IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/25/21

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 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 6/25/21 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
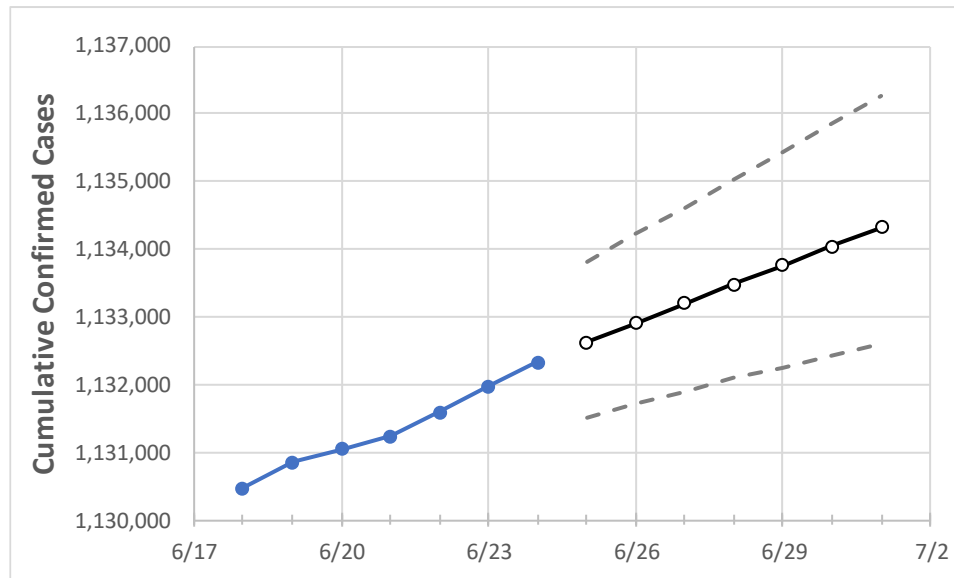
	Actual Confirmed Cases On:				Projected Cases For:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Georgia	1,131,232	1,131,583	1,131,972	1,132,329	1,132,622	1,132,909	1,133,200	1,133,484	1,133,764	1,134,047	1,134,324

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:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Bartow	14,905	14,906	14,912	14,932	14,937	14,941	14,946	14,950	14,954	14,959	14,963
Carroll	11,548	11,550	11,553	11,552	11,555	11,558	11,561	11,564	11,566	11,569	11,572
Cherokee	31,507	31,511	31,521	31,530	31,536	31,541	31,547	31,552	31,557	31,562	31,567
Clarke	15,189	15,191	15,196	15,199	15,201	15,204	15,206	15,208	15,210	15,212	15,214
Clayton	27,406	27,427	27,446	27,456	27,467	27,477	27,487	27,497	27,507	27,517	27,527
Cobb	80,039	80,053	80,087	80,103	80,123	80,142	80,161	80,181	80,199	80,218	80,236
DeKalb	67,118	67,148	67,182	67,204	67,223	67,243	67,263	67,282	67,302	67,322	67,340
Dougherty	7,695	7,694	7,696	7,700	7,702	7,703	7,705	7,707	7,708	7,710	7,711
Douglas	15,565	15,567	15,573	15,581	15,585	15,588	15,592	15,596	15,599	15,603	15,606
Fulton	99,099	99,122	99,160	99,185	99,217	99,248	99,279	99,310	99,341	99,372	99,403
Gwinnett	103,106	103,115	103,133	103,168	103,185	103,202	103,218	103,234	103,249	103,264	103,279
Hall	27,742	27,748	27,762	27,764	27,769	27,774	27,780	27,785	27,789	27,794	27,799
Henry	25,899	25,904	25,922	25,933	25,944	25,955	25,966	25,977	25,987	25,998	26,009
Lee	2,762	2,762	2,761	2,761	2,763	2,766	2,769	2,772	2,775	2,779	2,782

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:		
	6/21	6/22	6/23	6/24	6/26	6/28	6/30
Bartow	14,905	14,906	14,912	14,932	14,941 (2,988) [717] {359}	14,950 (2,990) [718] {359}	14,959 (2,992) [718] {359}
Carroll	11,548	11,550	11,553	11,552	11,558 (2,312) [555] {277}	11,564 (2,313) [555] {278}	11,569 (2,314) [555] {278}
Cherokee	31,507	31,511	31,521	31,530	31,541 (6,308) [1,514] {757}	31,552 (6,310) [1,514] {757}	31,562 (6,312) [1,515] {757}
Clarke	15,189	15,191	15,196	15,199	15,204 (3,041) [730] {365}	15,208 (3,042) [730] {365}	15,212 (3,042) [730] {365}
Clayton	27,406	27,427	27,446	27,456	27,477 (5,495) [1,319] {659}	27,497 (5,499) [1,320] {660}	27,517 (5,503) [1,321] {660}
Cobb	80,039	80,053	80,087	80,103	80,142 (16,028) [3,847] {1,923}	80,181 (16,036) [3,849] {1,924}	80,218 (16,044) [3,850] {1,925}
DeKalb	67,118	67,148	67,182	67,204	67,243 (13,449) [3,228] {1,614}	67,282 (13,456) [3,230] {1,615}	67,322 (13,464) [3,231] {1,616}
Dougherty	7,695	7,694	7,696	7,700	7,703 (1,541) [370] {185}	7,707 (1,541) [370] {185}	7,710 (1,542) [370] {185}
Douglas	15,565	15,567	15,573	15,581	15,588 (3,118) [748] {374}	15,596 (3,119) [749] {374}	15,603 (3,121) [749] {374}
Fulton	99,099	99,122	99,160	99,185	99,248 (19,850) [4,764] {2,382}	99,310 (19,862) [4,767] {2,383}	99,372 (19,874) [4,770] {2,385}
Gwinnett	103,106	103,115	103,133	103,168	103,202 (20,640) [4,954] {2,477}	103,234 (20,647) [4,955] {2,478}	103,264 (20,653) [4,957] {2,478}
Hall	27,742	27,748	27,762	27,764	27,774 (5,555) [1,333] {667}	27,785 (5,557) [1,334] {667}	27,794 (5,559) [1,334] {667}
Henry	25,899	25,904	25,922	25,933	25,955 (5,191) [1,246] {623}	25,977 (5,195) [1,247] {623}	25,998 (5,200) [1,248] {624}
Lee	2,762	2,762	2,761	2,761	2,766 (553) [133] {66}	2,772 (554) [133] {67}	2,779 (556) [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.