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

Date: 7/14/21

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 7/14/21 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.

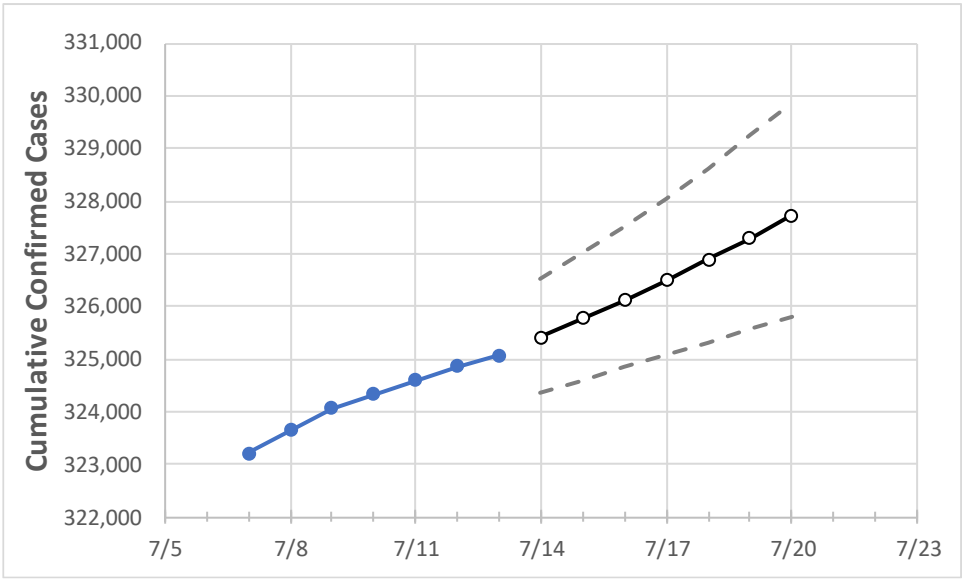
IEM's Modeling Lead

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Mississippi	324,322	324,588	324,853	325,072	325,411	325,768	326,117	326,496	326,886	327,298	327,728

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
DeSoto	22,523	22,538	22,552	22,566	22,583	22,601	22,619	22,638	22,659	22,679	22,701
Harrison	18,801	18,812	18,823	18,840	18,864	18,888	18,913	18,938	18,964	18,989	19,016
Hinds	21,433	21,503	21,573	21,625	21,701	21,782	21,867	21,960	22,059	22,162	22,276
Jackson	13,913	13,917	13,922	13,935	13,944	13,952	13,961	13,969	13,977	13,986	13,994
Lauderdale	7,294	7,297	7,301	7,301	7,304	7,308	7,312	7,316	7,320	7,324	7,329
Madison	10,404	10,418	10,431	10,440	10,452	10,466	10,479	10,494	10,509	10,525	10,542
Rankin	14,246	14,267	14,287	14,305	14,333	14,361	14,390	14,423	14,456	14,490	14,525

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:		
	7/10	7/11	7/12	7/13	7/15	7/17	7/19
DeSoto	22,523	22,538	22,552	22,566	22,601 (4,520) [1,085] {542}	22,638 (4,528) [1,087] {543}	22,679 (4,536) [1,089] {544}
Harrison	18,801	18,812	18,823	18,840	18,888 (3,778) [907] {453}	18,938 (3,788) [909] {455}	18,989 (3,798) [911] {456}
Hinds	21,433	21,503	21,573	21,625	21,782 (4,356) [1,046] {523}	21,960 (4,392) [1,054] {527}	22,162 (4,432) [1,064] {532}
Jackson	13,913	13,917	13,922	13,935	13,952 (2,790) [670] {335}	13,969 (2,794) [670] {335}	13,986 (2,797) [671] {336}
Lauderdale	7,294	7,297	7,301	7,301	7,308 (1,462) [351] {175}	7,316 (1,463) [351] {176}	7,324 (1,465) [352] {176}
Madison	10,404	10,418	10,431	10,440	10,466 (2,093) [502] {251}	10,494 (2,099) [504] {252}	10,525 (2,105) [505] {253}
Rankin	14,246	14,267	14,287	14,305	14,361 (2,872) [689] {345}	14,423 (2,885) [692] {346}	14,490 (2,898) [696] {348}

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.