IEM's AI Modeling: Short-term COVID-19 Projections
Date: 4/14/21

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 4/14/21 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
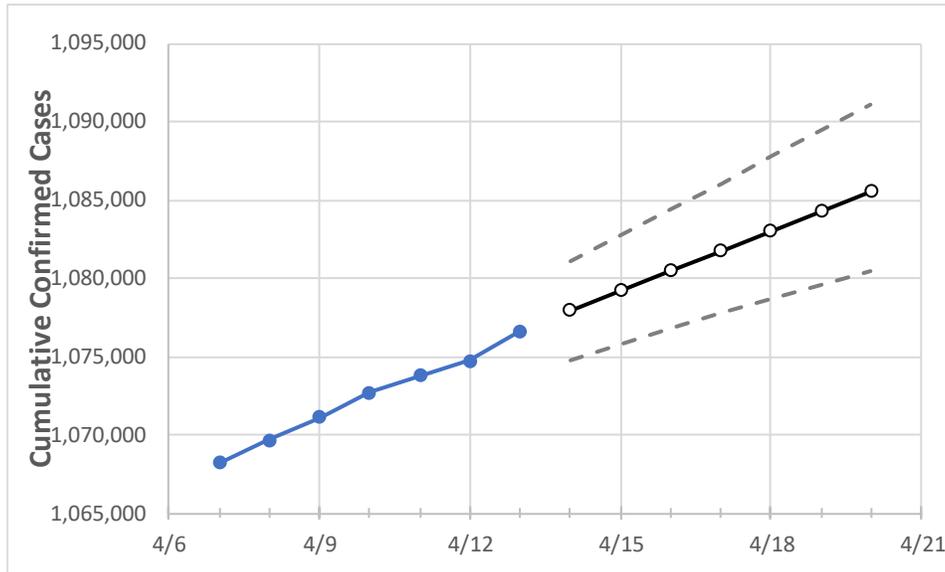
	Actual Confirmed Cases On:				Projected Cases For:						
	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20
Georgia	1,072,700	1,073,792	1,074,731	1,076,644	1,077,935	1,079,213	1,080,482	1,081,754	1,083,002	1,084,274	1,085,541

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:						
	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20
Bartow	14,148	14,157	14,174	14,215	14,233	14,252	14,270	14,288	14,306	14,324	14,341
Carroll	11,086	11,094	11,100	11,113	11,126	11,138	11,151	11,164	11,176	11,188	11,200
Cherokee	30,002	30,022	30,045	30,102	30,139	30,176	30,212	30,247	30,282	30,318	30,349
Clarke	14,720	14,726	14,731	14,760	14,772	14,785	14,797	14,810	14,822	14,834	14,847
Clayton	25,214	25,239	25,266	25,362	25,407	25,450	25,495	25,539	25,583	25,627	25,671
Cobb	75,327	75,405	75,487	75,634	75,750	75,870	75,984	76,096	76,207	76,316	76,425
DeKalb	62,493	62,695	62,887	63,075	63,239	63,410	63,586	63,761	63,941	64,126	64,312
Dougherty	7,298	7,299	7,304	7,315	7,321	7,326	7,331	7,337	7,342	7,347	7,352
Douglas	14,533	14,558	14,569	14,587	14,611	14,634	14,658	14,682	14,704	14,727	14,751
Fulton	93,318	93,440	93,561	93,755	93,902	94,050	94,194	94,337	94,482	94,623	94,765
Gwinnett	98,039	98,180	98,240	98,416	98,538	98,657	98,779	98,899	99,019	99,141	99,261
Hall	26,579	26,599	26,614	26,639	26,661	26,682	26,704	26,726	26,747	26,769	26,790
Henry	24,103	24,139	24,164	24,206	24,245	24,284	24,322	24,360	24,396	24,434	24,471
Lee	2,686	2,688	2,687	2,688	2,690	2,692	2,694	2,696	2,698	2,700	2,702

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:		
	4/10	4/11	4/12	4/13	4/15	4/17	4/19
Bartow	14,148	14,157	14,174	14,215	14,252 (2,850) [684] {342}	14,288 (2,858) [686] {343}	14,324 (2,865) [688] {344}
Carroll	11,086	11,094	11,100	11,113	11,138 (2,228) [535] {267}	11,164 (2,233) [536] {268}	11,188 (2,238) [537] {269}
Cherokee	30,002	30,022	30,045	30,102	30,176 (6,035) [1,448] {724}	30,247 (6,049) [1,452] {726}	30,318 (6,064) [1,455] {728}
Clarke	14,720	14,726	14,731	14,760	14,785 (2,957) [710] {355}	14,810 (2,962) [711] {355}	14,834 (2,967) [712] {356}
Clayton	25,214	25,239	25,266	25,362	25,450 (5,090) [1,222] {611}	25,539 (5,108) [1,226] {613}	25,627 (5,125) [1,230] {615}
Cobb	75,327	75,405	75,487	75,634	75,870 (15,174) [3,642] {1,821}	76,096 (15,219) [3,653] {1,826}	76,316 (15,263) [3,663] {1,832}
DeKalb	62,493	62,695	62,887	63,075	63,410 (12,682) [3,044] {1,522}	63,761 (12,752) [3,061] {1,530}	64,126 (12,825) [3,078] {1,539}
Dougherty	7,298	7,299	7,304	7,315	7,326 (1,465) [352] {176}	7,337 (1,467) [352] {176}	7,347 (1,469) [353] {176}
Douglas	14,533	14,558	14,569	14,587	14,634 (2,927) [702] {351}	14,682 (2,936) [705] {352}	14,727 (2,945) [707] {353}
Fulton	93,318	93,440	93,561	93,755	94,050 (18,810) [4,514] {2,257}	94,337 (18,867) [4,528] {2,264}	94,623 (18,925) [4,542] {2,271}
Gwinnett	98,039	98,180	98,240	98,416	98,657 (19,731) [4,736] {2,368}	98,899 (19,780) [4,747] {2,374}	99,141 (19,828) [4,759] {2,379}
Hall	26,579	26,599	26,614	26,639	26,682 (5,336) [1,281] {640}	26,726 (5,345) [1,283] {641}	26,769 (5,354) [1,285] {642}
Henry	24,103	24,139	24,164	24,206	24,284 (4,857) [1,166] {583}	24,360 (4,872) [1,169] {585}	24,434 (4,887) [1,173] {586}
Lee	2,686	2,688	2,687	2,688	2,692 (538) [129] {65}	2,696 (539) [129] {65}	2,700 (540) [130] {65}

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.