

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

Date: 1/25/21

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 1/25/21 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.**

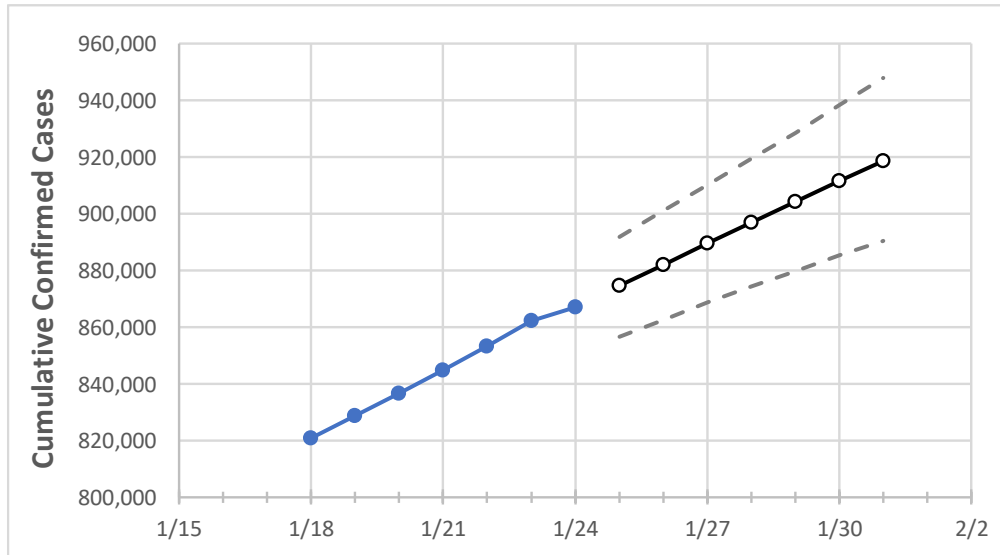
### IEM's Modeling Lead

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:						
	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31
Georgia	844,799	853,173	862,158	866,911	874,576	882,066	889,537	896,913	904,287	911,549	918,724

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:						
	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31
Bartow	10,297	10,443	10,529	10,567	10,658	10,746	10,835	10,922	11,009	11,094	11,176
Carroll	8,959	9,036	9,120	9,195	9,266	9,338	9,408	9,480	9,554	9,627	9,700
Cherokee	22,291	22,519	22,752	22,860	23,080	23,300	23,515	23,732	23,946	24,166	24,374
Clarke	12,214	12,305	12,469	12,515	12,607	12,700	12,790	12,887	12,981	13,072	13,166
Clayton	18,051	18,217	18,469	18,588	18,778	18,972	19,168	19,362	19,560	19,757	19,956
Cobb	57,774	58,349	58,973	59,345	59,891	60,424	60,954	61,481	62,002	62,508	63,024
DeKalb	47,622	48,028	48,541	48,857	49,291	49,718	50,152	50,580	51,015	51,441	51,863
Dougherty	6,068	6,145	6,216	6,247	6,300	6,354	6,407	6,459	6,510	6,560	6,610
Douglas	10,729	10,856	10,933	11,036	11,145	11,253	11,358	11,462	11,567	11,669	11,773
Fulton	71,867	72,509	73,264	73,780	74,449	75,116	75,785	76,451	77,107	77,756	78,415
Gwinnett	75,995	77,226	78,494	79,103	80,170	81,247	82,331	83,444	84,558	85,713	86,864
Hall	22,639	22,857	23,057	23,141	23,346	23,554	23,758	23,963	24,171	24,382	24,588
Henry	17,458	17,651	17,947	18,059	18,255	18,455	18,655	18,861	19,062	19,269	19,472
Lee	2,145	2,183	2,220	2,235	2,265	2,294	2,325	2,355	2,386	2,416	2,447

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:											
	1/21	1/22	1/23	1/24	1/26				1/28				1/30			
Bartow	10,297	10,443	10,529	10,567	10,746	(2,149)	[516]	{258}	10,922	(2,184)	[524]	{262}	11,094	(2,219)	[533]	{266}
Carroll	8,959	9,036	9,120	9,195	9,338	(1,868)	[448]	{224}	9,480	(1,896)	[455]	{228}	9,627	(1,925)	[462]	{231}
Cherokee	22,291	22,519	22,752	22,860	23,300	(4,660)	[1,118]	{559}	23,732	(4,746)	[1,139]	{570}	24,166	(4,833)	[1,160]	{580}
Clarke	12,214	12,305	12,469	12,515	12,700	(2,540)	[610]	{305}	12,887	(2,577)	[619]	{309}	13,072	(2,614)	[627]	{314}
Clayton	18,051	18,217	18,469	18,588	18,972	(3,794)	[911]	{455}	19,362	(3,872)	[929]	{465}	19,757	(3,951)	[948]	{474}
Cobb	57,774	58,349	58,973	59,345	60,424	(12,085)	[2,900]	{1,450}	61,481	(12,296)	[2,951]	{1,476}	62,508	(12,502)	[3,000]	{1,500}
DeKalb	47,622	48,028	48,541	48,857	49,718	(9,944)	[2,386]	{1,193}	50,580	(10,116)	[2,428]	{1,214}	51,441	(10,288)	[2,469]	{1,235}
Dougherty	6,068	6,145	6,216	6,247	6,354	(1,271)	[305]	{152}	6,459	(1,292)	[310]	{155}	6,560	(1,312)	[315]	{157}
Douglas	10,729	10,856	10,933	11,036	11,253	(2,251)	[540]	{270}	11,462	(2,292)	[550]	{275}	11,669	(2,334)	[560]	{280}
Fulton	71,867	72,509	73,264	73,780	75,116	(15,023)	[3,606]	{1,803}	76,451	(15,290)	[3,670]	{1,835}	77,756	(15,551)	[3,732]	{1,866}
Gwinnett	75,995	77,226	78,494	79,103	81,247	(16,249)	[3,900]	{1,950}	83,444	(16,689)	[4,005]	{2,003}	85,713	(17,143)	[4,114]	{2,057}
Hall	22,639	22,857	23,057	23,141	23,554	(4,711)	[1,131]	{565}	23,963	(4,793)	[1,150]	{575}	24,382	(4,876)	[1,170]	{585}
Henry	17,458	17,651	17,947	18,059	18,455	(3,691)	[886]	{443}	18,861	(3,772)	[905]	{453}	19,269	(3,854)	[925]	{462}
Lee	2,145	2,183	2,220	2,235	2,294	(459)	[110]	{55}	2,355	(471)	[113]	{57}	2,416	(483)	[116]	{58}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.