

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

Date: 4/1/21

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 4/1/21 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.

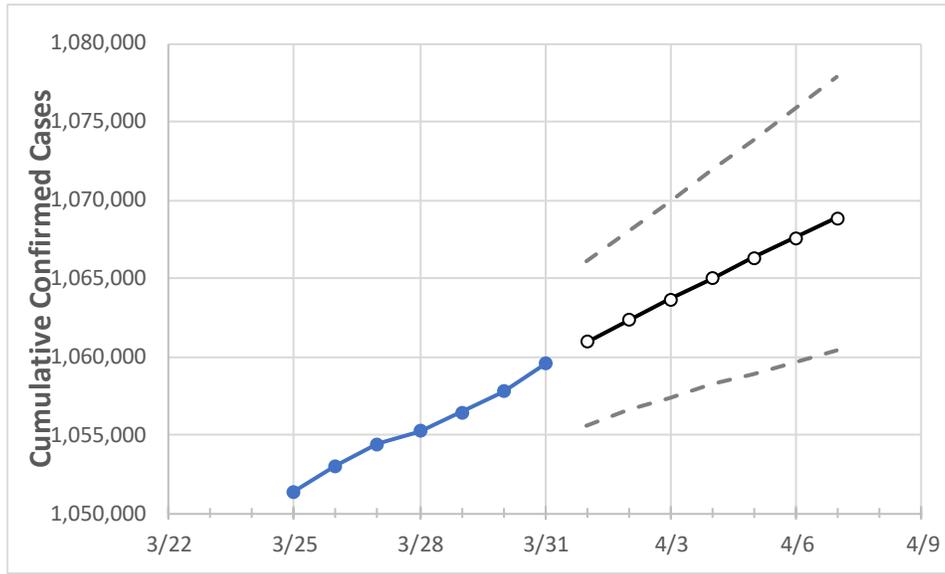
IEM's Modeling Lead

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:						
	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7

Georgia 1,055,256 1,056,421 1,057,741 1,059,548 1,060,938 1,062,291 1,063,627 1,064,982 1,066,303 1,067,578 1,068,856

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:						
	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7
Bartow	13,855	13,866	13,898	13,935	13,960	13,985	14,009	14,031	14,054	14,077	14,099
Carroll	10,889	10,902	10,917	10,937	10,952	10,968	10,984	11,000	11,017	11,033	11,049
Cherokee	29,316	29,365	29,405	29,522	29,594	29,665	29,736	29,807	29,877	29,949	30,019
Clarke	14,571	14,575	14,580	14,598	14,608	14,618	14,628	14,638	14,648	14,657	14,666
Clayton	24,647	24,677	24,709	24,760	24,805	24,849	24,893	24,936	24,978	25,023	25,065
Cobb	73,568	73,698	73,832	74,036	74,180	74,321	74,465	74,608	74,756	74,901	75,046
DeKalb	60,899	61,080	61,197	61,295	61,430	61,565	61,701	61,834	61,969	62,103	62,239
Dougherty	7,221	7,224	7,231	7,243	7,250	7,258	7,265	7,273	7,281	7,290	7,298
Douglas	14,194	14,219	14,241	14,278	14,306	14,333	14,361	14,390	14,418	14,446	14,474
Fulton	91,302	91,428	91,533	91,721	91,880	92,037	92,190	92,343	92,493	92,643	92,787
Gwinnett	96,486	96,586	96,701	96,854	96,980	97,101	97,222	97,343	97,470	97,589	97,706
Hall	26,271	26,283	26,309	26,334	26,357	26,379	26,402	26,425	26,448	26,471	26,494
Henry	23,561	23,604	23,625	23,667	23,701	23,733	23,765	23,796	23,827	23,856	23,884
Lee	2,662	2,663	2,663	2,663	2,664	2,666	2,667	2,669	2,670	2,672	2,673

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:											
	3/28	3/29	3/30	3/31	4/2				4/4				4/6			
Bartow	13,855	13,866	13,898	13,935	13,985	(2,797)	[671]	{336}	14,031	(2,806)	[673]	{337}	14,077	(2,815)	[676]	{338}
Carroll	10,889	10,902	10,917	10,937	10,968	(2,194)	[526]	{263}	11,000	(2,200)	[528]	{264}	11,033	(2,207)	[530]	{265}
Cherokee	29,316	29,365	29,405	29,522	29,665	(5,933)	[1,424]	{712}	29,807	(5,961)	[1,431]	{715}	29,949	(5,990)	[1,438]	{719}
Clarke	14,571	14,575	14,580	14,598	14,618	(2,924)	[702]	{351}	14,638	(2,928)	[703]	{351}	14,657	(2,931)	[704]	{352}
Clayton	24,647	24,677	24,709	24,760	24,849	(4,970)	[1,193]	{596}	24,936	(4,987)	[1,197]	{598}	25,023	(5,005)	[1,201]	{601}
Cobb	73,568	73,698	73,832	74,036	74,321	(14,864)	[3,567]	{1,784}	74,608	(14,922)	[3,581]	{1,791}	74,901	(14,980)	[3,595]	{1,798}
DeKalb	60,899	61,080	61,197	61,295	61,565	(12,313)	[2,955]	{1,478}	61,834	(12,367)	[2,968]	{1,484}	62,103	(12,421)	[2,981]	{1,490}
Dougherty	7,221	7,224	7,231	7,243	7,258	(1,452)	[348]	{174}	7,273	(1,455)	[349]	{175}	7,290	(1,458)	[350]	{175}
Douglas	14,194	14,219	14,241	14,278	14,333	(2,867)	[688]	{344}	14,390	(2,878)	[691]	{345}	14,446	(2,889)	[693]	{347}
Fulton	91,302	91,428	91,533	91,721	92,037	(18,407)	[4,418]	{2,209}	92,343	(18,469)	[4,432]	{2,216}	92,643	(18,529)	[4,447]	{2,223}
Gwinnett	96,486	96,586	96,701	96,854	97,101	(19,420)	[4,661]	{2,330}	97,343	(19,469)	[4,672]	{2,336}	97,589	(19,518)	[4,684]	{2,342}
Hall	26,271	26,283	26,309	26,334	26,379	(5,276)	[1,266]	{633}	26,425	(5,285)	[1,268]	{634}	26,471	(5,294)	[1,271]	{635}
Henry	23,561	23,604	23,625	23,667	23,733	(4,747)	[1,139]	{570}	23,796	(4,759)	[1,142]	{571}	23,856	(4,771)	[1,145]	{573}
Lee	2,662	2,663	2,663	2,663	2,666	(533)	[128]	{64}	2,669	(534)	[128]	{64}	2,672	(534)	[128]	{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.