IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/4/22

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 3/4/22 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
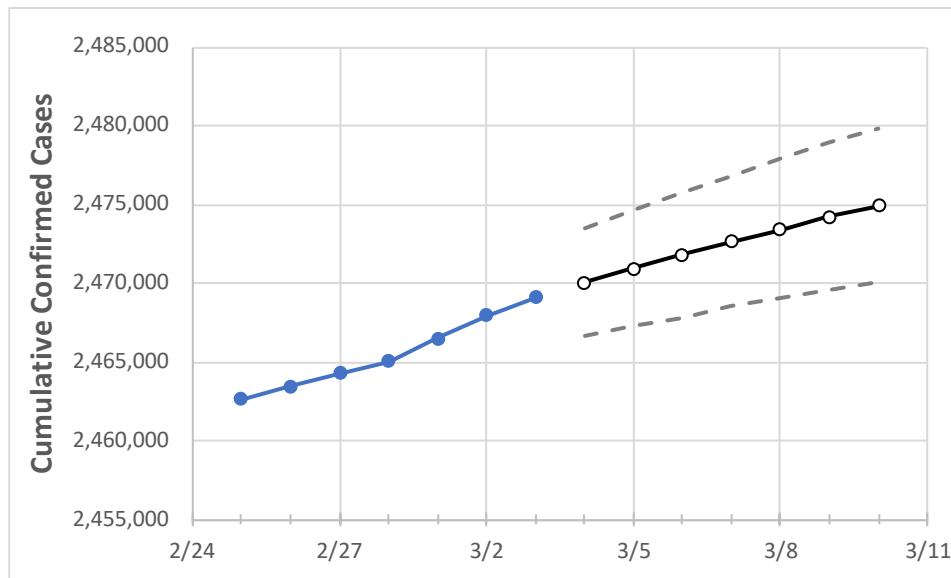
	Actual Confirmed Cases On:				Projected Cases For:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Georgia	2,465,056	2,466,525	2,467,923	2,469,089	2,470,074	2,470,948	2,471,843	2,472,635	2,473,396	2,474,204	2,474,946

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Bartow	28,621	28,640	28,676	28,698	28,718	28,738	28,756	28,773	28,791	28,810	28,824
Carroll	23,575	23,578	23,583	23,588	23,594	23,600	23,606	23,611	23,617	23,621	23,626
Cherokee	62,633	62,658	62,671	62,683	62,699	62,714	62,728	62,742	62,754	62,767	62,778
Clarke	29,457	29,466	29,468	29,474	29,479	29,483	29,487	29,491	29,495	29,498	29,501
Clayton	63,054	63,082	63,117	63,131	63,150	63,167	63,183	63,200	63,215	63,232	63,244
Cobb	169,159	169,230	169,302	169,360	169,417	169,472	169,525	169,576	169,621	169,668	169,712
DeKalb	144,166	144,240	144,341	144,409	144,479	144,540	144,605	144,664	144,720	144,782	144,832
Dougherty	19,328	19,333	19,340	19,341	19,347	19,352	19,356	19,361	19,365	19,369	19,374
Douglas	34,560	34,572	34,579	34,582	34,590	34,598	34,605	34,611	34,618	34,624	34,630
Fulton	212,120	212,186	212,301	212,382	212,457	212,534	212,604	212,676	212,736	212,806	212,863
Gwinnett	205,028	205,099	205,193	205,240	205,303	205,360	205,411	205,467	205,518	205,564	205,612
Hall	53,028	53,037	53,034	53,045	53,058	53,072	53,085	53,097	53,108	53,120	53,130
Henry	57,170	57,228	57,254	57,287	57,309	57,331	57,350	57,370	57,388	57,407	57,423
Lee	7,181	7,184	7,187	7,187	7,189	7,191	7,193	7,195	7,196	7,198	7,199

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:		
	2/28	3/1	3/2	3/3	3/5	3/7	3/9
Bartow	28,621	28,640	28,676	28,698	28,738 (5,748) [1,379] {690}	28,773 (5,755) [1,381] {691}	28,810 (5,762) [1,383] {691}
Carroll	23,575	23,578	23,583	23,588	23,600 (4,720) [1,133] {566}	23,611 (4,722) [1,133] {567}	23,621 (4,724) [1,134] {567}
Cherokee	62,633	62,658	62,671	62,683	62,714 (12,543) [3,010] {1,505}	62,742 (12,548) [3,012] {1,506}	62,767 (12,553) [3,013] {1,506}
Clarke	29,457	29,466	29,468	29,474	29,483 (5,897) [1,415] {708}	29,491 (5,898) [1,416] {708}	29,498 (5,900) [1,416] {708}
Clayton	63,054	63,082	63,117	63,131	63,167 (12,633) [3,032] {1,516}	63,200 (12,640) [3,034] {1,517}	63,232 (12,646) [3,035] {1,518}
Cobb	169,159	169,230	169,302	169,360	169,472 (33,894) [8,135] {4,067}	169,576 (33,915) [8,140] {4,070}	169,668 (33,934) [8,144] {4,072}
DeKalb	144,166	144,240	144,341	144,409	144,540 (28,908) [6,938] {3,469}	144,664 (28,933) [6,944] {3,472}	144,782 (28,956) [6,950] {3,475}
Dougherty	19,328	19,333	19,340	19,341	19,352 (3,870) [929] {464}	19,361 (3,872) [929] {465}	19,369 (3,874) [930] {465}
Douglas	34,560	34,572	34,579	34,582	34,598 (6,920) [1,661] {830}	34,611 (6,922) [1,661] {831}	34,624 (6,925) [1,662] {831}
Fulton	212,120	212,186	212,301	212,382	212,534 (42,507) [10,202] {5,101}	212,676 (42,535) [10,208] {5,104}	212,806 (42,561) [10,215] {5,107}
Gwinnett	205,028	205,099	205,193	205,240	205,360 (41,072) [9,857] {4,929}	205,467 (41,093) [9,862] {4,931}	205,564 (41,113) [9,867] {4,934}
Hall	53,028	53,037	53,034	53,045	53,072 (10,614) [2,547] {1,274}	53,097 (10,619) [2,549] {1,274}	53,120 (10,624) [2,550] {1,275}
Henry	57,170	57,228	57,254	57,287	57,331 (11,466) [2,752] {1,376}	57,370 (11,474) [2,754] {1,377}	57,407 (11,481) [2,756] {1,378}
Lee	7,181	7,184	7,187	7,187	7,191 (1,438) [345] {173}	7,195 (1,439) [345] {173}	7,198 (1,440) [346] {173}

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.