IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/16/21

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 6/16/21 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
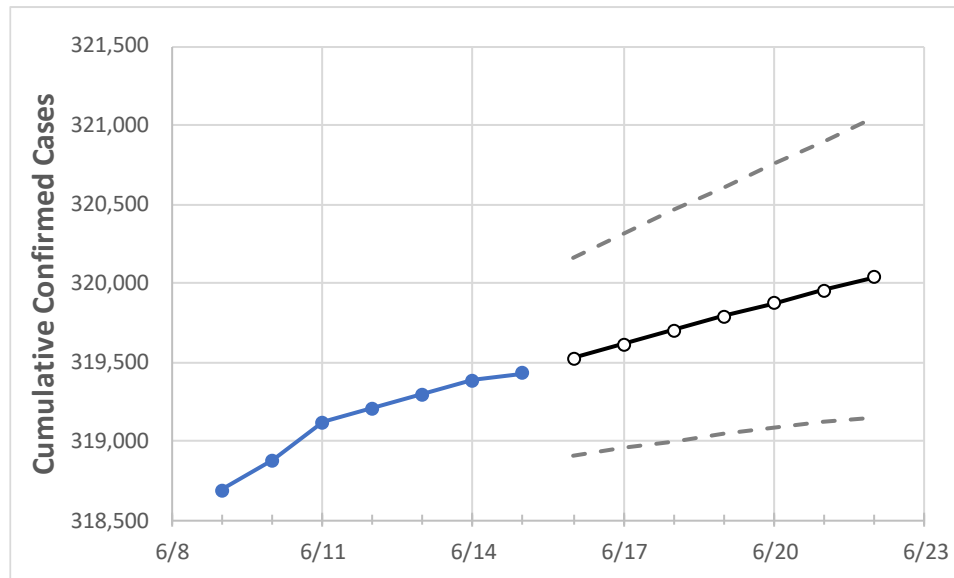
	Actual Confirmed Cases On:				Projected Cases For:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
Mississippi	319,204	319,292	319,381	319,428	319,520	319,611	319,703	319,791	319,870	319,957	320,038

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:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
DeSoto	22,252	22,258	22,264	22,264	22,273	22,282	22,291	22,299	22,308	22,316	22,324
Harrison	18,355	18,368	18,381	18,386	18,400	18,414	18,428	18,443	18,458	18,472	18,486
Hinds	20,619	20,627	20,634	20,645	20,655	20,665	20,675	20,685	20,696	20,706	20,716
Jackson	13,670	13,673	13,677	13,678	13,685	13,693	13,701	13,708	13,716	13,724	13,732
Lauderdale	7,255	7,256	7,257	7,257	7,258	7,260	7,261	7,262	7,264	7,265	7,266
Madison	10,220	10,227	10,234	10,237	10,240	10,244	10,247	10,251	10,254	10,257	10,261
Rankin	13,857	13,860	13,862	13,864	13,868	13,871	13,875	13,878	13,881	13,885	13,888

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: | | |
	6/12	6/13	6/14	6/15	6/17	6/19	6/21
DeSoto	22,252	22,258	22,264	22,264	22,282 (4,456) [1,070] {535}	22,299 (4,460) [1,070] {535}	22,316 (4,463) [1,071] {536}
Harrison	18,355	18,368	18,381	18,386	18,414 (3,683) [884] {442}	18,443 (3,689) [885] {443}	18,472 (3,694) [887] {443}
Hinds	20,619	20,627	20,634	20,645	20,665 (4,133) [992] {496}	20,685 (4,137) [993] {496}	20,706 (4,141) [994] {497}
Jackson	13,670	13,673	13,677	13,678	13,693 (2,739) [657] {329}	13,708 (2,742) [658] {329}	13,724 (2,745) [659] {329}
Lauderdale	7,255	7,256	7,257	7,257	7,260 (1,452) [348] {174}	7,262 (1,452) [349] {174}	7,265 (1,453) [349] {174}
Madison	10,220	10,227	10,234	10,237	10,244 (2,049) [492] {246}	10,251 (2,050) [492] {246}	10,257 (2,051) [492] {246}
Rankin	13,857	13,860	13,862	13,864	13,871 (2,774) [666] {333}	13,878 (2,776) [666] {333}	13,885 (2,777) [666] {333}

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.