

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

Date: 1/13/21

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 1/13/21 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.

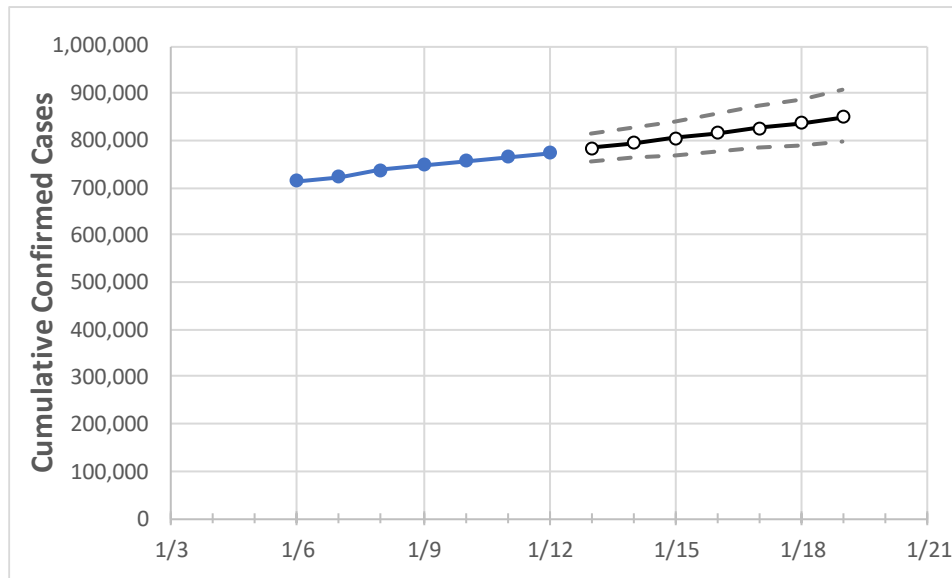
IEM's Modeling Lead

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:						
	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19
Georgia	748,852	757,045	764,499	773,692	783,772	793,983	804,490	815,205	826,318	837,404	848,620

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:						
	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19
Bartow	9,094	9,177	9,266	9,389	9,524	9,660	9,801	9,942	10,086	10,231	10,383
Carroll	8,211	8,273	8,339	8,389	8,459	8,530	8,601	8,672	8,746	8,817	8,890
Cherokee	19,212	19,484	19,709	19,999	20,351	20,720	21,087	21,473	21,862	22,265	22,667
Clarke	11,122	11,215	11,284	11,397	11,523	11,652	11,790	11,928	12,067	12,216	12,371
Clayton	15,968	16,113	16,248	16,434	16,630	16,834	17,040	17,249	17,470	17,689	17,917
Cobb	50,643	51,194	51,775	52,524	53,309	54,135	54,978	55,835	56,713	57,625	58,519
DeKalb	42,168	42,619	43,067	43,594	44,109	44,637	45,184	45,731	46,302	46,864	47,449
Dougherty	5,445	5,486	5,519	5,582	5,672	5,767	5,865	5,966	6,075	6,189	6,308
Douglas	9,429	9,520	9,631	9,732	9,865	10,001	10,141	10,279	10,426	10,578	10,731
Fulton	63,484	64,300	64,974	65,719	66,526	67,342	68,174	69,033	69,912	70,790	71,713
Gwinnett	65,067	65,881	66,849	68,006	69,069	70,189	71,337	72,509	73,740	74,973	76,274
Hall	20,191	20,359	20,538	20,793	21,015	21,237	21,466	21,695	21,929	22,165	22,400
Henry	15,197	15,378	15,538	15,776	15,993	16,215	16,447	16,676	16,904	17,136	17,374
Lee	1,804	1,825	1,864	1,903	1,944	1,986	2,028	2,073	2,120	2,168	2,219

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:											
	1/9	1/10	1/11	1/12	1/14			1/16			1/18					
Bartow	9,094	9,177	9,266	9,389	9,660	(1,932)	[464]	{232}	9,942	(1,988)	[477]	{239}	10,231	(2,046)	[491]	{246}
Carroll	8,211	8,273	8,339	8,389	8,530	(1,706)	[409]	{205}	8,672	(1,734)	[416]	{208}	8,817	(1,763)	[423]	{212}
Cherokee	19,212	19,484	19,709	19,999	20,720	(4,144)	[995]	{497}	21,473	(4,295)	[1,031]	{515}	22,265	(4,453)	[1,069]	{534}
Clarke	11,122	11,215	11,284	11,397	11,652	(2,330)	[559]	{280}	11,928	(2,386)	[573]	{286}	12,216	(2,443)	[586]	{293}
Clayton	15,968	16,113	16,248	16,434	16,834	(3,367)	[808]	{404}	17,249	(3,450)	[828]	{414}	17,689	(3,538)	[849]	{425}
Cobb	50,643	51,194	51,775	52,524	54,135	(10,827)	[2,598]	{1,299}	55,835	(11,167)	[2,680]	{1,340}	57,625	(11,525)	[2,766]	{1,383}
DeKalb	42,168	42,619	43,067	43,594	44,637	(8,927)	[2,143]	{1,071}	45,731	(9,146)	[2,195]	{1,098}	46,864	(9,373)	[2,249]	{1,125}
Dougherty	5,445	5,486	5,519	5,582	5,767	(1,153)	[277]	{138}	5,966	(1,193)	[286]	{143}	6,189	(1,238)	[297]	{149}
Douglas	9,429	9,520	9,631	9,732	10,001	(2,000)	[480]	{240}	10,279	(2,056)	[493]	{247}	10,578	(2,116)	[508]	{254}
Fulton	63,484	64,300	64,974	65,719	67,342	(13,468)	[3,232]	{1,616}	69,033	(13,807)	[3,314]	{1,657}	70,790	(14,158)	[3,398]	{1,699}
Gwinnett	65,067	65,881	66,849	68,006	70,189	(14,038)	[3,369]	{1,685}	72,509	(14,502)	[3,480]	{1,740}	74,973	(14,995)	[3,599]	{1,799}
Hall	20,191	20,359	20,538	20,793	21,237	(4,247)	[1,019]	{510}	21,695	(4,339)	[1,041]	{521}	22,165	(4,433)	[1,064]	{532}
Henry	15,197	15,378	15,538	15,776	16,215	(3,243)	[778]	{389}	16,676	(3,335)	[800]	{400}	17,136	(3,427)	[823]	{411}
Lee	1,804	1,825	1,864	1,903	1,986	(397)	[95]	{48}	2,073	(415)	[99]	{50}	2,168	(434)	[104]	{52}

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.