

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

Date: 3/23/21

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 3/23/21 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.

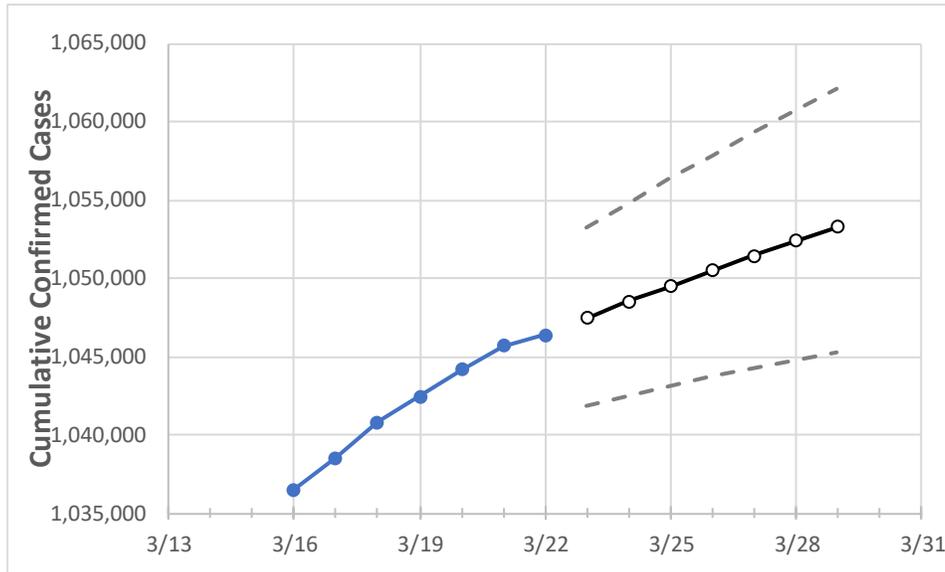
IEM's Modeling Lead

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:						
	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29
Georgia	1,042,417	1,044,134	1,045,694	1,046,382	1,047,448	1,048,506	1,049,501	1,050,507	1,051,465	1,052,376	1,053,269

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:						
	3/19	3/20	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29
Bartow	13,621	13,668	13,700	13,712	13,739	13,766	13,793	13,819	13,843	13,868	13,892
Carroll	10,758	10,775	10,791	10,794	10,801	10,808	10,815	10,821	10,827	10,833	10,839
Cherokee	28,677	28,751	28,837	28,895	28,957	29,019	29,079	29,138	29,198	29,258	29,317
Clarke	14,464	14,472	14,482	14,488	14,497	14,507	14,515	14,524	14,531	14,539	14,546
Clayton	24,205	24,248	24,319	24,361	24,400	24,439	24,477	24,515	24,551	24,585	24,620
Cobb	72,332	72,477	72,672	72,784	72,897	73,011	73,119	73,229	73,336	73,441	73,545
DeKalb	59,682	59,836	59,955	60,055	60,174	60,289	60,406	60,520	60,633	60,745	60,854
Dougherty	7,159	7,172	7,173	7,174	7,178	7,182	7,186	7,189	7,193	7,196	7,200
Douglas	13,952	13,979	14,015	14,034	14,052	14,069	14,086	14,102	14,118	14,133	14,148
Fulton	89,694	89,906	90,128	90,247	90,393	90,535	90,674	90,809	90,943	91,067	91,193
Gwinnett	95,315	95,447	95,591	95,659	95,747	95,832	95,911	95,991	96,068	96,143	96,210
Hall	26,040	26,070	26,099	26,108	26,129	26,148	26,167	26,186	26,204	26,221	26,238
Henry	23,154	23,205	23,254	23,277	23,319	23,361	23,400	23,437	23,473	23,508	23,542
Lee	2,640	2,641	2,642	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:											
	3/19	3/20	3/21	3/22	3/24			3/26			3/28					
Bartow	13,621	13,668	13,700	13,712	13,766	(2,753)	[661]	{330}	13,819	(2,764)	[663]	{332}	13,868	(2,774)	[666]	{333}
Carroll	10,758	10,775	10,791	10,794	10,808	(2,162)	[519]	{259}	10,821	(2,164)	[519]	{260}	10,833	(2,167)	[520]	{260}
Cherokee	28,677	28,751	28,837	28,895	29,019	(5,804)	[1,393]	{696}	29,138	(5,828)	[1,399]	{699}	29,258	(5,852)	[1,404]	{702}
Clarke	14,464	14,472	14,482	14,488	14,507	(2,901)	[696]	{348}	14,524	(2,905)	[697]	{349}	14,539	(2,908)	[698]	{349}
Clayton	24,205	24,248	24,319	24,361	24,439	(4,888)	[1,173]	{587}	24,515	(4,903)	[1,177]	{588}	24,585	(4,917)	[1,180]	{590}
Cobb	72,332	72,477	72,672	72,784	73,011	(14,602)	[3,505]	{1,752}	73,229	(14,646)	[3,515]	{1,757}	73,441	(14,688)	[3,525]	{1,763}
DeKalb	59,682	59,836	59,955	60,055	60,289	(12,058)	[2,894]	{1,447}	60,520	(12,104)	[2,905]	{1,452}	60,745	(12,149)	[2,916]	{1,458}
Dougherty	7,159	7,172	7,173	7,174	7,182	(1,436)	[345]	{172}	7,189	(1,438)	[345]	{173}	7,196	(1,439)	[345]	{173}
Douglas	13,952	13,979	14,015	14,034	14,069	(2,814)	[675]	{338}	14,102	(2,820)	[677]	{338}	14,133	(2,827)	[678]	{339}
Fulton	89,694	89,906	90,128	90,247	90,535	(18,107)	[4,346]	{2,173}	90,809	(18,162)	[4,359]	{2,179}	91,067	(18,213)	[4,371]	{2,186}
Gwinnett	95,315	95,447	95,591	95,659	95,832	(19,166)	[4,600]	{2,300}	95,991	(19,198)	[4,608]	{2,304}	96,143	(19,229)	[4,615]	{2,307}
Hall	26,040	26,070	26,099	26,108	26,148	(5,230)	[1,255]	{628}	26,186	(5,237)	[1,257]	{628}	26,221	(5,244)	[1,259]	{629}
Henry	23,154	23,205	23,254	23,277	23,361	(4,672)	[1,121]	{561}	23,437	(4,687)	[1,125]	{562}	23,508	(4,702)	[1,128]	{564}
Lee	2,640	2,641	2,642	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.