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

Date: 9/10/21

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 9/10/21 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.

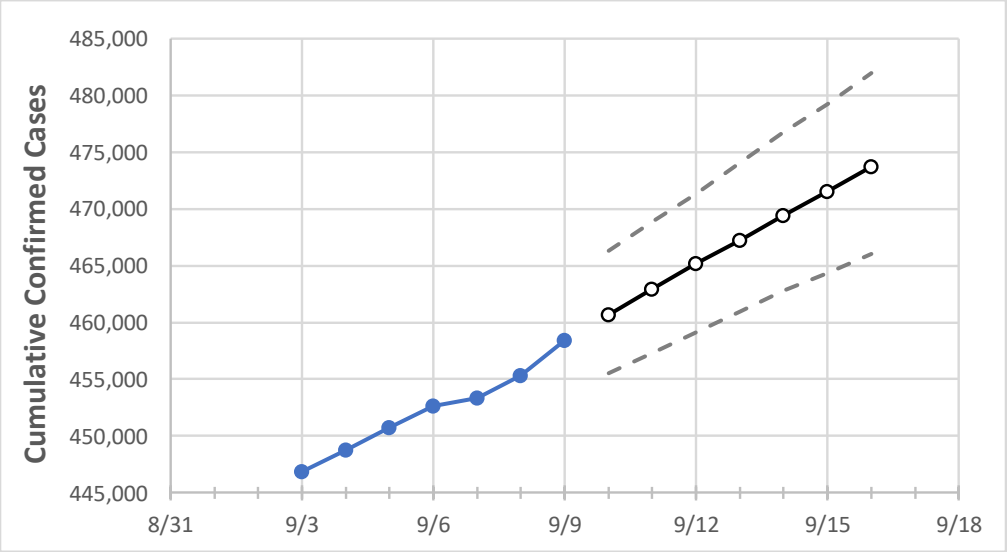
IEM's Modeling Lead

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:						
	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16
Mississippi	452,644	453,348	455,282	458,420	460,694	462,907	465,175	467,200	469,401	471,537	473,672

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:						
	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16
DeSoto	28,381	28,440	28,557	28,734	28,894	29,050	29,211	29,372	29,536	29,698	29,852
Harrison	30,666	30,728	30,897	31,179	31,348	31,507	31,663	31,819	31,980	32,117	32,263
Hinds	29,896	29,947	30,002	30,110	30,232	30,352	30,472	30,583	30,707	30,818	30,942
Jackson	21,932	21,996	22,100	22,341	22,458	22,574	22,687	22,794	22,900	23,013	23,115
Lauderdale	10,939	10,943	10,987	11,042	11,089	11,130	11,176	11,217	11,263	11,306	11,347
Madison	13,607	13,625	13,665	13,756	13,813	13,870	13,925	13,980	14,038	14,096	14,151
Rankin	20,526	20,547	20,597	20,738	20,831	20,920	21,009	21,093	21,179	21,267	21,356

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:											
	9/6	9/7	9/8	9/9	9/11				9/13				9/15			
DeSoto	28,381	28,440	28,557	28,734	29,050	(5,810)	[1,394]	{697}	29,372	(5,874)	[1,410]	{705}	29,698	(5,940)	[1,425]	{713}
Harrison	30,666	30,728	30,897	31,179	31,507	(6,301)	[1,512]	{756}	31,819	(6,364)	[1,527]	{764}	32,117	(6,423)	[1,542]	{771}
Hinds	29,896	29,947	30,002	30,110	30,352	(6,070)	[1,457]	{728}	30,583	(6,117)	[1,468]	{734}	30,818	(6,164)	[1,479]	{740}
Jackson	21,932	21,996	22,100	22,341	22,574	(4,515)	[1,084]	{542}	22,794	(4,559)	[1,094]	{547}	23,013	(4,603)	[1,105]	{552}
Lauderdale	10,939	10,943	10,987	11,042	11,130	(2,226)	[534]	{267}	11,217	(2,243)	[538]	{269}	11,306	(2,261)	[543]	{271}
Madison	13,607	13,625	13,665	13,756	13,870	(2,774)	[666]	{333}	13,980	(2,796)	[671]	{336}	14,096	(2,819)	[677]	{338}
Rankin	20,526	20,547	20,597	20,738	20,920	(4,184)	[1,004]	{502}	21,093	(4,219)	[1,012]	{506}	21,267	(4,253)	[1,021]	{510}

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.