IEM's AI Modeling: Short-term COVID-19 Projections
Date: 12/17/21

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 12/17/21 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
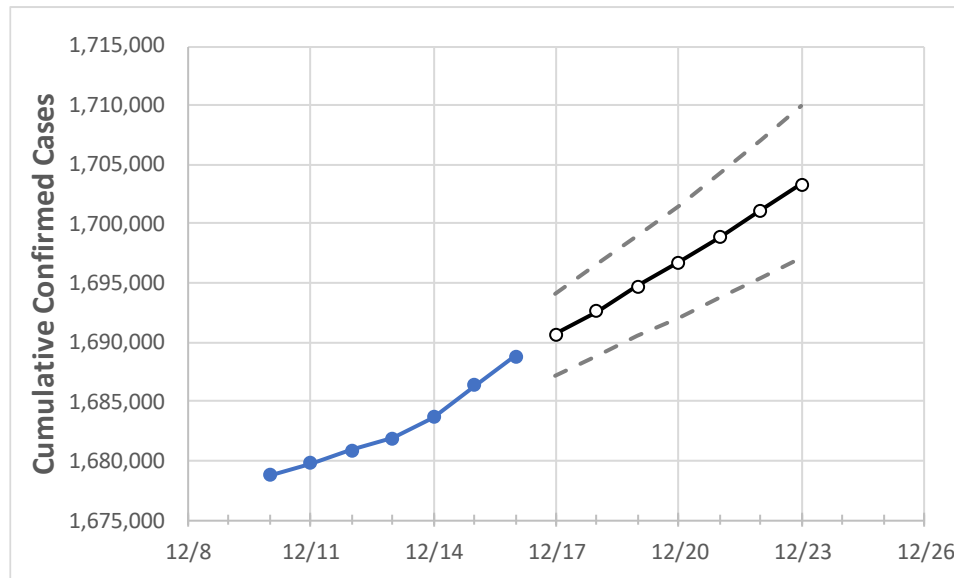
	Actual Confirmed Cases On:				Projected Cases For:						
	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23
Georgia	1,681,906	1,683,676	1,686,332	1,688,806	1,690,671	1,692,608	1,694,694	1,696,741	1,698,862	1,701,101	1,703,353

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:						
	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23
Bartow	21,113	21,138	21,175	21,198	21,224	21,250	21,276	21,304	21,331	21,361	21,390
Carroll	16,807	16,828	16,847	16,869	16,887	16,904	16,922	16,941	16,960	16,979	16,998
Cherokee	45,025	45,089	45,149	45,195	45,247	45,300	45,356	45,413	45,469	45,531	45,591
Clarke	20,539	20,557	20,570	20,590	20,609	20,627	20,646	20,666	20,687	20,708	20,730
Clayton	40,716	40,786	40,914	41,008	41,084	41,164	41,246	41,331	41,417	41,510	41,603
Cobb	113,425	113,538	113,806	114,016	114,164	114,304	114,453	114,604	114,763	114,925	115,088
DeKalb	94,566	94,688	94,976	95,212	95,369	95,533	95,702	95,873	96,051	96,247	96,449
Dougherty	12,588	12,587	12,588	12,593	12,598	12,602	12,606	12,611	12,616	12,621	12,625
Douglas	22,951	22,974	23,007	23,048	23,078	23,109	23,139	23,172	23,206	23,240	23,276
Fulton	136,605	136,771	137,244	137,659	137,936	138,212	138,511	138,807	139,144	139,479	139,829
Gwinnett	138,072	138,249	138,477	138,755	138,944	139,139	139,336	139,549	139,750	139,968	140,199
Hall	39,622	39,676	39,730	39,764	39,815	39,867	39,918	39,971	40,027	40,081	40,137
Henry	39,420	39,472	39,542	39,599	39,648	39,698	39,749	39,800	39,853	39,908	39,962
Lee	4,840	4,846	4,848	4,854	4,860	4,867	4,874	4,881	4,889	4,897	4,905

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

	\multicolumn{4}{c}{Actual Confirmed Cases On:}	\multicolumn{3}{c}{Projected Cases (Hospitalized) [ICU] {Ventilator} For:}
	12/13	12/14	12/15	12/16	12/18	12/20	12/22
Bartow	21,113	21,138	21,175	21,198	21,250 (4,250) [1,020] {510}	21,304 (4,261) [1,023] {511}	21,361 (4,272) [1,025] {513}
Carroll	16,807	16,828	16,847	16,869	16,904 (3,381) [811] {406}	16,941 (3,388) [813] {407}	16,979 (3,396) [815] {408}
Cherokee	45,025	45,089	45,149	45,195	45,300 (9,060) [2,174] {1,087}	45,413 (9,083) [2,180] {1,090}	45,531 (9,106) [2,185] {1,093}
Clarke	20,539	20,557	20,570	20,590	20,627 (4,125) [990] {495}	20,666 (4,133) [992] {496}	20,708 (4,142) [994] {497}
Clayton	40,716	40,786	40,914	41,008	41,164 (8,233) [1,976] {988}	41,331 (8,266) [1,984] {992}	41,510 (8,302) [1,992] {996}
Cobb	113,425	113,538	113,806	114,016	114,304 (22,861) [5,487] {2,743}	114,604 (22,921) [5,501] {2,751}	114,925 (22,985) [5,516] {2,758}
DeKalb	94,566	94,688	94,976	95,212	95,533 (19,107) [4,586] {2,293}	95,873 (19,175) [4,602] {2,301}	96,247 (19,249) [4,620] {2,310}
Dougherty	12,588	12,587	12,588	12,593	12,602 (2,520) [605] {302}	12,611 (2,522) [605] {303}	12,621 (2,524) [606] {303}
Douglas	22,951	22,974	23,007	23,048	23,109 (4,622) [1,109] {555}	23,172 (4,634) [1,112] {556}	23,240 (4,648) [1,116] {558}
Fulton	136,605	136,771	137,244	137,659	138,212 (27,642) [6,634] {3,317}	138,807 (27,761) [6,663] {3,331}	139,479 (27,896) [6,695] {3,348}
Gwinnett	138,072	138,249	138,477	138,755	139,139 (27,828) [6,679] {3,339}	139,549 (27,910) [6,698] {3,349}	139,968 (27,994) [6,718] {3,359}
Hall	39,622	39,676	39,730	39,764	39,867 (7,973) [1,914] {957}	39,971 (7,994) [1,919] {959}	40,081 (8,016) [1,924] {962}
Henry	39,420	39,472	39,542	39,599	39,698 (7,940) [1,905] {953}	39,800 (7,960) [1,910] {955}	39,908 (7,982) [1,916] {958}
Lee	4,840	4,846	4,848	4,854	4,867 (973) [234] {117}	4,881 (976) [234] {117}	4,897 (979) [235] {118}

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.