

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/22/21**

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 11/22/21 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.

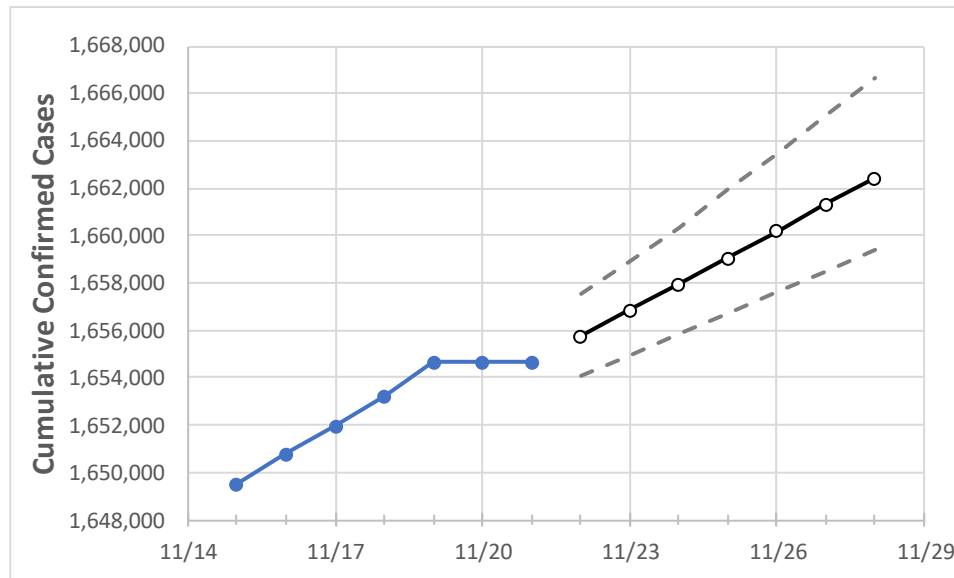
IEM's Modeling Lead

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:						
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28
Georgia	1,653,237	1,654,649	1,654,649	1,654,649	1,655,760	1,656,840	1,657,960	1,659,061	1,660,176	1,661,316	1,662,422

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:						
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28
Bartow	20,674	20,747	20,747	20,747	20,769	20,790	20,810	20,833	20,854	20,878	20,901
Carroll	16,515	16,523	16,523	16,523	16,531	16,539	16,547	16,555	16,563	16,572	16,580
Cherokee	44,251	44,264	44,264	44,264	44,287	44,310	44,332	44,356	44,378	44,402	44,426
Clarke	20,265	20,275	20,275	20,275	20,287	20,298	20,309	20,320	20,331	20,343	20,354
Clayton	39,822	39,849	39,849	39,849	39,873	39,897	39,921	39,944	39,968	39,992	40,014
Cobb	110,895	111,048	111,048	111,048	111,153	111,256	111,361	111,469	111,578	111,686	111,799
DeKalb	92,760	92,873	92,873	92,873	92,950	93,028	93,105	93,185	93,265	93,345	93,429
Dougherty	12,508	12,509	12,509	12,509	12,512	12,515	12,518	12,522	12,525	12,528	12,530
Douglas	22,541	22,558	22,558	22,558	22,575	22,592	22,610	22,628	22,646	22,665	22,683
Fulton	133,581	133,728	133,728	133,728	133,835	133,945	134,057	134,168	134,283	134,400	134,517
Gwinnett	135,128	135,293	135,293	135,293	135,424	135,555	135,690	135,824	135,965	136,107	136,250
Hall	38,677	38,724	38,724	38,724	38,765	38,806	38,846	38,888	38,931	38,974	39,016
Henry	38,616	38,646	38,646	38,646	38,672	38,699	38,725	38,751	38,778	38,804	38,832
Lee	4,763	4,765	4,765	4,765	4,768	4,771	4,773	4,776	4,779	4,781	4,784

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:											
	11/18	11/19	11/20	11/21	11/23				11/25				11/27			
Bartow	20,674	20,747	20,747	20,747	20,790	(4,158)	[998]	{499}	20,833	(4,167)	[1,000]	{500}	20,878	(4,176)	[1,002]	{501}
Carroll	16,515	16,523	16,523	16,523	16,539	(3,308)	[794]	{397}	16,555	(3,311)	[795]	{397}	16,572	(3,314)	[795]	{398}
Cherokee	44,251	44,264	44,264	44,264	44,310	(8,862)	[2,127]	{1,063}	44,356	(8,871)	[2,129]	{1,065}	44,402	(8,880)	[2,131]	{1,066}
Clarke	20,265	20,275	20,275	20,275	20,298	(4,060)	[974]	{487}	20,320	(4,064)	[975]	{488}	20,343	(4,069)	[976]	{488}
Clayton	39,822	39,849	39,849	39,849	39,897	(7,979)	[1,915]	{958}	39,944	(7,989)	[1,917]	{959}	39,992	(7,998)	[1,920]	{960}
Cobb	110,895	111,048	111,048	111,048	111,256	(22,251)	[5,340]	{2,670}	111,469	(22,294)	[5,350]	{2,675}	111,686	(22,337)	[5,361]	{2,680}
DeKalb	92,760	92,873	92,873	92,873	93,028	(18,606)	[4,465]	{2,233}	93,185	(18,637)	[4,473]	{2,236}	93,345	(18,669)	[4,481]	{2,240}
Dougherty	12,508	12,509	12,509	12,509	12,515	(2,503)	[601]	{300}	12,522	(2,504)	[601]	{301}	12,528	(2,506)	[601]	{301}
Douglas	22,541	22,558	22,558	22,558	22,592	(4,518)	[1,084]	{542}	22,628	(4,526)	[1,086]	{543}	22,665	(4,533)	[1,088]	{544}
Fulton	133,581	133,728	133,728	133,728	133,945	(26,789)	[6,429]	{3,215}	134,168	(26,834)	[6,440]	{3,220}	134,400	(26,880)	[6,451]	{3,226}
Gwinnett	135,128	135,293	135,293	135,293	135,555	(27,111)	[6,507]	{3,253}	135,824	(27,165)	[6,520]	{3,260}	136,107	(27,221)	[6,533]	{3,267}
Hall	38,677	38,724	38,724	38,724	38,806	(7,761)	[1,863]	{931}	38,888	(7,778)	[1,867]	{933}	38,974	(7,795)	[1,871]	{935}
Henry	38,616	38,646	38,646	38,646	38,699	(7,740)	[1,858]	{929}	38,751	(7,750)	[1,860]	{930}	38,804	(7,761)	[1,863]	{931}
Lee	4,763	4,765	4,765	4,765	4,771	(954)	[229]	{114}	4,776	(955)	[229]	{115}	4,781	(956)	[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.