IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/15/21

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 6/15/21 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
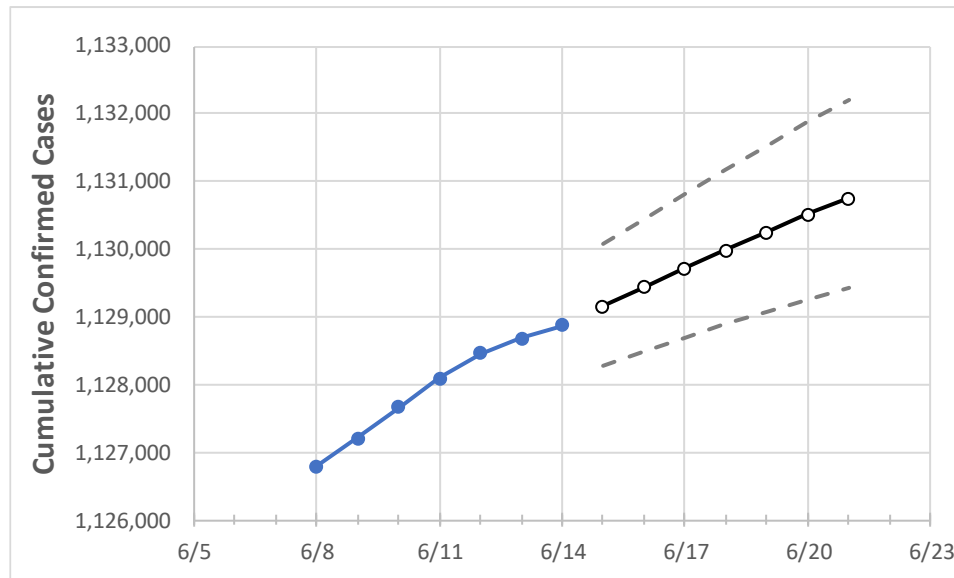
	Actual Confirmed Cases On:				Projected Cases For:						
	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21
Georgia	1,128,092	1,128,467	1,128,690	1,128,870	1,129,161	1,129,442	1,129,719	1,129,989	1,130,253	1,130,512	1,130,755

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:						
	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21
Bartow	14,869	14,873	14,876	14,878	14,883	14,887	14,892	14,896	14,901	14,905	14,910
Carroll	11,511	11,517	11,519	11,520	11,522	11,525	11,527	11,529	11,531	11,533	11,535
Cherokee	31,446	31,451	31,460	31,464	31,470	31,476	31,481	31,486	31,491	31,496	31,501
Clarke	15,168	15,170	15,175	15,177	15,179	15,181	15,183	15,185	15,187	15,189	15,191
Clayton	27,311	27,322	27,329	27,335	27,346	27,357	27,368	27,378	27,388	27,398	27,407
Cobb	79,809	79,832	79,851	79,868	79,887	79,906	79,923	79,941	79,959	79,975	79,991
DeKalb	66,921	66,947	66,967	66,982	66,997	67,012	67,026	67,040	67,053	67,066	67,078
Dougherty	7,680	7,683	7,683	7,683	7,686	7,689	7,692	7,695	7,698	7,701	7,704
Douglas	15,521	15,526	15,528	15,530	15,533	15,536	15,539	15,542	15,545	15,547	15,549
Fulton	98,762	98,783	98,806	98,818	98,839	98,860	98,880	98,899	98,918	98,937	98,955
Gwinnett	102,947	102,970	102,986	103,006	103,031	103,056	103,079	103,103	103,125	103,148	103,171
Hall	27,679	27,706	27,713	27,717	27,726	27,734	27,743	27,751	27,760	27,768	27,777
Henry	25,780	25,794	25,806	25,811	25,819	25,827	25,835	25,842	25,850	25,857	25,864
Lee	2,764	2,763	2,763	2,763	2,765	2,767	2,769	2,770	2,772	2,774	2,776

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:		
	6/11	6/12	6/13	6/14	6/16	6/18	6/20
Bartow	14,869	14,873	14,876	14,878	14,887 (2,977) [715] {357}	14,896 (2,979) [715] {358}	14,905 (2,981) [715] {358}
Carroll	11,511	11,517	11,519	11,520	11,525 (2,305) [553] {277}	11,529 (2,306) [553] {277}	11,533 (2,307) [554] {277}
Cherokee	31,446	31,451	31,460	31,464	31,476 (6,295) [1,511] {755}	31,486 (6,297) [1,511] {756}	31,496 (6,299) [1,512] {756}
Clarke	15,168	15,170	15,175	15,177	15,181 (3,036) [729] {364}	15,185 (3,037) [729] {364}	15,189 (3,038) [729] {365}
Clayton	27,311	27,322	27,329	27,335	27,357 (5,471) [1,313] {657}	27,378 (5,476) [1,314] {657}	27,398 (5,480) [1,315] {658}
Cobb	79,809	79,832	79,851	79,868	79,906 (15,981) [3,835] {1,918}	79,941 (15,988) [3,837] {1,919}	79,975 (15,995) [3,839] {1,919}
DeKalb	66,921	66,947	66,967	66,982	67,012 (13,402) [3,217] {1,608}	67,040 (13,408) [3,218] {1,609}	67,066 (13,413) [3,219] {1,610}
Dougherty	7,680	7,683	7,683	7,683	7,689 (1,538) [369] {185}	7,695 (1,539) [369] {185}	7,701 (1,540) [370] {185}
Douglas	15,521	15,526	15,528	15,530	15,536 (3,107) [746] {373}	15,542 (3,108) [746] {373}	15,547 (3,109) [746] {373}
Fulton	98,762	98,783	98,806	98,818	98,860 (19,772) [4,745] {2,373}	98,899 (19,780) [4,747] {2,374}	98,937 (19,787) [4,749] {2,374}
Gwinnett	102,947	102,970	102,986	103,006	103,056 (20,611) [4,947] {2,473}	103,103 (20,621) [4,949] {2,474}	103,148 (20,630) [4,951] {2,476}
Hall	27,679	27,706	27,713	27,717	27,734 (5,547) [1,331] {666}	27,751 (5,550) [1,332] {666}	27,768 (5,554) [1,333] {666}
Henry	25,780	25,794	25,806	25,811	25,827 (5,165) [1,240] {620}	25,842 (5,168) [1,240] {620}	25,857 (5,171) [1,241] {621}
Lee	2,764	2,763	2,763	2,763	2,767 (553) [133] {66}	2,770 (554) [133] {66}	2,774 (555) [133] {67}

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.