IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/1/21

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 6/1/21 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
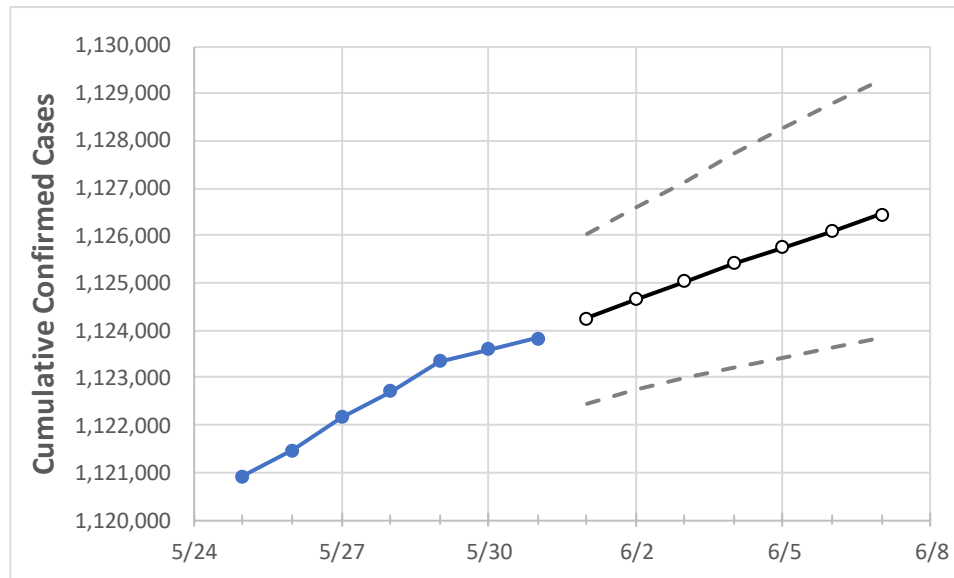
	Actual Confirmed Cases On:				Projected Cases For:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Georgia	1,122,711	1,123,343	1,123,604	1,123,841	1,124,255	1,124,664	1,125,043	1,125,408	1,125,745	1,126,101	1,126,445

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:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Bartow	14,800	14,801	14,801	14,803	14,809	14,814	14,820	14,825	14,830	14,835	14,840
Carroll	11,472	11,475	11,476	11,478	11,482	11,485	11,489	11,492	11,496	11,499	11,502
Cherokee	31,310	31,337	31,345	31,354	31,364	31,373	31,382	31,392	31,400	31,408	31,416
Clarke	15,135	15,137	15,139	15,140	15,142	15,145	15,147	15,150	15,152	15,154	15,156
Clayton	27,103	27,126	27,142	27,151	27,165	27,178	27,190	27,203	27,215	27,226	27,238
Cobb	79,449	79,482	79,500	79,522	79,553	79,583	79,612	79,639	79,667	79,693	79,718
DeKalb	66,655	66,690	66,706	66,717	66,741	66,763	66,784	66,805	66,824	66,843	66,860
Dougherty	7,629	7,634	7,637	7,640	7,643	7,646	7,649	7,652	7,655	7,657	7,660
Douglas	15,449	15,458	15,459	15,464	15,472	15,479	15,486	15,493	15,499	15,506	15,512
Fulton	98,315	98,371	98,390	98,416	98,448	98,480	98,510	98,539	98,566	98,591	98,616
Gwinnett	102,469	102,519	102,545	102,567	102,605	102,641	102,675	102,710	102,744	102,778	102,810
Hall	27,489	27,497	27,499	27,504	27,511	27,518	27,524	27,530	27,535	27,541	27,547
Henry	25,627	25,657	25,664	25,671	25,684	25,697	25,709	25,721	25,733	25,744	25,755
Lee	2,749	2,749	2,749	2,749	2,751	2,753	2,755	2,757	2,759	2,762	2,764

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:		
	5/28	5/29	5/30	5/31	6/2	6/4	6/6
Bartow	14,800	14,801	14,801	14,803	14,814 (2,963) [711] {356}	14,825 (2,965) [712] {356}	14,835 (2,967) [712] {356}
Carroll	11,472	11,475	11,476	11,478	11,485 (2,297) [551] {276}	11,492 (2,298) [552] {276}	11,499 (2,300) [552] {276}
Cherokee	31,310	31,337	31,345	31,354	31,373 (6,275) [1,506] {753}	31,392 (6,278) [1,507] {753}	31,408 (6,282) [1,508] {754}
Clarke	15,135	15,137	15,139	15,140	15,145 (3,029) [727] {363}	15,150 (3,030) [727] {364}	15,154 (3,031) [727] {364}
Clayton	27,103	27,126	27,142	27,151	27,178 (5,436) [1,305] {652}	27,203 (5,441) [1,306] {653}	27,226 (5,445) [1,307] {653}
Cobb	79,449	79,482	79,500	79,522	79,583 (15,917) [3,820] {1,910}	79,639 (15,928) [3,823] {1,911}	79,693 (15,939) [3,825] {1,913}
DeKalb	66,655	66,690	66,706	66,717	66,763 (13,353) [3,205] {1,602}	66,805 (13,361) [3,207] {1,603}	66,843 (13,369) [3,208] {1,604}
Dougherty	7,629	7,634	7,637	7,640	7,646 (1,529) [367] {184}	7,652 (1,530) [367] {184}	7,657 (1,531) [368] {184}
Douglas	15,449	15,458	15,459	15,464	15,479 (3,096) [743] {371}	15,493 (3,099) [744] {372}	15,506 (3,101) [744] {372}
Fulton	98,315	98,371	98,390	98,416	98,480 (19,696) [4,727] {2,364}	98,539 (19,708) [4,730] {2,365}	98,591 (19,718) [4,732] {2,366}
Gwinnett	102,469	102,519	102,545	102,567	102,641 (20,528) [4,927] {2,463}	102,710 (20,542) [4,930] {2,465}	102,778 (20,556) [4,933] {2,467}
Hall	27,489	27,497	27,499	27,504	27,518 (5,504) [1,321] {660}	27,530 (5,506) [1,321] {661}	27,541 (5,508) [1,322] {661}
Henry	25,627	25,657	25,664	25,671	25,697 (5,139) [1,233] {617}	25,721 (5,144) [1,235] {617}	25,744 (5,149) [1,236] {618}
Lee	2,749	2,749	2,749	2,749	2,753 (551) [132] {66}	2,757 (551) [132] {66}	2,762 (552) [133] {66}

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.