IEM's AI Modeling: Short-term COVID-19 Projections
Date: 11/3/20

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 11/3/20 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
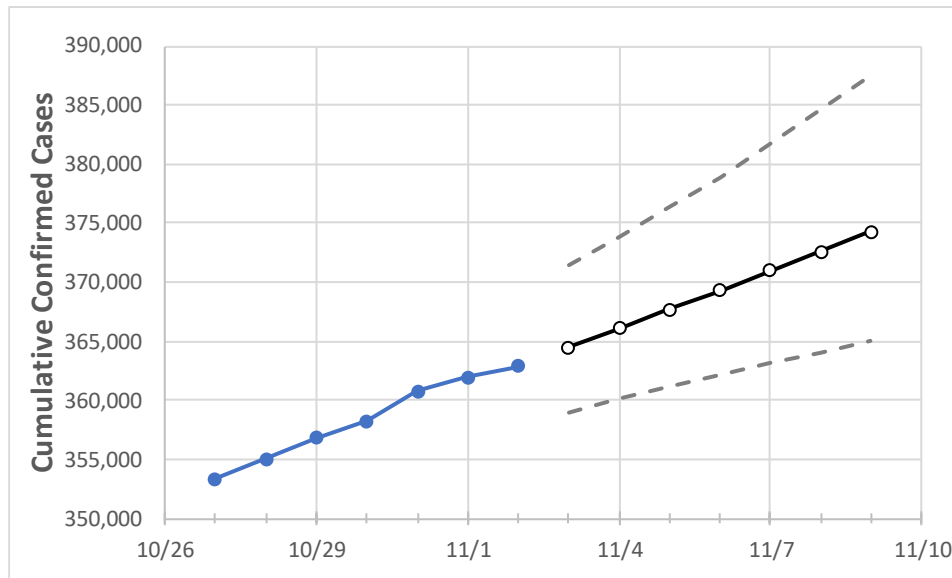
	Actual Confirmed Cases On:				Projected Cases For:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Georgia	358,225	360,790	361,982	362,921	364,492	366,080	367,686	369,310	370,952	372,612	374,292

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:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Bartow	3,689	3,714	3,716	3,717	3,728	3,738	3,748	3,758	3,767	3,776	3,785
Carroll	3,370	3,417	3,428	3,442	3,456	3,469	3,482	3,495	3,508	3,521	3,534
Cherokee	7,242	7,318	7,364	7,386	7,426	7,466	7,507	7,548	7,589	7,632	7,674
Clarke	5,809	5,848	5,865	5,877	5,898	5,919	5,940	5,961	5,983	6,004	6,026
Clayton	8,362	8,417	8,467	8,485	8,525	8,564	8,604	8,643	8,682	8,721	8,760
Cobb	22,132	22,342	22,375	22,430	22,507	22,584	22,661	22,739	22,816	22,894	22,971
DeKalb	21,441	21,587	21,678	21,744	21,844	21,946	22,048	22,153	22,258	22,366	22,474
Dougherty	3,307	3,312	3,318	3,320	3,323	3,326	3,329	3,331	3,334	3,337	3,339
Douglas	4,147	4,197	4,204	4,215	4,228	4,240	4,253	4,265	4,278	4,290	4,303
Fulton	31,428	31,655	31,753	31,843	31,978	32,114	32,252	32,391	32,532	32,674	32,818
Gwinnett	30,894	31,102	31,218	31,348	31,462	31,577	31,694	31,813	31,933	32,055	32,179
Hall	10,785	10,837	10,845	10,871	10,894	10,917	10,940	10,961	10,983	11,003	11,024
Henry	6,304	6,359	6,395	6,425	6,460	6,495	6,531	6,567	6,603	6,640	6,677
Lee	752	755	756	759	760	762	763	764	766	767	768

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:		
	10/30	10/31	11/1	11/2	11/4	11/6	11/8
Bartow	3,689	3,714	3,716	3,717	3,738 (748) [179] {90}	3,758 (752) [180] {90}	3,776 (755) [181] {91}
Carroll	3,370	3,417	3,428	3,442	3,469 (694) [167] {83}	3,495 (699) [168] {84}	3,521 (704) [169] {85}
Cherokee	7,242	7,318	7,364	7,386	7,466 (1,493) [358] {179}	7,548 (1,510) [362] {181}	7,632 (1,526) [366] {183}
Clarke	5,809	5,848	5,865	5,877	5,919 (1,184) [284] {142}	5,961 (1,192) [286] {143}	6,004 (1,201) [288] {144}
Clayton	8,362	8,417	8,467	8,485	8,564 (1,713) [411] {206}	8,643 (1,729) [415] {207}	8,721 (1,744) [419] {209}
Cobb	22,132	22,342	22,375	22,430	22,584 (4,517) [1,084] {542}	22,739 (4,548) [1,091] {546}	22,894 (4,579) [1,099] {549}
DeKalb	21,441	21,587	21,678	21,744	21,946 (4,389) [1,053] {527}	22,153 (4,431) [1,063] {532}	22,366 (4,473) [1,074] {537}
Dougherty	3,307	3,312	3,318	3,320	3,326 (665) [160] {80}	3,331 (666) [160] {80}	3,337 (667) [160] {80}
Douglas	4,147	4,197	4,204	4,215	4,240 (848) [204] {102}	4,265 (853) [205] {102}	4,290 (858) [206] {103}
Fulton	31,428	31,655	31,753	31,843	32,114 (6,423) [1,541] {771}	32,391 (6,478) [1,555] {777}	32,674 (6,535) [1,568] {784}
Gwinnett	30,894	31,102	31,218	31,348	31,577 (6,315) [1,516] {758}	31,813 (6,363) [1,527] {764}	32,055 (6,411) [1,539] {769}
Hall	10,785	10,837	10,845	10,871	10,917 (2,183) [524] {262}	10,961 (2,192) [526] {263}	11,003 (2,201) [528] {264}
Henry	6,304	6,359	6,395	6,425	6,495 (1,299) [312] {156}	6,567 (1,313) [315] {158}	6,640 (1,328) [319] {159}
Lee	752	755	756	759	762 (152) [37] {18}	764 (153) [37] {18}	767 (153) [37] {18}

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.