IEM's AI Modeling: Short-term COVID-19 Projections
Date: 1/8/21

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 1/8/21 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
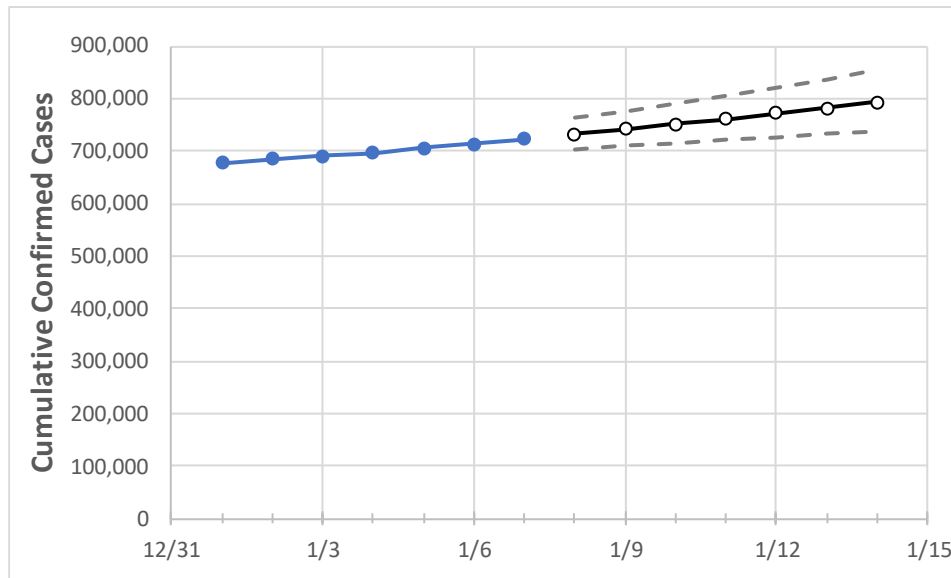
	Actual Confirmed Cases On:				Projected Cases For:						
	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14
Georgia	696,063	706,154	713,840	723,630	732,596	741,959	751,542	761,226	771,435	781,899	792,380

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:						
	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14
Bartow	8,315	8,430	8,554	8,758	8,892	9,029	9,172	9,315	9,467	9,621	9,780
Carroll	7,837	7,891	7,930	8,015	8,075	8,136	8,196	8,259	8,319	8,380	8,443
Cherokee	17,440	17,791	17,924	18,351	18,664	18,987	19,317	19,649	19,991	20,350	20,721
Clarke	10,432	10,546	10,678	10,790	10,899	11,012	11,132	11,255	11,386	11,516	11,656
Clayton	14,963	15,120	15,181	15,344	15,491	15,647	15,798	15,953	16,115	16,280	16,447
Cobb	46,617	47,325	47,707	48,473	49,125	49,782	50,475	51,177	51,894	52,616	53,357
DeKalb	39,499	40,055	40,402	40,876	41,280	41,693	42,089	42,514	42,933	43,361	43,798
Dougherty	4,941	5,014	5,123	5,209	5,292	5,382	5,474	5,574	5,676	5,788	5,907
Douglas	8,688	8,840	8,892	9,065	9,181	9,299	9,420	9,547	9,669	9,796	9,925
Fulton	59,255	59,999	60,247	61,428	62,088	62,761	63,452	64,167	64,888	65,589	66,287
Gwinnett	60,074	61,138	61,578	62,618	63,444	64,291	65,156	66,043	66,975	67,956	68,935
Hall	19,018	19,248	19,473	19,646	19,834	20,021	20,205	20,391	20,582	20,770	20,968
Henry	14,067	14,287	14,373	14,606	14,792	14,975	15,158	15,349	15,545	15,741	15,940
Lee	1,604	1,650	1,685	1,726	1,759	1,795	1,832	1,871	1,912	1,955	1,999

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:		
	1/4	1/5	1/6	1/7	1/9	1/11	1/13
Bartow	8,315	8,430	8,554	8,758	9,029 (1,806) [433] {217}	9,315 (1,863) [447] {224}	9,621 (1,924) [462] {231}
Carroll	7,837	7,891	7,930	8,015	8,136 (1,627) [391] {195}	8,259 (1,652) [396] {198}	8,380 (1,676) [402] {201}
Cherokee	17,440	17,791	17,924	18,351	18,987 (3,797) [911] {456}	19,649 (3,930) [943] {472}	20,350 (4,070) [977] {488}
Clarke	10,432	10,546	10,678	10,790	11,012 (2,202) [529] {264}	11,255 (2,251) [540] {270}	11,516 (2,303) [553] {276}
Clayton	14,963	15,120	15,181	15,344	15,647 (3,129) [751] {376}	15,953 (3,191) [766] {383}	16,280 (3,256) [781] {391}
Cobb	46,617	47,325	47,707	48,473	49,782 (9,956) [2,390] {1,195}	51,177 (10,235) [2,457] {1,228}	52,616 (10,523) [2,526] {1,263}
DeKalb	39,499	40,055	40,402	40,876	41,693 (8,339) [2,001] {1,001}	42,514 (8,503) [2,041] {1,020}	43,361 (8,672) [2,081] {1,041}
Dougherty	4,941	5,014	5,123	5,209	5,382 (1,076) [258] {129}	5,574 (1,115) [268] {134}	5,788 (1,158) [278] {139}
Douglas	8,688	8,840	8,892	9,065	9,299 (1,860) [446] {223}	9,547 (1,909) [458] {229}	9,796 (1,959) [470] {235}
Fulton	59,255	59,999	60,247	61,428	62,761 (12,552) [3,013] {1,506}	64,167 (12,833) [3,080] {1,540}	65,589 (13,118) [3,148] {1,574}
Gwinnett	60,074	61,138	61,578	62,618	64,291 (12,858) [3,086] {1,543}	66,043 (13,209) [3,170] {1,585}	67,956 (13,591) [3,262] {1,631}
Hall	19,018	19,248	19,473	19,646	20,021 (4,004) [961] {481}	20,391 (4,078) [979] {489}	20,770 (4,154) [997] {498}
Henry	14,067	14,287	14,373	14,606	14,975 (2,995) [719] {359}	15,349 (3,070) [737] {368}	15,741 (3,148) [756] {378}
Lee	1,604	1,650	1,685	1,726	1,795 (359) [86] {43}	1,871 (374) [90] {45}	1,955 (391) [94] {47}

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.