586	32,606	32,625	32,652	32,696 (6,539) [1,569] {785}	32,739 (6,548) [1,571] {786}	32,783 (6,557) [1,574] {787}
Harrison	34,569	34,576	34,582	34,599	34,621 (6,924) [1,662] {831}	34,642 (6,928) [1,663] {831}	34,665 (6,933) [1,664] {832}
Hinds	32,268	32,280	32,293	32,308	32,340 (6,468) [1,552] {776}	32,372 (6,474) [1,554] {777}	32,404 (6,481) [1,555] {778}
Jackson	24,664	24,669	24,675	24,693	24,710 (4,942) [1,186] {593}	24,727 (4,945) [1,187] {593}	24,744 (4,949) [1,188] {594}
Lauderdale	12,100	12,103	12,107	12,121	12,133 (2,427) [582] {291}	12,145 (2,429) [583] {291}	12,158 (2,432) [584] {292}
Madison	14,761	14,766	14,771	14,778	14,796 (2,959) [710] {355}	14,813 (2,963) [711] {356}	14,830 (2,966) [712] {356}
Rankin	22,277	22,284	22,290	22,294	22,321 (4,464) [1,071] {536}	22,347 (4,469) [1,073] {536}	22,374 (4,475) [1,074] {537}

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.