IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/2/21

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 7/2/21 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
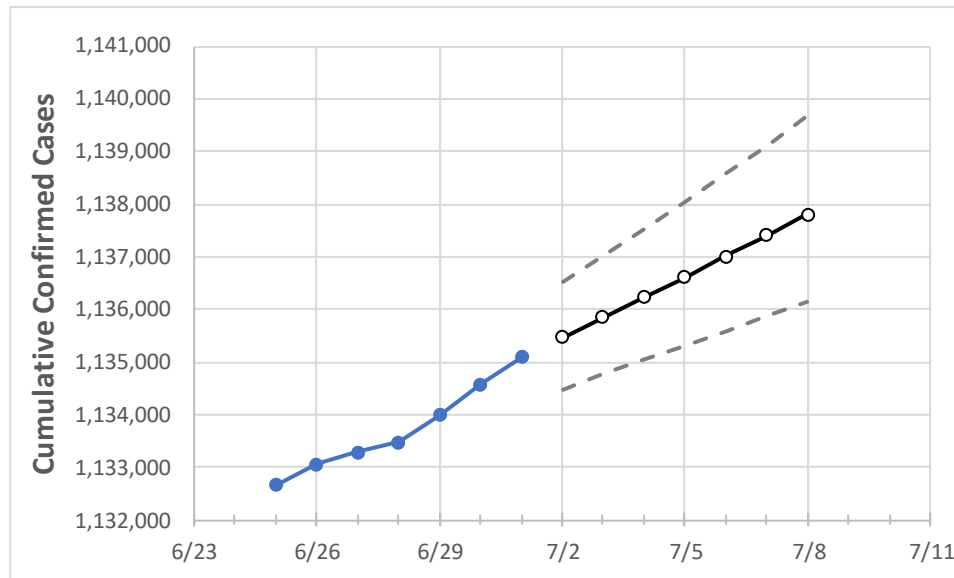
	Actual Confirmed Cases On:				Projected Cases For:						
	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7	7/8
Georgia	1,133,481	1,133,983	1,134,573	1,135,093	1,135,475	1,135,856	1,136,237	1,136,617	1,137,007	1,137,401	1,137,798

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:						
	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7	7/8
Bartow	14,949	14,953	14,959	14,963	14,968	14,973	14,978	14,983	14,988	14,993	14,998
Carroll	11,570	11,572	11,574	11,579	11,582	11,586	11,589	11,592	11,595	11,599	11,602
Cherokee	31,561	31,571	31,582	31,591	31,599	31,608	31,617	31,626	31,634	31,644	31,653
Clarke	15,206	15,207	15,211	15,211	15,213	15,215	15,217	15,220	15,222	15,224	15,226
Clayton	27,493	27,505	27,527	27,537	27,548	27,558	27,569	27,579	27,590	27,600	27,610
Cobb	80,181	80,235	80,289	80,316	80,341	80,367	80,394	80,420	80,446	80,472	80,499
DeKalb	67,291	67,297	67,313	67,317	67,334	67,351	67,367	67,384	67,400	67,417	67,433
Dougherty	7,701	7,709	7,711	7,719	7,722	7,724	7,727	7,730	7,733	7,735	7,738
Douglas	15,606	15,609	15,618	15,625	15,631	15,637	15,643	15,649	15,655	15,662	15,668
Fulton	99,290	99,334	99,368	99,403	99,434	99,464	99,495	99,526	99,557	99,588	99,619
Gwinnett	103,267	103,290	103,333	103,368	103,392	103,416	103,440	103,465	103,489	103,513	103,539
Hall	27,773	27,792	27,801	27,816	27,821	27,827	27,832	27,837	27,842	27,848	27,853
Henry	25,950	25,952	25,961	25,968	25,975	25,982	25,988	25,995	26,001	26,008	26,013
Lee	2,762	2,762	2,766	2,768	2,769	2,770	2,771	2,772	2,773	2,774	2,775

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:		
	6/28	6/29	6/30	7/1	7/3	7/5	7/7
Bartow	14,949	14,953	14,959	14,963	14,973 (2,995) [719] {359}	14,983 (2,997) [719] {360}	14,993 (2,999) [720] {360}
Carroll	11,570	11,572	11,574	11,579	11,586 (2,317) [556] {278}	11,592 (2,318) [556] {278}	11,599 (2,320) [557] {278}
Cherokee	31,561	31,571	31,582	31,591	31,608 (6,322) [1,517] {759}	31,626 (6,325) [1,518] {759}	31,644 (6,329) [1,519] {759}
Clarke	15,206	15,207	15,211	15,211	15,215 (3,043) [730] {365}	15,220 (3,044) [731] {365}	15,224 (3,045) [731] {365}
Clayton	27,493	27,505	27,527	27,537	27,558 (5,512) [1,323] {661}	27,579 (5,516) [1,324] {662}	27,600 (5,520) [1,325] {662}
Cobb	80,181	80,235	80,289	80,316	80,367 (16,073) [3,858] {1,929}	80,420 (16,084) [3,860] {1,930}	80,472 (16,094) [3,863] {1,931}
DeKalb	67,291	67,297	67,313	67,317	67,351 (13,470) [3,233] {1,616}	67,384 (13,477) [3,234] {1,617}	67,417 (13,483) [3,236] {1,618}
Dougherty	7,701	7,709	7,711	7,719	7,724 (1,545) [371] {185}	7,730 (1,546) [371] {186}	7,735 (1,547) [371] {186}
Douglas	15,606	15,609	15,618	15,625	15,637 (3,127) [751] {375}	15,649 (3,130) [751] {376}	15,662 (3,132) [752] {376}
Fulton	99,290	99,334	99,368	99,403	99,464 (19,893) [4,774] {2,387}	99,526 (19,905) [4,777] {2,389}	99,588 (19,918) [4,780] {2,390}
Gwinnett	103,267	103,290	103,333	103,368	103,416 (20,683) [4,964] {2,482}	103,465 (20,693) [4,966] {2,483}	103,513 (20,703) [4,969] {2,484}
Hall	27,773	27,792	27,801	27,816	27,827 (5,565) [1,336] {668}	27,837 (5,567) [1,336] {668}	27,848 (5,570) [1,337] {668}
Henry	25,950	25,952	25,961	25,968	25,982 (5,196) [1,247] {624}	25,995 (5,199) [1,248] {624}	26,008 (5,202) [1,248] {624}
Lee	2,762	2,762	2,766	2,768	2,770 (554) [133] {66}	2,772 (554) [133] {67}	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.