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.

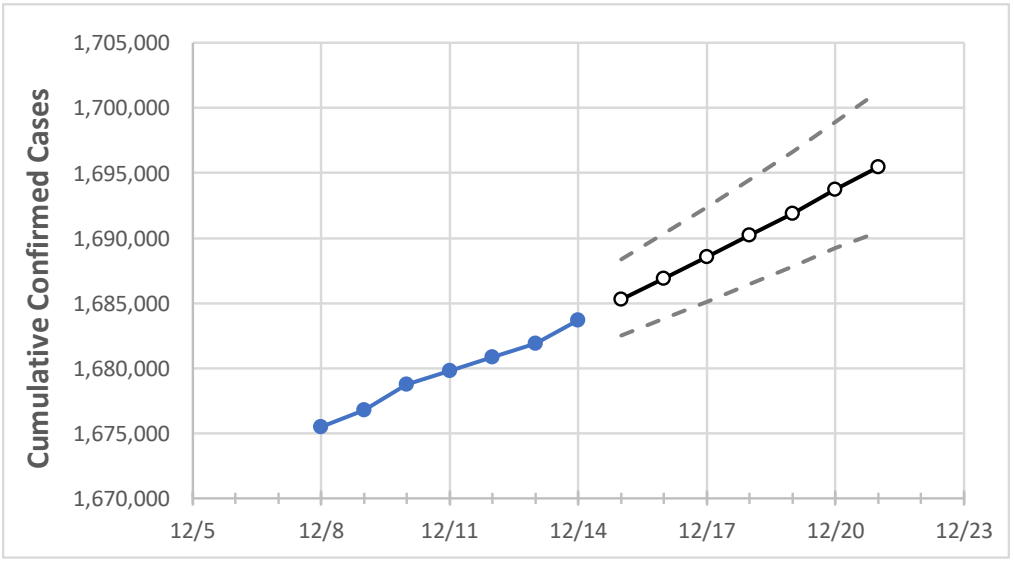
IEM's Modeling Lead

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.

Georgia 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
Georgia	1,679,799	1,680,853	1,681,906	1,683,676	1,685,263	1,686,874	1,688,521	1,690,213	1,691,892	1,693,740	1,695,443

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.

Georgia 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
Bartow	21,076	21,095	21,113	21,138	21,160	21,182	21,205	21,228	21,252	21,276	21,302
Carroll	16,781	16,794	16,807	16,828	16,844	16,859	16,875	16,891	16,907	16,924	16,941
Cherokee	44,966	44,995	45,025	45,089	45,140	45,189	45,242	45,295	45,350	45,407	45,464
Clarke	20,516	20,527	20,539	20,557	20,575	20,593	20,611	20,630	20,650	20,671	20,692
Clayton	40,658	40,687	40,716	40,786	40,846	40,908	40,969	41,035	41,100	41,170	41,242
Cobb	113,252	113,338	113,425	113,538	113,649	113,763	113,877	113,991	114,106	114,227	114,342
DeKalb	94,447	94,507	94,566	94,688	94,796	94,899	95,010	95,118	95,233	95,350	95,472
Dougherty	12,579	12,583	12,588	12,587	12,592	12,597	12,601	12,606	12,611	12,617	12,622
Douglas	22,913	22,932	22,951	22,974	22,999	23,025	23,051	23,078	23,106	23,135	23,165
Fulton	136,351	136,478	136,605	136,771	136,955	137,149	137,342	137,543	137,748	137,961	138,181
Gwinnett	137,883	137,977	138,072	138,249	138,412	138,575	138,741	138,917	139,086	139,275	139,455
Hall	39,553	39,588	39,622	39,676	39,728	39,783	39,836	39,891	39,947	40,005	40,063
Henry	39,366	39,393	39,420	39,472	39,516	39,559	39,603	39,649	39,695	39,741	39,788
Lee	4,827	4,833	4,840	4,846	4,853	4,860	4,868	4,876	4,884	4,893	4,902

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.*

Georgia 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
Bartow	21,076	21,095	21,113	21,138	21,182 (4,236) [1,017] {508}	21,228 (4,246) [1,019] {509}	21,276 (4,255) [1,021] {511}
Carroll	16,781	16,794	16,807	16,828	16,859 (3,372) [809] {405}	16,891 (3,378) [811] {405}	16,924 (3,385) [812] {406}
Cherokee	44,966	44,995	45,025	45,089	45,189 (9,038) [2,169] {1,085}	45,295 (9,059) [2,174] {1,087}	45,407 (9,081) [2,180] {1,090}
Clarke	20,516	20,527	20,539	20,557	20,593 (4,119) [988] {494}	20,630 (4,126) [990] {495}	20,671 (4,134) [992] {496}
Clayton	40,658	40,687	40,716	40,786	40,908 (8,182) [1,964] {982}	41,035 (8,207) [1,970] {985}	41,170 (8,234) [1,976] {988}
Cobb	113,252	113,338	113,425	113,538	113,763 (22,753) [5,461] {2,730}	113,991 (22,798) [5,472] {2,736}	114,227 (22,845) [5,483] {2,741}
DeKalb	94,447	94,507	94,566	94,688	94,899 (18,980) [4,555] {2,278}	95,118 (19,024) [4,566] {2,283}	95,350 (19,070) [4,577] {2,288}
Dougherty	12,579	12,583	12,588	12,587	12,597 (2,519) [605] {302}	12,606 (2,521) [605] {303}	12,617 (2,523) [606] {303}
Douglas	22,913	22,932	22,951	22,974	23,025 (4,605) [1,105] {553}	23,078 (4,616) [1,108] {554}	23,135 (4,627) [1,110] {555}
Fulton	136,351	136,478	136,605	136,771	137,149 (27,430) [6,583] {3,292}	137,543 (27,509) [6,602] {3,301}	137,961 (27,592) [6,622] {3,311}
Gwinnett	137,883	137,977	138,072	138,249	138,575 (27,715) [6,652] {3,326}	138,917 (27,783) [6,668] {3,334}	139,275 (27,855) [6,685] {3,343}
Hall	39,553	39,588	39,622	39,676	39,783 (7,957) [1,910] {955}	39,891 (7,978) [1,915] {957}	40,005 (8,001) [1,920] {960}
Henry	39,366	39,393	39,420	39,472	39,559 (7,912) [1,899] {949}	39,649 (7,930) [1,903] {952}	39,741 (7,948) [1,908] {954}
Lee	4,827	4,833	4,840	4,846	4,860 (972) [233] {117}	4,876 (975) [234] {117}	4,893 (979) [235] {117}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.