

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

Date: 1/28/21

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 1/28/21 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.

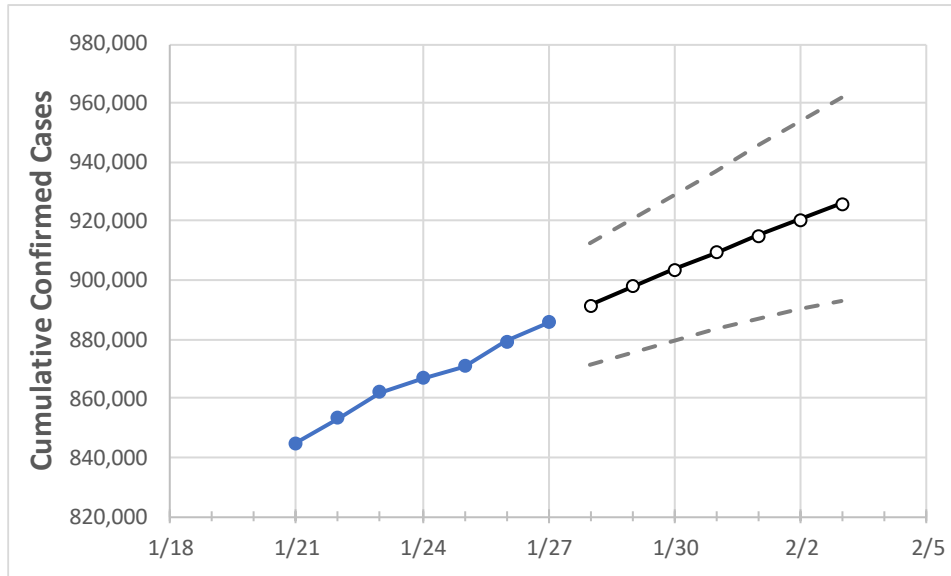
IEM's Modeling Lead

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
Georgia	866,911	870,828	879,221	885,605	891,618	897,847	903,585	909,377	915,026	920,623	925,996

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
Bartow	10,567	10,627	10,748	10,883	10,970	11,056	11,142	11,227	11,307	11,383	11,462
Carroll	9,195	9,240	9,320	9,405	9,476	9,546	9,617	9,689	9,761	9,832	9,903
Cherokee	22,860	22,995	23,305	23,491	23,671	23,856	24,025	24,202	24,370	24,529	24,694
Clarke	12,515	12,546	12,660	12,736	12,813	12,886	12,959	13,027	13,097	13,168	13,235
Clayton	18,588	18,667	18,942	19,099	19,252	19,407	19,558	19,711	19,859	20,009	20,154
Cobb	59,345	59,751	60,420	60,876	61,346	61,807	62,264	62,710	63,155	63,589	64,023
DeKalb	48,857	49,095	49,617	49,958	50,302	50,640	50,971	51,293	51,619	51,936	52,249
Dougherty	6,247	6,275	6,323	6,418	6,464	6,510	6,556	6,600	6,645	6,690	6,733
Douglas	11,036	11,111	11,243	11,330	11,426	11,522	11,620	11,716	11,809	11,904	11,996
Fulton	73,780	74,265	74,969	75,399	75,960	76,522	77,060	77,601	78,122	78,627	79,136
Gwinnett	79,103	79,518	80,517	81,132	82,000	82,862	83,721	84,575	85,444	86,288	87,142
Hall	23,141	23,207	23,392	23,515	23,670	23,821	23,973	24,119	24,262	24,411	24,557
Henry	18,059	18,143	18,393	18,577	18,752	18,925	19,098	19,276	19,449	19,612	19,784
Lee	2,235	2,241	2,278	2,321	2,346	2,371	2,395	2,418	2,442	2,466	2,489

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:											
	1/24	1/25	1/26	1/27	1/29				1/31				2/2			
Bartow	10,567	10,627	10,748	10,883	11,056	(2,211)	[531]	{265}	11,227	(2,245)	[539]	{269}	11,383	(2,277)	[546]	{273}
Carroll	9,195	9,240	9,320	9,405	9,546	(1,909)	[458]	{229}	9,689	(1,938)	[465]	{233}	9,832	(1,966)	[472]	{236}
Cherokee	22,860	22,995	23,305	23,491	23,856	(4,771)	[1,145]	{573}	24,202	(4,840)	[1,162]	{581}	24,529	(4,906)	[1,177]	{589}
Clarke	12,515	12,546	12,660	12,736	12,886	(2,577)	[619]	{309}	13,027	(2,605)	[625]	{313}	13,168	(2,634)	[632]	{316}
Clayton	18,588	18,667	18,942	19,099	19,407	(3,881)	[932]	{466}	19,711	(3,942)	[946]	{473}	20,009	(4,002)	[960]	{480}
Cobb	59,345	59,751	60,420	60,876	61,807	(12,361)	[2,967]	{1,483}	62,710	(12,542)	[3,010]	{1,505}	63,589	(12,718)	[3,052]	{1,526}
DeKalb	48,857	49,095	49,617	49,958	50,640	(10,128)	[2,431]	{1,215}	51,293	(10,259)	[2,462]	{1,231}	51,936	(10,387)	[2,493]	{1,246}
Dougherty	6,247	6,275	6,323	6,418	6,510	(1,302)	[312]	{156}	6,600	(1,320)	[317]	{158}	6,690	(1,338)	[321]	{161}
Douglas	11,036	11,111	11,243	11,330	11,522	(2,304)	[553]	{277}	11,716	(2,343)	[562]	{281}	11,904	(2,381)	[571]	{286}
Fulton	73,780	74,265	74,969	75,399	76,522	(15,304)	[3,673]	{1,837}	77,601	(15,520)	[3,725]	{1,862}	78,627	(15,725)	[3,774]	{1,887}
Gwinnett	79,103	79,518	80,517	81,132	82,862	(16,572)	[3,977]	{1,989}	84,575	(16,915)	[4,060]	{2,030}	86,288	(17,258)	[4,142]	{2,071}
Hall	23,141	23,207	23,392	23,515	23,821	(4,764)	[1,143]	{572}	24,119	(4,824)	[1,158]	{579}	24,411	(4,882)	[1,172]	{586}
Henry	18,059	18,143	18,393	18,577	18,925	(3,785)	[908]	{454}	19,276	(3,855)	[925]	{463}	19,612	(3,922)	[941]	{471}
Lee	2,235	2,241	2,278	2,321	2,371	(474)	[114]	{57}	2,418	(484)	[116]	{58}	2,466	(493)	[118]	{59}

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.