

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 4/23/21**

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 4/23/21 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.

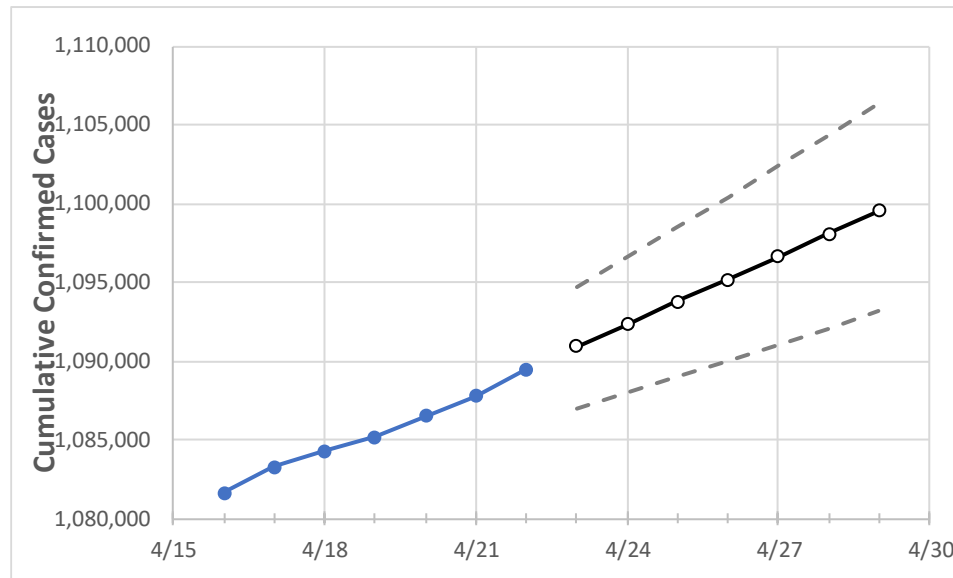
IEM's Modeling Lead

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:						
	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29
Georgia	1,085,161	1,086,473	1,087,791	1,089,497	1,090,922	1,092,333	1,093,778	1,095,181	1,096,622	1,098,065	1,099,523

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:						
	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29
Bartow	14,332	14,351	14,376	14,416	14,438	14,460	14,481	14,503	14,524	14,546	14,568
Carroll	11,184	11,189	11,194	11,201	11,209	11,216	11,223	11,230	11,237	11,244	11,250
Cherokee	30,324	30,346	30,371	30,422	30,452	30,481	30,510	30,539	30,565	30,591	30,617
Clarke	14,842	14,851	14,856	14,873	14,886	14,898	14,911	14,924	14,936	14,949	14,961
Clayton	25,692	25,738	25,789	25,856	25,914	25,972	26,031	26,091	26,151	26,213	26,276
Cobb	76,387	76,496	76,586	76,713	76,826	76,937	77,047	77,156	77,263	77,370	77,474
DeKalb	63,830	63,920	63,997	64,105	64,237	64,365	64,494	64,621	64,748	64,875	65,001
Dougherty	7,361	7,378	7,389	7,400	7,408	7,417	7,426	7,435	7,445	7,455	7,464
Douglas	14,779	14,800	14,822	14,844	14,871	14,898	14,925	14,953	14,980	15,008	15,036
Fulton	94,575	94,694	94,850	95,006	95,143	95,281	95,420	95,558	95,697	95,832	95,965
Gwinnett	99,283	99,390	99,535	99,724	99,870	100,020	100,171	100,322	100,474	100,634	100,794
Hall	26,758	26,778	26,807	26,838	26,858	26,878	26,897	26,916	26,936	26,955	26,974
Henry	24,494	24,523	24,563	24,637	24,685	24,734	24,783	24,832	24,883	24,933	24,986
Lee	2,694	2,694	2,695	2,696	2,697	2,698	2,699	2,700	2,701	2,702	2,703

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:											
	4/19	4/20	4/21	4/22	4/24				4/26				4/28			
Bartow	14,332	14,351	14,376	14,416	14,460	(2,892)	[694]	{347}	14,503	(2,901)	[696]	{348}	14,546	(2,909)	[698]	{349}
Carroll	11,184	11,189	11,194	11,201	11,216	(2,243)	[538]	{269}	11,230	(2,246)	[539]	{270}	11,244	(2,249)	[540]	{270}
Cherokee	30,324	30,346	30,371	30,422	30,481	(6,096)	[1,463]	{732}	30,539	(6,108)	[1,466]	{733}	30,591	(6,118)	[1,468]	{734}
Clarke	14,842	14,851	14,856	14,873	14,898	(2,980)	[715]	{358}	14,924	(2,985)	[716]	{358}	14,949	(2,990)	[718]	{359}
Clayton	25,692	25,738	25,789	25,856	25,972	(5,194)	[1,247]	{623}	26,091	(5,218)	[1,252]	{626}	26,213	(5,243)	[1,258]	{629}
Cobb	76,387	76,496	76,586	76,713	76,937	(15,387)	[3,693]	{1,846}	77,156	(15,431)	[3,703]	{1,852}	77,370	(15,474)	[3,714]	{1,857}
DeKalb	63,830	63,920	63,997	64,105	64,365	(12,873)	[3,090]	{1,545}	64,621	(12,924)	[3,102]	{1,551}	64,875	(12,975)	[3,114]	{1,557}
Dougherty	7,361	7,378	7,389	7,400	7,417	(1,483)	[356]	{178}	7,435	(1,487)	[357]	{178}	7,455	(1,491)	[358]	{179}
Douglas	14,779	14,800	14,822	14,844	14,898	(2,980)	[715]	{358}	14,953	(2,991)	[718]	{359}	15,008	(3,002)	[720]	{360}
Fulton	94,575	94,694	94,850	95,006	95,281	(19,056)	[4,574]	{2,287}	95,558	(19,112)	[4,587]	{2,293}	95,832	(19,166)	[4,600]	{2,300}
Gwinnett	99,283	99,390	99,535	99,724	100,020	(20,004)	[4,801]	{2,400}	100,322	(20,064)	[4,815]	{2,408}	100,634	(20,127)	[4,830]	{2,415}
Hall	26,758	26,778	26,807	26,838	26,878	(5,376)	[1,290]	{645}	26,916	(5,383)	[1,292]	{646}	26,955	(5,391)	[1,294]	{647}
Henry	24,494	24,523	24,563	24,637	24,734	(4,947)	[1,187]	{594}	24,832	(4,966)	[1,192]	{596}	24,933	(4,987)	[1,197]	{598}
Lee	2,694	2,694	2,695	2,696	2,698	(540)	[130]	{65}	2,700	(540)	[130]	{65}	2,702	(540)	[130]	{65}

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.