

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/31/20**

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 12/31/20 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.

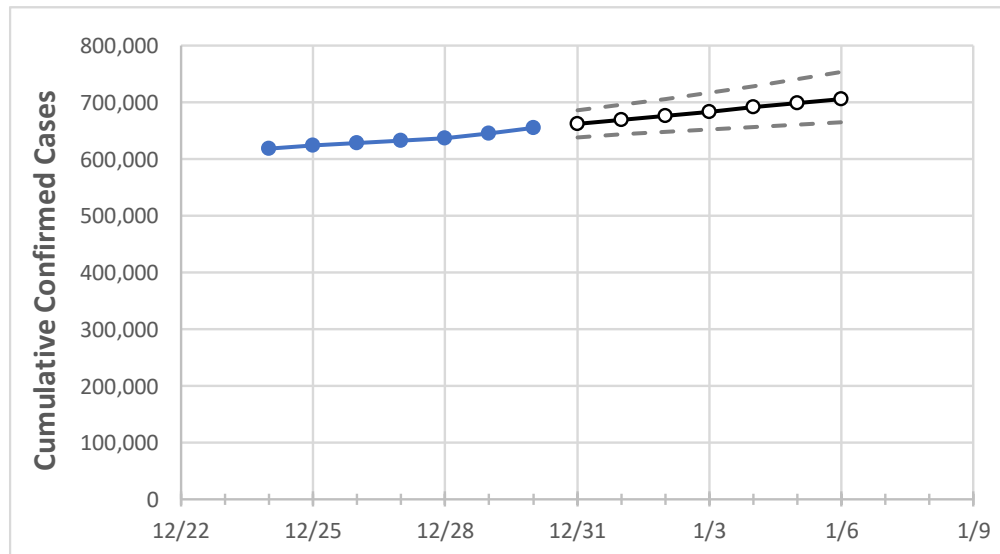
IEM's Modeling Lead

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:						
	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	1/5	1/6
Georgia	632,299	636,240	645,690	654,743	661,932	669,153	676,380	683,713	691,076	698,457	706,318

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 20%, and are often within 10%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	1/5	1/6
Bartow	7,445	7,508	7,617	7,768	7,866	7,966	8,065	8,167	8,268	8,369	8,470
Carroll	7,337	7,374	7,422	7,508	7,560	7,611	7,662	7,714	7,766	7,814	7,865
Cherokee	15,310	15,460	15,771	16,087	16,333	16,586	16,856	17,124	17,404	17,696	17,989
Clarke	9,736	9,758	9,884	9,983	10,043	10,105	10,167	10,229	10,290	10,350	10,411
Clayton	13,697	13,793	13,962	14,101	14,209	14,313	14,420	14,527	14,633	14,741	14,845
Cobb	41,711	42,088	42,676	43,391	43,895	44,413	44,910	45,421	45,957	46,493	47,015
DeKalb	36,358	36,674	37,120	37,592	37,941	38,300	38,663	39,030	39,399	39,760	40,132
Dougherty	4,538	4,561	4,601	4,670	4,701	4,730	4,762	4,792	4,823	4,854	4,884
Douglas	7,896	7,920	8,022	8,109	8,184	8,258	8,334	8,406	8,479	8,553	8,624
Fulton	54,514	54,826	55,555	55,939	56,465	56,993	57,528	58,066	58,628	59,167	59,720
Gwinnett	54,368	54,894	55,727	56,485	57,117	57,743	58,370	58,997	59,658	60,324	60,999
Hall	17,582	17,639	17,886	18,083	18,267	18,452	18,624	18,801	18,983	19,156	19,326
Henry	12,579	12,714	12,880	13,067	13,228	13,386	13,546	13,708	13,872	14,037	14,201
Lee	1,393	1,406	1,447	1,492	1,516	1,542	1,568	1,596	1,623	1,652	1,682

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:											
	12/27	12/28	12/29	12/30	1/1				1/3				1/5			
Bartow	7,445	7,508	7,617	7,768	7,966	(1,593)	[382]	{191}	8,167	(1,633)	[392]	{196}	8,369	(1,674)	[402]	{201}
Carroll	7,337	7,374	7,422	7,508	7,611	(1,522)	[365]	{183}	7,714	(1,543)	[370]	{185}	7,814	(1,563)	[375]	{188}
Cherokee	15,310	15,460	15,771	16,087	16,586	(3,317)	[796]	{398}	17,124	(3,425)	[822]	{411}	17,696	(3,539)	[849]	{425}
Clarke	9,736	9,758	9,884	9,983	10,105	(2,021)	[485]	{243}	10,229	(2,046)	[491]	{245}	10,350	(2,070)	[497]	{248}
Clayton	13,697	13,793	13,962	14,101	14,313	(2,863)	[687]	{344}	14,527	(2,905)	[697]	{349}	14,741	(2,948)	[708]	{354}
Cobb	41,711	42,088	42,676	43,391	44,413	(8,883)	[2,132]	{1,066}	45,421	(9,084)	[2,180]	{1,090}	46,493	(9,299)	[2,232]	{1,116}
DeKalb	36,358	36,674	37,120	37,592	38,300	(7,660)	[1,838]	{919}	39,030	(7,806)	[1,873]	{937}	39,760	(7,952)	[1,908]	{954}
Dougherty	4,538	4,561	4,601	4,670	4,730	(946)	[227]	{114}	4,792	(958)	[230]	{115}	4,854	(971)	[233]	{116}
Douglas	7,896	7,920	8,022	8,109	8,258	(1,652)	[396]	{198}	8,406	(1,681)	[403]	{202}	8,553	(1,711)	[411]	{205}
Fulton	54,514	54,826	55,555	55,939	56,993	(11,399)	[2,736]	{1,368}	58,066	(11,613)	[2,787]	{1,394}	59,167	(11,833)	[2,840]	{1,420}
Gwinnett	54,368	54,894	55,727	56,485	57,743	(11,549)	[2,772]	{1,386}	58,997	(11,799)	[2,832]	{1,416}	60,324	(12,065)	[2,896]	{1,448}
Hall	17,582	17,639	17,886	18,083	18,452	(3,690)	[886]	{443}	18,801	(3,760)	[902]	{451}	19,156	(3,831)	[919]	{460}
Henry	12,579	12,714	12,880	13,067	13,386	(2,677)	[643]	{321}	13,708	(2,742)	[658]	{329}	14,037	(2,807)	[674]	{337}
Lee	1,393	1,406	1,447	1,492	1,542	(308)	[74]	{37}	1,596	(319)	[77]	{38}	1,652	(330)	[79]	{40}

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.