

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

**Date: 12/4/20**

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 12/4/20 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.**

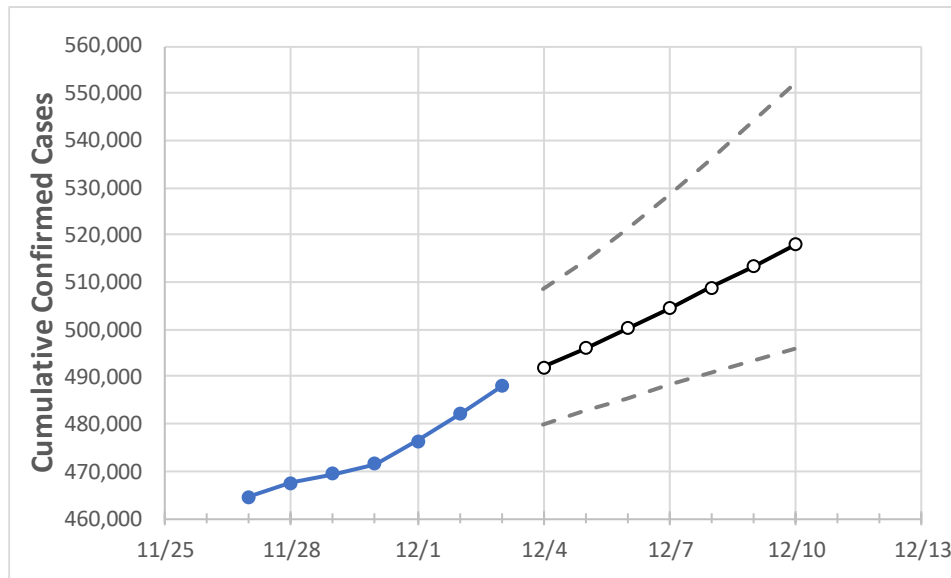
### **IEM's Modeling Lead**

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:							
	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	
Georgia	471,563	476,405	482,139	487,978	491,934	495,996	500,167	504,448	508,843	513,354	517,983	

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:							
	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	
Bartow	5,211	5,282	5,350	5,404	5,454	5,506	5,558	5,612	5,666	5,721	5,778	
Carroll	5,645	5,692	5,774	5,829	5,883	5,938	5,994	6,051	6,108	6,166	6,224	
Cherokee	10,680	10,837	11,013	11,209	11,324	11,441	11,561	11,684	11,809	11,937	12,067	
Clarke	7,979	8,032	8,121	8,196	8,238	8,281	8,325	8,370	8,416	8,464	8,513	
Clayton	10,515	10,585	10,683	10,778	10,837	10,897	10,957	11,019	11,081	11,145	11,209	
Cobb	30,075	30,411	30,827	31,222	31,479	31,743	32,013	32,289	32,572	32,862	33,159	
DeKalb	27,645	27,876	28,195	28,509	28,699	28,891	29,085	29,282	29,481	29,682	29,885	
Dougherty	3,713	3,773	3,819	3,849	3,862	3,875	3,889	3,904	3,920	3,937	3,954	
Douglas	5,722	5,816	5,875	5,967	6,016	6,067	6,119	6,172	6,227	6,282	6,340	
Fulton	40,794	41,231	41,629	42,130	42,464	42,807	43,158	43,519	43,888	44,267	44,656	
Gwinnett	39,906	40,332	40,884	41,349	41,701	42,063	42,436	42,821	43,217	43,625	44,045	
Hall	12,759	12,907	13,042	13,209	13,314	13,424	13,538	13,658	13,783	13,913	14,049	
Henry	8,758	8,887	9,017	9,145	9,230	9,317	9,408	9,500	9,595	9,693	9,794	
Lee	959	985	1,010	1,025	1,034	1,043	1,053	1,063	1,074	1,086	1,099	

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:											
	11/30	12/1	12/2	12/3	12/5			12/7			12/9					
Bartow	5,211	5,282	5,350	5,404	5,506	(1,101)	[264]	{132}	5,612	(1,122)	[269]	{135}	5,721	(1,144)	[275]	{137}
Carroll	5,645	5,692	5,774	5,829	5,938	(1,188)	[285]	{143}	6,051	(1,210)	[290]	{145}	6,166	(1,233)	[296]	{148}
Cherokee	10,680	10,837	11,013	11,209	11,441	(2,288)	[549]	{275}	11,684	(2,337)	[561]	{280}	11,937	(2,387)	[573]	{286}
Clarke	7,979	8,032	8,121	8,196	8,281	(1,656)	[397]	{199}	8,370	(1,674)	[402]	{201}	8,464	(1,693)	[406]	{203}
Clayton	10,515	10,585	10,683	10,778	10,897	(2,179)	[523]	{262}	11,019	(2,204)	[529]	{264}	11,145	(2,229)	[535]	{267}
Cobb	30,075	30,411	30,827	31,222	31,743	(6,349)	[1,524]	{762}	32,289	(6,458)	[1,550]	{775}	32,862	(6,572)	[1,577]	{789}
DeKalb	27,645	27,876	28,195	28,509	28,891	(5,778)	[1,387]	{693}	29,282	(5,856)	[1,406]	{703}	29,682	(5,936)	[1,425]	{712}
Dougherty	3,713	3,773	3,819	3,849	3,875	(775)	[186]	{93}	3,904	(781)	[187]	{94}	3,937	(787)	[189]	{94}
Douglas	5,722	5,816	5,875	5,967	6,067	(1,213)	[291]	{146}	6,172	(1,234)	[296]	{148}	6,282	(1,256)	[302]	{151}
Fulton	40,794	41,231	41,629	42,130	42,807	(8,561)	[2,055]	{1,027}	43,519	(8,704)	[2,089]	{1,044}	44,267	(8,853)	[2,125]	{1,062}
Gwinnett	39,906	40,332	40,884	41,349	42,063	(8,413)	[2,019]	{1,010}	42,821	(8,564)	[2,055]	{1,028}	43,625	(8,725)	[2,094]	{1,047}
Hall	12,759	12,907	13,042	13,209	13,424	(2,685)	[644]	{322}	13,658	(2,732)	[656]	{328}	13,913	(2,783)	[668]	{334}
Henry	8,758	8,887	9,017	9,145	9,317	(1,863)	[447]	{224}	9,500	(1,900)	[456]	{228}	9,693	(1,939)	[465]	{233}
Lee	959	985	1,010	1,025	1,043	(209)	[50]	{25}	1,063	(213)	[51]	{26}	1,086	(217)	[52]	{26}

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.