

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

Date: 2/1/21

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 2/1/21 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.

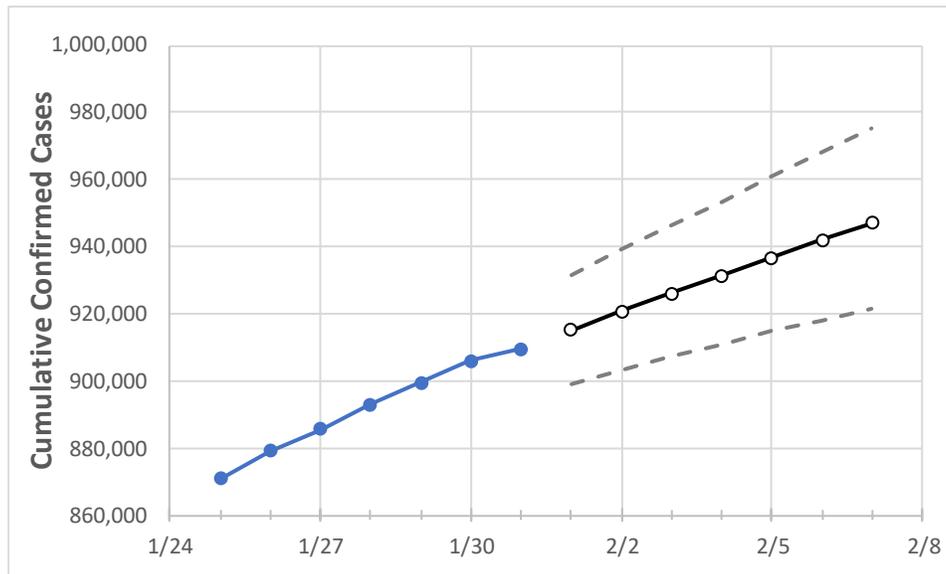
IEM's Modeling Lead

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:						
	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7
Georgia	892,957	899,515	905,858	909,445	915,023	920,661	926,070	931,522	936,764	941,972	947,058

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:						
	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7
Bartow	11,010	11,107	11,195	11,249	11,333	11,418	11,501	11,584	11,665	11,745	11,823
Carroll	9,461	9,521	9,581	9,614	9,676	9,737	9,799	9,859	9,919	9,978	10,037
Cherokee	23,746	23,903	24,096	24,211	24,384	24,550	24,712	24,872	25,025	25,171	25,322
Clarke	12,853	12,947	13,011	13,054	13,124	13,191	13,257	13,325	13,392	13,459	13,523
Clayton	19,277	19,449	19,589	19,700	19,849	19,994	20,140	20,284	20,425	20,565	20,708
Cobb	61,400	61,976	62,440	62,694	63,132	63,561	63,985	64,392	64,791	65,195	65,580
DeKalb	50,352	50,687	51,063	51,275	51,594	51,915	52,223	52,532	52,833	53,119	53,416
Dougherty	6,522	6,568	6,594	6,613	6,659	6,702	6,746	6,790	6,832	6,874	6,915
Douglas	11,452	11,549	11,659	11,746	11,843	11,939	12,034	12,129	12,223	12,318	12,411
Fulton	75,935	76,471	77,020	77,344	77,837	78,309	78,784	79,246	79,695	80,142	80,566
Gwinnett	81,838	82,359	83,090	83,370	84,075	84,763	85,429	86,107	86,765	87,390	88,005
Hall	23,640	23,764	23,868	23,916	24,041	24,160	24,282	24,401	24,513	24,625	24,737
Henry	18,740	18,893	19,032	19,121	19,269	19,415	19,558	19,703	19,847	19,985	20,125
Lee	2,344	2,364	2,379	2,385	2,405	2,425	2,445	2,463	2,482	2,501	2,519

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:											
	1/28	1/29	1/30	1/31	2/2			2/4			2/6					
Bartow	11,010	11,107	11,195	11,249	11,418	(2,284)	[548]	{274}	11,584	(2,317)	[556]	{278}	11,745	(2,349)	[564]	{282}
Carroll	9,461	9,521	9,581	9,614	9,737	(1,947)	[467]	{234}	9,859	(1,972)	[473]	{237}	9,978	(1,996)	[479]	{239}
Cherokee	23,746	23,903	24,096	24,211	24,550	(4,910)	[1,178]	{589}	24,872	(4,974)	[1,194]	{597}	25,171	(5,034)	[1,208]	{604}
Clarke	12,853	12,947	13,011	13,054	13,191	(2,638)	[633]	{317}	13,325	(2,665)	[640]	{320}	13,459	(2,692)	[646]	{323}
Clayton	19,277	19,449	19,589	19,700	19,994	(3,999)	[960]	{480}	20,284	(4,057)	[974]	{487}	20,565	(4,113)	[987]	{494}
Cobb	61,400	61,976	62,440	62,694	63,561	(12,712)	[3,051]	{1,525}	64,392	(12,878)	[3,091]	{1,545}	65,195	(13,039)	[3,129]	{1,565}
DeKalb	50,352	50,687	51,063	51,275	51,915	(10,383)	[2,492]	{1,246}	52,532	(10,506)	[2,522]	{1,261}	53,119	(10,624)	[2,550]	{1,275}
Dougherty	6,522	6,568	6,594	6,613	6,702	(1,340)	[322]	{161}	6,790	(1,358)	[326]	{163}	6,874	(1,375)	[330]	{165}
Douglas	11,452	11,549	11,659	11,746	11,939	(2,388)	[573]	{287}	12,129	(2,426)	[582]	{291}	12,318	(2,464)	[591]	{296}
Fulton	75,935	76,471	77,020	77,344	78,309	(15,662)	[3,759]	{1,879}	79,246	(15,849)	[3,804]	{1,902}	80,142	(16,028)	[3,847]	{1,923}
Gwinnett	81,838	82,359	83,090	83,370	84,763	(16,953)	[4,069]	{2,034}	86,107	(17,221)	[4,133]	{2,067}	87,390	(17,478)	[4,195]	{2,097}
Hall	23,640	23,764	23,868	23,916	24,160	(4,832)	[1,160]	{580}	24,401	(4,880)	[1,171]	{586}	24,625	(4,925)	[1,182]	{591}
Henry	18,740	18,893	19,032	19,121	19,415	(3,883)	[932]	{466}	19,703	(3,941)	[946]	{473}	19,985	(3,997)	[959]	{480}
Lee	2,344	2,364	2,379	2,385	2,425	(485)	[116]	{58}	2,463	(493)	[118]	{59}	2,501	(500)	[120]	{60}

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.