IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/11/21

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 8/11/21 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
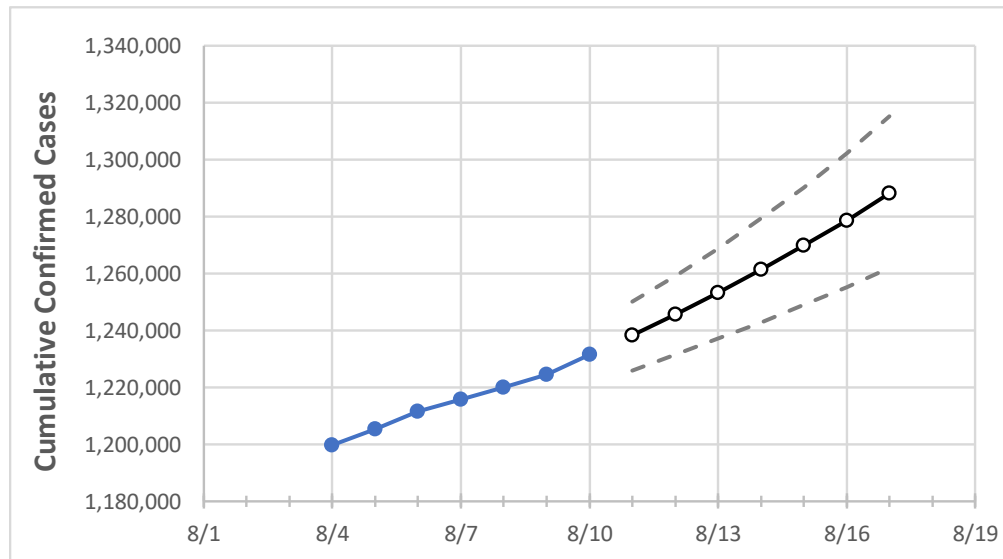
	Actual Confirmed Cases On:				Projected Cases For:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Georgia	1,215,786	1,220,133	1,224,480	1,231,425	1,238,274	1,245,558	1,253,237	1,261,363	1,269,789	1,278,728	1,288,105

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Bartow	15,729	15,770	15,810	15,854	15,901	15,950	16,000	16,052	16,105	16,161	16,220
Carroll	12,460	12,515	12,569	12,635	12,707	12,784	12,864	12,950	13,041	13,136	13,237
Cherokee	33,206	33,313	33,420	33,601	33,752	33,917	34,092	34,279	34,480	34,696	34,925
Clarke	15,906	15,950	15,993	16,032	16,089	16,149	16,213	16,280	16,351	16,425	16,504
Clayton	29,532	29,628	29,723	29,831	29,964	30,105	30,250	30,401	30,557	30,724	30,897
Cobb	85,099	85,350	85,601	85,902	86,243	86,604	86,986	87,377	87,792	88,228	88,690
DeKalb	71,605	71,829	72,054	72,397	72,749	73,125	73,526	73,944	74,400	74,874	75,379
Dougherty	8,344	8,387	8,429	8,464	8,522	8,586	8,653	8,725	8,803	8,886	8,974
Douglas	16,750	16,800	16,850	16,947	17,029	17,113	17,201	17,295	17,392	17,496	17,604
Fulton	106,039	106,403	106,767	107,186	107,690	108,227	108,786	109,364	109,981	110,629	111,313
Gwinnett	107,790	108,014	108,238	108,585	108,905	109,239	109,593	109,964	110,361	110,773	111,206
Hall	28,978	29,039	29,099	29,212	29,307	29,406	29,513	29,626	29,746	29,871	30,003
Henry	28,118	28,232	28,347	28,499	28,646	28,800	28,961	29,126	29,299	29,486	29,676
Lee	3,118	3,130	3,143	3,170	3,200	3,231	3,263	3,298	3,335	3,375	3,416

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:		
	8/7	8/8	8/9	8/10	8/12	8/14	8/16
Bartow	15,729	15,770	15,810	15,854	15,950 (3,190) [766] {383}	16,052 (3,210) [770] {385}	16,161 (3,232) [776] {388}
Carroll	12,460	12,515	12,569	12,635	12,784 (2,557) [614] {307}	12,950 (2,590) [622] {311}	13,136 (2,627) [631] {315}
Cherokee	33,206	33,313	33,420	33,601	33,917 (6,783) [1,628] {814}	34,279 (6,856) [1,645] {823}	34,696 (6,939) [1,665] {833}
Clarke	15,906	15,950	15,993	16,032	16,149 (3,230) [775] {388}	16,280 (3,256) [781] {391}	16,425 (3,285) [788] {394}
Clayton	29,532	29,628	29,723	29,831	30,105 (6,021) [1,445] {723}	30,401 (6,080) [1,459] {730}	30,724 (6,145) [1,475] {737}
Cobb	85,099	85,350	85,601	85,902	86,604 (17,321) [4,157] {2,079}	87,377 (17,475) [4,194] {2,097}	88,228 (17,646) [4,235] {2,117}
DeKalb	71,605	71,829	72,054	72,397	73,125 (14,625) [3,510] {1,755}	73,944 (14,789) [3,549] {1,775}	74,874 (14,975) [3,594] {1,797}
Dougherty	8,344	8,387	8,429	8,464	8,586 (1,717) [412] {206}	8,725 (1,745) [419] {209}	8,886 (1,777) [427] {213}
Douglas	16,750	16,800	16,850	16,947	17,113 (3,423) [821] {411}	17,295 (3,459) [830] {415}	17,496 (3,499) [840] {420}
Fulton	106,039	106,403	106,767	107,186	108,227 (21,645) [5,195] {2,597}	109,364 (21,873) [5,249] {2,625}	110,629 (22,126) [5,310] {2,655}
Gwinnett	107,790	108,014	108,238	108,585	109,239 (21,848) [5,243] {2,622}	109,964 (21,993) [5,278] {2,639}	110,773 (22,155) [5,317] {2,659}
Hall	28,978	29,039	29,099	29,212	29,406 (5,881) [1,411] {706}	29,626 (5,925) [1,422] {711}	29,871 (5,974) [1,434] {717}
Henry	28,118	28,232	28,347	28,499	28,800 (5,760) [1,382] {691}	29,126 (5,825) [1,398] {699}	29,486 (5,897) [1,415] {708}
Lee	3,118	3,130	3,143	3,170	3,231 (646) [155] {78}	3,298 (660) [158] {79}	3,375 (675) [162] {81}

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.