

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/12/21**

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 11/12/21 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.

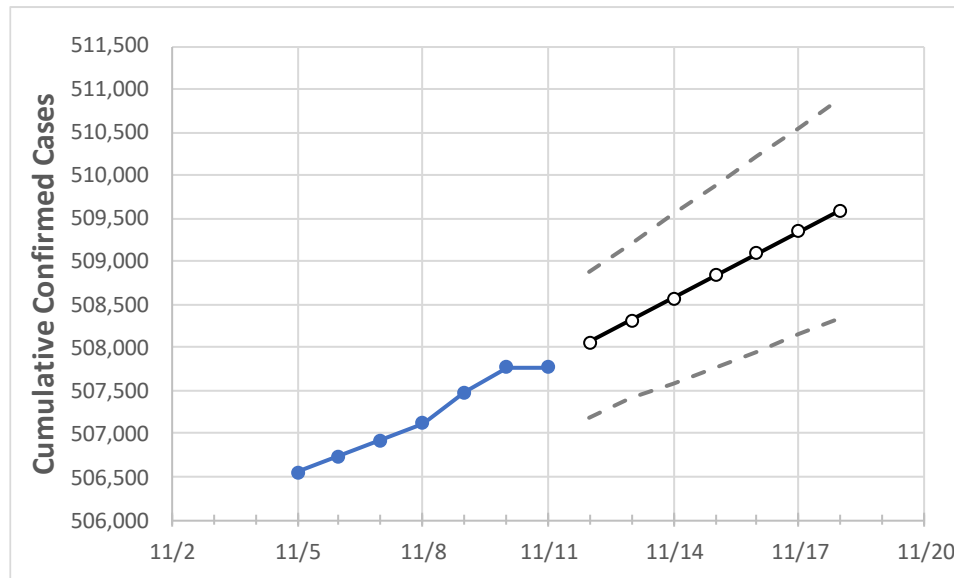
IEM's Modeling Lead

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:						
	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18
Mississippi	507,116	507,476	507,775	507,775	508,059	508,312	508,570	508,841	509,098	509,348	509,599

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:						
	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18
DeSoto	32,625	32,652	32,678	32,678	32,700	32,723	32,744	32,765	32,788	32,809	32,830
Harrison	34,582	34,599	34,617	34,617	34,628	34,640	34,651	34,661	34,672	34,683	34,693
Hinds	32,293	32,308	32,336	32,336	32,353	32,371	32,388	32,406	32,424	32,441	32,459
Jackson	24,675	24,693	24,699	24,699	24,707	24,716	24,724	24,732	24,739	24,748	24,755
Lauderdale	12,107	12,121	12,123	12,123	12,129	12,135	12,141	12,147	12,153	12,159	12,165
Madison	14,771	14,778	14,781	14,781	14,789	14,797	14,805	14,814	14,822	14,831	14,839
Rankin	22,290	22,294	22,302	22,302	22,316	22,328	22,340	22,354	22,366	22,377	22,391

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:											
	11/8	11/9	11/10	11/11	11/13				11/15				11/17			
DeSoto	32,625	32,652	32,678	32,678	32,723	(6,545)	[1,571]	{785}	32,765	(6,553)	[1,573]	{786}	32,809	(6,562)	[1,575]	{787}
Harrison	34,582	34,599	34,617	34,617	34,640	(6,928)	[1,663]	{831}	34,661	(6,932)	[1,664]	{832}	34,683	(6,937)	[1,665]	{832}
Hinds	32,293	32,308	32,336	32,336	32,371	(6,474)	[1,554]	{777}	32,406	(6,481)	[1,556]	{778}	32,441	(6,488)	[1,557]	{779}
Jackson	24,675	24,693	24,699	24,699	24,716	(4,943)	[1,186]	{593}	24,732	(4,946)	[1,187]	{594}	24,748	(4,950)	[1,188]	{594}
Lauderdale	12,107	12,121	12,123	12,123	12,135	(2,427)	[582]	{291}	12,147	(2,429)	[583]	{292}	12,159	(2,432)	[584]	{292}
Madison	14,771	14,778	14,781	14,781	14,797	(2,959)	[710]	{355}	14,814	(2,963)	[711]	{356}	14,831	(2,966)	[712]	{356}
Rankin	22,290	22,294	22,302	22,302	22,328	(4,466)	[1,072]	{536}	22,354	(4,471)	[1,073]	{536}	22,377	(4,475)	[1,074]	{537}

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.