IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/29/21

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 10/29/21 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
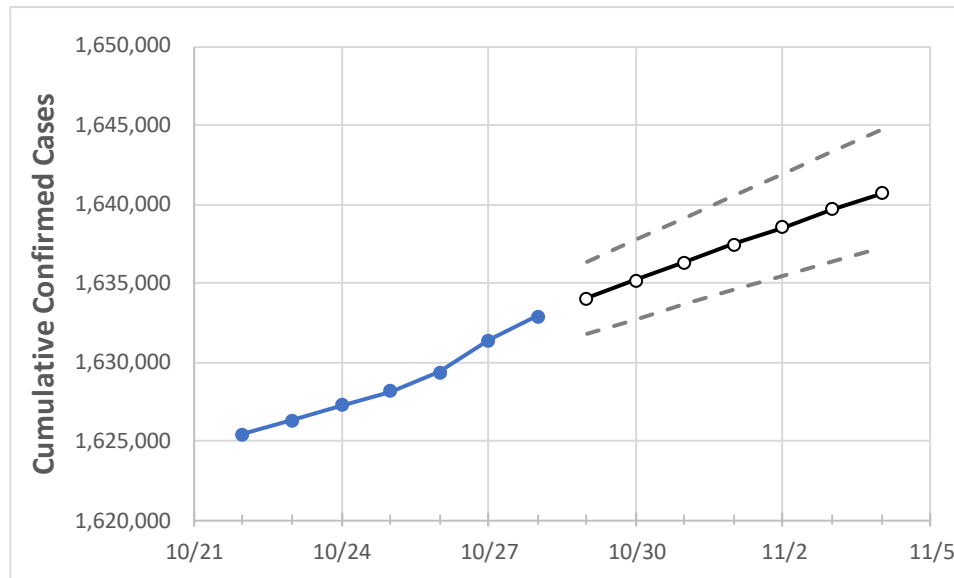
	Actual Confirmed Cases On:				Projected Cases For:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Georgia	1,628,166	1,629,337	1,631,348	1,632,870	1,634,051	1,635,186	1,636,330	1,637,466	1,638,537	1,639,652	1,640,701

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Bartow	20,331	20,346	20,376	20,394	20,406	20,419	20,431	20,443	20,454	20,465	20,476
Carroll	16,329	16,332	16,339	16,348	16,355	16,363	16,369	16,376	16,383	16,390	16,397
Cherokee	43,220	43,240	43,745	43,784	43,855	43,920	43,983	44,055	44,121	44,212	44,265
Clarke	19,983	19,986	19,999	20,009	20,019	20,029	20,039	20,048	20,058	20,067	20,076
Clayton	39,107	39,138	39,171	39,231	39,261	39,290	39,318	39,347	39,375	39,403	39,429
Cobb	108,763	108,843	109,032	109,125	109,213	109,299	109,386	109,471	109,557	109,641	109,725
DeKalb	91,103	91,179	91,217	91,356	91,420	91,484	91,544	91,606	91,660	91,721	91,776
Dougherty	12,368	12,378	12,384	12,388	12,395	12,402	12,409	12,415	12,421	12,427	12,433
Douglas	22,193	22,201	22,213	22,241	22,253	22,264	22,275	22,285	22,296	22,306	22,315
Fulton	131,476	131,559	131,658	131,781	131,859	131,937	132,010	132,083	132,156	132,227	132,294
Gwinnett	132,598	132,737	132,879	133,024	133,108	133,197	133,275	133,359	133,439	133,513	133,584
Hall	37,806	37,848	37,893	37,942	37,984	38,023	38,060	38,100	38,138	38,177	38,212
Henry	37,954	37,975	38,020	38,081	38,117	38,153	38,188	38,224	38,259	38,296	38,330
Lee	4,675	4,676	4,680	4,682	4,687	4,692	4,697	4,702	4,707	4,712	4,717

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:		
	10/25	10/26	10/27	10/28	10/30	11/1	11/3
Bartow	20,331	20,346	20,376	20,394	20,419 (4,084) [980] {490}	20,443 (4,089) [981] {491}	20,465 (4,093) [982] {491}
Carroll	16,329	16,332	16,339	16,348	16,363 (3,273) [785] {393}	16,376 (3,275) [786] {393}	16,390 (3,278) [787] {393}
Cherokee	43,220	43,240	43,745	43,784	43,920 (8,784) [2,108] {1,054}	44,055 (8,811) [2,115] {1,057}	44,212 (8,842) [2,122] {1,061}
Clarke	19,983	19,986	19,999	20,009	20,029 (4,006) [961] {481}	20,048 (4,010) [962] {481}	20,067 (4,013) [963] {482}
Clayton	39,107	39,138	39,171	39,231	39,290 (7,858) [1,886] {943}	39,347 (7,869) [1,889] {944}	39,403 (7,881) [1,891] {946}
Cobb	108,763	108,843	109,032	109,125	109,299 (21,860) [5,246] {2,623}	109,471 (21,894) [5,255] {2,627}	109,641 (21,928) [5,263] {2,631}
DeKalb	91,103	91,179	91,217	91,356	91,484 (18,297) [4,391] {2,196}	91,606 (18,321) [4,397] {2,199}	91,721 (18,344) [4,403] {2,201}
Dougherty	12,368	12,378	12,384	12,388	12,402 (2,480) [595] {298}	12,415 (2,483) [596] {298}	12,427 (2,485) [597] {298}
Douglas	22,193	22,201	22,213	22,241	22,264 (4,453) [1,069] {534}	22,285 (4,457) [1,070] {535}	22,306 (4,461) [1,071] {535}
Fulton	131,476	131,559	131,658	131,781	131,937 (26,387) [6,333] {3,166}	132,083 (26,417) [6,340] {3,170}	132,227 (26,445) [6,347] {3,173}
Gwinnett	132,598	132,737	132,879	133,024	133,197 (26,639) [6,393] {3,197}	133,359 (26,672) [6,401] {3,201}	133,513 (26,703) [6,409] {3,204}
Hall	37,806	37,848	37,893	37,942	38,023 (7,605) [1,825] {913}	38,100 (7,620) [1,829] {914}	38,177 (7,635) [1,833] {916}
Henry	37,954	37,975	38,020	38,081	38,153 (7,631) [1,831] {916}	38,224 (7,645) [1,835] {917}	38,296 (7,659) [1,838] {919}
Lee	4,675	4,676	4,680	4,682	4,692 (938) [225] {113}	4,702 (940) [226] {113}	4,712 (942) [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.