

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

Date: 9/24/21

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 9/24/21 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.

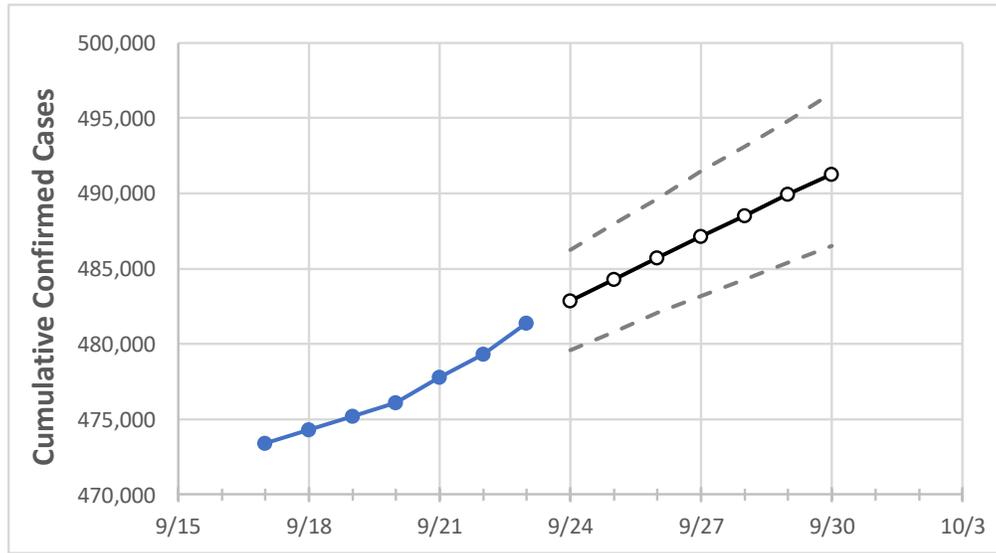
IEM's Modeling Lead

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Mississippi	476,100	477,769	479,326	481,397	482,850	484,290	485,736	487,135	488,517	489,931	491,276

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
DeSoto	30,014	30,148	30,319	30,491	30,609	30,730	30,848	30,966	31,082	31,200	31,316
Harrison	32,559	32,698	32,779	32,996	33,115	33,231	33,340	33,456	33,568	33,679	33,785
Hinds	30,837	30,882	30,924	30,973	31,026	31,076	31,127	31,174	31,221	31,268	31,316
Jackson	23,380	23,474	23,542	23,650	23,736	23,821	23,901	23,978	24,058	24,140	24,215
Lauderdale	11,429	11,467	11,501	11,538	11,569	11,597	11,625	11,653	11,681	11,710	11,738
Madison	14,086	14,101	14,120	14,145	14,169	14,191	14,213	14,234	14,256	14,277	14,297
Rankin	21,167	21,203	21,235	21,267	21,299	21,328	21,357	21,386	21,412	21,442	21,466

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:											
	9/20	9/21	9/22	9/23	9/25				9/27				9/29			
DeSoto	30,014	30,148	30,319	30,491	30,730	(6,146)	[1,475]	{738}	30,966	(6,193)	[1,486]	{743}	31,200	(6,240)	[1,498]	{749}
Harrison	32,559	32,698	32,779	32,996	33,231	(6,646)	[1,595]	{798}	33,456	(6,691)	[1,606]	{803}	33,679	(6,736)	[1,617]	{808}
Hinds	30,837	30,882	30,924	30,973	31,076	(6,215)	[1,492]	{746}	31,174	(6,235)	[1,496]	{748}	31,268	(6,254)	[1,501]	{750}
Jackson	23,380	23,474	23,542	23,650	23,821	(4,764)	[1,143]	{572}	23,978	(4,796)	[1,151]	{575}	24,140	(4,828)	[1,159]	{579}
Lauderdale	11,429	11,467	11,501	11,538	11,597	(2,319)	[557]	{278}	11,653	(2,331)	[559]	{280}	11,710	(2,342)	[562]	{281}
Madison	14,086	14,101	14,120	14,145	14,191	(2,838)	[681]	{341}	14,234	(2,847)	[683]	{342}	14,277	(2,855)	[685]	{343}
Rankin	21,167	21,203	21,235	21,267	21,328	(4,266)	[1,024]	{512}	21,386	(4,277)	[1,027]	{513}	21,442	(4,288)	[1,029]	{515}

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.