

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

Date: 7/1/21

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 7/1/21 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.

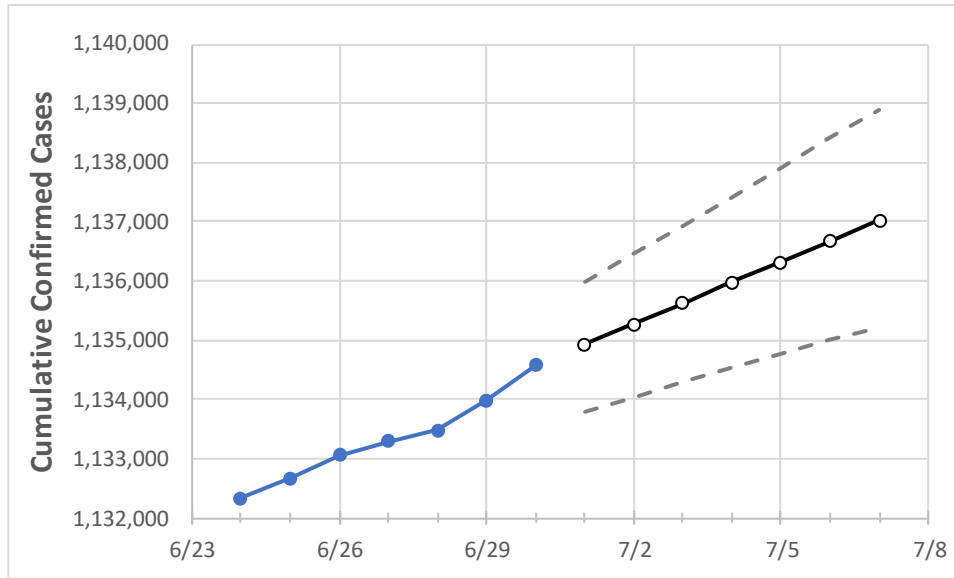
IEM's Modeling Lead

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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7

Georgia 1,133,291 1,133,481 1,133,983 1,134,573 1,134,924 1,135,275 1,135,625 1,135,973 1,136,323 1,136,674 1,137,019

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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
Bartow	14,947	14,949	14,953	14,959	14,964	14,969	14,973	14,978	14,983	14,988	14,993
Carroll	11,568	11,570	11,572	11,574	11,577	11,580	11,583	11,586	11,590	11,593	11,596
Cherokee	31,554	31,561	31,571	31,582	31,590	31,598	31,607	31,616	31,624	31,633	31,642
Clarke	15,205	15,206	15,207	15,211	15,213	15,215	15,217	15,219	15,221	15,223	15,225
Clayton	27,485	27,493	27,505	27,527	27,538	27,549	27,559	27,570	27,581	27,592	27,602
Cobb	80,162	80,181	80,235	80,289	80,316	80,343	80,370	80,397	80,426	80,455	80,484
DeKalb	67,275	67,291	67,297	67,313	67,332	67,351	67,369	67,388	67,407	67,425	67,443
Dougherty	7,701	7,701	7,709	7,711	7,713	7,714	7,716	7,718	7,720	7,722	7,724
Douglas	15,601	15,606	15,609	15,618	15,624	15,630	15,636	15,642	15,648	15,655	15,661
Fulton	99,264	99,290	99,334	99,368	99,399	99,430	99,461	99,492	99,522	99,553	99,584
Gwinnett	103,252	103,267	103,290	103,333	103,355	103,377	103,400	103,422	103,444	103,466	103,488
Hall	27,773	27,773	27,792	27,801	27,805	27,809	27,813	27,817	27,821	27,825	27,829
Henry	25,946	25,950	25,952	25,961	25,968	25,976	25,983	25,990	25,996	26,003	26,009
Lee	2,762	2,762	2,762	2,766	2,767	2,768	2,769	2,770	2,771	2,771	2,772

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:											
	6/27	6/28	6/29	6/30	7/2				7/4				7/6			
Bartow	14,947	14,949	14,953	14,959	14,969	(2,994)	[718]	{359}	14,978	(2,996)	[719]	{359}	14,988	(2,998)	[719]	{360}
Carroll	11,568	11,570	11,572	11,574	11,580	(2,316)	[556]	{278}	11,586	(2,317)	[556]	{278}	11,593	(2,319)	[556]	{278}
Cherokee	31,554	31,561	31,571	31,582	31,598	(6,320)	[1,517]	{758}	31,616	(6,323)	[1,518]	{759}	31,633	(6,327)	[1,518]	{759}
Clarke	15,205	15,206	15,207	15,211	15,215	(3,043)	[730]	{365}	15,219	(3,044)	[731]	{365}	15,223	(3,045)	[731]	{365}
Clayton	27,485	27,493	27,505	27,527	27,549	(5,510)	[1,322]	{661}	27,570	(5,514)	[1,323]	{662}	27,592	(5,518)	[1,324]	{662}
Cobb	80,162	80,181	80,235	80,289	80,343	(16,069)	[3,856]	{1,928}	80,397	(16,079)	[3,859]	{1,930}	80,455	(16,091)	[3,862]	{1,931}
DeKalb	67,275	67,291	67,297	67,313	67,351	(13,470)	[3,233]	{1,616}	67,388	(13,478)	[3,235]	{1,617}	67,425	(13,485)	[3,236]	{1,618}
Dougherty	7,701	7,701	7,709	7,711	7,714	(1,543)	[370]	{185}	7,718	(1,544)	[370]	{185}	7,722	(1,544)	[371]	{185}
Douglas	15,601	15,606	15,609	15,618	15,630	(3,126)	[750]	{375}	15,642	(3,128)	[751]	{375}	15,655	(3,131)	[751]	{376}
Fulton	99,264	99,290	99,334	99,368	99,430	(19,886)	[4,773]	{2,386}	99,492	(19,898)	[4,776]	{2,388}	99,553	(19,911)	[4,779]	{2,389}
Gwinnett	103,252	103,267	103,290	103,333	103,377	(20,675)	[4,962]	{2,481}	103,422	(20,684)	[4,964]	{2,482}	103,466	(20,693)	[4,966]	{2,483}
Hall	27,773	27,773	27,792	27,801	27,809	(5,562)	[1,335]	{667}	27,817	(5,563)	[1,335]	{668}	27,825	(5,565)	[1,336]	{668}
Henry	25,946	25,950	25,952	25,961	25,976	(5,195)	[1,247]	{623}	25,990	(5,198)	[1,248]	{624}	26,003	(5,201)	[1,248]	{624}
Lee	2,762	2,762	2,762	2,766	2,768	(554)	[133]	{66}	2,770	(554)	[133]	{66}	2,771	(554)	[133]	{67}

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.