

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

Date: 1/7/22

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 1/7/22 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.**

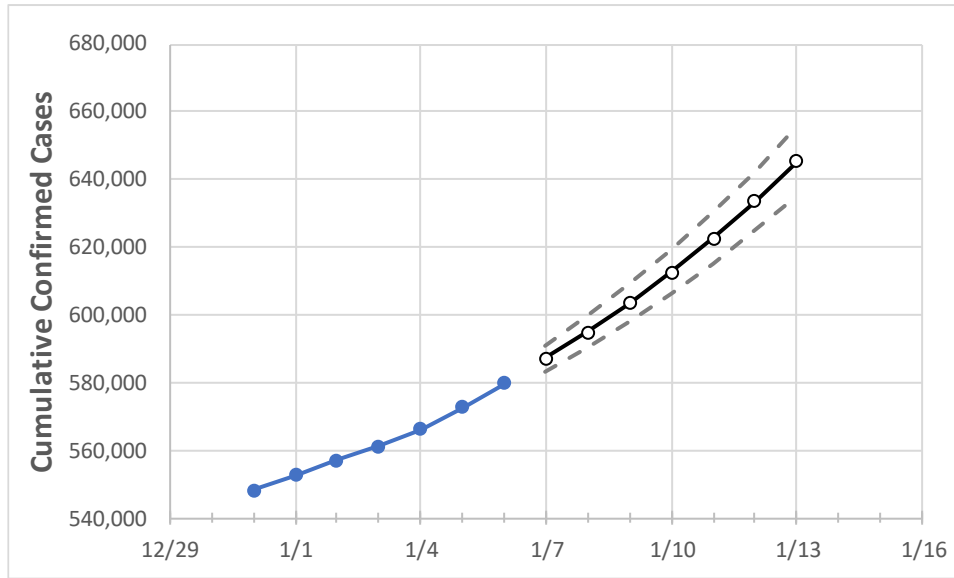
### IEM's Modeling Lead

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:							
	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	
Mississippi	561,262	566,102	572,694	579,773	587,049	594,827	603,356	612,602	622,617	633,584	645,463	

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:							
	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	
DeSoto	37,222	37,555	38,008	38,524	39,041	39,595	40,186	40,818	41,499	42,240	43,024	
Harrison	36,758	37,028	37,544	37,914	38,340	38,806	39,326	39,905	40,544	41,253	42,034	
Hinds	39,015	39,306	39,829	40,368	41,208	42,130	43,102	44,192	45,339	46,618	47,952	
Jackson	26,139	26,397	26,767	27,175	27,550	27,966	28,432	28,961	29,549	30,207	30,938	
Lauderdale	13,026	13,130	13,306	13,469	13,617	13,780	13,958	14,152	14,369	14,603	14,860	
Madison	17,076	17,214	17,461	17,667	17,943	18,237	18,556	18,893	19,258	19,655	20,080	
Rankin	25,481	25,681	25,943	26,205	26,584	26,987	27,419	27,887	28,396	28,935	29,521	

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:											
	1/3	1/4	1/5	1/6	1/8			1/10			1/12					
DeSoto	37,222	37,555	38,008	38,524	39,595	(7,919)	[1,901]	{950}	40,818	(8,164)	[1,959]	{980}	42,240	(8,448)	[2,028]	{1,014}
Harrison	36,758	37,028	37,544	37,914	38,806	(7,761)	[1,863]	{931}	39,905	(7,981)	[1,915]	{958}	41,253	(8,251)	[1,980]	{990}
Hinds	39,015	39,306	39,829	40,368	42,130	(8,426)	[2,022]	{1,011}	44,192	(8,838)	[2,121]	{1,061}	46,618	(9,324)	[2,238]	{1,119}
Jackson	26,139	26,397	26,767	27,175	27,966	(5,593)	[1,342]	{671}	28,961	(5,792)	[1,390]	{695}	30,207	(6,041)	[1,450]	{725}
Lauderdale	13,026	13,130	13,306	13,469	13,780	(2,756)	[661]	{331}	14,152	(2,830)	[679]	{340}	14,603	(2,921)	[701]	{350}
Madison	17,076	17,214	17,461	17,667	18,237	(3,647)	[875]	{438}	18,893	(3,779)	[907]	{453}	19,655	(3,931)	[943]	{472}
Rankin	25,481	25,681	25,943	26,205	26,987	(5,397)	[1,295]	{648}	27,887	(5,577)	[1,339]	{669}	28,935	(5,787)	[1,389]	{694}

For additional information from IEM, please contact Jon Mabry, Vice President of Disaster Recovery at 601-953-4562 or [jon.mabry@iem.com](mailto:jon.mabry@iem.com) or Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966.