IEM's AI Modeling: Short-term COVID-19 Projections
Date: 5/25/21

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 5/25/21 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
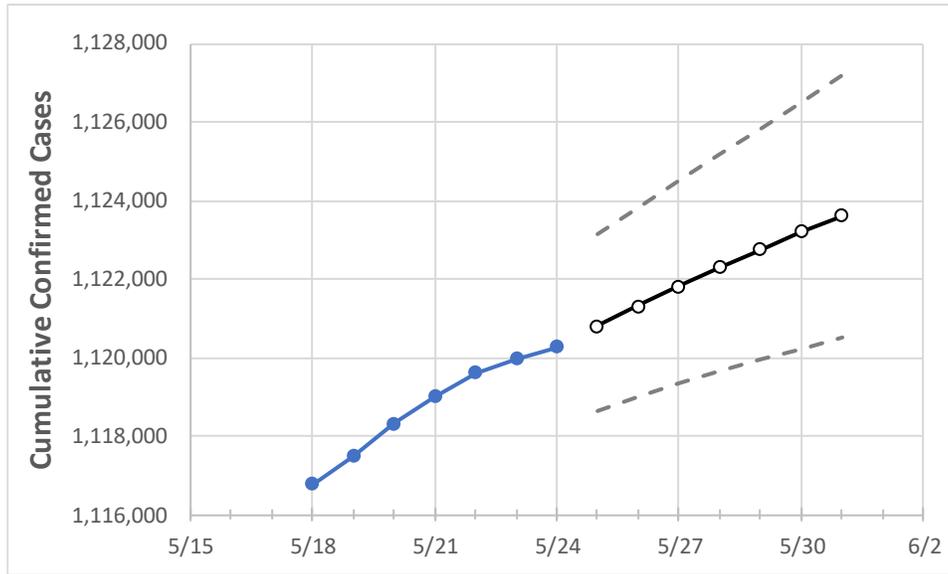
	Actual Confirmed Cases On:				Projected Cases For:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Georgia	1,119,012	1,119,614	1,119,979	1,120,272	1,120,799	1,121,307	1,121,815	1,122,292	1,122,759	1,123,198	1,123,621

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Bartow	14,743	14,749	14,756	14,762	14,769	14,776	14,783	14,790	14,797	14,804	14,811
Carroll	11,433	11,441	11,445	11,449	11,454	11,460	11,465	11,470	11,475	11,479	11,484
Cherokee	31,232	31,251	31,259	31,270	31,285	31,299	31,313	31,326	31,339	31,352	31,363
Clarke	15,107	15,109	15,111	15,112	15,116	15,120	15,124	15,127	15,130	15,134	15,137
Clayton	26,975	26,994	27,012	27,022	27,041	27,059	27,077	27,093	27,109	27,124	27,139
Cobb	79,138	79,180	79,223	79,237	79,279	79,319	79,357	79,393	79,427	79,460	79,492
DeKalb	66,439	66,462	66,489	66,499	66,528	66,554	66,580	66,606	66,629	66,651	66,673
Dougherty	7,602	7,603	7,604	7,610	7,615	7,619	7,624	7,628	7,633	7,637	7,641
Douglas	15,369	15,389	15,400	15,404	15,415	15,426	15,436	15,446	15,456	15,466	15,476
Fulton	98,062	98,120	98,170	98,212	98,261	98,308	98,355	98,398	98,440	98,480	98,518
Gwinnett	102,152	102,205	102,237	102,257	102,298	102,337	102,374	102,411	102,445	102,479	102,512
Hall	27,416	27,424	27,430	27,438	27,448	27,458	27,468	27,477	27,486	27,494	27,502
Henry	25,505	25,523	25,537	25,545	25,561	25,576	25,591	25,606	25,620	25,634	25,647
Lee	2,748	2,749	2,745	2,745	2,747	2,749	2,751	2,753	2,755	2,757	2,759

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:		
	5/21	5/22	5/23	5/24	5/26	5/28	5/30
Bartow	14,743	14,749	14,756	14,762	14,776 (2,955) [709] {355}	14,790 (2,958) [710] {355}	14,804 (2,961) [711] {355}
Carroll	11,433	11,441	11,445	11,449	11,460 (2,292) [550] {275}	11,470 (2,294) [551] {275}	11,479 (2,296) [551] {276}
Cherokee	31,232	31,251	31,259	31,270	31,299 (6,260) [1,502] {751}	31,326 (6,265) [1,504] {752}	31,352 (6,270) [1,505] {752}
Clarke	15,107	15,109	15,111	15,112	15,120 (3,024) [726] {363}	15,127 (3,025) [726] {363}	15,134 (3,027) [726] {363}
Clayton	26,975	26,994	27,012	27,022	27,059 (5,412) [1,299] {649}	27,093 (5,419) [1,300] {650}	27,124 (5,425) [1,302] {651}
Cobb	79,138	79,180	79,223	79,237	79,319 (15,864) [3,807] {1,904}	79,393 (15,879) [3,811] {1,905}	79,460 (15,892) [3,814] {1,907}
DeKalb	66,439	66,462	66,489	66,499	66,554 (13,311) [3,195] {1,597}	66,606 (13,321) [3,197] {1,599}	66,651 (13,330) [3,199] {1,600}
Dougherty	7,602	7,603	7,604	7,610	7,619 (1,524) [366] {183}	7,628 (1,526) [366] {183}	7,637 (1,527) [367] {183}
Douglas	15,369	15,389	15,400	15,404	15,426 (3,085) [740] {370}	15,446 (3,089) [741] {371}	15,466 (3,093) [742] {371}
Fulton	98,062	98,120	98,170	98,212	98,308 (19,662) [4,719] {2,359}	98,398 (19,680) [4,723] {2,362}	98,480 (19,696) [4,727] {2,364}
Gwinnett	102,152	102,205	102,237	102,257	102,337 (20,467) [4,912] {2,456}	102,411 (20,482) [4,916] {2,458}	102,479 (20,496) [4,919] {2,460}
Hall	27,416	27,424	27,430	27,438	27,458 (5,492) [1,318] {659}	27,477 (5,495) [1,319] {659}	27,494 (5,499) [1,320] {660}
Henry	25,505	25,523	25,537	25,545	25,576 (5,115) [1,228] {614}	25,606 (5,121) [1,229] {615}	25,634 (5,127) [1,230] {615}
Lee	2,748	2,749	2,745	2,745	2,749 (550) [132] {66}	2,753 (551) [132] {66}	2,757 (551) [132] {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.