

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

Date: 12/10/21

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 12/10/21 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.**

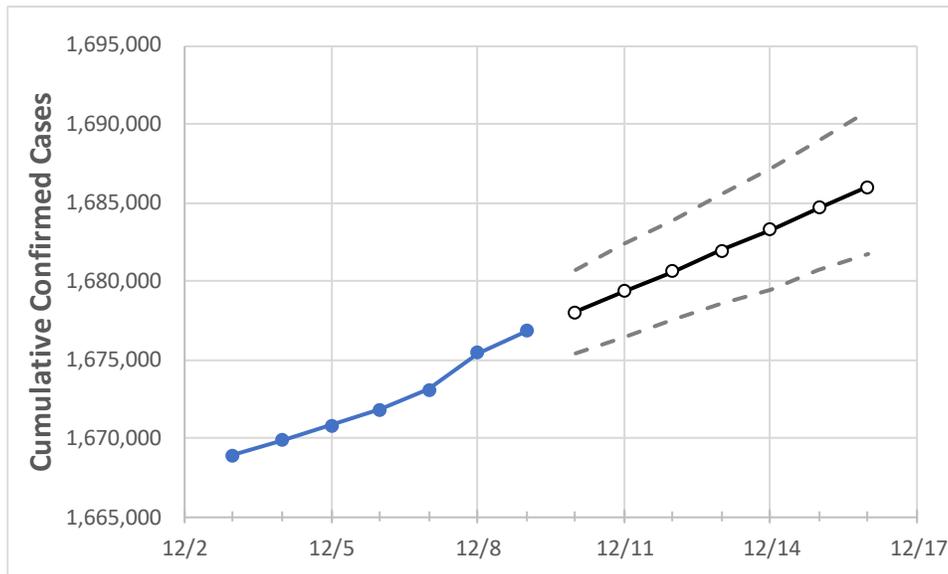
### IEM's Modeling Lead

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:							
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16	
Georgia	1,671,787	1,673,082	1,675,453	1,676,787	1,678,047	1,679,352	1,680,602	1,681,920	1,683,285	1,684,694	1,685,971	

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:							
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16	
Bartow	20,965	20,981	21,020	21,036	21,051	21,067	21,082	21,097	21,112	21,127	21,142	
Carroll	16,715	16,721	16,743	16,749	16,762	16,776	16,789	16,803	16,816	16,830	16,844	
Cherokee	44,743	44,772	44,826	44,867	44,908	44,950	44,993	45,036	45,081	45,128	45,174	
Clarke	20,426	20,441	20,470	20,485	20,498	20,511	20,525	20,538	20,552	20,566	20,581	
Clayton	40,367	40,446	40,512	40,575	40,629	40,684	40,740	40,799	40,858	40,923	40,987	
Cobb	112,655	112,733	112,910	113,020	113,127	113,232	113,339	113,446	113,554	113,665	113,775	
DeKalb	93,894	93,977	94,145	94,250	94,330	94,410	94,490	94,570	94,652	94,738	94,823	
Dougherty	12,559	12,561	12,568	12,569	12,572	12,575	12,579	12,582	12,586	12,589	12,592	
Douglas	22,798	22,816	22,851	22,868	22,885	22,902	22,920	22,937	22,956	22,973	22,992	
Fulton	135,432	135,562	135,819	135,999	136,139	136,283	136,434	136,577	136,730	136,885	137,044	
Gwinnett	137,010	137,119	137,412	137,591	137,718	137,848	137,979	138,107	138,245	138,379	138,514	
Hall	39,289	39,334	39,414	39,452	39,497	39,543	39,588	39,634	39,682	39,731	39,778	
Henry	39,180	39,217	39,268	39,297	39,340	39,384	39,428	39,475	39,521	39,569	39,616	
Lee	4,798	4,803	4,810	4,812	4,814	4,817	4,819	4,821	4,824	4,826	4,828	

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:											
	12/6	12/7	12/8	12/9	12/11			12/13			12/15					
Bartow	20,965	20,981	21,020	21,036	21,067	(4,213)	[1,011]	{506}	21,097	(4,219)	[1,013]	{506}	21,127	(4,225)	[1,014]	{507}
Carroll	16,715	16,721	16,743	16,749	16,776	(3,355)	[805]	{403}	16,803	(3,361)	[807]	{403}	16,830	(3,366)	[808]	{404}
Cherokee	44,743	44,772	44,826	44,867	44,950	(8,990)	[2,158]	{1,079}	45,036	(9,007)	[2,162]	{1,081}	45,128	(9,026)	[2,166]	{1,083}
Clarke	20,426	20,441	20,470	20,485	20,511	(4,102)	[985]	{492}	20,538	(4,108)	[986]	{493}	20,566	(4,113)	[987]	{494}
Clayton	40,367	40,446	40,512	40,575	40,684	(8,137)	[1,953]	{976}	40,799	(8,160)	[1,958]	{979}	40,923	(8,185)	[1,964]	{982}
Cobb	112,655	112,733	112,910	113,020	113,232	(22,646)	[5,435]	{2,718}	113,446	(22,689)	[5,445]	{2,723}	113,665	(22,733)	[5,456]	{2,728}
DeKalb	93,894	93,977	94,145	94,250	94,410	(18,882)	[4,532]	{2,266}	94,570	(18,914)	[4,539]	{2,270}	94,738	(18,948)	[4,547]	{2,274}
Dougherty	12,559	12,561	12,568	12,569	12,575	(2,515)	[604]	{302}	12,582	(2,516)	[604]	{302}	12,589	(2,518)	[604]	{302}
Douglas	22,798	22,816	22,851	22,868	22,902	(4,580)	[1,099]	{550}	22,937	(4,587)	[1,101]	{550}	22,973	(4,595)	[1,103]	{551}
Fulton	135,432	135,562	135,819	135,999	136,283	(27,257)	[6,542]	{3,271}	136,577	(27,315)	[6,556]	{3,278}	136,885	(27,377)	[6,570]	{3,285}
Gwinnett	137,010	137,119	137,412	137,591	137,848	(27,570)	[6,617]	{3,308}	138,107	(27,621)	[6,629]	{3,315}	138,379	(27,676)	[6,642]	{3,321}
Hall	39,289	39,334	39,414	39,452	39,543	(7,909)	[1,898]	{949}	39,634	(7,927)	[1,902]	{951}	39,731	(7,946)	[1,907]	{954}
Henry	39,180	39,217	39,268	39,297	39,384	(7,877)	[1,890]	{945}	39,475	(7,895)	[1,895]	{947}	39,569	(7,914)	[1,899]	{950}
Lee	4,798	4,803	4,810	4,812	4,817	(963)	[231]	{116}	4,821	(964)	[231]	{116}	4,826	(965)	[232]	{116}

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.