

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

Date: 3/15/21

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 3/15/21 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.

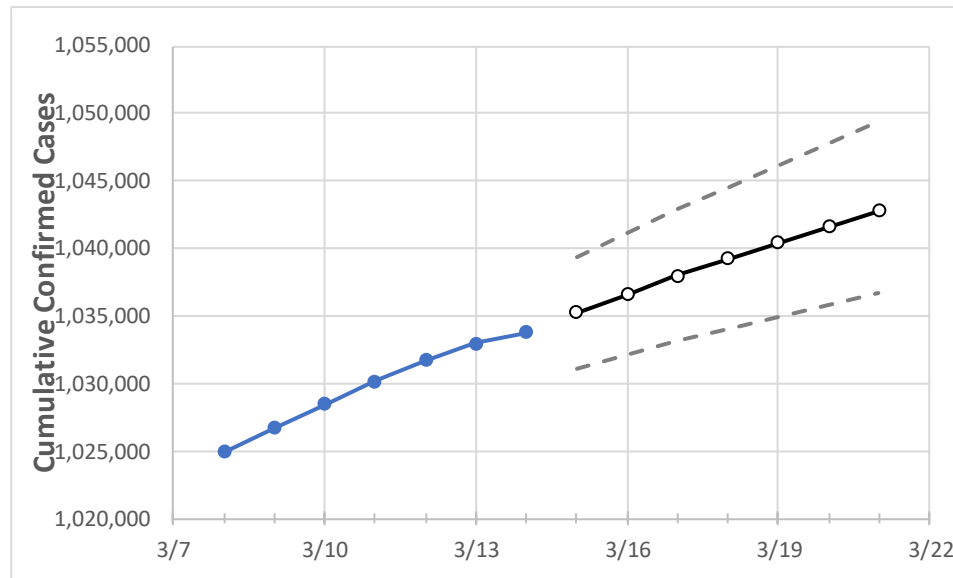
IEM's Modeling Lead

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
Georgia	1,030,146	1,031,713	1,032,967	1,033,786	1,035,243	1,036,622	1,038,003	1,039,273	1,040,466	1,041,635	1,042,778

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
Bartow	13,361	13,395	13,414	13,437	13,462	13,486	13,509	13,531	13,554	13,575	13,596
Carroll	10,686	10,699	10,703	10,707	10,714	10,722	10,728	10,734	10,740	10,746	10,752
Cherokee	28,184	28,217	28,254	28,301	28,350	28,397	28,441	28,485	28,527	28,567	28,606
Clarke	14,365	14,381	14,392	14,398	14,415	14,433	14,450	14,467	14,483	14,499	14,514
Clayton	23,874	23,916	23,964	23,985	24,025	24,066	24,105	24,141	24,177	24,213	24,247
Cobb	71,304	71,453	71,535	71,615	71,739	71,855	71,966	72,073	72,176	72,275	72,371
DeKalb	58,629	58,752	58,851	58,891	59,001	59,108	59,208	59,307	59,404	59,496	59,588
Dougherty	7,120	7,126	7,135	7,137	7,142	7,146	7,151	7,155	7,160	7,164	7,168
Douglas	13,788	13,818	13,833	13,849	13,873	13,896	13,919	13,940	13,962	13,982	14,002
Fulton	88,394	88,544	88,679	88,786	88,959	89,128	89,287	89,445	89,594	89,739	89,883
Gwinnett	94,313	94,440	94,528	94,593	94,723	94,847	94,964	95,080	95,191	95,295	95,397
Hall	25,844	25,869	25,891	25,900	25,920	25,940	25,959	25,978	25,997	26,014	26,031
Henry	22,641	22,723	22,793	22,861	22,933	23,003	23,072	23,140	23,206	23,270	23,334
Lee	2,625	2,630	2,633	2,633	2,637	2,640	2,644	2,648	2,651	2,654	2,657

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:											
	3/11	3/12	3/13	3/14	3/16				3/18				3/20			
Bartow	13,361	13,395	13,414	13,437	13,486	(2,697)	[647]	{324}	13,531	(2,706)	[650]	{325}	13,575	(2,715)	[652]	{326}
Carroll	10,686	10,699	10,703	10,707	10,722	(2,144)	[515]	{257}	10,734	(2,147)	[515]	{258}	10,746	(2,149)	[516]	{258}
Cherokee	28,184	28,217	28,254	28,301	28,397	(5,679)	[1,363]	{682}	28,485	(5,697)	[1,367]	{684}	28,567	(5,713)	[1,371]	{686}
Clarke	14,365	14,381	14,392	14,398	14,433	(2,887)	[693]	{346}	14,467	(2,893)	[694]	{347}	14,499	(2,900)	[696]	{348}
Clayton	23,874	23,916	23,964	23,985	24,066	(4,813)	[1,155]	{578}	24,141	(4,828)	[1,159]	{579}	24,213	(4,843)	[1,162]	{581}
Cobb	71,304	71,453	71,535	71,615	71,855	(14,371)	[3,449]	{1,725}	72,073	(14,415)	[3,459]	{1,730}	72,275	(14,455)	[3,469]	{1,735}
DeKalb	58,629	58,752	58,851	58,891	59,108	(11,822)	[2,837]	{1,419}	59,307	(11,861)	[2,847]	{1,423}	59,496	(11,899)	[2,856]	{1,428}
Dougherty	7,120	7,126	7,135	7,137	7,146	(1,429)	[343]	{172}	7,155	(1,431)	[343]	{172}	7,164	(1,433)	[344]	{172}
Douglas	13,788	13,818	13,833	13,849	13,896	(2,779)	[667]	{334}	13,940	(2,788)	[669]	{335}	13,982	(2,796)	[671]	{336}
Fulton	88,394	88,544	88,679	88,786	89,128	(17,826)	[4,278]	{2,139}	89,445	(17,889)	[4,293]	{2,147}	89,739	(17,948)	[4,307]	{2,154}
Gwinnett	94,313	94,440	94,528	94,593	94,847	(18,969)	[4,553]	{2,276}	95,080	(19,016)	[4,564]	{2,282}	95,295	(19,059)	[4,574]	{2,287}
Hall	25,844	25,869	25,891	25,900	25,940	(5,188)	[1,245]	{623}	25,978	(5,196)	[1,247]	{623}	26,014	(5,203)	[1,249]	{624}
Henry	22,641	22,723	22,793	22,861	23,003	(4,601)	[1,104]	{552}	23,140	(4,628)	[1,111]	{555}	23,270	(4,654)	[1,117]	{558}
Lee	2,625	2,630	2,633	2,633	2,640	(528)	[127]	{63}	2,648	(530)	[127]	{64}	2,654	(531)	[127]	{64}

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.