

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

Date: 2/23/22

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 2/23/22 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.

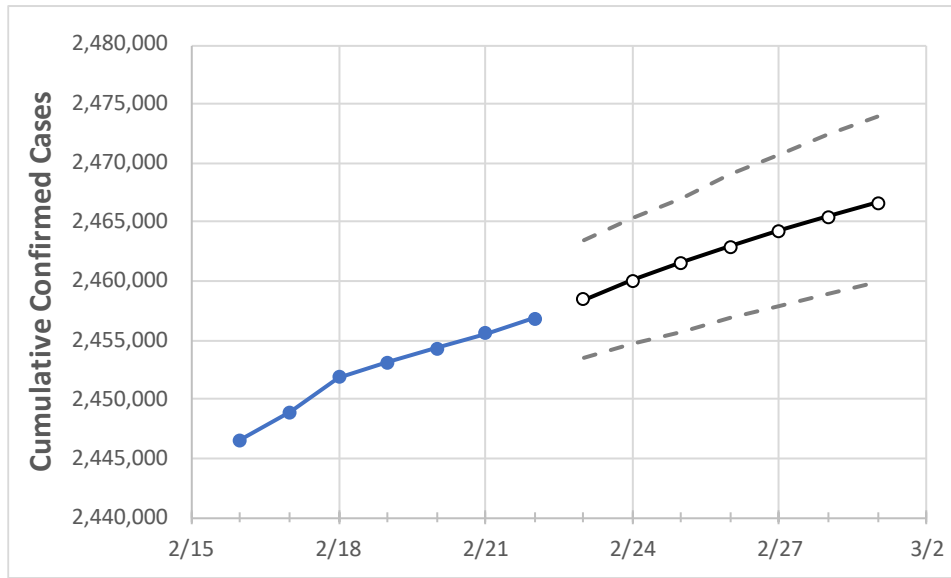
IEM's Modeling Lead

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:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Georgia	2,453,130	2,454,351	2,455,573	2,456,866	2,458,468	2,460,046	2,461,543	2,462,924	2,464,236	2,465,500	2,466,678

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:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Bartow	28,416	28,434	28,451	28,467	28,491	28,516	28,538	28,563	28,586	28,607	28,628
Carroll	23,485	23,495	23,505	23,524	23,537	23,550	23,561	23,573	23,584	23,595	23,604
Cherokee	62,411	62,449	62,488	62,509	62,539	62,567	62,593	62,618	62,639	62,663	62,684
Clarke	29,385	29,396	29,408	29,414	29,426	29,438	29,450	29,460	29,470	29,481	29,489
Clayton	62,832	62,852	62,871	62,896	62,927	62,955	62,982	63,006	63,031	63,056	63,080
Cobb	168,390	168,466	168,542	168,623	168,727	168,824	168,921	169,009	169,097	169,181	169,258
DeKalb	143,329	143,401	143,473	143,552	143,669	143,767	143,877	143,970	144,064	144,157	144,234
Dougherty	19,241	19,248	19,255	19,277	19,288	19,298	19,307	19,316	19,325	19,332	19,339
Douglas	34,442	34,451	34,461	34,476	34,490	34,504	34,516	34,528	34,539	34,551	34,560
Fulton	211,080	211,190	211,299	211,426	211,568	211,697	211,826	211,944	212,063	212,172	212,272
Gwinnett	204,187	204,299	204,410	204,490	204,607	204,724	204,826	204,925	205,027	205,128	205,208
Hall	52,812	52,831	52,850	52,868	52,899	52,927	52,953	52,977	53,002	53,025	53,047
Henry	56,957	56,981	57,004	57,030	57,065	57,098	57,129	57,159	57,190	57,219	57,246
Lee	7,150	7,153	7,157	7,159	7,164	7,169	7,173	7,177	7,180	7,184	7,187

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:											
	2/19	2/20	2/21	2/22	2/24			2/26			2/28					
Bartow	28,416	28,434	28,451	28,467	28,516	(5,703)	[1,369]	{684}	28,563	(5,713)	[1,371]	{686}	28,607	(5,721)	[1,373]	{687}
Carroll	23,485	23,495	23,505	23,524	23,550	(4,710)	[1,130]	{565}	23,573	(4,715)	[1,132]	{566}	23,595	(4,719)	[1,133]	{566}
Cherokee	62,411	62,449	62,488	62,509	62,567	(12,513)	[3,003]	{1,502}	62,618	(12,524)	[3,006]	{1,503}	62,663	(12,533)	[3,008]	{1,504}
Clarke	29,385	29,396	29,408	29,414	29,438	(5,888)	[1,413]	{707}	29,460	(5,892)	[1,414]	{707}	29,481	(5,896)	[1,415]	{708}
Clayton	62,832	62,852	62,871	62,896	62,955	(12,591)	[3,022]	{1,511}	63,006	(12,601)	[3,024]	{1,512}	63,056	(12,611)	[3,027]	{1,513}
Cobb	168,390	168,466	168,542	168,623	168,824	(33,765)	[8,104]	{4,052}	169,009	(33,802)	[8,112]	{4,056}	169,181	(33,836)	[8,121]	{4,060}
DeKalb	143,329	143,401	143,473	143,552	143,767	(28,753)	[6,901]	{3,450}	143,970	(28,794)	[6,911]	{3,455}	144,157	(28,831)	[6,920]	{3,460}
Dougherty	19,241	19,248	19,255	19,277	19,298	(3,860)	[926]	{463}	19,316	(3,863)	[927]	{464}	19,332	(3,866)	[928]	{464}
Douglas	34,442	34,451	34,461	34,476	34,504	(6,901)	[1,656]	{828}	34,528	(6,906)	[1,657]	{829}	34,551	(6,910)	[1,658]	{829}
Fulton	211,080	211,190	211,299	211,426	211,697	(42,339)	[10,161]	{5,081}	211,944	(42,389)	[10,173]	{5,087}	212,172	(42,434)	[10,184]	{5,092}
Gwinnett	204,187	204,299	204,410	204,490	204,724	(40,945)	[9,827]	{4,913}	204,925	(40,985)	[9,836]	{4,918}	205,128	(41,026)	[9,846]	{4,923}
Hall	52,812	52,831	52,850	52,868	52,927	(10,585)	[2,540]	{1,270}	52,977	(10,595)	[2,543]	{1,271}	53,025	(10,605)	[2,545]	{1,273}
Henry	56,957	56,981	57,004	57,030	57,098	(11,420)	[2,741]	{1,370}	57,159	(11,432)	[2,744]	{1,372}	57,219	(11,444)	[2,747]	{1,373}
Lee	7,150	7,153	7,157	7,159	7,169	(1,434)	[344]	{172}	7,177	(1,435)	[344]	{172}	7,184	(1,437)	[345]	{172}

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.