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

Date: 2/26/21

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 2/26/21 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.

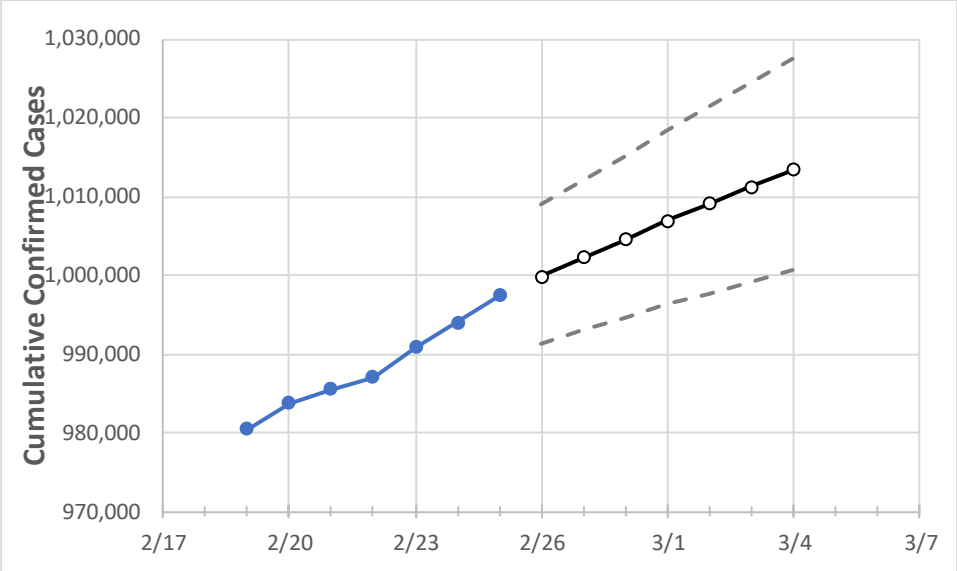
IEM's Modeling Lead

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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Georgia	987,041	990,821	994,061	997,388	999,839	1,002,232	1,004,546	1,006,872	1,009,067	1,011,240	1,013,366

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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Bartow	12,611	12,701	12,767	12,839	12,894	12,951	13,008	13,063	13,116	13,170	13,219
Carroll	10,383	10,418	10,452	10,479	10,501	10,521	10,542	10,561	10,580	10,599	10,617
Cherokee	26,592	26,797	26,953	27,124	27,232	27,340	27,445	27,551	27,656	27,759	27,862
Clarke	13,914	13,945	13,983	14,024	14,048	14,071	14,094	14,115	14,137	14,157	14,177
Clayton	22,644	22,753	22,928	23,022	23,100	23,176	23,251	23,326	23,399	23,467	23,535
Cobb	68,282	68,506	68,691	68,897	69,060	69,219	69,380	69,534	69,685	69,826	69,969
DeKalb	55,772	56,014	56,231	56,458	56,616	56,767	56,918	57,070	57,216	57,365	57,505
Dougherty	6,983	6,995	7,012	7,035	7,043	7,052	7,060	7,067	7,075	7,081	7,088
Douglas	13,149	13,210	13,250	13,299	13,338	13,377	13,414	13,449	13,483	13,516	13,549
Fulton	83,698	83,962	84,258	84,623	84,852	85,078	85,301	85,523	85,748	85,964	86,179
Gwinnett	90,437	90,706	91,053	91,412	91,625	91,832	92,038	92,234	92,433	92,619	92,801
Hall	25,180	25,239	25,314	25,361	25,399	25,435	25,471	25,505	25,535	25,568	25,599
Henry	20,993	21,080	21,169	21,277	21,341	21,405	21,467	21,530	21,590	21,650	21,708
Lee	2,539	2,545	2,563	2,567	2,571	2,574	2,577	2,580	2,583	2,586	2,589

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:		
	2/22	2/23	2/24	2/25	2/27	3/1	3/3
Bartow	12,611	12,701	12,767	12,839	12,951 (2,590) [622] {311}	13,063 (2,613) [627] {314}	13,170 (2,634) [632] {316}
Carroll	10,383	10,418	10,452	10,479	10,521 (2,104) [505] {253}	10,561 (2,112) [507] {253}	10,599 (2,120) [509] {254}
Cherokee	26,592	26,797	26,953	27,124	27,340 (5,468) [1,312] {656}	27,551 (5,510) [1,322] {661}	27,759 (5,552) [1,332] {666}
Clarke	13,914	13,945	13,983	14,024	14,071 (2,814) [675] {338}	14,115 (2,823) [678] {339}	14,157 (2,831) [680] {340}
Clayton	22,644	22,753	22,928	23,022	23,176 (4,635) [1,112] {556}	23,326 (4,665) [1,120] {560}	23,467 (4,693) [1,126] {563}
Cobb	68,282	68,506	68,691	68,897	69,219 (13,844) [3,323] {1,661}	69,534 (13,907) [3,338] {1,669}	69,826 (13,965) [3,352] {1,676}
DeKalb	55,772	56,014	56,231	56,458	56,767 (11,353) [2,725] {1,362}	57,070 (11,414) [2,739] {1,370}	57,365 (11,473) [2,754] {1,377}
Dougherty	6,983	6,995	7,012	7,035	7,052 (1,410) [338] {169}	7,067 (1,413) [339] {170}	7,081 (1,416) [340] {170}
Douglas	13,149	13,210	13,250	13,299	13,377 (2,675) [642] {321}	13,449 (2,690) [646] {323}	13,516 (2,703) [649] {324}
Fulton	83,698	83,962	84,258	84,623	85,078 (17,016) [4,084] {2,042}	85,523 (17,105) [4,105] {2,053}	85,964 (17,193) [4,126] {2,063}
Gwinnett	90,437	90,706	91,053	91,412	91,832 (18,366) [4,408] {2,204}	92,234 (18,447) [4,427] {2,214}	92,619 (18,524) [4,446] {2,223}
Hall	25,180	25,239	25,314	25,361	25,435 (5,087) [1,221] {610}	25,505 (5,101) [1,224] {612}	25,568 (5,114) [1,227] {614}
Henry	20,993	21,080	21,169	21,277	21,405 (4,281) [1,027] {514}	21,530 (4,306) [1,033] {517}	21,650 (4,330) [1,039] {520}
Lee	2,539	2,545	2,563	2,567	2,574 (515) [124] {62}	2,580 (516) [124] {62}	2,586 (517) [124] {62}

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.