IEM's AI Modeling: Short-term COVID-19 Projections

Date: 3/8/22

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 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 3/8/22 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.

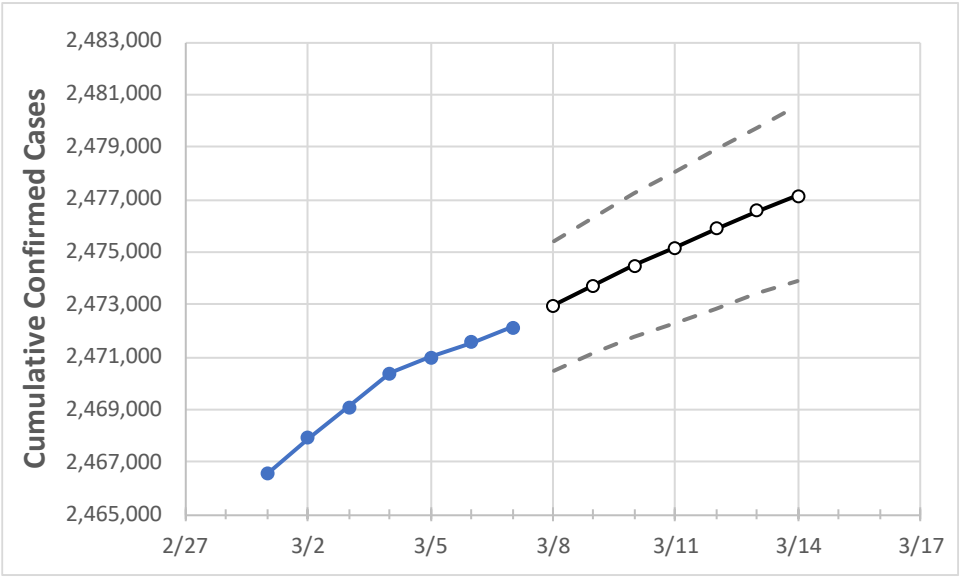
IEM's Modeling Lead

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Georgia	2,470,384	2,470,969	2,471,555	2,472,140	2,472,979	2,473,739	2,474,470	2,475,171	2,475,891	2,476,557	2,477,153

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Bartow	28,718	28,728	28,737	28,747	28,764	28,780	28,794	28,810	28,824	28,839	28,853
Carroll	23,589	23,591	23,594	23,596	23,600	23,604	23,607	23,610	23,613	23,617	23,620
Cherokee	62,702	62,710	62,718	62,726	62,737	62,749	62,759	62,768	62,778	62,787	62,796
Clarke	29,476	29,479	29,481	29,484	29,487	29,490	29,493	29,496	29,499	29,501	29,503
Clayton	63,145	63,153	63,162	63,170	63,184	63,198	63,211	63,224	63,236	63,248	63,259
Cobb	169,438	169,483	169,528	169,573	169,623	169,669	169,715	169,758	169,797	169,840	169,878
DeKalb	144,480	144,517	144,554	144,591	144,648	144,698	144,750	144,798	144,845	144,891	144,936
Dougherty	19,345	19,350	19,355	19,360	19,365	19,369	19,373	19,378	19,381	19,385	19,388
Douglas	34,588	34,596	34,605	34,613	34,620	34,626	34,633	34,639	34,645	34,651	34,656
Fulton	212,450	212,510	212,570	212,630	212,693	212,758	212,816	212,874	212,929	212,982	213,034
Gwinnett	205,340	205,396	205,451	205,507	205,560	205,610	205,659	205,706	205,750	205,793	205,834
Hall	53,053	53,061	53,068	53,076	53,087	53,097	53,107	53,116	53,125	53,133	53,141
Henry	57,307	57,316	57,324	57,333	57,351	57,366	57,381	57,396	57,410	57,425	57,438
Lee	7,188	7,191	7,193	7,196	7,198	7,199	7,201	7,202	7,203	7,205	7,206

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:		
	3/4	3/5	3/6	3/7	3/9	3/11	3/13
Bartow	28,718	28,728	28,737	28,747	28,780 (5,756) [1,381] {691}	28,810 (5,762) [1,383] {691}	28,839 (5,768) [1,384] {692}
Carroll	23,589	23,591	23,594	23,596	23,604 (4,721) [1,133] {566}	23,610 (4,722) [1,133] {567}	23,617 (4,723) [1,134] {567}
Cherokee	62,702	62,710	62,718	62,726	62,749 (12,550) [3,012] {1,506}	62,768 (12,554) [3,013] {1,506}	62,787 (12,557) [3,014] {1,507}
Clarke	29,476	29,479	29,481	29,484	29,490 (5,898) [1,416] {708}	29,496 (5,899) [1,416] {708}	29,501 (5,900) [1,416] {708}
Clayton	63,145	63,153	63,162	63,170	63,198 (12,640) [3,033] {1,517}	63,224 (12,645) [3,035] {1,517}	63,248 (12,650) [3,036] {1,518}
Cobb	169,438	169,483	169,528	169,573	169,669 (33,934) [8,144] {4,072}	169,758 (33,952) [8,148] {4,074}	169,840 (33,968) [8,152] {4,076}
DeKalb	144,480	144,517	144,554	144,591	144,698 (28,940) [6,946] {3,473}	144,798 (28,960) [6,950] {3,475}	144,891 (28,978) [6,955] {3,477}
Dougherty	19,345	19,350	19,355	19,360	19,369 (3,874) [930] {465}	19,378 (3,876) [930] {465}	19,385 (3,877) [930] {465}
Douglas	34,588	34,596	34,605	34,613	34,626 (6,925) [1,662] {831}	34,639 (6,928) [1,663] {831}	34,651 (6,930) [1,663] {832}
Fulton	212,450	212,510	212,570	212,630	212,758 (42,552) [10,212] {5,106}	212,874 (42,575) [10,218] {5,109}	212,982 (42,596) [10,223] {5,112}
Gwinnett	205,340	205,396	205,451	205,507	205,610 (41,122) [9,869] {4,935}	205,706 (41,141) [9,874] {4,937}	205,793 (41,159) [9,878] {4,939}
Hall	53,053	53,061	53,068	53,076	53,097 (10,619) [2,549] {1,274}	53,116 (10,623) [2,550] {1,275}	53,133 (10,627) [2,550] {1,275}
Henry	57,307	57,316	57,324	57,333	57,366 (11,473) [2,754] {1,377}	57,396 (11,479) [2,755] {1,377}	57,425 (11,485) [2,756] {1,378}
Lee	7,188	7,191	7,193	7,196	7,199 (1,440) [346] {173}	7,202 (1,440) [346] {173}	7,205 (1,441) [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.