IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/25/21

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 10/25/21 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
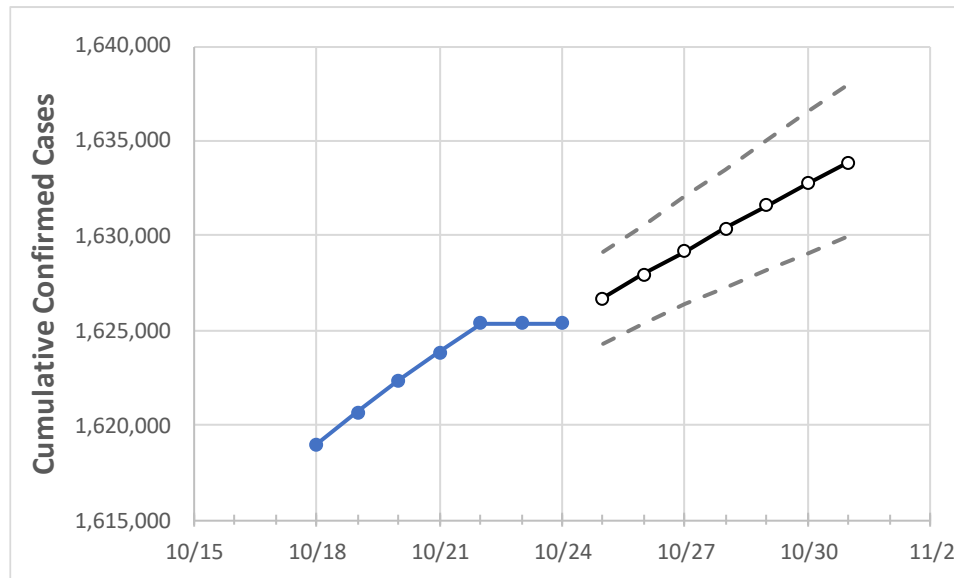
	Actual Confirmed Cases On:				Projected Cases For:						
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31
Georgia	1,623,863	1,625,399	1,625,399	1,625,399	1,626,695	1,627,953	1,629,197	1,630,378	1,631,580	1,632,737	1,633,888

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:						
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31
Bartow	20,286	20,296	20,296	20,296	20,307	20,318	20,328	20,338	20,347	20,356	20,365
Carroll	16,293	16,306	16,306	16,306	16,314	16,322	16,330	16,337	16,344	16,352	16,359
Cherokee	43,128	43,151	43,151	43,151	43,177	43,203	43,227	43,251	43,275	43,297	43,320
Clarke	19,943	19,956	19,956	19,956	19,968	19,981	19,993	20,005	20,017	20,029	20,040
Clayton	38,995	39,029	39,029	39,029	39,061	39,092	39,123	39,153	39,180	39,207	39,236
Cobb	108,446	108,543	108,543	108,543	108,641	108,740	108,839	108,938	109,037	109,135	109,232
DeKalb	90,829	90,928	90,928	90,928	91,000	91,072	91,143	91,208	91,275	91,337	91,401
Dougherty	12,338	12,351	12,351	12,351	12,362	12,372	12,381	12,391	12,400	12,410	12,418
Douglas	22,151	22,173	22,173	22,173	22,187	22,202	22,215	22,229	22,241	22,254	22,266
Fulton	131,151	131,261	131,261	131,261	131,345	131,427	131,508	131,587	131,660	131,732	131,805
Gwinnett	132,266	132,410	132,410	132,410	132,503	132,603	132,684	132,770	132,852	132,934	133,009
Hall	37,662	37,726	37,726	37,726	37,776	37,826	37,876	37,926	37,976	38,024	38,074
Henry	37,793	37,843	37,843	37,843	37,876	37,908	37,942	37,973	38,004	38,035	38,064
Lee	4,657	4,667	4,667	4,667	4,675	4,683	4,691	4,698	4,707	4,715	4,724

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:		
	10/21	10/22	10/23	10/24	10/26	10/28	10/30
Bartow	20,286	20,296	20,296	20,296	20,318 (4,064) [975] {488}	20,338 (4,068) [976] {488}	20,356 (4,071) [977] {489}
Carroll	16,293	16,306	16,306	16,306	16,322 (3,264) [783] {392}	16,337 (3,267) [784] {392}	16,352 (3,270) [785] {392}
Cherokee	43,128	43,151	43,151	43,151	43,203 (8,641) [2,074] {1,037}	43,251 (8,650) [2,076] {1,038}	43,297 (8,659) [2,078] {1,039}
Clarke	19,943	19,956	19,956	19,956	19,981 (3,996) [959] {480}	20,005 (4,001) [960] {480}	20,029 (4,006) [961] {481}
Clayton	38,995	39,029	39,029	39,029	39,092 (7,818) [1,876] {938}	39,153 (7,831) [1,879] {940}	39,207 (7,841) [1,882] {941}
Cobb	108,446	108,543	108,543	108,543	108,740 (21,748) [5,220] {2,610}	108,938 (21,788) [5,229] {2,615}	109,135 (21,827) [5,238] {2,619}
DeKalb	90,829	90,928	90,928	90,928	91,072 (18,214) [4,371] {2,186}	91,208 (18,242) [4,378] {2,189}	91,337 (18,267) [4,384] {2,192}
Dougherty	12,338	12,351	12,351	12,351	12,372 (2,474) [594] {297}	12,391 (2,478) [595] {297}	12,410 (2,482) [596] {298}
Douglas	22,151	22,173	22,173	22,173	22,202 (4,440) [1,066] {533}	22,229 (4,446) [1,067] {533}	22,254 (4,451) [1,068] {534}
Fulton	131,151	131,261	131,261	131,261	131,427 (26,285) [6,309] {3,154}	131,587 (26,317) [6,316] {3,158}	131,732 (26,346) [6,323] {3,162}
Gwinnett	132,266	132,410	132,410	132,410	132,603 (26,521) [6,365] {3,182}	132,770 (26,554) [6,373] {3,186}	132,934 (26,587) [6,381] {3,190}
Hall	37,662	37,726	37,726	37,726	37,826 (7,565) [1,816] {908}	37,926 (7,585) [1,820] {910}	38,024 (7,605) [1,825] {913}
Henry	37,793	37,843	37,843	37,843	37,908 (7,582) [1,820] {910}	37,973 (7,595) [1,823] {911}	38,035 (7,607) [1,826] {913}
Lee	4,657	4,667	4,667	4,667	4,683 (937) [225] {112}	4,698 (940) [226] {113}	4,715 (943) [226] {113}

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.