

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

Date: 3/22/21

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 3/22/21 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.

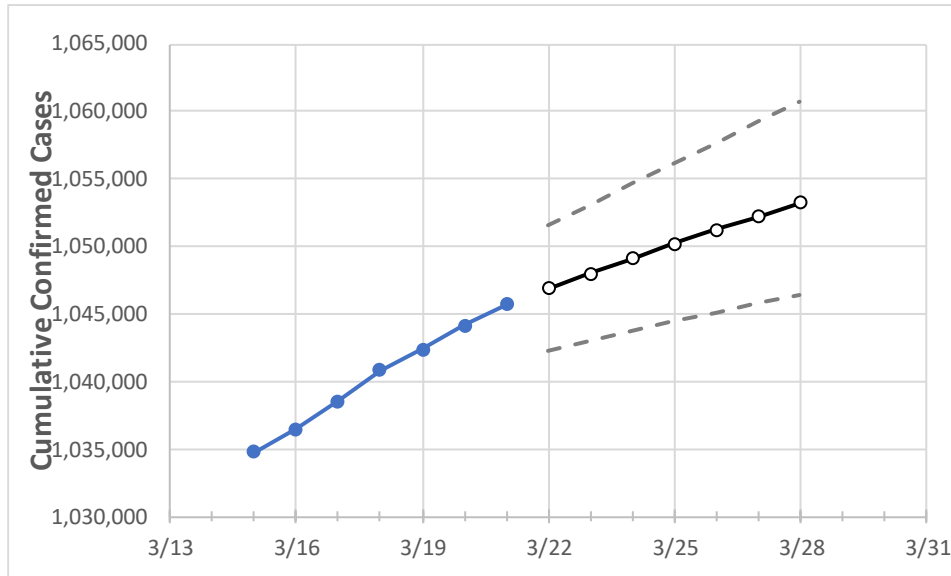
IEM's Modeling Lead

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:						
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28
Georgia	1,040,817	1,042,417	1,044,134	1,045,694	1,046,874	1,047,983	1,049,113	1,050,204	1,051,227	1,052,236	1,053,221

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:						
	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28
Bartow	13,573	13,621	13,668	13,700	13,734	13,768	13,801	13,835	13,868	13,902	13,937
Carroll	10,753	10,758	10,775	10,791	10,798	10,805	10,812	10,819	10,825	10,831	10,838
Cherokee	28,619	28,677	28,751	28,837	28,896	28,956	29,013	29,071	29,128	29,185	29,240
Clarke	14,454	14,464	14,472	14,482	14,492	14,502	14,511	14,521	14,529	14,538	14,546
Clayton	24,173	24,205	24,248	24,319	24,357	24,394	24,431	24,466	24,499	24,532	24,565
Cobb	72,204	72,332	72,477	72,672	72,799	72,924	73,047	73,170	73,288	73,410	73,531
DeKalb	59,553	59,682	59,836	59,955	60,077	60,195	60,314	60,434	60,552	60,667	60,783
Dougherty	7,152	7,159	7,172	7,173	7,177	7,181	7,186	7,190	7,194	7,198	7,201
Douglas	13,931	13,952	13,979	14,015	14,032	14,049	14,066	14,082	14,097	14,112	14,127
Fulton	89,532	89,694	89,906	90,128	90,270	90,409	90,542	90,674	90,805	90,930	91,052
Gwinnett	95,203	95,315	95,447	95,591	95,688	95,780	95,872	95,958	96,043	96,125	96,204
Hall	26,022	26,040	26,070	26,099	26,120	26,139	26,158	26,177	26,195	26,213	26,231
Henry	23,124	23,154	23,205	23,254	23,298	23,342	23,383	23,423	23,462	23,499	23,535
Lee	2,639	2,640	2,641	2,642	2,643	2,645	2,646	2,647	2,648	2,649	2,650

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:											
	3/18	3/19	3/20	3/21	3/23				3/25				3/27			
Bartow	13,573	13,621	13,668	13,700	13,768	(2,754)	[661]	{330}	13,835	(2,767)	[664]	{332}	13,902	(2,780)	[667]	{334}
Carroll	10,753	10,758	10,775	10,791	10,805	(2,161)	[519]	{259}	10,819	(2,164)	[519]	{260}	10,831	(2,166)	[520]	{260}
Cherokee	28,619	28,677	28,751	28,837	28,956	(5,791)	[1,390]	{695}	29,071	(5,814)	[1,395]	{698}	29,185	(5,837)	[1,401]	{700}
Clarke	14,454	14,464	14,472	14,482	14,502	(2,900)	[696]	{348}	14,521	(2,904)	[697]	{348}	14,538	(2,908)	[698]	{349}
Clayton	24,173	24,205	24,248	24,319	24,394	(4,879)	[1,171]	{585}	24,466	(4,893)	[1,174]	{587}	24,532	(4,906)	[1,178]	{589}
Cobb	72,204	72,332	72,477	72,672	72,924	(14,585)	[3,500]	{1,750}	73,170	(14,634)	[3,512]	{1,756}	73,410	(14,682)	[3,524]	{1,762}
DeKalb	59,553	59,682	59,836	59,955	60,195	(12,039)	[2,889]	{1,445}	60,434	(12,087)	[2,901]	{1,450}	60,667	(12,133)	[2,912]	{1,456}
Dougherty	7,152	7,159	7,172	7,173	7,181	(1,436)	[345]	{172}	7,190	(1,438)	[345]	{173}	7,198	(1,440)	[345]	{173}
Douglas	13,931	13,952	13,979	14,015	14,049	(2,810)	[674]	{337}	14,082	(2,816)	[676]	{338}	14,112	(2,822)	[677]	{339}
Fulton	89,532	89,694	89,906	90,128	90,409	(18,082)	[4,340]	{2,170}	90,674	(18,135)	[4,352]	{2,176}	90,930	(18,186)	[4,365]	{2,182}
Gwinnett	95,203	95,315	95,447	95,591	95,780	(19,156)	[4,597]	{2,299}	95,958	(19,192)	[4,606]	{2,303}	96,125	(19,225)	[4,614]	{2,307}
Hall	26,022	26,040	26,070	26,099	26,139	(5,228)	[1,255]	{627}	26,177	(5,235)	[1,256]	{628}	26,213	(5,243)	[1,258]	{629}
Henry	23,124	23,154	23,205	23,254	23,342	(4,668)	[1,120]	{560}	23,423	(4,685)	[1,124]	{562}	23,499	(4,700)	[1,128]	{564}
Lee	2,639	2,640	2,641	2,642	2,645	(529)	[127]	{63}	2,647	(529)	[127]	{64}	2,649	(530)	[127]	{64}

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.