

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

Date: 2/16/22

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 2/16/22 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.

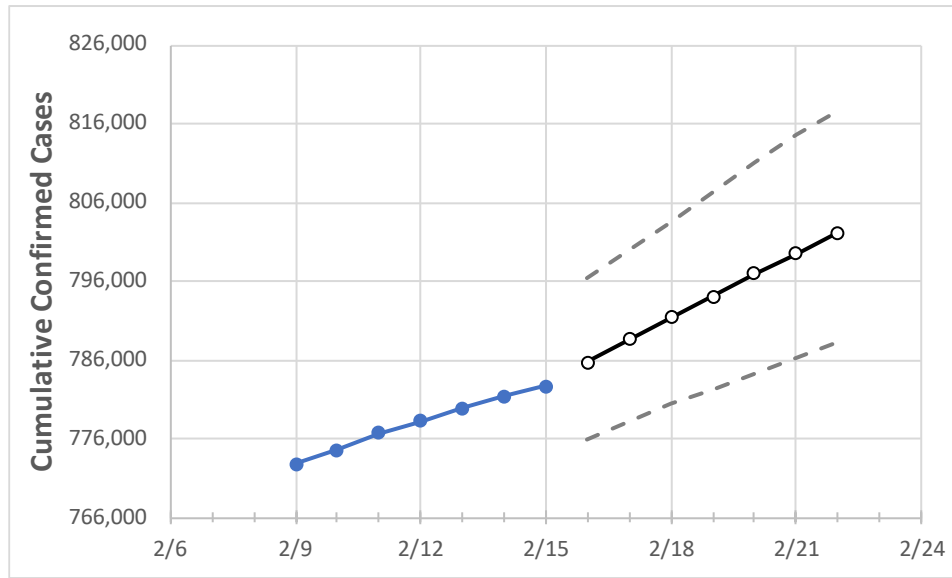
IEM's Modeling Lead

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Mississippi	778,290	779,863	781,436	782,689	785,709	788,560	791,385	794,094	796,931	799,566	802,117	

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
DeSoto	49,019	49,113	49,208	49,387	49,552	49,710	49,858	50,007	50,157	50,311	50,441	
Harrison	52,173	52,346	52,519	52,643	52,996	53,320	53,646	53,966	54,293	54,622	54,944	
Hinds	51,418	51,459	51,499	51,535	51,628	51,715	51,791	51,875	51,949	52,027	52,098	
Jackson	36,277	36,329	36,381	36,457	36,572	36,686	36,793	36,900	37,004	37,111	37,206	
Lauderdale	18,328	18,366	18,405	18,448	18,497	18,539	18,581	18,622	18,662	18,701	18,737	
Madison	23,539	23,585	23,630	23,651	23,722	23,796	23,860	23,925	23,987	24,055	24,113	
Rankin	35,787	35,835	35,882	35,923	36,048	36,176	36,298	36,418	36,530	36,651	36,755	

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:											
	2/12	2/13	2/14	2/15	2/17		2/19		2/21							
DeSoto	49,019	49,113	49,208	49,387	49,710	(9,942)	[2,386]	{1,193}	50,007	(10,001)	[2,400]	{1,200}	50,311	(10,062)	[2,415]	{1,207}
Harrison	52,173	52,346	52,519	52,643	53,320	(10,664)	[2,559]	{1,280}	53,966	(10,793)	[2,590]	{1,295}	54,622	(10,924)	[2,622]	{1,311}
Hinds	51,418	51,459	51,499	51,535	51,715	(10,343)	[2,482]	{1,241}	51,875	(10,375)	[2,490]	{1,245}	52,027	(10,405)	[2,497]	{1,249}
Jackson	36,277	36,329	36,381	36,457	36,686	(7,337)	[1,761]	{880}	36,900	(7,380)	[1,771]	{886}	37,111	(7,422)	[1,781]	{891}
Lauderdale	18,328	18,366	18,405	18,448	18,539	(3,708)	[890]	{445}	18,622	(3,724)	[894]	{447}	18,701	(3,740)	[898]	{449}
Madison	23,539	23,585	23,630	23,651	23,796	(4,759)	[1,142]	{571}	23,925	(4,785)	[1,148]	{574}	24,055	(4,811)	[1,155]	{577}
Rankin	35,787	35,835	35,882	35,923	36,176	(7,235)	[1,736]	{868}	36,418	(7,284)	[1,748]	{874}	36,651	(7,330)	[1,759]	{880}

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.