

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

Date: 4/21/21

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 4/21/21 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.

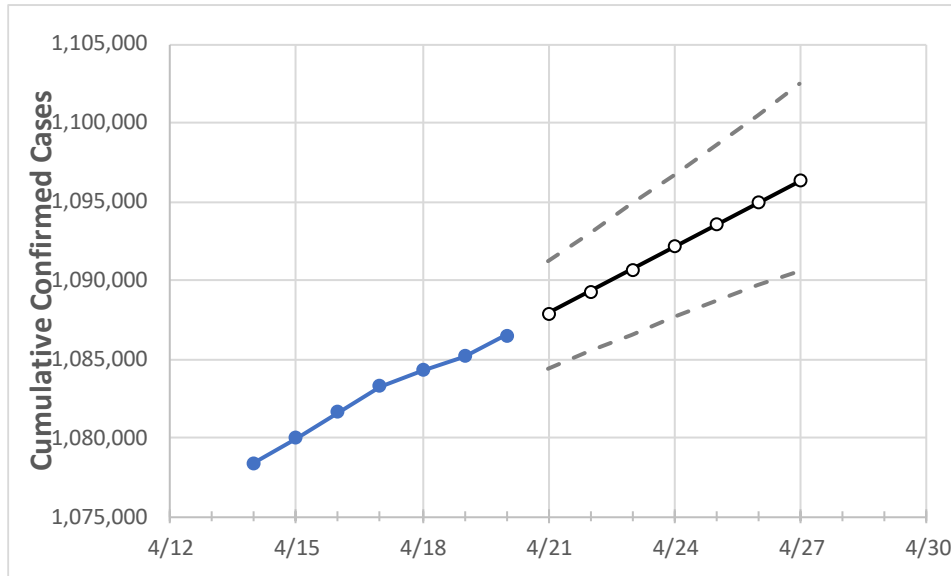
IEM's Modeling Lead

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:						
	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27
Georgia	1,083,300	1,084,272	1,085,161	1,086,473	1,087,887	1,089,301	1,090,699	1,092,128	1,093,539	1,094,923	1,096,302

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:						
	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26	4/27
Bartow	14,305	14,319	14,332	14,351	14,370	14,389	14,407	14,426	14,444	14,463	14,481
Carroll	11,175	11,181	11,184	11,184	11,193	11,203	11,212	11,222	11,230	11,240	11,248
Cherokee	30,285	30,308	30,324	30,346	30,375	30,404	30,432	30,458	30,485	30,511	30,537
Clarke	14,830	14,834	14,842	14,851	14,864	14,877	14,888	14,900	14,912	14,925	14,937
Clayton	25,603	25,657	25,692	25,738	25,795	25,851	25,908	25,968	26,027	26,086	26,147
Cobb	76,229	76,296	76,387	76,496	76,611	76,725	76,837	76,950	77,064	77,172	77,283
DeKalb	63,674	63,742	63,830	63,920	64,063	64,206	64,347	64,489	64,630	64,774	64,917
Dougherty	7,356	7,359	7,361	7,378	7,386	7,393	7,402	7,409	7,418	7,426	7,435
Douglas	14,741	14,766	14,779	14,800	14,828	14,857	14,886	14,915	14,945	14,976	15,006
Fulton	94,364	94,470	94,575	94,694	94,831	94,965	95,100	95,235	95,365	95,498	95,628
Gwinnett	99,091	99,191	99,283	99,390	99,536	99,682	99,828	99,974	100,120	100,268	100,417
Hall	26,733	26,747	26,758	26,778	26,797	26,816	26,835	26,854	26,872	26,890	26,908
Henry	24,420	24,453	24,494	24,523	24,567	24,612	24,657	24,700	24,744	24,788	24,832
Lee	2,692	2,693	2,694	2,694	2,695	2,696	2,697	2,698	2,699	2,700	2,701

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:											
	4/17	4/18	4/19	4/20	4/22				4/24				4/26			
Bartow	14,305	14,319	14,332	14,351	14,389	(2,878)	[691]	{345}	14,426	(2,885)	[692]	{346}	14,463	(2,893)	[694]	{347}
Carroll	11,175	11,181	11,184	11,184	11,203	(2,241)	[538]	{269}	11,222	(2,244)	[539]	{269}	11,240	(2,248)	[539]	{270}
Cherokee	30,285	30,308	30,324	30,346	30,404	(6,081)	[1,459]	{730}	30,458	(6,092)	[1,462]	{731}	30,511	(6,102)	[1,465]	{732}
Clarke	14,830	14,834	14,842	14,851	14,877	(2,975)	[714]	{357}	14,900	(2,980)	[715]	{358}	14,925	(2,985)	[716]	{358}
Clayton	25,603	25,657	25,692	25,738	25,851	(5,170)	[1,241]	{620}	25,968	(5,194)	[1,246]	{623}	26,086	(5,217)	[1,252]	{626}
Cobb	76,229	76,296	76,387	76,496	76,725	(15,345)	[3,683]	{1,841}	76,950	(15,390)	[3,694]	{1,847}	77,172	(15,434)	[3,704]	{1,852}
DeKalb	63,674	63,742	63,830	63,920	64,206	(12,841)	[3,082]	{1,541}	64,489	(12,898)	[3,095]	{1,548}	64,774	(12,955)	[3,109]	{1,555}
Dougherty	7,356	7,359	7,361	7,378	7,393	(1,479)	[355]	{177}	7,409	(1,482)	[356]	{178}	7,426	(1,485)	[356]	{178}
Douglas	14,741	14,766	14,779	14,800	14,857	(2,971)	[713]	{357}	14,915	(2,983)	[716]	{358}	14,976	(2,995)	[719]	{359}
Fulton	94,364	94,470	94,575	94,694	94,965	(18,993)	[4,558]	{2,279}	95,235	(19,047)	[4,571]	{2,286}	95,498	(19,100)	[4,584]	{2,292}
Gwinnett	99,091	99,191	99,283	99,390	99,682	(19,936)	[4,785]	{2,392}	99,974	(19,995)	[4,799]	{2,399}	100,268	(20,054)	[4,813]	{2,406}
Hall	26,733	26,747	26,758	26,778	26,816	(5,363)	[1,287]	{644}	26,854	(5,371)	[1,289]	{644}	26,890	(5,378)	[1,291]	{645}
Henry	24,420	24,453	24,494	24,523	24,612	(4,922)	[1,181]	{591}	24,700	(4,940)	[1,186]	{593}	24,788	(4,958)	[1,190]	{595}
Lee	2,692	2,693	2,694	2,694	2,696	(539)	[129]	{65}	2,698	(540)	[130]	{65}	2,700	(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.