

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

Date: 6/22/21

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 6/22/21 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.

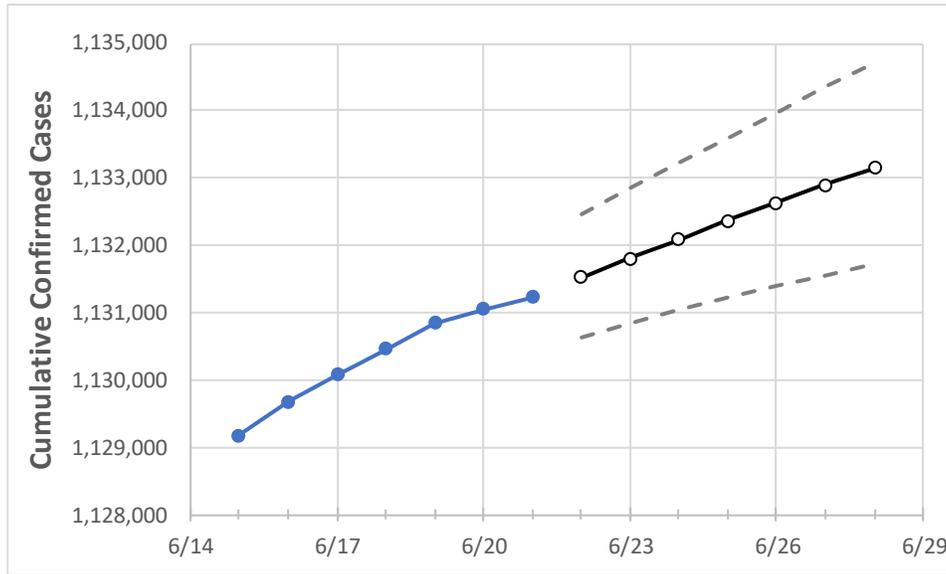
IEM's Modeling Lead

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:					
	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28

Georgia 1,130,468 1,130,845 1,131,048 1,131,232 1,131,522 1,131,806 1,132,087 1,132,360 1,132,636 1,132,894 1,133,147

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:						
	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28
Bartow	14,897	14,898	14,903	14,903	14,907	14,910	14,914	14,917	14,920	14,924	14,927
Carroll	11,542	11,544	11,546	11,548	11,551	11,554	11,557	11,561	11,564	11,567	11,570
Cherokee	31,495	31,499	31,502	31,507	31,512	31,517	31,522	31,526	31,531	31,535	31,539
Clarke	15,181	15,187	15,188	15,189	15,191	15,193	15,195	15,197	15,199	15,201	15,202
Clayton	27,391	27,398	27,400	27,406	27,415	27,424	27,433	27,442	27,451	27,459	27,467
Cobb	79,989	80,009	80,024	80,039	80,058	80,078	80,097	80,116	80,135	80,152	80,170
DeKalb	67,071	67,095	67,111	67,118	67,135	67,151	67,167	67,183	67,199	67,214	67,229
Dougherty	7,693	7,692	7,693	7,695	7,697	7,698	7,700	7,701	7,703	7,704	7,706
Douglas	15,553	15,563	15,564	15,565	15,568	15,572	15,575	15,578	15,581	15,584	15,587
Fulton	99,000	99,052	99,082	99,099	99,131	99,164	99,196	99,228	99,261	99,293	99,326
Gwinnett	103,048	103,068	103,090	103,106	103,125	103,143	103,161	103,178	103,195	103,211	103,227
Hall	27,739	27,740	27,741	27,742	27,747	27,753	27,758	27,763	27,768	27,774	27,778
Henry	25,866	25,879	25,883	25,899	25,910	25,921	25,932	25,943	25,953	25,963	25,974
Lee	2,764	2,764	2,764	2,764	2,765	2,765	2,766	2,767	2,767	2,768	2,768

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:											
	6/18	6/19	6/20	6/21	6/23				6/25				6/27			
Bartow	14,897	14,898	14,903	14,903	14,910	(2,982)	[716]	{358}	14,917	(2,983)	[716]	{358}	14,924	(2,985)	[716]	{358}
Carroll	11,542	11,544	11,546	11,548	11,554	(2,311)	[555]	{277}	11,561	(2,312)	[555]	{277}	11,567	(2,313)	[555]	{278}
Cherokee	31,495	31,499	31,502	31,507	31,517	(6,303)	[1,513]	{756}	31,526	(6,305)	[1,513]	{757}	31,535	(6,307)	[1,514]	{757}
Clarke	15,181	15,187	15,188	15,189	15,193	(3,039)	[729]	{365}	15,197	(3,039)	[729]	{365}	15,201	(3,040)	[730]	{365}
Clayton	27,391	27,398	27,400	27,406	27,424	(5,485)	[1,316]	{658}	27,442	(5,488)	[1,317]	{659}	27,459	(5,492)	[1,318]	{659}
Cobb	79,989	80,009	80,024	80,039	80,078	(16,016)	[3,844]	{1,922}	80,116	(16,023)	[3,846]	{1,923}	80,152	(16,030)	[3,847]	{1,924}
DeKalb	67,071	67,095	67,111	67,118	67,151	(13,430)	[3,223]	{1,612}	67,183	(13,437)	[3,225]	{1,612}	67,214	(13,443)	[3,226]	{1,613}
Dougherty	7,693	7,692	7,693	7,695	7,698	(1,540)	[370]	{185}	7,701	(1,540)	[370]	{185}	7,704	(1,541)	[370]	{185}
Douglas	15,553	15,563	15,564	15,565	15,572	(3,114)	[747]	{374}	15,578	(3,116)	[748]	{374}	15,584	(3,117)	[748]	{374}
Fulton	99,000	99,052	99,082	99,099	99,164	(19,833)	[4,760]	{2,380}	99,228	(19,846)	[4,763]	{2,381}	99,293	(19,859)	[4,766]	{2,383}
Gwinnett	103,048	103,068	103,090	103,106	103,143	(20,629)	[4,951]	{2,475}	103,178	(20,636)	[4,953]	{2,476}	103,211	(20,642)	[4,954]	{2,477}
Hall	27,739	27,740	27,741	27,742	27,753	(5,551)	[1,332]	{666}	27,763	(5,553)	[1,333]	{666}	27,774	(5,555)	[1,333]	{667}
Henry	25,866	25,879	25,883	25,899	25,921	(5,184)	[1,244]	{622}	25,943	(5,189)	[1,245]	{623}	25,963	(5,193)	[1,246]	{623}
Lee	2,764	2,764	2,764	2,764	2,765	(553)	[133]	{66}	2,767	(553)	[133]	{66}	2,768	(554)	[133]	{66}

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.