

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

Date: 3/29/22

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 3/29/22 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.

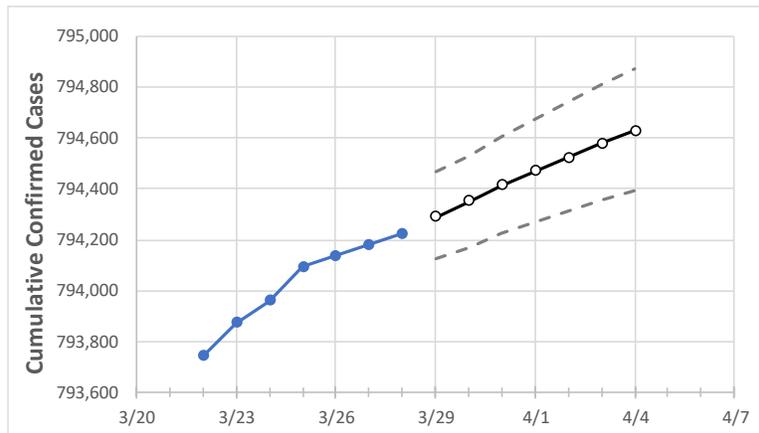
IEM's Modeling Lead

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:					
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Mississippi	794,093	794,137	794,181	794,225	794,289	794,353	794,412	794,469	794,523	794,579	794,628

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:					
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
DeSoto	49,996	50,000	50,004	50,008	50,012	50,015	50,019	50,022	50,025	50,028	50,031
Harrison	53,495	53,501	53,506	53,512	53,517	53,522	53,527	53,531	53,536	53,540	53,544
Hinds	52,072	52,077	52,082	52,087	52,092	52,098	52,103	52,109	52,114	52,120	52,126
Jackson	36,842	36,847	36,851	36,856	36,860	36,865	36,870	36,874	36,879	36,884	36,889
Lauderdale	18,750	18,751	18,752	18,753	18,754	18,755	18,755	18,756	18,757	18,757	18,758
Madison	23,961	23,964	23,966	23,969	23,972	23,974	23,977	23,980	23,982	23,985	23,987
Rankin	36,469	36,473	36,478	36,482	36,486	36,490	36,495	36,499	36,503	36,507	36,510

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:											
	3/25	3/26	3/27	3/28	3/30				4/1				4/3			
DeSoto	49,996	50,000	50,004	50,008	50,015	(10,003)	[2,401]	{1,200}	50,022	(10,004)	[2,401]	{1,201}	50,028	(10,006)	[2,401]	{1,201}
Harrison	53,495	53,501	53,506	53,512	53,522	(10,704)	[2,569]	{1,285}	53,531	(10,706)	[2,570]	{1,285}	53,540	(10,708)	[2,570]	{1,285}
Hinds	52,072	52,077	52,082	52,087	52,098	(10,420)	[2,501]	{1,250}	52,109	(10,422)	[2,501]	{1,251}	52,120	(10,424)	[2,502]	{1,251}
Jackson	36,842	36,847	36,851	36,856	36,865	(7,373)	[1,770]	{885}	36,874	(7,375)	[1,770]	{885}	36,884	(7,377)	[1,770]	{885}
Lauderdale	18,750	18,751	18,752	18,753	18,755	(3,751)	[900]	{450}	18,756	(3,751)	[900]	{450}	18,757	(3,751)	[900]	{450}
Madison	23,961	23,964	23,966	23,969	23,974	(4,795)	[1,151]	{575}	23,980	(4,796)	[1,151]	{576}	23,985	(4,797)	[1,151]	{576}
Rankin	36,469	36,473	36,478	36,482	36,490	(7,298)	[1,752]	{876}	36,499	(7,300)	[1,752]	{876}	36,507	(7,301)	[1,752]	{876}

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.