

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/1/21**

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 12/1/21 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.

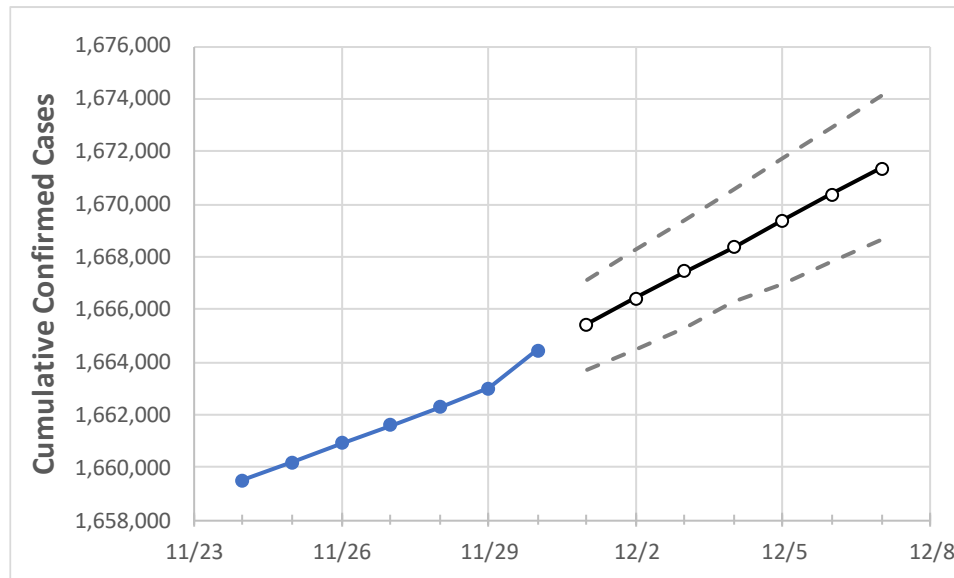
IEM's Modeling Lead

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
Georgia	1,661,593	1,662,294	1,662,995	1,664,456	1,665,435	1,666,430	1,667,426	1,668,364	1,669,380	1,670,365	1,671,351

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
Bartow	20,848	20,858	20,867	20,882	20,900	20,919	20,936	20,955	20,973	20,994	21,012
Carroll	16,605	16,615	16,625	16,636	16,647	16,658	16,669	16,679	16,691	16,702	16,714
Cherokee	44,432	44,452	44,473	44,513	44,537	44,561	44,586	44,611	44,635	44,661	44,686
Clarke	20,338	20,345	20,352	20,355	20,362	20,370	20,377	20,384	20,392	20,399	20,406
Clayton	40,009	40,032	40,054	40,086	40,108	40,131	40,153	40,175	40,198	40,220	40,243
Cobb	111,743	111,816	111,889	112,032	112,135	112,236	112,336	112,436	112,538	112,644	112,746
DeKalb	93,302	93,348	93,394	93,482	93,542	93,604	93,664	93,725	93,785	93,846	93,906
Dougherty	12,530	12,532	12,534	12,533	12,535	12,537	12,539	12,541	12,542	12,544	12,546
Douglas	22,643	22,651	22,659	22,674	22,685	22,696	22,707	22,718	22,729	22,740	22,750
Fulton	134,379	134,452	134,525	134,627	134,721	134,817	134,910	135,004	135,103	135,201	135,297
Gwinnett	136,013	136,090	136,166	136,327	136,440	136,557	136,671	136,785	136,903	137,022	137,140
Hall	38,922	38,950	38,978	39,035	39,069	39,102	39,134	39,166	39,201	39,234	39,268
Henry	38,799	38,816	38,833	38,874	38,896	38,919	38,942	38,963	38,986	39,009	39,031
Lee	4,778	4,779	4,779	4,784	4,786	4,788	4,789	4,791	4,792	4,794	4,795

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:											
	11/27	11/28	11/29	11/30	12/2				12/4				12/6			
Bartow	20,848	20,858	20,867	20,882	20,919	(4,184)	[1,004]	{502}	20,955	(4,191)	[1,006]	{503}	20,994	(4,199)	[1,008]	{504}
Carroll	16,605	16,615	16,625	16,636	16,658	(3,332)	[800]	{400}	16,679	(3,336)	[801]	{400}	16,702	(3,340)	[802]	{401}
Cherokee	44,432	44,452	44,473	44,513	44,561	(8,912)	[2,139]	{1,069}	44,611	(8,922)	[2,141]	{1,071}	44,661	(8,932)	[2,144]	{1,072}
Clarke	20,338	20,345	20,352	20,355	20,370	(4,074)	[978]	{489}	20,384	(4,077)	[978]	{489}	20,399	(4,080)	[979]	{490}
Clayton	40,009	40,032	40,054	40,086	40,131	(8,026)	[1,926]	{963}	40,175	(8,035)	[1,928]	{964}	40,220	(8,044)	[1,931]	{965}
Cobb	111,743	111,816	111,889	112,032	112,236	(22,447)	[5,387]	{2,694}	112,436	(22,487)	[5,397]	{2,698}	112,644	(22,529)	[5,407]	{2,703}
DeKalb	93,302	93,348	93,394	93,482	93,604	(18,721)	[4,493]	{2,246}	93,725	(18,745)	[4,499]	{2,249}	93,846	(18,769)	[4,505]	{2,252}
Dougherty	12,530	12,532	12,534	12,533	12,537	(2,507)	[602]	{301}	12,541	(2,508)	[602]	{301}	12,544	(2,509)	[602]	{301}
Douglas	22,643	22,651	22,659	22,674	22,696	(4,539)	[1,089]	{545}	22,718	(4,544)	[1,090]	{545}	22,740	(4,548)	[1,092]	{546}
Fulton	134,379	134,452	134,525	134,627	134,817	(26,963)	[6,471]	{3,236}	135,004	(27,001)	[6,480]	{3,240}	135,201	(27,040)	[6,490]	{3,245}
Gwinnett	136,013	136,090	136,166	136,327	136,557	(27,311)	[6,555]	{3,277}	136,785	(27,357)	[6,566]	{3,283}	137,022	(27,404)	[6,577]	{3,289}
Hall	38,922	38,950	38,978	39,035	39,102	(7,820)	[1,877]	{938}	39,166	(7,833)	[1,880]	{940}	39,234	(7,847)	[1,883]	{942}
Henry	38,799	38,816	38,833	38,874	38,919	(7,784)	[1,868]	{934}	38,963	(7,793)	[1,870]	{935}	39,009	(7,802)	[1,872]	{936}
Lee	4,778	4,779	4,779	4,784	4,788	(958)	[230]	{115}	4,791	(958)	[230]	{115}	4,794	(959)	[230]	{115}

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.