

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

Date: 3/2/22

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 3/2/22 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.

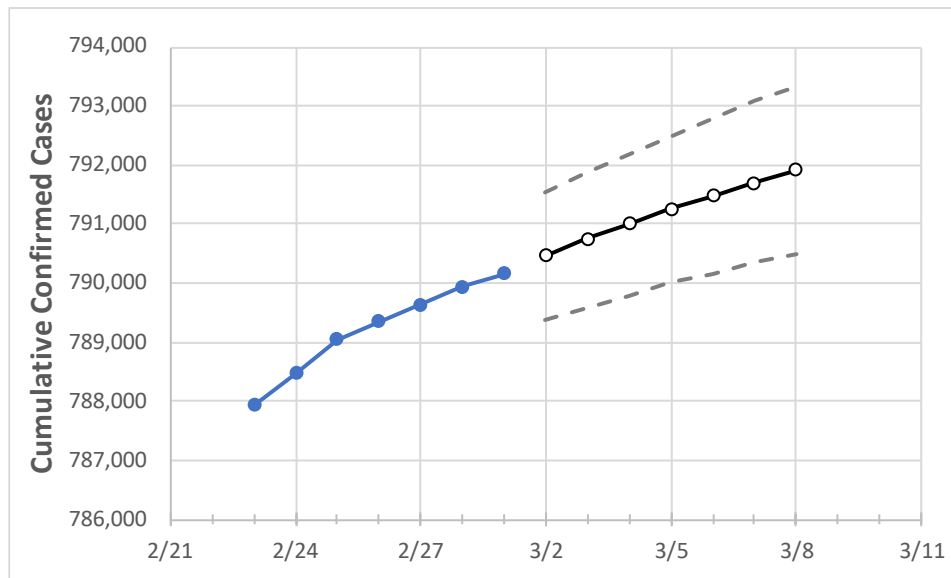
IEM's Modeling Lead

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:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
Mississippi	789,351	789,645	789,940	790,168	790,465	790,751	791,001	791,264	791,488	791,705	791,916

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:						
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8
DeSoto	49,790	49,808	49,826	49,837	49,857	49,874	49,891	49,908	49,923	49,938	49,952
Harrison	53,110	53,131	53,152	53,183	53,205	53,224	53,244	53,260	53,276	53,292	53,307
Hinds	51,857	51,870	51,884	51,897	51,915	51,931	51,946	51,960	51,975	51,989	52,001
Jackson	36,691	36,703	36,714	36,723	36,733	36,743	36,752	36,761	36,769	36,777	36,785
Lauderdale	18,684	18,689	18,695	18,696	18,707	18,718	18,728	18,737	18,746	18,755	18,762
Madison	23,844	23,851	23,857	23,869	23,879	23,891	23,899	23,910	23,918	23,927	23,935
Rankin	36,281	36,292	36,303	36,319	36,339	36,357	36,372	36,389	36,404	36,419	36,436

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:											
	2/26	2/27	2/28	3/1	3/3			3/5			3/7					
DeSoto	49,790	49,808	49,826	49,837	49,874	(9,975)	[2,394]	{1,197}	49,908	(9,982)	[2,396]	{1,198}	49,938	(9,988)	[2,397]	{1,199}
Harrison	53,110	53,131	53,152	53,183	53,224	(10,645)	[2,555]	{1,277}	53,260	(10,652)	[2,556]	{1,278}	53,292	(10,658)	[2,558]	{1,279}
Hinds	51,857	51,870	51,884	51,897	51,931	(10,386)	[2,493]	{1,246}	51,960	(10,392)	[2,494]	{1,247}	51,989	(10,398)	[2,495]	{1,248}
Jackson	36,691	36,703	36,714	36,723	36,743	(7,349)	[1,764]	{882}	36,761	(7,352)	[1,765]	{882}	36,777	(7,355)	[1,765]	{883}
Lauderdale	18,684	18,689	18,695	18,696	18,718	(3,744)	[898]	{449}	18,737	(3,747)	[899]	{450}	18,755	(3,751)	[900]	{450}
Madison	23,844	23,851	23,857	23,869	23,891	(4,778)	[1,147]	{573}	23,910	(4,782)	[1,148]	{574}	23,927	(4,785)	[1,148]	{574}
Rankin	36,281	36,292	36,303	36,319	36,357	(7,271)	[1,745]	{873}	36,389	(7,278)	[1,747]	{873}	36,419	(7,284)	[1,748]	{874}

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.