

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 4/22/21**

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 4/22/21 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.

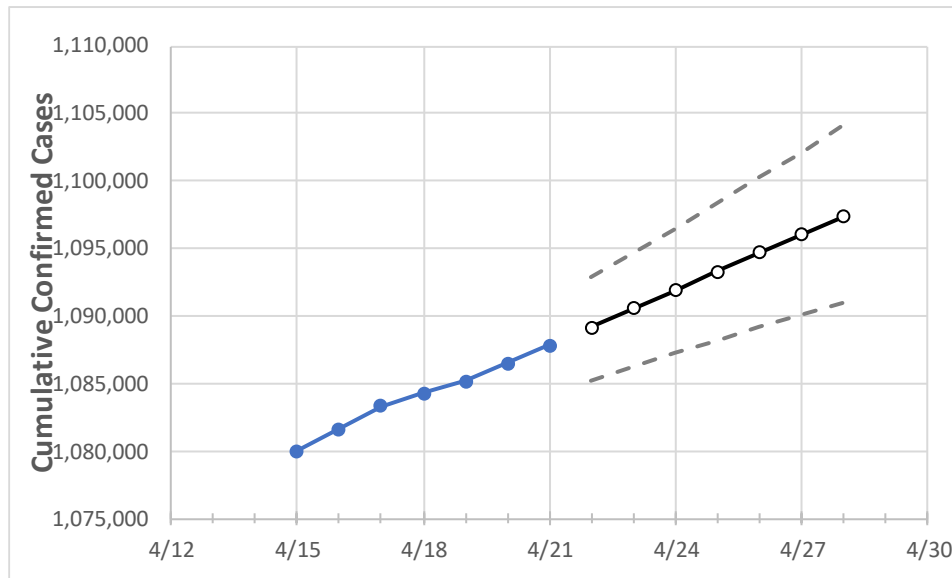
IEM's Modeling Lead

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:						
	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28
Georgia	1,084,272	1,085,161	1,086,473	1,087,791	1,089,163	1,090,549	1,091,906	1,093,273	1,094,667	1,096,038	1,097,386

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:							
	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27	4/28	
Bartow	14,319	14,332	14,351	14,376	14,395	14,415	14,434	14,453	14,473	14,491	14,511	
Carroll	11,181	11,184	11,189	11,194	11,203	11,211	11,219	11,228	11,236	11,244	11,251	
Cherokee	30,308	30,324	30,346	30,371	30,400	30,429	30,456	30,482	30,507	30,531	30,554	
Clarke	14,834	14,842	14,851	14,856	14,867	14,879	14,890	14,901	14,912	14,924	14,935	
Clayton	25,657	25,692	25,738	25,789	25,845	25,901	25,958	26,015	26,073	26,130	26,191	
Cobb	76,296	76,387	76,496	76,586	76,696	76,806	76,916	77,025	77,135	77,241	77,344	
DeKalb	63,742	63,830	63,920	63,997	64,129	64,260	64,391	64,520	64,648	64,773	64,898	
Dougherty	7,359	7,361	7,378	7,389	7,398	7,406	7,415	7,424	7,434	7,443	7,453	
Douglas	14,766	14,779	14,800	14,822	14,849	14,877	14,905	14,934	14,962	14,990	15,019	
Fulton	94,470	94,575	94,694	94,850	94,986	95,123	95,259	95,393	95,526	95,661	95,791	
Gwinnett	99,191	99,283	99,390	99,535	99,679	99,823	99,967	100,114	100,261	100,403	100,551	
Hall	26,747	26,758	26,778	26,807	26,826	26,844	26,863	26,881	26,899	26,917	26,935	
Henry	24,453	24,494	24,523	24,563	24,605	24,649	24,693	24,734	24,777	24,819	24,862	
Lee	2,693	2,694	2,694	2,695	2,696	2,697	2,698	2,699	2,700	2,701	2,702	

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:											
	4/18	4/19	4/20	4/21	4/23				4/25				4/27			
Bartow	14,319	14,332	14,351	14,376	14,415	(2,883)	[692]	{346}	14,453	(2,891)	[694]	{347}	14,491	(2,898)	[696]	{348}
Carroll	11,181	11,184	11,189	11,194	11,211	(2,242)	[538]	{269}	11,228	(2,246)	[539]	{269}	11,244	(2,249)	[540]	{270}
Cherokee	30,308	30,324	30,346	30,371	30,429	(6,086)	[1,461]	{730}	30,482	(6,096)	[1,463]	{732}	30,531	(6,106)	[1,465]	{733}
Clarke	14,834	14,842	14,851	14,856	14,879	(2,976)	[714]	{357}	14,901	(2,980)	[715]	{358}	14,924	(2,985)	[716]	{358}
Clayton	25,657	25,692	25,738	25,789	25,901	(5,180)	[1,243]	{622}	26,015	(5,203)	[1,249]	{624}	26,130	(5,226)	[1,254]	{627}
Cobb	76,296	76,387	76,496	76,586	76,806	(15,361)	[3,687]	{1,843}	77,025	(15,405)	[3,697]	{1,849}	77,241	(15,448)	[3,708]	{1,854}
DeKalb	63,742	63,830	63,920	63,997	64,260	(12,852)	[3,084]	{1,542}	64,520	(12,904)	[3,097]	{1,548}	64,773	(12,955)	[3,109]	{1,555}
Dougherty	7,359	7,361	7,378	7,389	7,406	(1,481)	[355]	{178}	7,424	(1,485)	[356]	{178}	7,443	(1,489)	[357]	{179}
Douglas	14,766	14,779	14,800	14,822	14,877	(2,975)	[714]	{357}	14,934	(2,987)	[717]	{358}	14,990	(2,998)	[720]	{360}
Fulton	94,470	94,575	94,694	94,850	95,123	(19,025)	[4,566]	{2,283}	95,393	(19,079)	[4,579]	{2,289}	95,661	(19,132)	[4,592]	{2,296}
Gwinnett	99,191	99,283	99,390	99,535	99,823	(19,965)	[4,791]	{2,396}	100,114	(20,023)	[4,805]	{2,403}	100,403	(20,081)	[4,819]	{2,410}
Hall	26,747	26,758	26,778	26,807	26,844	(5,369)	[1,289]	{644}	26,881	(5,376)	[1,290]	{645}	26,917	(5,383)	[1,292]	{646}
Henry	24,453	24,494	24,523	24,563	24,649	(4,930)	[1,183]	{592}	24,734	(4,947)	[1,187]	{594}	24,819	(4,964)	[1,191]	{596}
Lee	2,693	2,694	2,694	2,695	2,697	(539)	[129]	{65}	2,699	(540)	[130]	{65}	2,701	(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.