IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/2/21

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 2/2/21 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
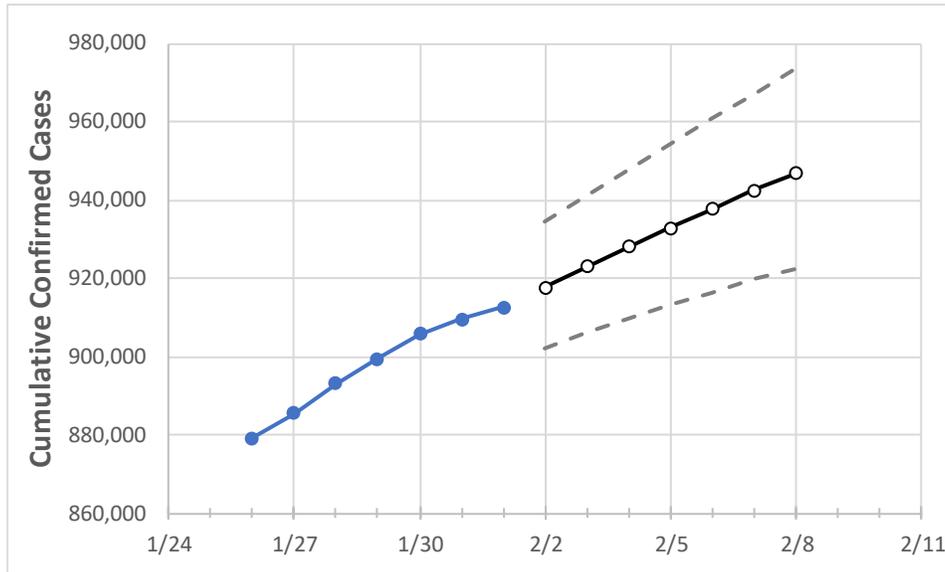
	Actual Confirmed Cases On:				Projected Cases For:						
	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8
Georgia	899,515	905,858	909,445	912,479	917,688	922,887	927,953	932,756	937,731	942,341	946,835

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:						
	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8
Bartow	11,107	11,195	11,249	11,292	11,370	11,447	11,522	11,596	11,671	11,744	11,816
Carroll	9,521	9,581	9,614	9,646	9,704	9,760	9,815	9,870	9,924	9,978	10,033
Cherokee	23,903	24,096	24,211	24,291	24,451	24,607	24,755	24,906	25,053	25,190	25,333
Clarke	12,947	13,011	13,054	13,080	13,150	13,217	13,282	13,347	13,411	13,473	13,530
Clayton	19,449	19,589	19,700	19,768	19,912	20,048	20,184	20,316	20,449	20,585	20,721
Cobb	61,976	62,440	62,694	62,974	63,383	63,787	64,168	64,548	64,921	65,286	65,634
DeKalb	50,687	51,063	51,275	51,476	51,771	52,062	52,345	52,630	52,913	53,185	53,446
Dougherty	6,568	6,594	6,613	6,623	6,664	6,707	6,747	6,788	6,828	6,869	6,908
Douglas	11,549	11,659	11,746	11,818	11,911	12,005	12,095	12,186	12,277	12,365	12,452
Fulton	76,471	77,020	77,344	77,629	78,080	78,527	78,968	79,402	79,814	80,228	80,608
Gwinnett	82,359	83,090	83,370	83,675	84,303	84,928	85,533	86,120	86,710	87,282	87,825
Hall	23,764	23,868	23,916	23,954	24,076	24,192	24,306	24,413	24,516	24,626	24,720
Henry	18,893	19,032	19,121	19,197	19,339	19,480	19,617	19,753	19,887	20,012	20,140
Lee	2,364	2,379	2,385	2,389	2,409	2,428	2,446	2,465	2,482	2,499	2,516

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:		
	1/29	1/30	1/31	2/1	2/3	2/5	2/7
Bartow	11,107	11,195	11,249	11,292	11,447 (2,289) [549] {275}	11,596 (2,319) [557] {278}	11,744 (2,349) [564] {282}
Carroll	9,521	9,581	9,614	9,646	9,760 (1,952) [468] {234}	9,870 (1,974) [474] {237}	9,978 (1,996) [479] {239}
Cherokee	23,903	24,096	24,211	24,291	24,607 (4,921) [1,181] {591}	24,906 (4,981) [1,195] {598}	25,190 (5,038) [1,209] {605}
Clarke	12,947	13,011	13,054	13,080	13,217 (2,643) [634] {317}	13,347 (2,669) [641] {320}	13,473 (2,695) [647] {323}
Clayton	19,449	19,589	19,700	19,768	20,048 (4,010) [962] {481}	20,316 (4,063) [975] {488}	20,585 (4,117) [988] {494}
Cobb	61,976	62,440	62,694	62,974	63,787 (12,757) [3,062] {1,531}	64,548 (12,910) [3,098] {1,549}	65,286 (13,057) [3,134] {1,567}
DeKalb	50,687	51,063	51,275	51,476	52,062 (10,412) [2,499] {1,249}	52,630 (10,526) [2,526] {1,263}	53,185 (10,637) [2,553] {1,276}
Dougherty	6,568	6,594	6,613	6,623	6,707 (1,341) [322] {161}	6,788 (1,358) [326] {163}	6,869 (1,374) [330] {165}
Douglas	11,549	11,659	11,746	11,818	12,005 (2,401) [576] {288}	12,186 (2,437) [585] {292}	12,365 (2,473) [594] {297}
Fulton	76,471	77,020	77,344	77,629	78,527 (15,705) [3,769] {1,885}	79,402 (15,880) [3,811] {1,906}	80,228 (16,046) [3,851] {1,925}
Gwinnett	82,359	83,090	83,370	83,675	84,928 (16,986) [4,077] {2,038}	86,120 (17,224) [4,134] {2,067}	87,282 (17,456) [4,190] {2,095}
Hall	23,764	23,868	23,916	23,954	24,192 (4,838) [1,161] {581}	24,413 (4,883) [1,172] {586}	24,626 (4,925) [1,182] {591}
Henry	18,893	19,032	19,121	19,197	19,480 (3,896) [935] {468}	19,753 (3,951) [948] {474}	20,012 (4,002) [961] {480}
Lee	2,364	2,379	2,385	2,389	2,428 (486) [117] {58}	2,465 (493) [118] {59}	2,499 (500) [120] {60}

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.