

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/27/21**

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 1/27/21 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.

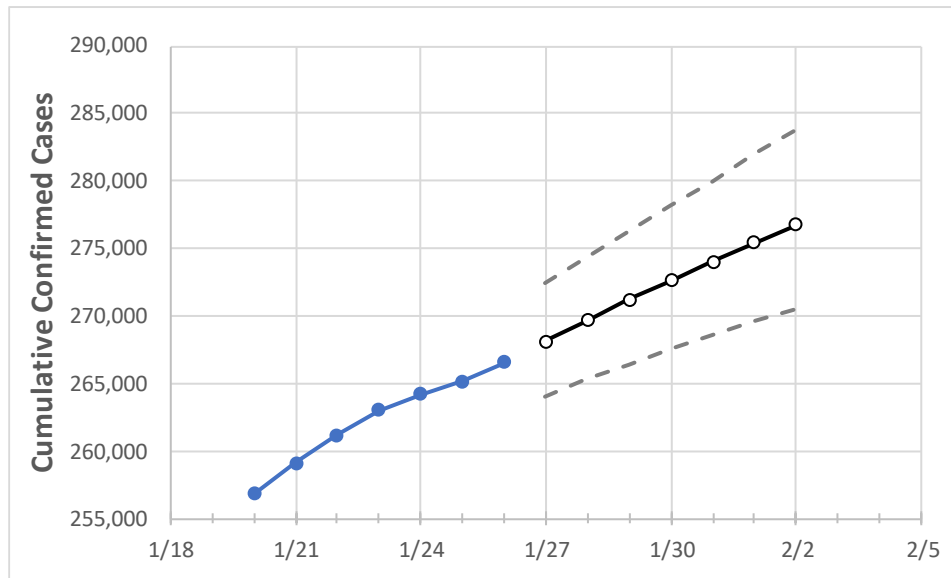
IEM's Modeling Lead

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:						
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2
Mississippi	263,023	264,219	265,146	266,598	268,133	269,667	271,204	272,649	274,043	275,434	276,774

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:						
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2
DeSoto	17,675	17,741	17,807	17,928	18,016	18,100	18,182	18,262	18,339	18,416	18,490
Harrison	14,224	14,279	14,298	14,510	14,652	14,790	14,926	15,064	15,208	15,348	15,487
Hinds	16,813	16,891	16,967	17,030	17,131	17,231	17,328	17,424	17,519	17,617	17,710
Jackson	10,839	10,917	10,976	11,054	11,143	11,231	11,320	11,408	11,495	11,583	11,670
Lauderdale	6,097	6,121	6,128	6,161	6,199	6,237	6,275	6,314	6,350	6,387	6,423
Madison	8,568	8,599	8,619	8,663	8,711	8,759	8,805	8,852	8,901	8,946	8,995
Rankin	11,167	11,239	11,280	11,315	11,386	11,458	11,529	11,598	11,660	11,729	11,792

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:											
	1/23	1/24	1/25	1/26	1/28				1/30				2/1			
DeSoto	17,675	17,741	17,807	17,928	18,100	(3,620)	[869]	{434}	18,262	(3,652)	[877]	{438}	18,416	(3,683)	[884]	{442}
Harrison	14,224	14,279	14,298	14,510	14,790	(2,958)	[710]	{355}	15,064	(3,013)	[723]	{362}	15,348	(3,070)	[737]	{368}
Hinds	16,813	16,891	16,967	17,030	17,231	(3,446)	[827]	{414}	17,424	(3,485)	[836]	{418}	17,617	(3,523)	[846]	{423}
Jackson	10,839	10,917	10,976	11,054	11,231	(2,246)	[539]	{270}	11,408	(2,282)	[548]	{274}	11,583	(2,317)	[556]	{278}
Lauderdale	6,097	6,121	6,128	6,161	6,237	(1,247)	[299]	{150}	6,314	(1,263)	[303]	{152}	6,387	(1,277)	[307]	{153}
Madison	8,568	8,599	8,619	8,663	8,759	(1,752)	[420]	{210}	8,852	(1,770)	[425]	{212}	8,946	(1,789)	[429]	{215}
Rankin	11,167	11,239	11,280	11,315	11,458	(2,292)	[550]	{275}	11,598	(2,320)	[557]	{278}	11,729	(2,346)	[563]	{281}

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.