

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/19/21**

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 3/19/21 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.

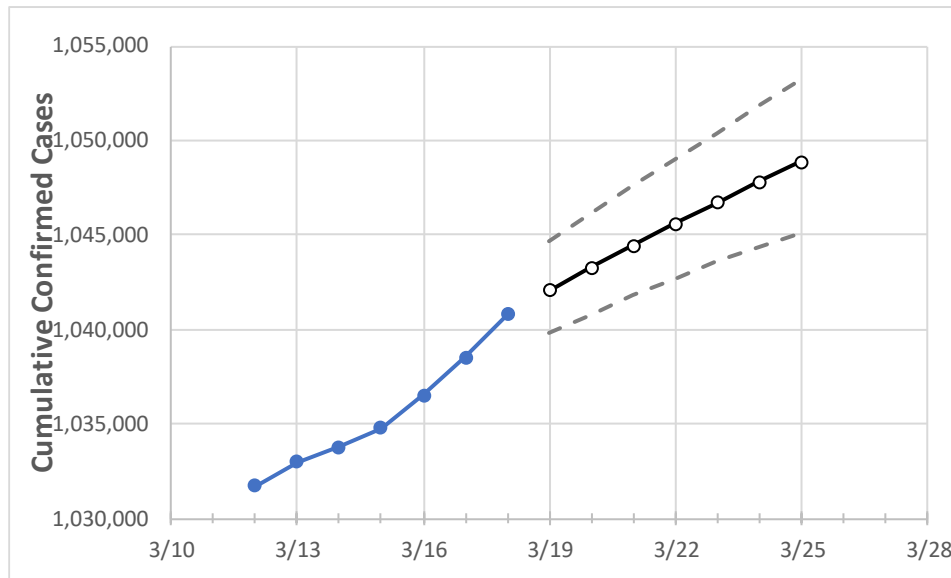
IEM's Modeling Lead

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Georgia	1,034,763	1,036,506	1,038,550	1,040,817	1,042,066	1,043,268	1,044,456	1,045,616	1,046,716	1,047,793	1,048,856

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Bartow	13,458	13,485	13,525	13,573	13,601	13,628	13,654	13,681	13,707	13,733	13,758
Carroll	10,715	10,724	10,742	10,753	10,760	10,767	10,774	10,780	10,786	10,792	10,797
Cherokee	28,332	28,401	28,518	28,619	28,672	28,724	28,775	28,825	28,875	28,923	28,970
Clarke	14,406	14,418	14,437	14,454	14,466	14,478	14,490	14,501	14,512	14,522	14,532
Clayton	24,020	24,067	24,117	24,173	24,210	24,245	24,280	24,314	24,346	24,378	24,408
Cobb	71,712	71,831	71,968	72,204	72,306	72,404	72,497	72,590	72,681	72,766	72,848
DeKalb	59,001	59,194	59,391	59,553	59,672	59,791	59,906	60,021	60,134	60,248	60,362
Dougherty	7,139	7,140	7,145	7,152	7,156	7,159	7,163	7,166	7,168	7,172	7,174
Douglas	13,868	13,879	13,899	13,931	13,948	13,963	13,978	13,992	14,005	14,017	14,030
Fulton	88,902	89,094	89,302	89,532	89,671	89,804	89,934	90,060	90,182	90,304	90,416
Gwinnett	94,676	94,809	94,989	95,203	95,308	95,410	95,508	95,601	95,692	95,781	95,864
Hall	25,914	25,945	25,983	26,022	26,041	26,060	26,078	26,095	26,113	26,129	26,144
Henry	22,917	23,001	23,062	23,124	23,177	23,228	23,278	23,325	23,369	23,413	23,458
Lee	2,634	2,635	2,637	2,639	2,641	2,642	2,644	2,645	2,647	2,648	2,649

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:											
	3/15	3/16	3/17	3/18	3/20				3/22				3/24			
Bartow	13,458	13,485	13,525	13,573	13,628	(2,726)	[654]	{327}	13,681	(2,736)	[657]	{328}	13,733	(2,747)	[659]	{330}
Carroll	10,715	10,724	10,742	10,753	10,767	(2,153)	[517]	{258}	10,780	(2,156)	[517]	{259}	10,792	(2,158)	[518]	{259}
Cherokee	28,332	28,401	28,518	28,619	28,724	(5,745)	[1,379]	{689}	28,825	(5,765)	[1,384]	{692}	28,923	(5,785)	[1,388]	{694}
Clarke	14,406	14,418	14,437	14,454	14,478	(2,896)	[695]	{347}	14,501	(2,900)	[696]	{348}	14,522	(2,904)	[697]	{349}
Clayton	24,020	24,067	24,117	24,173	24,245	(4,849)	[1,164]	{582}	24,314	(4,863)	[1,167]	{584}	24,378	(4,876)	[1,170]	{585}
Cobb	71,712	71,831	71,968	72,204	72,404	(14,481)	[3,475]	{1,738}	72,590	(14,518)	[3,484]	{1,742}	72,766	(14,553)	[3,493]	{1,746}
DeKalb	59,001	59,194	59,391	59,553	59,791	(11,958)	[2,870]	{1,435}	60,021	(12,004)	[2,881]	{1,441}	60,248	(12,050)	[2,892]	{1,446}
Dougherty	7,139	7,140	7,145	7,152	7,159	(1,432)	[344]	{172}	7,166	(1,433)	[344]	{172}	7,172	(1,434)	[344]	{172}
Douglas	13,868	13,879	13,899	13,931	13,963	(2,793)	[670]	{335}	13,992	(2,798)	[672]	{336}	14,017	(2,803)	[673]	{336}
Fulton	88,902	89,094	89,302	89,532	89,804	(17,961)	[4,311]	{2,155}	90,060	(18,012)	[4,323]	{2,161}	90,304	(18,061)	[4,335]	{2,167}
Gwinnett	94,676	94,809	94,989	95,203	95,410	(19,082)	[4,580]	{2,290}	95,601	(19,120)	[4,589]	{2,294}	95,781	(19,156)	[4,597]	{2,299}
Hall	25,914	25,945	25,983	26,022	26,060	(5,212)	[1,251]	{625}	26,095	(5,219)	[1,253]	{626}	26,129	(5,226)	[1,254]	{627}
Henry	22,917	23,001	23,062	23,124	23,228	(4,646)	[1,115]	{557}	23,325	(4,665)	[1,120]	{560}	23,413	(4,683)	[1,124]	{562}
Lee	2,634	2,635	2,637	2,639	2,642	(528)	[127]	{63}	2,645	(529)	[127]	{63}	2,648	(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.