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

Date: 1/24/22

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 1/24/22 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.

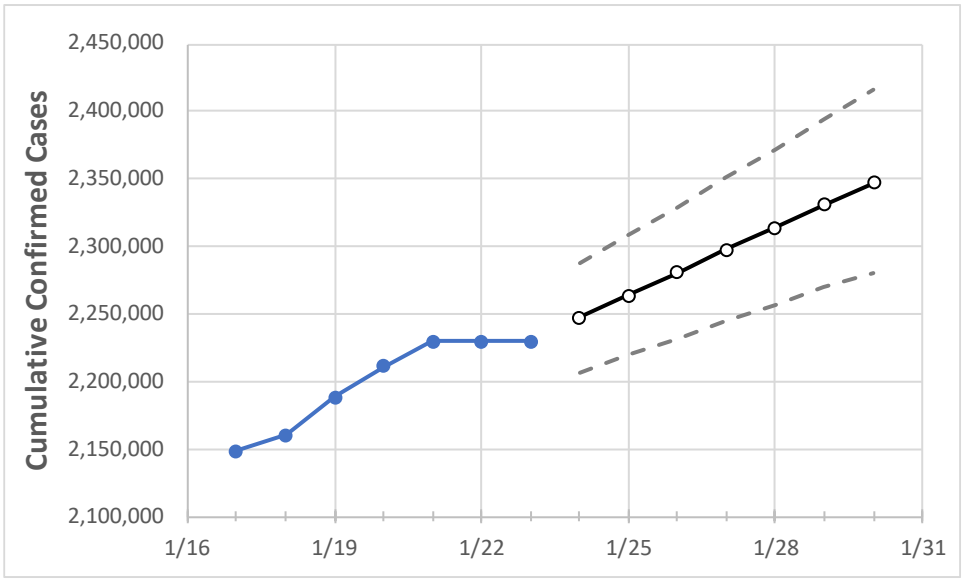
IEM's Modeling Lead

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:						
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30
Georgia	2,211,004	2,229,675	2,229,675	2,229,675	2,247,331	2,263,715	2,280,339	2,297,662	2,313,966	2,330,858	2,347,399

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:						
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30
Bartow	26,267	26,459	26,459	26,459	26,608	26,755	26,900	27,044	27,189	27,322	27,465
Carroll	21,679	21,851	21,851	21,851	21,985	22,117	22,243	22,372	22,499	22,625	22,748
Cherokee	57,291	57,758	57,758	57,758	58,166	58,556	58,958	59,367	59,756	60,153	60,543
Clarke	27,019	27,253	27,253	27,253	27,512	27,745	28,006	28,249	28,493	28,737	28,984
Clayton	56,001	56,272	56,272	56,272	56,551	56,800	57,060	57,291	57,540	57,777	57,995
Cobb	153,404	154,274	154,274	154,274	155,142	155,949	156,734	157,545	158,312	159,096	159,814
DeKalb	128,069	128,917	128,917	128,917	129,604	130,277	130,933	131,574	132,213	132,820	133,433
Dougherty	16,535	16,699	16,699	16,699	16,986	17,270	17,570	17,869	18,178	18,515	18,833
Douglas	32,106	32,261	32,261	32,261	32,404	32,536	32,666	32,801	32,922	33,038	33,151
Fulton	192,040	193,430	193,430	193,430	194,333	195,203	196,057	196,866	197,627	198,459	199,192
Gwinnett	184,869	186,117	186,117	186,117	187,298	188,459	189,649	190,786	191,954	193,078	194,133
Hall	48,719	49,113	49,113	49,113	49,444	49,771	50,096	50,418	50,735	51,069	51,369
Henry	53,191	53,420	53,420	53,420	53,626	53,825	54,014	54,213	54,374	54,558	54,722
Lee	5,981	6,084	6,084	6,084	6,190	6,309	6,432	6,558	6,696	6,839	6,993

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:		
	1/20	1/21	1/22	1/23	1/25	1/27	1/29
Bartow	26,267	26,459	26,459	26,459	26,755 (5,351) [1,284] {642}	27,044 (5,409) [1,298] {649}	27,322 (5,464) [1,311] {656}
Carroll	21,679	21,851	21,851	21,851	22,117 (4,423) [1,062] {531}	22,372 (4,474) [1,074] {537}	22,625 (4,525) [1,086] {543}
Cherokee	57,291	57,758	57,758	57,758	58,556 (11,711) [2,811] {1,405}	59,367 (11,873) [2,850] {1,425}	60,153 (12,031) [2,887] {1,444}
Clarke	27,019	27,253	27,253	27,253	27,745 (5,549) [1,332] {666}	28,249 (5,650) [1,356] {678}	28,737 (5,747) [1,379] {690}
Clayton	56,001	56,272	56,272	56,272	56,800 (11,360) [2,726] {1,363}	57,291 (11,458) [2,750] {1,375}	57,777 (11,555) [2,773] {1,387}
Cobb	153,404	154,274	154,274	154,274	155,949 (31,190) [7,486] {3,743}	157,545 (31,509) [7,562] {3,781}	159,096 (31,819) [7,637] {3,818}
DeKalb	128,069	128,917	128,917	128,917	130,277 (26,055) [6,253] {3,127}	131,574 (26,315) [6,316] {3,158}	132,820 (26,564) [6,375] {3,188}
Dougherty	16,535	16,699	16,699	16,699	17,270 (3,454) [829] {414}	17,869 (3,574) [858] {429}	18,515 (3,703) [889] {444}
Douglas	32,106	32,261	32,261	32,261	32,536 (6,507) [1,562] {781}	32,801 (6,560) [1,574] {787}	33,038 (6,608) [1,586] {793}
Fulton	192,040	193,430	193,430	193,430	195,203 (39,041) [9,370] {4,685}	196,866 (39,373) [9,450] {4,725}	198,459 (39,692) [9,526] {4,763}
Gwinnett	184,869	186,117	186,117	186,117	188,459 (37,692) [9,046] {4,523}	190,786 (38,157) [9,158] {4,579}	193,078 (38,616) [9,268] {4,634}
Hall	48,719	49,113	49,113	49,113	49,771 (9,954) [2,389] {1,195}	50,418 (10,084) [2,420] {1,210}	51,069 (10,214) [2,451] {1,226}
Henry	53,191	53,420	53,420	53,420	53,825 (10,765) [2,584] {1,292}	54,213 (10,843) [2,602] {1,301}	54,558 (10,912) [2,619] {1,309}
Lee	5,981	6,084	6,084	6,084	6,309 (1,262) [303] {151}	6,558 (1,312) [315] {157}	6,839 (1,368) [328] {164}

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.