

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

Date: 2/11/22

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 2/11/22 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.

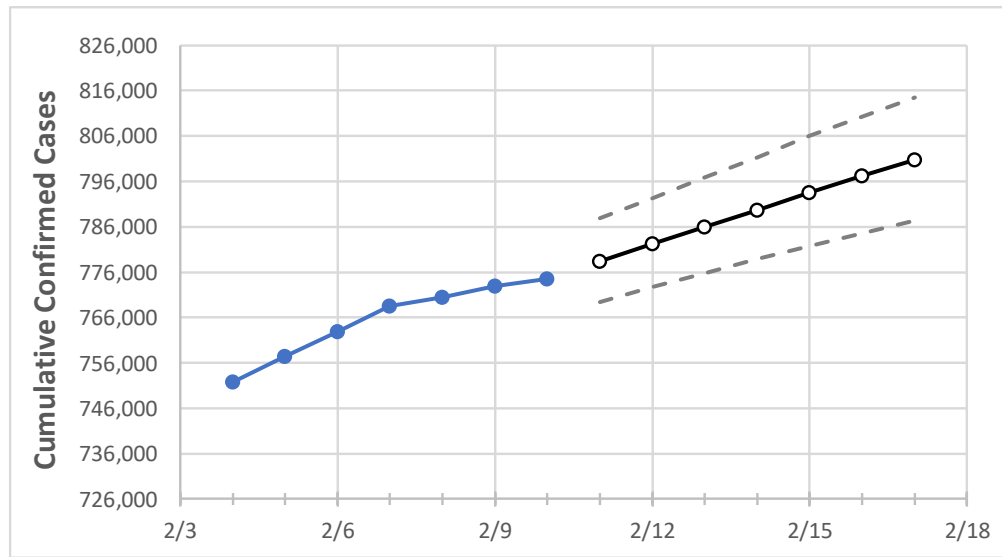
IEM's Modeling Lead

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Mississippi	768,457	770,522	772,844	774,505	778,466	782,339	786,025	789,628	793,467	797,318	800,730

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
DeSoto	48,441	48,557	48,746	48,821	49,030	49,238	49,434	49,636	49,833	50,014	50,205
Harrison	51,319	51,511	51,706	51,829	52,224	52,594	52,971	53,341	53,726	54,105	54,491
Hinds	51,024	51,054	51,141	51,219	51,346	51,475	51,601	51,715	51,828	51,944	52,049
Jackson	35,877	36,077	36,140	36,182	36,342	36,506	36,664	36,817	36,962	37,116	37,260
Lauderdale	18,102	18,154	18,197	18,244	18,313	18,388	18,457	18,521	18,590	18,656	18,718
Madison	23,264	23,296	23,354	23,381	23,467	23,555	23,644	23,724	23,808	23,892	23,967
Rankin	35,347	35,404	35,465	35,556	35,749	35,948	36,118	36,298	36,484	36,673	36,846

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:											
	2/7	2/8	2/9	2/10	2/12				2/14				2/16			
DeSoto	48,441	48,557	48,746	48,821	49,238	(9,848)	[2,363]	{1,182}	49,636	(9,927)	[2,383]	{1,191}	50,014	(10,003)	[2,401]	{1,200}
Harrison	51,319	51,511	51,706	51,829	52,594	(10,519)	[2,525]	{1,262}	53,341	(10,668)	[2,560]	{1,280}	54,105	(10,821)	[2,597]	{1,299}
Hinds	51,024	51,054	51,141	51,219	51,475	(10,295)	[2,471]	{1,235}	51,715	(10,343)	[2,482]	{1,241}	51,944	(10,389)	[2,493]	{1,247}
Jackson	35,877	36,077	36,140	36,182	36,506	(7,301)	[1,752]	{876}	36,817	(7,363)	[1,767]	{884}	37,116	(7,423)	[1,782]	{891}
Lauderdale	18,102	18,154	18,197	18,244	18,388	(3,678)	[883]	{441}	18,521	(3,704)	[889]	{445}	18,656	(3,731)	[896]	{448}
Madison	23,264	23,296	23,354	23,381	23,555	(4,711)	[1,131]	{565}	23,724	(4,745)	[1,139]	{569}	23,892	(4,778)	[1,147]	{573}
Rankin	35,347	35,404	35,465	35,556	35,948	(7,190)	[1,725]	{863}	36,298	(7,260)	[1,742]	{871}	36,673	(7,335)	[1,760]	{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.