IEM's AI Modeling: Short-term COVID-19 Projections
Date: 12/15/21

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 12/15/21 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
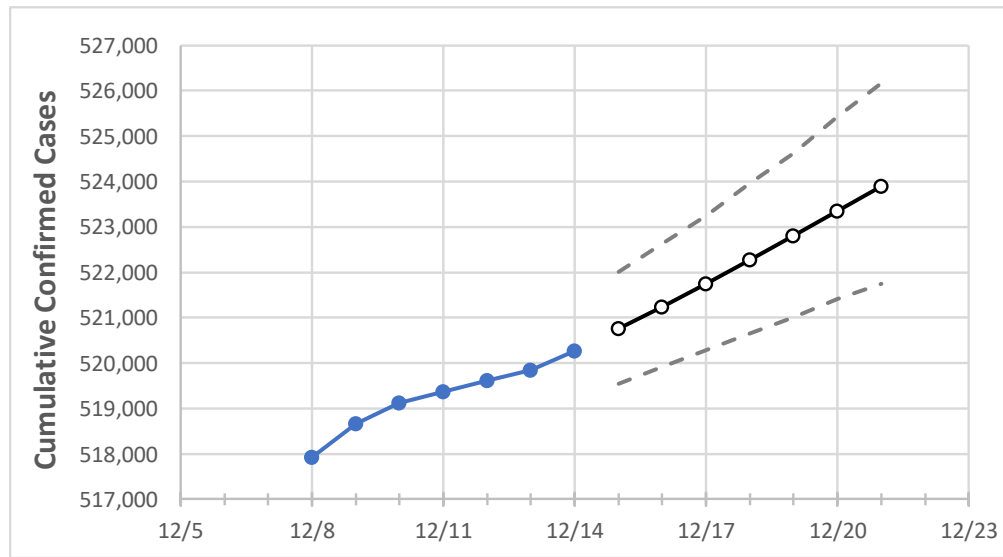
	Actual Confirmed Cases On:				Projected Cases For:						
	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21
Mississippi	519,360	519,606	519,851	520,259	520,752	521,233	521,744	522,271	522,800	523,356	523,895

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:						
	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21
DeSoto	33,707	33,728	33,749	33,780	33,824	33,867	33,912	33,957	34,004	34,053	34,102
Harrison	35,158	35,167	35,175	35,187	35,205	35,224	35,242	35,260	35,279	35,298	35,316
Hinds	32,961	32,980	32,998	33,007	33,037	33,067	33,098	33,130	33,161	33,195	33,228
Jackson	24,994	25,002	25,009	25,017	25,028	25,039	25,050	25,062	25,074	25,086	25,098
Lauderdale	12,397	12,399	12,400	12,408	12,416	12,427	12,435	12,445	12,454	12,463	12,473
Madison	15,055	15,060	15,066	15,077	15,088	15,101	15,112	15,124	15,137	15,150	15,163
Rankin	22,710	22,720	22,731	22,740	22,759	22,776	22,794	22,812	22,832	22,852	22,871

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:		
	12/11	12/12	12/13	12/14	12/16	12/18	12/20
DeSoto	33,707	33,728	33,749	33,780	33,867 (6,773) [1,626] {813}	33,957 (6,791) [1,630] {815}	34,053 (6,811) [1,635] {817}
Harrison	35,158	35,167	35,175	35,187	35,224 (7,045) [1,691] {845}	35,260 (7,052) [1,692] {846}	35,298 (7,060) [1,694] {847}
Hinds	32,961	32,980	32,998	33,007	33,067 (6,613) [1,587] {794}	33,130 (6,626) [1,590] {795}	33,195 (6,639) [1,593] {797}
Jackson	24,994	25,002	25,009	25,017	25,039 (5,008) [1,202] {601}	25,062 (5,012) [1,203] {601}	25,086 (5,017) [1,204] {602}
Lauderdale	12,397	12,399	12,400	12,408	12,427 (2,485) [596] {298}	12,445 (2,489) [597] {299}	12,463 (2,493) [598] {299}
Madison	15,055	15,060	15,066	15,077	15,101 (3,020) [725] {362}	15,124 (3,025) [726] {363}	15,150 (3,030) [727] {364}
Rankin	22,710	22,720	22,731	22,740	22,776 (4,555) [1,093] {547}	22,812 (4,562) [1,095] {547}	22,852 (4,570) [1,097] {548}

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.