IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/7/21

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 6/7/21 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
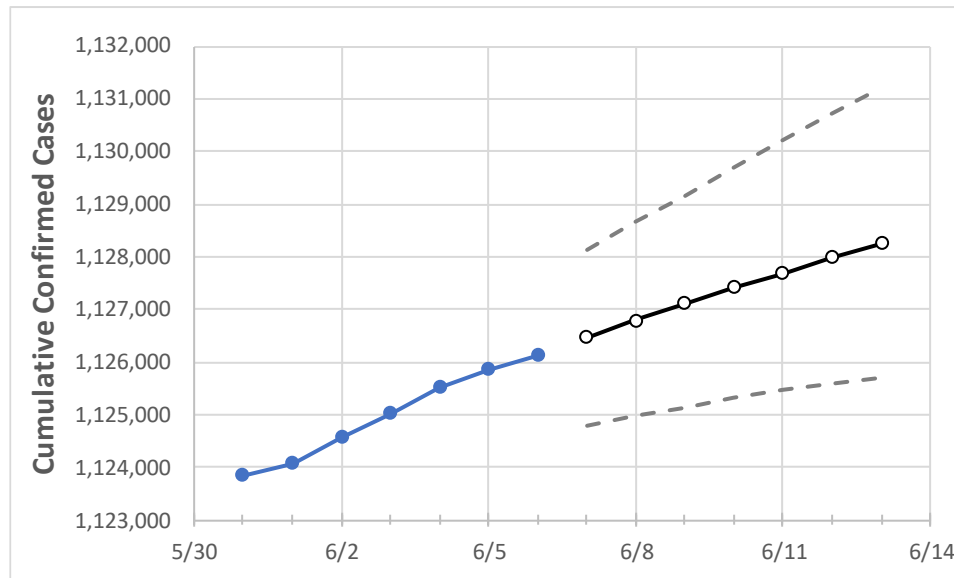
	Actual Confirmed Cases On:				Projected Cases For:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
Georgia	1,125,017	1,125,512	1,125,854	1,126,134	1,126,464	1,126,795	1,127,112	1,127,415	1,127,691	1,127,979	1,128,252

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:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
Bartow	14,815	14,821	14,831	14,838	14,842	14,847	14,851	14,855	14,859	14,863	14,867
Carroll	11,492	11,493	11,496	11,496	11,499	11,501	11,503	11,506	11,508	11,510	11,512
Cherokee	31,392	31,393	31,395	31,403	31,410	31,417	31,424	31,430	31,436	31,442	31,447
Clarke	15,147	15,151	15,152	15,155	15,157	15,159	15,161	15,162	15,164	15,165	15,167
Clayton	27,195	27,211	27,220	27,230	27,243	27,256	27,269	27,281	27,293	27,305	27,317
Cobb	79,602	79,642	79,660	79,685	79,710	79,733	79,756	79,778	79,799	79,820	79,840
DeKalb	66,768	66,797	66,820	66,829	66,845	66,860	66,875	66,889	66,902	66,915	66,928
Dougherty	7,653	7,655	7,656	7,657	7,660	7,662	7,664	7,667	7,669	7,671	7,673
Douglas	15,485	15,492	15,493	15,493	15,498	15,502	15,507	15,511	15,515	15,519	15,522
Fulton	98,514	98,548	98,587	98,613	98,636	98,659	98,680	98,701	98,719	98,738	98,756
Gwinnett	102,682	102,722	102,763	102,781	102,814	102,846	102,877	102,909	102,940	102,970	103,000
Hall	27,529	27,539	27,549	27,552	27,559	27,565	27,571	27,578	27,583	27,589	27,595
Henry	25,696	25,707	25,720	25,723	25,732	25,740	25,748	25,755	25,762	25,769	25,776
Lee	2,755	2,757	2,758	2,758	2,759	2,760	2,761	2,762	2,763	2,763	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:		
	6/3	6/4	6/5	6/6	6/8	6/10	6/12
Bartow	14,815	14,821	14,831	14,838	14,847 (2,969) [713] {356}	14,855 (2,971) [713] {357}	14,863 (2,973) [713] {357}
Carroll	11,492	11,493	11,496	11,496	11,501 (2,300) [552] {276}	11,506 (2,301) [552] {276}	11,510 (2,302) [552] {276}
Cherokee	31,392	31,393	31,395	31,403	31,417 (6,283) [1,508] {754}	31,430 (6,286) [1,509] {754}	31,442 (6,288) [1,509] {755}
Clarke	15,147	15,151	15,152	15,155	15,159 (3,032) [728] {364}	15,162 (3,032) [728] {364}	15,165 (3,033) [728] {364}
Clayton	27,195	27,211	27,220	27,230	27,256 (5,451) [1,308] {654}	27,281 (5,456) [1,309] {655}	27,305 (5,461) [1,311] {655}
Cobb	79,602	79,642	79,660	79,685	79,733 (15,947) [3,827] {1,914}	79,778 (15,956) [3,829] {1,915}	79,820 (15,964) [3,831] {1,916}
DeKalb	66,768	66,797	66,820	66,829	66,860 (13,372) [3,209] {1,605}	66,889 (13,378) [3,211] {1,605}	66,915 (13,383) [3,212] {1,606}
Dougherty	7,653	7,655	7,656	7,657	7,662 (1,532) [368] {184}	7,667 (1,533) [368] {184}	7,671 (1,534) [368] {184}
Douglas	15,485	15,492	15,493	15,493	15,502 (3,100) [744] {372}	15,511 (3,102) [745] {372}	15,519 (3,104) [745] {372}
Fulton	98,514	98,548	98,587	98,613	98,659 (19,732) [4,736] {2,368}	98,701 (19,740) [4,738] {2,369}	98,738 (19,748) [4,739] {2,370}
Gwinnett	102,682	102,722	102,763	102,781	102,846 (20,569) [4,937] {2,468}	102,909 (20,582) [4,940] {2,470}	102,970 (20,594) [4,943] {2,471}
Hall	27,529	27,539	27,549	27,552	27,565 (5,513) [1,323] {662}	27,578 (5,516) [1,324] {662}	27,589 (5,518) [1,324] {662}
Henry	25,696	25,707	25,720	25,723	25,740 (5,148) [1,236] {618}	25,755 (5,151) [1,236] {618}	25,769 (5,154) [1,237] {618}
Lee	2,755	2,757	2,758	2,758	2,760 (552) [132] {66}	2,762 (552) [133] {66}	2,763 (553) [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.