

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/22/21**

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 1/22/21 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.

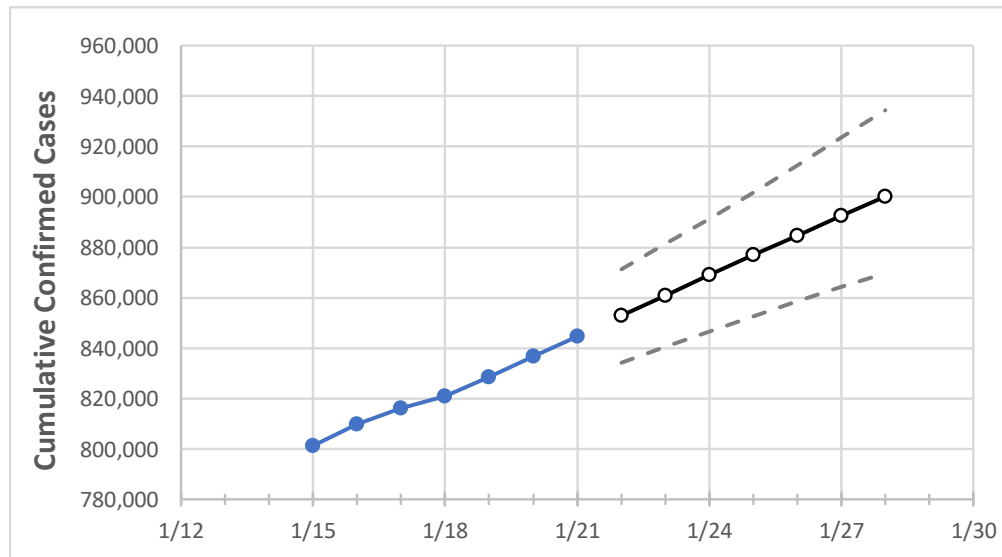
IEM's Modeling Lead

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:						
	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28
Georgia	820,952	828,581	836,210	843,839	851,468	859,097	866,726	874,355	881,984	889,613	897,242

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:						
	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28
Bartow	10,005	10,105	10,208	10,297	10,396	10,496	10,594	10,689	10,783	10,878	10,969
Carroll	8,777	8,856	8,905	8,959	9,023	9,086	9,148	9,209	9,270	9,331	9,392
Cherokee	21,472	21,714	22,034	22,291	22,549	22,816	23,080	23,335	23,598	23,855	24,111
Clarke	11,947	12,039	12,120	12,214	12,309	12,401	12,494	12,582	12,673	12,766	12,856
Clayton	17,596	17,771	17,878	18,051	18,236	18,414	18,594	18,777	18,965	19,147	19,329
Cobb	56,098	56,680	57,204	57,774	58,380	58,993	59,593	60,197	60,787	61,358	61,938
DeKalb	46,512	46,838	47,256	47,622	48,091	48,550	49,013	49,464	49,922	50,378	50,824
Dougherty	5,902	5,946	6,014	6,068	6,124	6,181	6,237	6,294	6,349	6,404	6,461
Douglas	10,416	10,519	10,597	10,729	10,842	10,953	11,065	11,178	11,289	11,398	11,506
Fulton	70,010	70,642	71,285	71,867	72,578	73,266	73,982	74,682	75,390	76,090	76,800
Gwinnett	72,796	73,677	74,787	75,995	77,013	78,051	79,077	80,140	81,196	82,270	83,397
Hall	21,871	22,094	22,311	22,639	22,858	23,082	23,305	23,528	23,756	23,989	24,215
Henry	16,884	17,071	17,257	17,458	17,661	17,867	18,075	18,280	18,485	18,693	18,903
Lee	2,049	2,074	2,117	2,145	2,174	2,204	2,234	2,264	2,294	2,325	2,358

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:											
	1/18	1/19	1/20	1/21	1/23				1/25				1/27			
Bartow	10,005	10,105	10,208	10,297	10,496	(2,099)	[504]	{252}	10,689	(2,138)	[513]	{257}	10,878	(2,176)	[522]	{261}
Carroll	8,777	8,856	8,905	8,959	9,086	(1,817)	[436]	{218}	9,209	(1,842)	[442]	{221}	9,331	(1,866)	[448]	{224}
Cherokee	21,472	21,714	22,034	22,291	22,816	(4,563)	[1,095]	{548}	23,335	(4,667)	[1,120]	{560}	23,855	(4,771)	[1,145]	{573}
Clarke	11,947	12,039	12,120	12,214	12,401	(2,480)	[595]	{298}	12,582	(2,516)	[604]	{302}	12,766	(2,553)	[613]	{306}
Clayton	17,596	17,771	17,878	18,051	18,414	(3,683)	[884]	{442}	18,777	(3,755)	[901]	{451}	19,147	(3,829)	[919]	{460}
Cobb	56,098	56,680	57,204	57,774	58,993	(11,799)	[2,832]	{1,416}	60,197	(12,039)	[2,889]	{1,445}	61,358	(12,272)	[2,945]	{1,473}
DeKalb	46,512	46,838	47,256	47,622	48,550	(9,710)	[2,330]	{1,165}	49,464	(9,893)	[2,374]	{1,187}	50,378	(10,076)	[2,418]	{1,209}
Dougherty	5,902	5,946	6,014	6,068	6,181	(1,236)	[297]	{148}	6,294	(1,259)	[302]	{151}	6,404	(1,281)	[307]	{154}
Douglas	10,416	10,519	10,597	10,729	10,953	(2,191)	[526]	{263}	11,178	(2,236)	[537]	{268}	11,398	(2,280)	[547]	{274}
Fulton	70,010	70,642	71,285	71,867	73,266	(14,653)	[3,517]	{1,758}	74,682	(14,936)	[3,585]	{1,792}	76,090	(15,218)	[3,652]	{1,826}
Gwinnett	72,796	73,677	74,787	75,995	78,051	(15,610)	[3,746]	{1,873}	80,140	(16,028)	[3,847]	{1,923}	82,270	(16,454)	[3,949]	{1,974}
Hall	21,871	22,094	22,311	22,639	23,082	(4,616)	[1,108]	{554}	23,528	(4,706)	[1,129]	{565}	23,989	(4,798)	[1,151]	{576}
Henry	16,884	17,071	17,257	17,458	17,867	(3,573)	[858]	{429}	18,280	(3,656)	[877]	{439}	18,693	(3,739)	[897]	{449}
Lee	2,049	2,074	2,117	2,145	2,204	(441)	[106]	{53}	2,264	(453)	[109]	{54}	2,325	(465)	[112]	{56}

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.