

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/20/21**

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 1/20/21 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.

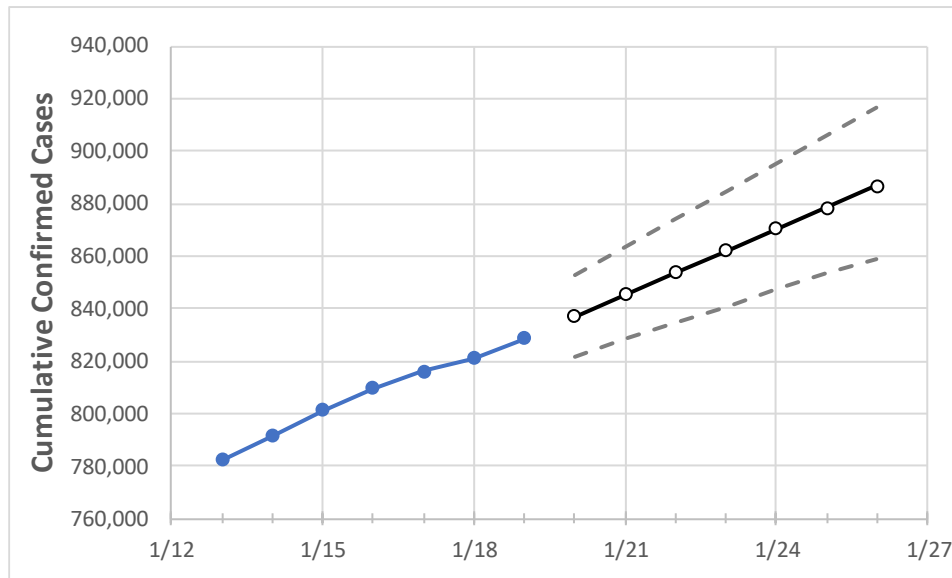
IEM's Modeling Lead

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:						
	1/16	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26
Georgia	809,663	815,995	820,952	828,581	836,950	845,354	853,786	862,096	870,439	878,542	886,646

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:						
	1/16	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26
Bartow	9,858	9,938	10,005	10,105	10,212	10,318	10,424	10,528	10,630	10,733	10,835
Carroll	8,689	8,725	8,777	8,856	8,930	9,002	9,074	9,148	9,223	9,298	9,375
Cherokee	21,192	21,359	21,472	21,714	21,969	22,225	22,477	22,727	22,982	23,234	23,481
Clarke	11,847	11,904	11,947	12,039	12,135	12,235	12,331	12,433	12,530	12,630	12,726
Clayton	17,317	17,475	17,596	17,771	17,983	18,201	18,418	18,638	18,869	19,098	19,334
Cobb	55,120	55,659	56,098	56,680	57,348	58,007	58,664	59,330	59,990	60,666	61,320
DeKalb	45,723	46,206	46,512	46,838	47,335	47,842	48,357	48,871	49,390	49,902	50,420
Dougherty	5,864	5,895	5,902	5,946	6,001	6,056	6,109	6,165	6,220	6,274	6,327
Douglas	10,226	10,330	10,416	10,519	10,636	10,756	10,873	10,990	11,113	11,234	11,348
Fulton	68,716	69,381	70,010	70,642	71,418	72,229	73,009	73,826	74,650	75,498	76,344
Gwinnett	71,503	72,209	72,796	73,677	74,619	75,576	76,548	77,529	78,515	79,491	80,494
Hall	21,653	21,751	21,871	22,094	22,299	22,503	22,707	22,917	23,124	23,335	23,544
Henry	16,575	16,750	16,884	17,071	17,283	17,496	17,707	17,923	18,136	18,352	18,571
Lee	2,036	2,045	2,049	2,074	2,102	2,129	2,156	2,184	2,211	2,238	2,263

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:											
	1/16	1/17	1/18	1/19	1/21				1/23				1/25			
Bartow	9,858	9,938	10,005	10,105	10,318	(2,064)	[495]	{248}	10,528	(2,106)	[505]	{253}	10,733	(2,147)	[515]	{258}
Carroll	8,689	8,725	8,777	8,856	9,002	(1,800)	[432]	{216}	9,148	(1,830)	[439]	{220}	9,298	(1,860)	[446]	{223}
Cherokee	21,192	21,359	21,472	21,714	22,225	(4,445)	[1,067]	{533}	22,727	(4,545)	[1,091]	{545}	23,234	(4,647)	[1,115]	{558}
Clarke	11,847	11,904	11,947	12,039	12,235	(2,447)	[587]	{294}	12,433	(2,487)	[597]	{298}	12,630	(2,526)	[606]	{303}
Clayton	17,317	17,475	17,596	17,771	18,201	(3,640)	[874]	{437}	18,638	(3,728)	[895]	{447}	19,098	(3,820)	[917]	{458}
Cobb	55,120	55,659	56,098	56,680	58,007	(11,601)	[2,784]	{1,392}	59,330	(11,866)	[2,848]	{1,424}	60,666	(12,133)	[2,912]	{1,456}
DeKalb	45,723	46,206	46,512	46,838	47,842	(9,568)	[2,296]	{1,148}	48,871	(9,774)	[2,346]	{1,173}	49,902	(9,980)	[2,395]	{1,198}
Dougherty	5,864	5,895	5,902	5,946	6,056	(1,211)	[291]	{145}	6,165	(1,233)	[296]	{148}	6,274	(1,255)	[301]	{151}
Douglas	10,226	10,330	10,416	10,519	10,756	(2,151)	[516]	{258}	10,990	(2,198)	[528]	{264}	11,234	(2,247)	[539]	{270}
Fulton	68,716	69,381	70,010	70,642	72,229	(14,446)	[3,467]	{1,733}	73,826	(14,765)	[3,544]	{1,772}	75,498	(15,100)	[3,624]	{1,812}
Gwinnett	71,503	72,209	72,796	73,677	75,576	(15,115)	[3,628]	{1,814}	77,529	(15,506)	[3,721]	{1,861}	79,491	(15,898)	[3,816]	{1,908}
Hall	21,653	21,751	21,871	22,094	22,503	(4,501)	[1,080]	{540}	22,917	(4,583)	[1,100]	{550}	23,335	(4,667)	[1,120]	{560}
Henry	16,575	16,750	16,884	17,071	17,496	(3,499)	[840]	{420}	17,923	(3,585)	[860]	{430}	18,352	(3,670)	[881]	{440}
Lee	2,036	2,045	2,049	2,074	2,129	(426)	[102]	{51}	2,184	(437)	[105]	{52}	2,238	(448)	[107]	{54}

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.