

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

Date: 1/29/21

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 1/29/21 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.

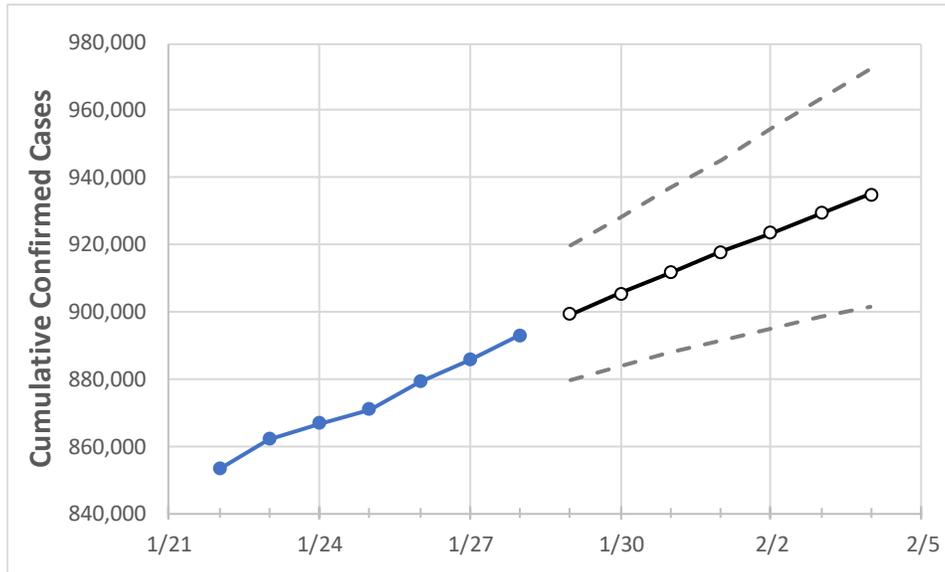
IEM's Modeling Lead

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Georgia	870,828	879,221	885,605	892,957	899,288	905,573	911,786	917,777	923,567	929,373	934,887

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Bartow	10,627	10,748	10,883	11,010	11,103	11,192	11,281	11,371	11,459	11,546	11,634
Carroll	9,240	9,320	9,405	9,461	9,529	9,597	9,664	9,732	9,800	9,869	9,937
Cherokee	22,995	23,305	23,491	23,746	23,937	24,129	24,314	24,495	24,676	24,854	25,022
Clarke	12,546	12,660	12,736	12,853	12,932	13,009	13,085	13,162	13,237	13,311	13,388
Clayton	18,667	18,942	19,099	19,277	19,435	19,598	19,760	19,914	20,075	20,233	20,387
Cobb	59,751	60,420	60,876	61,400	61,871	62,335	62,794	63,236	63,668	64,109	64,537
DeKalb	49,095	49,617	49,958	50,352	50,699	51,043	51,381	51,721	52,047	52,366	52,673
Dougherty	6,275	6,323	6,418	6,522	6,577	6,631	6,685	6,739	6,792	6,844	6,899
Douglas	11,111	11,243	11,330	11,452	11,554	11,655	11,755	11,855	11,955	12,052	12,153
Fulton	74,265	74,969	75,399	75,935	76,486	77,031	77,565	78,090	78,598	79,104	79,609
Gwinnett	79,518	80,517	81,132	81,838	82,670	83,483	84,304	85,126	85,932	86,731	87,522
Hall	23,207	23,392	23,515	23,640	23,789	23,938	24,084	24,222	24,356	24,500	24,636
Henry	18,143	18,393	18,577	18,740	18,910	19,075	19,245	19,417	19,574	19,737	19,902
Lee	2,241	2,278	2,321	2,344	2,368	2,391	2,415	2,439	2,463	2,487	2,511

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:											
	1/25	1/26	1/27	1/28	1/30			2/1			2/3					
Bartow	10,627	10,748	10,883	11,010	11,192	(2,238)	{537}	{269}	11,371	(2,274)	{546}	{273}	11,546	(2,309)	{554}	{277}
Carroll	9,240	9,320	9,405	9,461	9,597	(1,919)	{461}	{230}	9,732	(1,946)	{467}	{234}	9,869	(1,974)	{474}	{237}
Cherokee	22,995	23,305	23,491	23,746	24,129	(4,826)	{1,158}	{579}	24,495	(4,899)	{1,176}	{588}	24,854	(4,971)	{1,193}	{596}
Clarke	12,546	12,660	12,736	12,853	13,009	(2,602)	{624}	{312}	13,162	(2,632)	{632}	{316}	13,311	(2,662)	{639}	{319}
Clayton	18,667	18,942	19,099	19,277	19,598	(3,920)	{941}	{470}	19,914	(3,983)	{956}	{478}	20,233	(4,047)	{971}	{486}
Cobb	59,751	60,420	60,876	61,400	62,335	(12,467)	{2,992}	{1,496}	63,236	(12,647)	{3,035}	{1,518}	64,109	(12,822)	{3,077}	{1,539}
DeKalb	49,095	49,617	49,958	50,352	51,043	(10,209)	{2,450}	{1,225}	51,721	(10,344)	{2,483}	{1,241}	52,366	(10,473)	{2,514}	{1,257}
Dougherty	6,275	6,323	6,418	6,522	6,631	(1,326)	{318}	{159}	6,739	(1,348)	{323}	{162}	6,844	(1,369)	{328}	{164}
Douglas	11,111	11,243	11,330	11,452	11,655	(2,331)	{559}	{280}	11,855	(2,371)	{569}	{285}	12,052	(2,410)	{579}	{289}
Fulton	74,265	74,969	75,399	75,935	77,031	(15,406)	{3,698}	{1,849}	78,090	(15,618)	{3,748}	{1,874}	79,104	(15,821)	{3,797}	{1,898}
Gwinnett	79,518	80,517	81,132	81,838	83,483	(16,697)	{4,007}	{2,004}	85,126	(17,025)	{4,086}	{2,043}	86,731	(17,346)	{4,163}	{2,082}
Hall	23,207	23,392	23,515	23,640	23,938	(4,788)	{1,149}	{575}	24,222	(4,844)	{1,163}	{581}	24,500	(4,900)	{1,176}	{588}
Henry	18,143	18,393	18,577	18,740	19,075	(3,815)	{916}	{458}	19,417	(3,883)	{932}	{466}	19,737	(3,947)	{947}	{474}
Lee	2,241	2,278	2,321	2,344	2,391	(478)	{115}	{57}	2,439	(488)	{117}	{59}	2,487	(497)	{119}	{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.