

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

Date: 4/27/21

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 4/27/21 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.

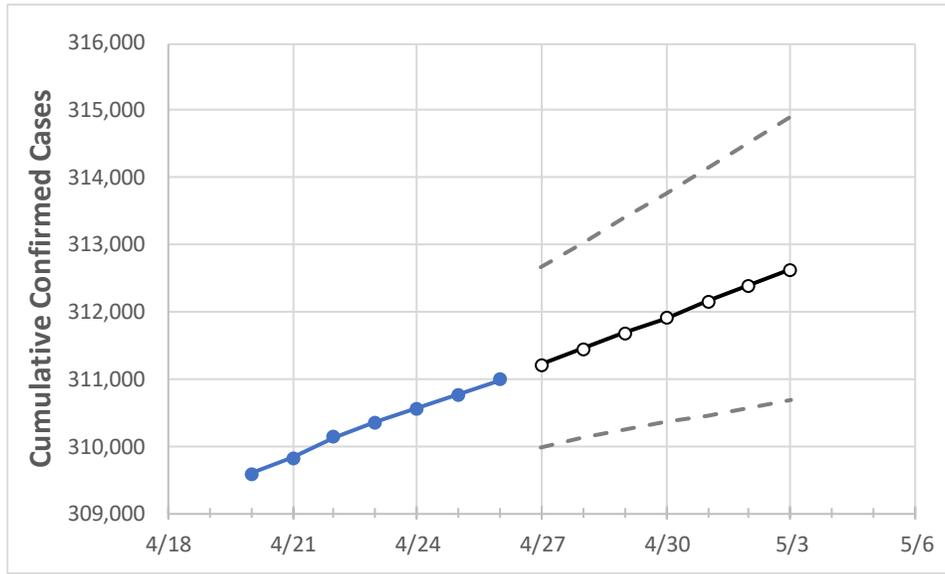
IEM's Modeling Lead

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:							
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	
Mississippi	310,349	310,562	310,774	310,987	311,215	311,448	311,680	311,910	312,155	312,386	312,624	

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:							
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	
DeSoto	21,158	21,178	21,197	21,217	21,248	21,278	21,309	21,341	21,373	21,404	21,437	
Harrison	17,647	17,656	17,666	17,675	17,688	17,701	17,715	17,728	17,742	17,755	17,767	
Hinds	20,080	20,103	20,127	20,150	20,168	20,187	20,205	20,223	20,242	20,260	20,278	
Jackson	13,254	13,277	13,301	13,324	13,343	13,362	13,383	13,406	13,429	13,454	13,480	
Lauderdale	7,261	7,263	7,264	7,266	7,270	7,273	7,277	7,280	7,284	7,287	7,290	
Madison	9,990	9,994	9,999	10,003	10,009	10,015	10,021	10,027	10,033	10,039	10,044	
Rankin	13,447	13,453	13,460	13,466	13,476	13,486	13,496	13,506	13,516	13,526	13,537	

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:											
	4/23	4/24	4/25	4/26	4/28				4/30				5/2			
DeSoto	21,158	21,178	21,197	21,217	21,278	(4,256)	[1,021]	{511}	21,341	(4,268)	[1,024]	{512}	21,404	(4,281)	[1,027]	{514}
Harrison	17,647	17,656	17,666	17,675	17,701	(3,540)	[850]	{425}	17,728	(3,546)	[851]	{425}	17,755	(3,551)	[852]	{426}
Hinds	20,080	20,103	20,127	20,150	20,187	(4,037)	[969]	{484}	20,223	(4,045)	[971]	{485}	20,260	(4,052)	[973]	{486}
Jackson	13,254	13,277	13,301	13,324	13,362	(2,672)	[641]	{321}	13,406	(2,681)	[643]	{322}	13,454	(2,691)	[646]	{323}
Lauderdale	7,261	7,263	7,264	7,266	7,273	(1,455)	[349]	{175}	7,280	(1,456)	[349]	{175}	7,287	(1,457)	[350]	{175}
Madison	9,990	9,994	9,999	10,003	10,015	(2,003)	[481]	{240}	10,027	(2,005)	[481]	{241}	10,039	(2,008)	[482]	{241}
Rankin	13,447	13,453	13,460	13,466	13,486	(2,697)	[647]	{324}	13,506	(2,701)	[648]	{324}	13,526	(2,705)	[649]	{325}

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.