

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

Date: 12/6/21

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 12/6/21 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.

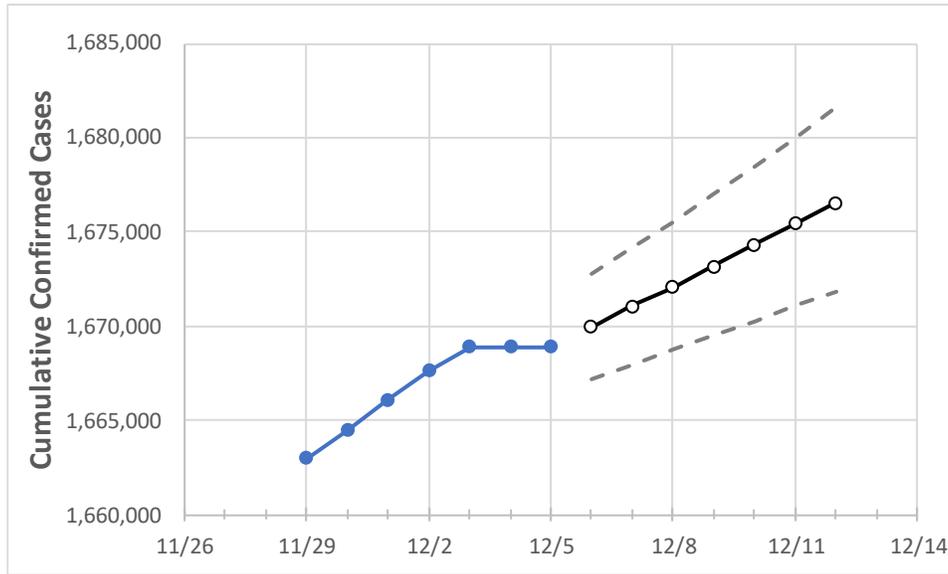
IEM's Modeling Lead

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:						
	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12

Georgia 1,667,630 1,668,875 1,668,875 1,668,875 1,669,945 1,671,067 1,672,073 1,673,185 1,674,353 1,675,429 1,676,539

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:						
	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12
Bartow	20,916	20,936	20,936	20,936	20,949	20,962	20,975	20,988	21,001	21,014	21,026
Carroll	16,669	16,681	16,681	16,681	16,694	16,709	16,723	16,737	16,752	16,767	16,782
Cherokee	44,603	44,646	44,646	44,646	44,680	44,717	44,753	44,791	44,829	44,870	44,910
Clarke	20,384	20,395	20,395	20,395	20,404	20,413	20,422	20,431	20,440	20,449	20,458
Clayton	40,204	40,253	40,253	40,253	40,290	40,330	40,368	40,408	40,450	40,494	40,537
Cobb	112,289	112,394	112,394	112,394	112,494	112,600	112,702	112,807	112,913	113,024	113,127
DeKalb	93,647	93,725	93,725	93,725	93,787	93,852	93,914	93,978	94,040	94,105	94,168
Dougherty	12,540	12,550	12,550	12,550	12,553	12,556	12,559	12,563	12,566	12,569	12,572
Douglas	22,725	22,748	22,748	22,748	22,760	22,772	22,784	22,796	22,809	22,821	22,833
Fulton	134,978	135,102	135,102	135,102	135,207	135,310	135,417	135,525	135,632	135,743	135,853
Gwinnett	136,615	136,729	136,729	136,729	136,832	136,936	137,035	137,136	137,238	137,342	137,445
Hall	39,138	39,190	39,190	39,190	39,229	39,268	39,310	39,350	39,390	39,434	39,475
Henry	39,003	39,062	39,062	39,062	39,103	39,145	39,190	39,235	39,282	39,329	39,376
Lee	4,792	4,795	4,795	4,795	4,797	4,799	4,801	4,803	4,804	4,806	4,808

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:											
	12/2	12/3	12/4	12/5	12/7			12/9			12/11					
Bartow	20,916	20,936	20,936	20,936	20,962	(4,192)	[1,006]	{503}	20,988	(4,198)	[1,007]	{504}	21,014	(4,203)	[1,009]	{504}
Carroll	16,669	16,681	16,681	16,681	16,709	(3,342)	[802]	{401}	16,737	(3,347)	[803]	{402}	16,767	(3,353)	[805]	{402}
Cherokee	44,603	44,646	44,646	44,646	44,717	(8,943)	[2,146]	{1,073}	44,791	(8,958)	[2,150]	{1,075}	44,870	(8,974)	[2,154]	{1,077}
Clarke	20,384	20,395	20,395	20,395	20,413	(4,083)	[980]	{490}	20,431	(4,086)	[981]	{490}	20,449	(4,090)	[982]	{491}
Clayton	40,204	40,253	40,253	40,253	40,330	(8,066)	[1,936]	{968}	40,408	(8,082)	[1,940]	{970}	40,494	(8,099)	[1,944]	{972}
Cobb	112,289	112,394	112,394	112,394	112,600	(22,520)	[5,405]	{2,702}	112,807	(22,561)	[5,415]	{2,707}	113,024	(22,605)	[5,425]	{2,713}
DeKalb	93,647	93,725	93,725	93,725	93,852	(18,770)	[4,505]	{2,252}	93,978	(18,796)	[4,511]	{2,255}	94,105	(18,821)	[4,517]	{2,259}
Dougherty	12,540	12,550	12,550	12,550	12,556	(2,511)	[603]	{301}	12,563	(2,513)	[603]	{302}	12,569	(2,514)	[603]	{302}
Douglas	22,725	22,748	22,748	22,748	22,772	(4,554)	[1,093]	{547}	22,796	(4,559)	[1,094]	{547}	22,821	(4,564)	[1,095]	{548}
Fulton	134,978	135,102	135,102	135,102	135,310	(27,062)	[6,495]	{3,247}	135,525	(27,105)	[6,505]	{3,253}	135,743	(27,149)	[6,516]	{3,258}
Gwinnett	136,615	136,729	136,729	136,729	136,936	(27,387)	[6,573]	{3,286}	137,136	(27,427)	[6,583]	{3,291}	137,342	(27,468)	[6,592]	{3,296}
Hall	39,138	39,190	39,190	39,190	39,268	(7,854)	[1,885]	{942}	39,350	(7,870)	[1,889]	{944}	39,434	(7,887)	[1,893]	{946}
Henry	39,003	39,062	39,062	39,062	39,145	(7,829)	[1,879]	{939}	39,235	(7,847)	[1,883]	{942}	39,329	(7,866)	[1,888]	{944}
Lee	4,792	4,795	4,795	4,795	4,799	(960)	[230]	{115}	4,803	(961)	[231]	{115}	4,806	(961)	[231]	{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.