

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

Date: 3/8/21

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 3/8/21 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.

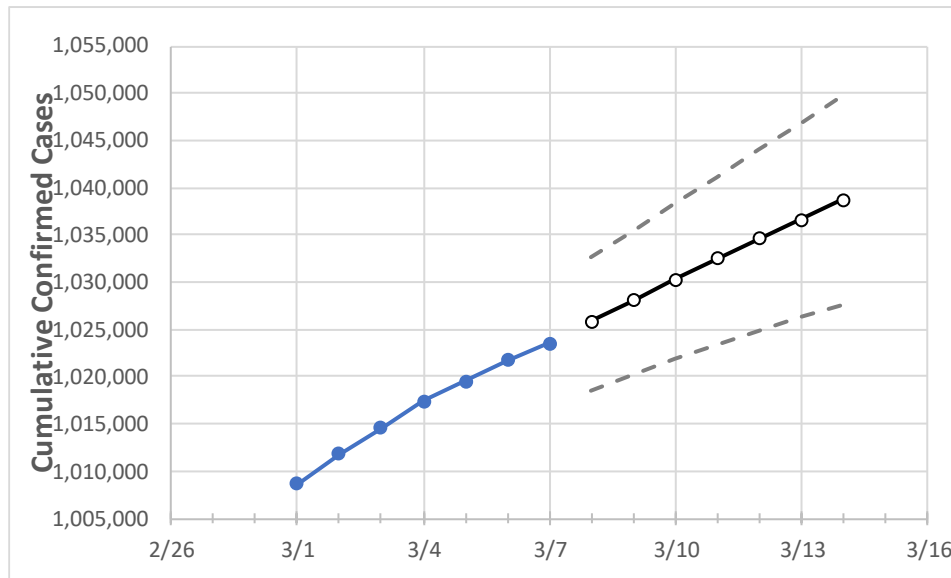
IEM's Modeling Lead

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Georgia	1,017,428	1,019,509	1,021,778	1,023,487	1,025,810	1,028,067	1,030,276	1,032,451	1,034,575	1,036,645	1,038,725

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Bartow	13,129	13,156	13,211	13,233	13,272	13,310	13,347	13,384	13,420	13,454	13,488
Carroll	10,601	10,611	10,627	10,643	10,657	10,671	10,684	10,697	10,708	10,720	10,730
Cherokee	27,713	27,786	27,858	27,924	28,017	28,110	28,196	28,285	28,367	28,451	28,529
Clarke	14,232	14,256	14,261	14,273	14,294	14,315	14,335	14,355	14,374	14,393	14,411
Clayton	23,518	23,572	23,621	23,654	23,714	23,772	23,829	23,883	23,937	23,989	24,040
Cobb	70,279	70,417	70,607	70,781	70,955	71,121	71,286	71,452	71,614	71,774	71,929
DeKalb	57,718	57,841	58,026	58,143	58,298	58,453	58,613	58,766	58,921	59,075	59,217
Dougherty	7,085	7,092	7,097	7,100	7,106	7,112	7,117	7,123	7,128	7,133	7,138
Douglas	13,556	13,602	13,663	13,689	13,722	13,755	13,788	13,819	13,850	13,880	13,909
Fulton	86,856	87,076	87,372	87,609	87,890	88,171	88,457	88,733	89,009	89,283	89,551
Gwinnett	93,192	93,360	93,536	93,720	93,927	94,131	94,330	94,523	94,711	94,899	95,087
Hall	25,657	25,682	25,709	25,728	25,761	25,793	25,824	25,855	25,882	25,911	25,940
Henry	22,142	22,238	22,324	22,398	22,503	22,611	22,718	22,825	22,934	23,042	23,153
Lee	2,601	2,603	2,604	2,610	2,614	2,618	2,622	2,626	2,630	2,633	2,637

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:											
	3/4	3/5	3/6	3/7	3/9				3/11				3/13			
Bartow	13,129	13,156	13,211	13,233	13,310	(2,662)	[639]	{319}	13,384	(2,677)	[642]	{321}	13,454	(2,691)	[646]	{323}
Carroll	10,601	10,611	10,627	10,643	10,671	(2,134)	[512]	{256}	10,697	(2,139)	[513]	{257}	10,720	(2,144)	[515]	{257}
Cherokee	27,713	27,786	27,858	27,924	28,110	(5,622)	[1,349]	{675}	28,285	(5,657)	[1,358]	{679}	28,451	(5,690)	[1,366]	{683}
Clarke	14,232	14,256	14,261	14,273	14,315	(2,863)	[687]	{344}	14,355	(2,871)	[689]	{345}	14,393	(2,879)	[691]	{345}
Clayton	23,518	23,572	23,621	23,654	23,772	(4,754)	[1,141]	{571}	23,883	(4,777)	[1,146]	{573}	23,989	(4,798)	[1,151]	{576}
Cobb	70,279	70,417	70,607	70,781	71,121	(14,224)	[3,414]	{1,707}	71,452	(14,290)	[3,430]	{1,715}	71,774	(14,355)	[3,445]	{1,723}
DeKalb	57,718	57,841	58,026	58,143	58,453	(11,691)	[2,806]	{1,403}	58,766	(11,753)	[2,821]	{1,410}	59,075	(11,815)	[2,836]	{1,418}
Dougherty	7,085	7,092	7,097	7,100	7,112	(1,422)	[341]	{171}	7,123	(1,425)	[342]	{171}	7,133	(1,427)	[342]	{171}
Douglas	13,556	13,602	13,663	13,689	13,755	(2,751)	[660]	{330}	13,819	(2,764)	[663]	{332}	13,880	(2,776)	[666]	{333}
Fulton	86,856	87,076	87,372	87,609	88,171	(17,634)	[4,232]	{2,116}	88,733	(17,747)	[4,259]	{2,130}	89,283	(17,857)	[4,286]	{2,143}
Gwinnett	93,192	93,360	93,536	93,720	94,131	(18,826)	[4,518]	{2,259}	94,523	(18,905)	[4,537]	{2,269}	94,899	(18,980)	[4,555]	{2,278}
Hall	25,657	25,682	25,709	25,728	25,793	(5,159)	[1,238]	{619}	25,855	(5,171)	[1,241]	{621}	25,911	(5,182)	[1,244]	{622}
Henry	22,142	22,238	22,324	22,398	22,611	(4,522)	[1,085]	{543}	22,825	(4,565)	[1,096]	{548}	23,042	(4,608)	[1,106]	{553}
Lee	2,601	2,603	2,604	2,610	2,618	(524)	[126]	{63}	2,626	(525)	[126]	{63}	2,633	(527)	[126]	{63}

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.