IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/29/22

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 3/29/22 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
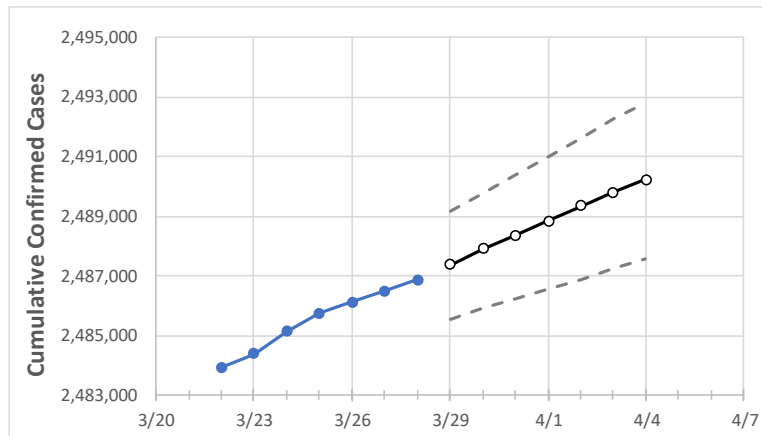
	Actual Confirmed Cases On:				Projected Cases For:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Georgia	2,485,736	2,486,113	2,486,489	2,486,866	2,487,364	2,487,894	2,488,367	2,488,828	2,489,339	2,489,798	2,490,234

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Bartow	28,947	28,959	28,970	28,982	28,989	28,997	29,004	29,011	29,018	29,025	29,032
Carroll	23,631	23,632	23,633	23,634	23,636	23,637	23,639	23,640	23,642	23,643	23,645
Cherokee	62,802	62,807	62,812	62,817	62,823	62,828	62,834	62,839	62,844	62,849	62,854
Clarke	29,553	29,554	29,556	29,557	29,559	29,561	29,563	29,565	29,567	29,569	29,570
Clayton	63,351	63,356	63,360	63,365	63,372	63,378	63,384	63,390	63,396	63,402	63,407
Cobb	170,482	170,509	170,535	170,562	170,601	170,641	170,678	170,718	170,756	170,795	170,826
DeKalb	145,578	145,627	145,675	145,724	145,778	145,827	145,879	145,931	145,981	146,036	146,085
Dougherty	19,413	19,415	19,417	19,419	19,421	19,423	19,425	19,427	19,428	19,430	19,432
Douglas	34,681	34,685	34,688	34,692	34,695	34,697	34,699	34,702	34,704	34,706	34,709
Fulton	213,776	213,828	213,880	213,932	213,994	214,057	214,119	214,182	214,245	214,308	214,370
Gwinnett	206,174	206,197	206,220	206,243	206,272	206,301	206,329	206,356	206,385	206,411	206,437
Hall	53,116	53,125	53,134	53,143	53,151	53,158	53,166	53,174	53,181	53,189	53,197
Henry	57,537	57,543	57,548	57,554	57,561	57,566	57,572	57,577	57,582	57,588	57,593
Lee	7,209	7,209	7,209	7,209	7,209	7,210	7,210	7,211	7,211	7,211	7,212

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: | | |
	3/25	3/26	3/27	3/28	3/30	4/1	4/3
Bartow	28,947	28,959	28,970	28,982	28,997 (5,799) [1,392] {696}	29,011 (5,802) [1,393] {696}	29,025 (5,805) [1,393] {697}
Carroll	23,631	23,632	23,633	23,634	23,637 (4,727) [1,135] {567}	23,640 (4,728) [1,135] {567}	23,643 (4,729) [1,135] {567}
Cherokee	62,802	62,807	62,812	62,817	62,828 (12,566) [3,016] {1,508}	62,839 (12,568) [3,016] {1,508}	62,849 (12,570) [3,017] {1,508}
Clarke	29,553	29,554	29,556	29,557	29,561 (5,912) [1,419] {709}	29,565 (5,913) [1,419] {710}	29,569 (5,914) [1,419] {710}
Clayton	63,351	63,356	63,360	63,365	63,378 (12,676) [3,042] {1,521}	63,390 (12,678) [3,043] {1,521}	63,402 (12,680) [3,043] {1,522}
Cobb	170,482	170,509	170,535	170,562	170,641 (34,128) [8,191] {4,095}	170,718 (34,144) [8,194] {4,097}	170,795 (34,159) [8,198] {4,099}
DeKalb	145,578	145,627	145,675	145,724	145,827 (29,165) [7,000] {3,500}	145,931 (29,186) [7,005] {3,502}	146,036 (29,207) [7,010] {3,505}
Dougherty	19,413	19,415	19,417	19,419	19,423 (3,885) [932] {466}	19,427 (3,885) [932] {466}	19,430 (3,886) [933] {466}
Douglas	34,681	34,685	34,688	34,692	34,697 (6,939) [1,665] {833}	34,702 (6,940) [1,666] {833}	34,706 (6,941) [1,666] {833}
Fulton	213,776	213,828	213,880	213,932	214,057 (42,811) [10,275] {5,137}	214,182 (42,836) [10,281] {5,140}	214,308 (42,862) [10,287] {5,143}
Gwinnett	206,174	206,197	206,220	206,243	206,301 (41,260) [9,902] {4,951}	206,356 (41,271) [9,905] {4,953}	206,411 (41,282) [9,908] {4,954}
Hall	53,116	53,125	53,134	53,143	53,158 (10,632) [2,552] {1,276}	53,174 (10,635) [2,552] {1,276}	53,189 (10,638) [2,553] {1,277}
Henry	57,537	57,543	57,548	57,554	57,566 (11,513) [2,763] {1,382}	57,577 (11,515) [2,764] {1,382}	57,588 (11,518) [2,764] {1,382}
Lee	7,209	7,209	7,209	7,209	7,210 (1,442) [346] {173}	7,211 (1,442) [346] {173}	7,211 (1,442) [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.