

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

Date: 6/29/21

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 6/29/21 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.

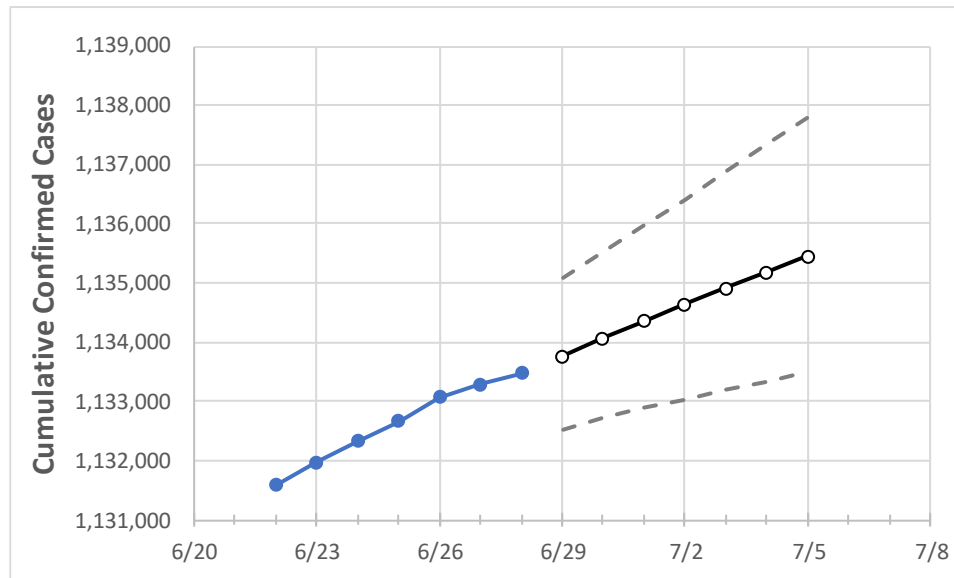
IEM's Modeling Lead

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Georgia	1,132,661	1,133,063	1,133,291	1,133,481	1,133,769	1,134,061	1,134,349	1,134,634	1,134,910	1,135,182	1,135,451

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Bartow	14,939	14,944	14,947	14,949	14,954	14,959	14,964	14,968	14,973	14,978	14,983
Carroll	11,556	11,563	11,568	11,568	11,572	11,576	11,580	11,585	11,589	11,593	11,598
Cherokee	31,541	31,548	31,554	31,561	31,568	31,575	31,581	31,588	31,595	31,602	31,608
Clarke	15,200	15,204	15,205	15,205	15,207	15,209	15,212	15,214	15,216	15,218	15,220
Clayton	27,465	27,476	27,485	27,493	27,503	27,512	27,522	27,531	27,540	27,549	27,558
Cobb	80,113	80,136	80,162	80,181	80,200	80,219	80,238	80,257	80,276	80,294	80,312
DeKalb	67,226	67,258	67,275	67,291	67,313	67,334	67,357	67,379	67,401	67,423	67,445
Dougherty	7,699	7,700	7,701	7,701	7,702	7,703	7,704	7,705	7,706	7,707	7,708
Douglas	15,584	15,593	15,601	15,606	15,612	15,617	15,623	15,629	15,635	15,640	15,646
Fulton	99,207	99,245	99,264	99,290	99,321	99,351	99,380	99,410	99,439	99,468	99,496
Gwinnett	103,181	103,217	103,252	103,267	103,285	103,303	103,320	103,338	103,355	103,372	103,389
Hall	27,770	27,772	27,773	27,773	27,776	27,778	27,780	27,782	27,785	27,786	27,788
Henry	25,939	25,944	25,946	25,950	25,958	25,965	25,973	25,981	25,988	25,995	26,002
Lee	2,761	2,761	2,761	2,761	2,762	2,762	2,763	2,763	2,764	2,765	2,765

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:											
	6/25	6/26	6/27	6/28	6/30				7/2				7/4			
Bartow	14,939	14,944	14,947	14,949	14,959	(2,992)	[718]	{359}	14,968	(2,994)	[718]	{359}	14,978	(2,996)	[719]	{359}
Carroll	11,556	11,563	11,568	11,568	11,576	(2,315)	[556]	{278}	11,585	(2,317)	[556]	{278}	11,593	(2,319)	[556]	{278}
Cherokee	31,541	31,548	31,554	31,561	31,575	(6,315)	[1,516]	{758}	31,588	(6,318)	[1,516]	{758}	31,602	(6,320)	[1,517]	{758}
Clarke	15,200	15,204	15,205	15,205	15,209	(3,042)	[730]	{365}	15,214	(3,043)	[730]	{365}	15,218	(3,044)	[730]	{365}
Clayton	27,465	27,476	27,485	27,493	27,512	(5,502)	[1,321]	{660}	27,531	(5,506)	[1,321]	{661}	27,549	(5,510)	[1,322]	{661}
Cobb	80,113	80,136	80,162	80,181	80,219	(16,044)	[3,851]	{1,925}	80,257	(16,051)	[3,852]	{1,926}	80,294	(16,059)	[3,854]	{1,927}
DeKalb	67,226	67,258	67,275	67,291	67,334	(13,467)	[3,232]	{1,616}	67,379	(13,476)	[3,234]	{1,617}	67,423	(13,485)	[3,236]	{1,618}
Dougherty	7,699	7,700	7,701	7,701	7,703	(1,541)	[370]	{185}	7,705	(1,541)	[370]	{185}	7,707	(1,541)	[370]	{185}
Douglas	15,584	15,593	15,601	15,606	15,617	(3,123)	[750]	{375}	15,629	(3,126)	[750]	{375}	15,640	(3,128)	[751]	{375}
Fulton	99,207	99,245	99,264	99,290	99,351	(19,870)	[4,769]	{2,384}	99,410	(19,882)	[4,772]	{2,386}	99,468	(19,894)	[4,774]	{2,387}
Gwinnett	103,181	103,217	103,252	103,267	103,303	(20,661)	[4,959]	{2,479}	103,338	(20,668)	[4,960]	{2,480}	103,372	(20,674)	[4,962]	{2,481}
Hall	27,770	27,772	27,773	27,773	27,778	(5,556)	[1,333]	{667}	27,782	(5,556)	[1,334]	{667}	27,786	(5,557)	[1,334]	{667}
Henry	25,939	25,944	25,946	25,950	25,965	(5,193)	[1,246]	{623}	25,981	(5,196)	[1,247]	{624}	25,995	(5,199)	[1,248]	{624}
Lee	2,761	2,761	2,761	2,761	2,762	(552)	[133]	{66}	2,763	(553)	[133]	{66}	2,765	(553)	[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.