IEM's AI Modeling: Short-term COVID-19 Projections
Date: 12/22/20

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 12/22/20 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
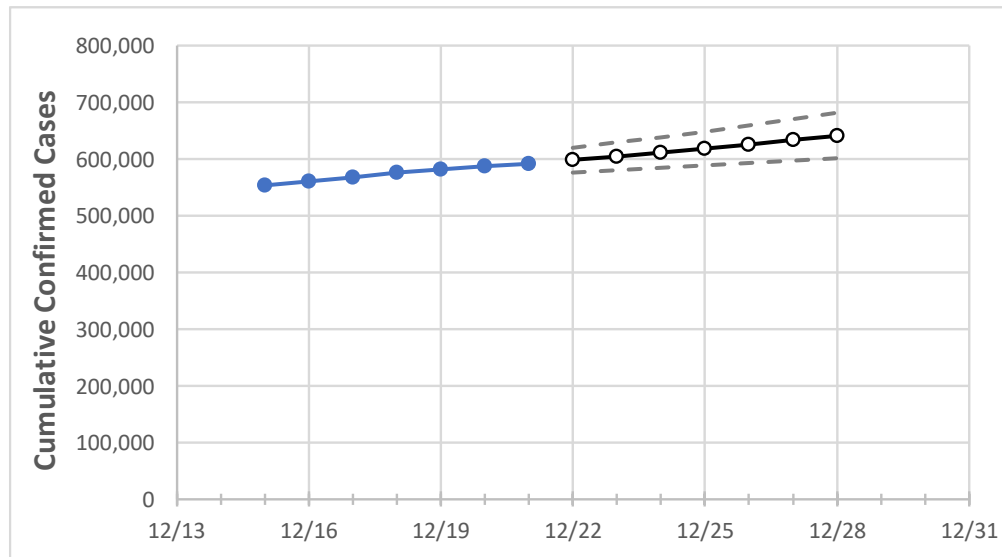
	Actual Confirmed Cases On:				Projected Cases For:						
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Georgia	576,537	582,300	587,918	591,438	598,114	604,919	611,853	618,917	626,112	633,441	640,903

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 20%, and are often within 10%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Bartow	6,703	6,780	6,830	6,881	6,979	7,079	7,181	7,285	7,390	7,498	7,608
Carroll	6,866	6,904	6,943	6,978	7,036	7,094	7,152	7,209	7,265	7,321	7,377
Cherokee	13,562	13,741	13,913	13,991	14,178	14,370	14,565	14,765	14,969	15,176	15,388
Clarke	9,224	9,286	9,337	9,389	9,459	9,530	9,602	9,674	9,747	9,821	9,895
Clayton	12,761	12,863	12,960	13,012	13,142	13,273	13,406	13,539	13,674	13,809	13,946
Cobb	37,583	38,123	38,585	38,829	39,372	39,931	40,504	41,092	41,696	42,317	42,953
DeKalb	33,361	33,717	34,026	34,143	34,457	34,771	35,086	35,402	35,719	36,036	36,354
Dougherty	4,331	4,341	4,375	4,385	4,417	4,450	4,483	4,516	4,550	4,584	4,619
Douglas	7,158	7,228	7,350	7,404	7,493	7,584	7,676	7,768	7,863	7,958	8,055
Fulton	49,716	50,078	50,599	50,890	51,422	51,959	52,503	53,053	53,608	54,169	54,737
Gwinnett	49,541	50,023	50,561	50,824	51,385	51,948	52,514	53,083	53,654	54,227	54,803
Hall	15,963	16,211	16,304	16,420	16,630	16,845	17,066	17,293	17,525	17,763	18,007
Henry	11,251	11,404	11,531	11,621	11,783	11,948	12,116	12,287	12,461	12,638	12,818
Lee	1,274	1,286	1,294	1,304	1,320	1,337	1,354	1,371	1,389	1,407	1,426

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:		
	12/18	12/19	12/20	12/21	12/23	12/25	12/27
Bartow	6,703	6,780	6,830	6,881	7,079 (1,416) [340] {170}	7,285 (1,457) [350] {175}	7,498 (1,500) [360] {180}
Carroll	6,866	6,904	6,943	6,978	7,094 (1,419) [341] {170}	7,209 (1,442) [346] {173}	7,321 (1,464) [351] {176}
Cherokee	13,562	13,741	13,913	13,991	14,370 (2,874) [690] {345}	14,765 (2,953) [709] {354}	15,176 (3,035) [728] {364}
Clarke	9,224	9,286	9,337	9,389	9,530 (1,906) [457] {229}	9,674 (1,935) [464] {232}	9,821 (1,964) [471] {236}
Clayton	12,761	12,863	12,960	13,012	13,273 (2,655) [637] {319}	13,539 (2,708) [650] {325}	13,809 (2,762) [663] {331}
Cobb	37,583	38,123	38,585	38,829	39,931 (7,986) [1,917] {958}	41,092 (8,218) [1,972] {986}	42,317 (8,463) [2,031] {1,016}
DeKalb	33,361	33,717	34,026	34,143	34,771 (6,954) [1,669] {835}	35,402 (7,080) [1,699] {850}	36,036 (7,207) [1,730] {865}
Dougherty	4,331	4,341	4,375	4,385	4,450 (890) [214] {107}	4,516 (903) [217] {108}	4,584 (917) [220] {110}
Douglas	7,158	7,228	7,350	7,404	7,584 (1,517) [364] {182}	7,768 (1,554) [373] {186}	7,958 (1,592) [382] {191}
Fulton	49,716	50,078	50,599	50,890	51,959 (10,392) [2,494] {1,247}	53,053 (10,611) [2,547] {1,273}	54,169 (10,834) [2,600] {1,300}
Gwinnett	49,541	50,023	50,561	50,824	51,948 (10,390) [2,494] {1,247}	53,083 (10,617) [2,548] {1,274}	54,227 (10,845) [2,603] {1,301}
Hall	15,963	16,211	16,304	16,420	16,845 (3,369) [809] {404}	17,293 (3,459) [830] {415}	17,763 (3,553) [853] {426}
Henry	11,251	11,404	11,531	11,621	11,948 (2,390) [574] {287}	12,287 (2,457) [590] {295}	12,638 (2,528) [607] {303}
Lee	1,274	1,286	1,294	1,304	1,337 (267) [64] {32}	1,371 (274) [66] {33}	1,407 (281) [68] {34}

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.