

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

Date: 7/28/21

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 7/28/21 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.

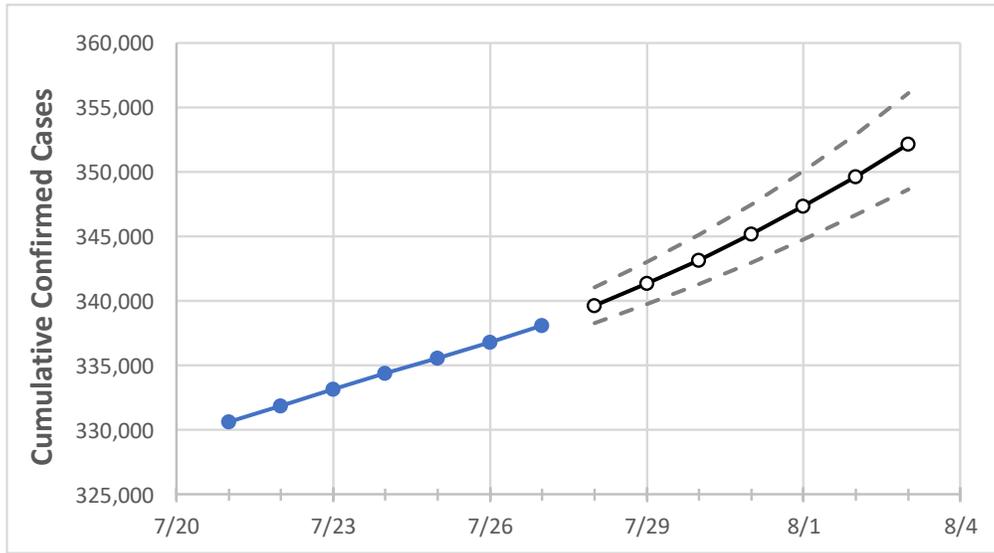
IEM's Modeling Lead

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:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Mississippi	334,383	335,585	336,788	338,079	339,649	341,355	343,176	345,159	347,316	349,632	352,130

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:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
DeSoto	22,943	22,984	23,026	23,069	23,123	23,179	23,240	23,304	23,371	23,442	23,518
Harrison	19,690	19,811	19,932	20,064	20,223	20,398	20,587	20,794	21,024	21,274	21,548
Hinds	22,943	23,105	23,268	23,409	23,587	23,773	23,971	24,177	24,396	24,620	24,860
Jackson	14,426	14,511	14,595	14,743	14,888	15,057	15,255	15,478	15,742	16,041	16,390
Lauderdale	7,595	7,628	7,662	7,684	7,729	7,780	7,835	7,895	7,962	8,034	8,111
Madison	10,724	10,755	10,787	10,806	10,843	10,881	10,922	10,966	11,012	11,061	11,113
Rankin	14,920	14,989	15,058	15,119	15,202	15,292	15,387	15,487	15,593	15,704	15,819

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:											
	7/24	7/25	7/26	7/27	7/29				7/31				8/2			
DeSoto	22,943	22,984	23,026	23,069	23,179	(4,636)	[1,113]	{556}	23,304	(4,661)	[1,119]	{559}	23,442	(4,688)	[1,125]	{563}
Harrison	19,690	19,811	19,932	20,064	20,398	(4,080)	[979]	{490}	20,794	(4,159)	[998]	{499}	21,274	(4,255)	[1,021]	{511}
Hinds	22,943	23,105	23,268	23,409	23,773	(4,755)	[1,141]	{571}	24,177	(4,835)	[1,160]	{580}	24,620	(4,924)	[1,182]	{591}
Jackson	14,426	14,511	14,595	14,743	15,057	(3,011)	[723]	{361}	15,478	(3,096)	[743]	{371}	16,041	(3,208)	[770]	{385}
Lauderdale	7,595	7,628	7,662	7,684	7,780	(1,556)	[373]	{187}	7,895	(1,579)	[379]	{189}	8,034	(1,607)	[386]	{193}
Madison	10,724	10,755	10,787	10,806	10,881	(2,176)	[522]	{261}	10,966	(2,193)	[526]	{263}	11,061	(2,212)	[531]	{265}
Rankin	14,920	14,989	15,058	15,119	15,292	(3,058)	[734]	{367}	15,487	(3,097)	[743]	{372}	15,704	(3,141)	[754]	{377}

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.