IEM's AI Modeling: Short-term COVID-19 Projections
Date: 11/30/20

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 11/30/20 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
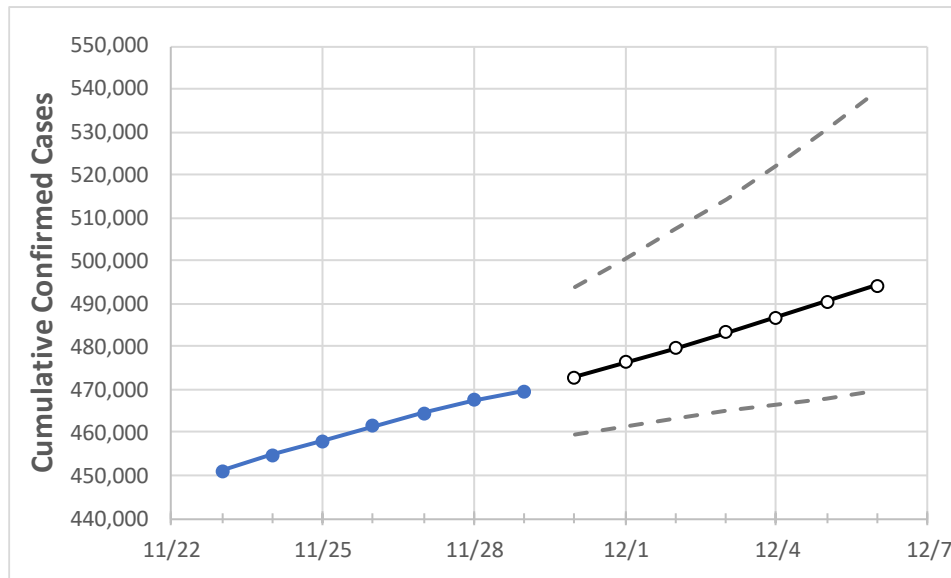
	Actual Confirmed Cases On:				Projected Cases For:						
	11/26	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6
Georgia	461,517	464,526	467,564	469,516	472,850	476,249	479,715	483,247	486,847	490,516	494,255

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:						
	11/26	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6
Bartow	5,067	5,106	5,134	5,169	5,210	5,252	5,293	5,336	5,378	5,421	5,465
Carroll	5,469	5,518	5,570	5,612	5,666	5,720	5,776	5,832	5,890	5,948	6,008
Cherokee	10,385	10,454	10,572	10,616	10,702	10,790	10,878	10,966	11,055	11,145	11,236
Clarke	7,871	7,901	7,925	7,941	7,972	8,004	8,035	8,067	8,100	8,132	8,165
Clayton	10,347	10,409	10,463	10,483	10,531	10,579	10,627	10,675	10,724	10,772	10,820
Cobb	29,421	29,639	29,833	29,937	30,155	30,376	30,602	30,830	31,063	31,299	31,539
DeKalb	27,104	27,305	27,465	27,548	27,719	27,890	28,061	28,233	28,405	28,578	28,751
Dougherty	3,693	3,702	3,706	3,710	3,717	3,724	3,731	3,738	3,745	3,752	3,760
Douglas	5,604	5,663	5,682	5,703	5,749	5,797	5,845	5,895	5,946	5,999	6,052
Fulton	39,942	40,185	40,486	40,630	40,912	41,200	41,495	41,796	42,103	42,417	42,738
Gwinnett	38,986	39,249	39,510	39,694	39,969	40,248	40,534	40,825	41,122	41,424	41,732
Hall	12,516	12,560	12,635	12,678	12,756	12,837	12,920	13,006	13,095	13,187	13,282
Henry	8,536	8,623	8,687	8,716	8,787	8,860	8,935	9,011	9,089	9,169	9,251
Lee	947	952	954	956	961	966	971	977	983	989	995

facebook.com/ieminc   twitter.com/iemnews   linkedin.com/company/iem   WWW.IEM.COM

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:		
	11/26	11/27	11/28	11/29	12/1	12/3	12/5
Bartow	5,067	5,106	5,134	5,169	5,252 (1,050) [252] {126}	5,336 (1,067) [256] {128}	5,421 (1,084) [260] {130}
Carroll	5,469	5,518	5,570	5,612	5,720 (1,144) [275] {137}	5,832 (1,166) [280] {140}	5,948 (1,190) [286] {143}
Cherokee	10,385	10,454	10,572	10,616	10,790 (2,158) [518] {259}	10,966 (2,193) [526] {263}	11,145 (2,229) [535] {267}
Clarke	7,871	7,901	7,925	7,941	8,004 (1,601) [384] {192}	8,067 (1,613) [387] {194}	8,132 (1,626) [390] {195}
Clayton	10,347	10,409	10,463	10,483	10,579 (2,116) [508] {254}	10,675 (2,135) [512] {256}	10,772 (2,154) [517] {259}
Cobb	29,421	29,639	29,833	29,937	30,376 (6,075) [1,458] {729}	30,830 (6,166) [1,480] {740}	31,299 (6,260) [1,502] {751}
DeKalb	27,104	27,305	27,465	27,548	27,890 (5,578) [1,339] {669}	28,233 (5,647) [1,355] {678}	28,578 (5,716) [1,372] {686}
Dougherty	3,693	3,702	3,706	3,710	3,724 (745) [179] {89}	3,738 (748) [179] {90}	3,752 (750) [180] {90}
Douglas	5,604	5,663	5,682	5,703	5,797 (1,159) [278] {139}	5,895 (1,179) [283] {141}	5,999 (1,200) [288] {144}
Fulton	39,942	40,185	40,486	40,630	41,200 (8,240) [1,978] {989}	41,796 (8,359) [2,006] {1,003}	42,417 (8,483) [2,036] {1,018}
Gwinnett	38,986	39,249	39,510	39,694	40,248 (8,050) [1,932] {966}	40,825 (8,165) [1,960] {980}	41,424 (8,285) [1,988] {994}
Hall	12,516	12,560	12,635	12,678	12,837 (2,567) [616] {308}	13,006 (2,601) [624] {312}	13,187 (2,637) [633] {316}
Henry	8,536	8,623	8,687	8,716	8,860 (1,772) [425] {213}	9,011 (1,802) [433] {216}	9,169 (1,834) [440] {220}
Lee	947	952	954	956	966 (193) [46] {23}	977 (195) [47] {23}	989 (198) [47] {24}

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.