IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/23/21

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 <u>not</u> 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 8/23/21 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
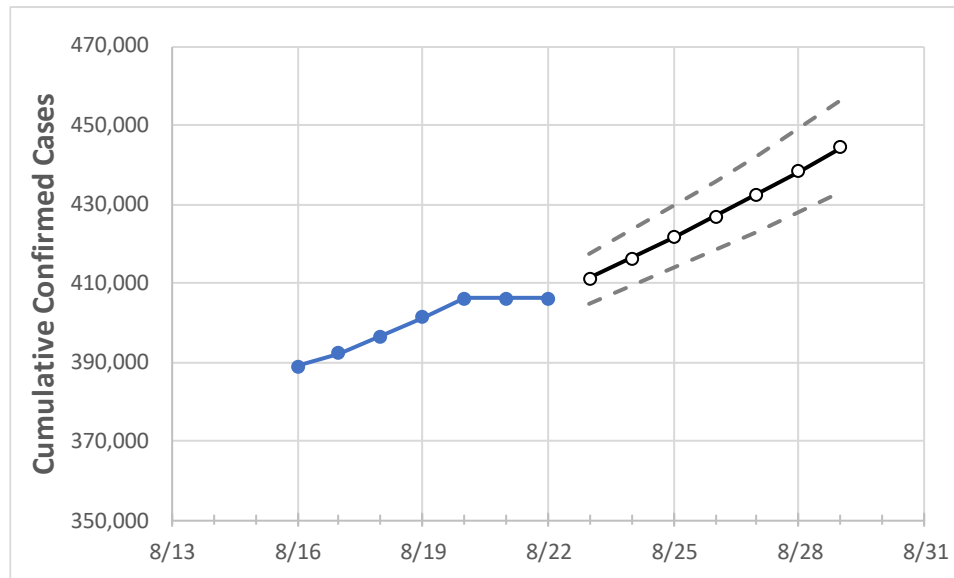
	Actual Confirmed Cases On:				Projected Cases For:						
	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29
Mississippi	401,201	406,249	406,249	406,249	411,119	416,263	421,447	426,901	432,481	438,293	444,321

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:						
	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29
DeSoto	25,456	25,652	25,652	25,652	25,839	26,039	26,240	26,444	26,663	26,884	27,120
Harrison	26,270	26,670	26,670	26,670	27,155	27,650	28,165	28,682	29,217	29,775	30,356
Hinds	27,164	27,441	27,441	27,441	27,636	27,833	28,027	28,229	28,433	28,636	28,841
Jackson	19,114	19,371	19,371	19,371	19,644	19,924	20,204	20,500	20,792	21,095	21,403
Lauderdale	9,735	9,904	9,904	9,904	10,042	10,190	10,342	10,492	10,655	10,815	10,982
Madison	12,335	12,520	12,520	12,520	12,637	12,763	12,888	13,020	13,158	13,302	13,447
Rankin	18,022	18,502	18,502	18,502	18,752	18,999	19,269	19,522	19,798	20,084	20,390

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: | | |
	8/19	8/20	8/21	8/22	8/24	8/26	8/28
DeSoto	25,456	25,652	25,652	25,652	26,039 (5,208) [1,250] {625}	26,444 (5,289) [1,269] {635}	26,884 (5,377) [1,290] {645}
Harrison	26,270	26,670	26,670	26,670	27,650 (5,530) [1,327] {664}	28,682 (5,736) [1,377] {688}	29,775 (5,955) [1,429] {715}
Hinds	27,164	27,441	27,441	27,441	27,833 (5,567) [1,336] {668}	28,229 (5,646) [1,355] {677}	28,636 (5,727) [1,375] {687}
Jackson	19,114	19,371	19,371	19,371	19,924 (3,985) [956] {478}	20,500 (4,100) [984] {492}	21,095 (4,219) [1,013] {506}
Lauderdale	9,735	9,904	9,904	9,904	10,190 (2,038) [489] {245}	10,492 (2,098) [504] {252}	10,815 (2,163) [519] {260}
Madison	12,335	12,520	12,520	12,520	12,763 (2,553) [613] {306}	13,020 (2,604) [625] {312}	13,302 (2,660) [639] {319}
Rankin	18,022	18,502	18,502	18,502	18,999 (3,800) [912] {456}	19,522 (3,904) [937] {469}	20,084 (4,017) [964] {482}

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.