IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/16/21

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 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 3/16/21 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
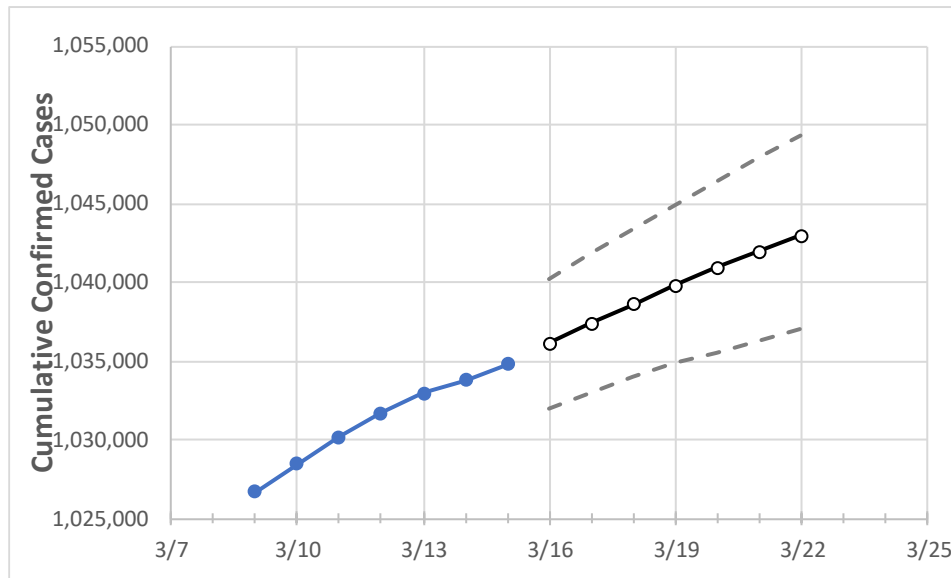
	Actual Confirmed Cases On:				Projected Cases For:						
	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22
Georgia	1,031,713	1,032,967	1,033,786	1,034,763	1,036,122	1,037,391	1,038,608	1,039,791	1,040,900	1,041,953	1,042,978

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:						
	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22
Bartow	13,395	13,414	13,437	13,458	13,482	13,505	13,527	13,549	13,569	13,589	13,608
Carroll	10,699	10,703	10,707	10,715	10,722	10,729	10,736	10,742	10,748	10,753	10,758
Cherokee	28,217	28,254	28,301	28,332	28,378	28,422	28,464	28,506	28,546	28,583	28,618
Clarke	14,381	14,392	14,398	14,406	14,422	14,438	14,453	14,468	14,483	14,498	14,513
Clayton	23,916	23,964	23,985	24,020	24,060	24,099	24,136	24,172	24,204	24,238	24,270
Cobb	71,453	71,535	71,615	71,712	71,820	71,924	72,026	72,123	72,215	72,304	72,390
DeKalb	58,752	58,851	58,891	59,001	59,110	59,213	59,312	59,408	59,501	59,594	59,682
Dougherty	7,126	7,135	7,137	7,139	7,143	7,147	7,152	7,156	7,159	7,163	7,166
Douglas	13,818	13,833	13,849	13,868	13,891	13,914	13,935	13,956	13,977	13,997	14,017
Fulton	88,544	88,679	88,786	88,902	89,061	89,213	89,357	89,495	89,625	89,752	89,875
Gwinnett	94,440	94,528	94,593	94,676	94,792	94,903	95,009	95,112	95,210	95,303	95,389
Hall	25,869	25,891	25,900	25,914	25,933	25,952	25,971	25,988	26,005	26,022	26,037
Henry	22,723	22,793	22,861	22,917	22,982	23,044	23,106	23,165	23,223	23,278	23,334
Lee	2,630	2,633	2,634	2,634	2,637	2,640	2,642	2,645	2,647	2,650	2,652

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:		
	3/12	3/13	3/14	3/15	3/17	3/19	3/21
Bartow	13,395	13,414	13,437	13,458	13,505 (2,701) [648] {324}	13,549 (2,710) [650] {325}	13,589 (2,718) [652] {326}
Carroll	10,699	10,703	10,707	10,715	10,729 (2,146) [515] {258}	10,742 (2,148) [516] {258}	10,753 (2,151) [516] {258}
Cherokee	28,217	28,254	28,301	28,332	28,422 (5,684) [1,364] {682}	28,506 (5,701) [1,368] {684}	28,583 (5,717) [1,372] {686}
Clarke	14,381	14,392	14,398	14,406	14,438 (2,888) [693] {347}	14,468 (2,894) [694] {347}	14,498 (2,900) [696] {348}
Clayton	23,916	23,964	23,985	24,020	24,099 (4,820) [1,157] {578}	24,172 (4,834) [1,160] {580}	24,238 (4,848) [1,163] {582}
Cobb	71,453	71,535	71,615	71,712	71,924 (14,385) [3,452] {1,726}	72,123 (14,425) [3,462] {1,731}	72,304 (14,461) [3,471] {1,735}
DeKalb	58,752	58,851	58,891	59,001	59,213 (11,843) [2,842] {1,421}	59,408 (11,882) [2,852] {1,426}	59,594 (11,919) [2,860] {1,430}
Dougherty	7,126	7,135	7,137	7,139	7,147 (1,429) [343] {172}	7,156 (1,431) [343] {172}	7,163 (1,433) [344] {172}
Douglas	13,818	13,833	13,849	13,868	13,914 (2,783) [668] {334}	13,956 (2,791) [670] {335}	13,997 (2,799) [672] {336}
Fulton	88,544	88,679	88,786	88,902	89,213 (17,843) [4,282] {2,141}	89,495 (17,899) [4,296] {2,148}	89,752 (17,950) [4,308] {2,154}
Gwinnett	94,440	94,528	94,593	94,676	94,903 (18,981) [4,555] {2,278}	95,112 (19,022) [4,565] {2,283}	95,303 (19,061) [4,575] {2,287}
Hall	25,869	25,891	25,900	25,914	25,952 (5,190) [1,246] {623}	25,988 (5,198) [1,247] {624}	26,022 (5,204) [1,249] {625}
Henry	22,723	22,793	22,861	22,917	23,044 (4,609) [1,106] {553}	23,165 (4,633) [1,112] {556}	23,278 (4,656) [1,117] {559}
Lee	2,630	2,633	2,634	2,634	2,640 (528) [127] {63}	2,645 (529) [127] {63}	2,650 (530) [127] {64}

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.