

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

Date: 1/10/22

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 1/10/22 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.

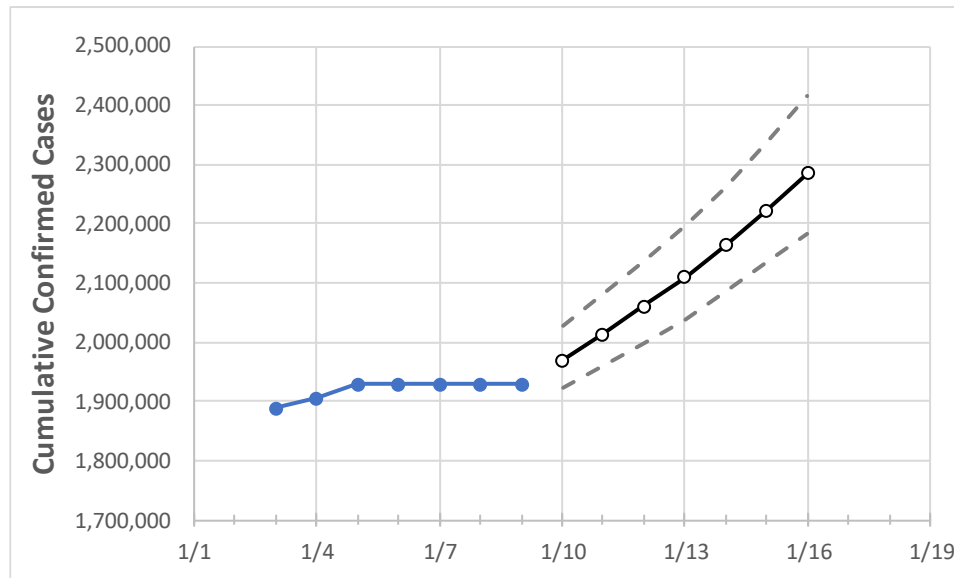
IEM's Modeling Lead

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:						
	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16
Georgia	1,928,942	1,928,942	1,928,942	1,928,942	1,969,710	2,013,862	2,060,000	2,109,616	2,164,221	2,222,177	2,285,148

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:							
	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	
Bartow	23,755	23,755	23,755	23,755	24,164	24,604	25,066	25,570	26,105	26,680	27,301	
Carroll	19,287	19,287	19,287	19,287	19,714	20,164	20,656	21,197	21,772	22,419	23,090	
Cherokee	50,734	50,734	50,734	50,734	51,687	52,724	53,805	54,995	56,284	57,677	59,161	
Clarke	23,148	23,148	23,148	23,148	23,652	24,198	24,796	25,458	26,177	26,958	27,800	
Clayton	49,609	49,609	49,609	49,609	50,844	52,151	53,534	54,965	56,543	58,204	59,983	
Cobb	137,074	137,074	137,074	137,074	140,638	144,492	148,514	152,868	157,591	162,578	167,974	
DeKalb	113,655	113,655	113,655	113,655	116,429	119,347	122,517	125,900	129,512	133,357	137,507	
Dougherty	13,602	13,602	13,602	13,602	13,887	14,209	14,562	14,961	15,406	15,908	16,465	
Douglas	28,240	28,240	28,240	28,240	29,196	30,224	31,332	32,569	33,847	35,268	36,807	
Fulton	171,062	171,062	171,062	171,062	175,881	180,909	186,230	191,965	198,082	204,533	211,447	
Gwinnett	161,671	161,671	161,671	161,671	165,683	169,918	174,631	179,561	184,970	190,667	196,859	
Hall	43,180	43,180	43,180	43,180	43,796	44,462	45,176	45,944	46,780	47,698	48,681	
Henry	47,623	47,623	47,623	47,623	48,997	50,514	52,112	53,888	55,744	57,767	59,931	
Lee	5,154	5,154	5,154	5,154	5,207	5,263	5,324	5,389	5,461	5,535	5,618	

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:											
	1/6	1/7	1/8	1/9	1/11				1/13				1/15			
Bartow	23,755	23,755	23,755	23,755	24,604	(4,921)	[1,181]	{590}	25,570	(5,114)	[1,227]	{614}	26,680	(5,336)	[1,281]	{640}
Carroll	19,287	19,287	19,287	19,287	20,164	(4,033)	[968]	{484}	21,197	(4,239)	[1,017]	{509}	22,419	(4,484)	[1,076]	{538}
Cherokee	50,734	50,734	50,734	50,734	52,724	(10,545)	[2,531]	{1,265}	54,995	(10,999)	[2,640]	{1,320}	57,677	(11,535)	[2,768]	{1,384}
Clarke	23,148	23,148	23,148	23,148	24,198	(4,840)	[1,161]	{581}	25,458	(5,092)	[1,222]	{611}	26,958	(5,392)	[1,294]	{647}
Clayton	49,609	49,609	49,609	49,609	52,151	(10,430)	[2,503]	{1,252}	54,965	(10,993)	[2,638]	{1,319}	58,204	(11,641)	[2,794]	{1,397}
Cobb	137,074	137,074	137,074	137,074	144,492	(28,898)	[6,936]	{3,468}	152,868	(30,574)	[7,338]	{3,669}	162,578	(32,516)	[7,804]	{3,902}
DeKalb	113,655	113,655	113,655	113,655	119,347	(23,869)	[5,729]	{2,864}	125,900	(25,180)	[6,043]	{3,022}	133,357	(26,671)	[6,401]	{3,201}
Dougherty	13,602	13,602	13,602	13,602	14,209	(2,842)	[682]	{341}	14,961	(2,992)	[718]	{359}	15,908	(3,182)	[764]	{382}
Douglas	28,240	28,240	28,240	28,240	30,224	(6,045)	[1,451]	{725}	32,569	(6,514)	[1,563]	{782}	35,268	(7,054)	[1,693]	{846}
Fulton	171,062	171,062	171,062	171,062	180,909	(36,182)	[8,684]	{4,342}	191,965	(38,393)	[9,214]	{4,607}	204,533	(40,907)	[9,818]	{4,909}
Gwinnett	161,671	161,671	161,671	161,671	169,918	(33,984)	[8,156]	{4,078}	179,561	(35,912)	[8,619]	{4,309}	190,667	(38,133)	[9,152]	{4,576}
Hall	43,180	43,180	43,180	43,180	44,462	(8,892)	[2,134]	{1,067}	45,944	(9,189)	[2,205]	{1,103}	47,698	(9,540)	[2,290]	{1,145}
Henry	47,623	47,623	47,623	47,623	50,514	(10,103)	[2,425]	{1,212}	53,888	(10,778)	[2,587]	{1,293}	57,767	(11,553)	[2,773]	{1,386}
Lee	5,154	5,154	5,154	5,154	5,263	(1,053)	[253]	{126}	5,389	(1,078)	[259]	{129}	5,535	(1,107)	[266]	{133}

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.