

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

Date: 2/24/21

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 2/24/21 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.

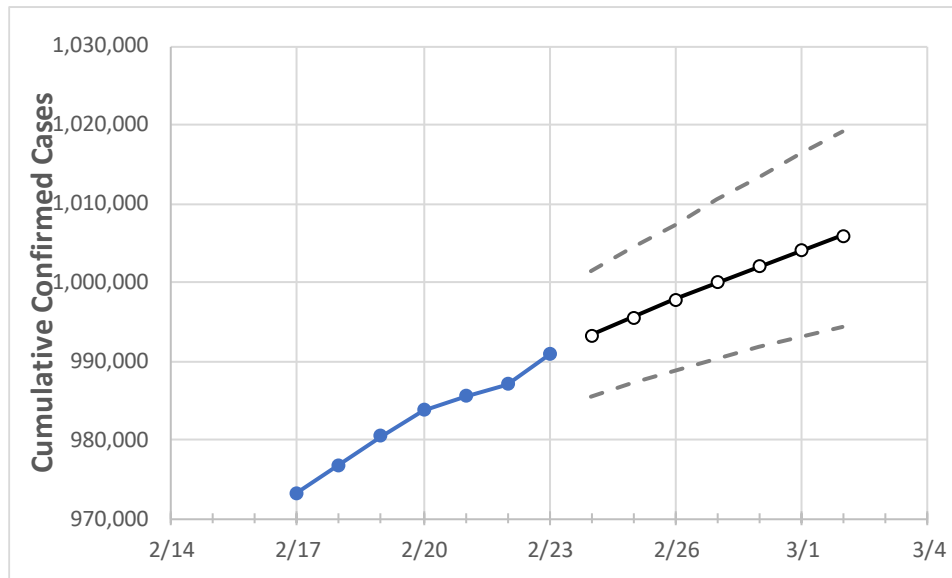
IEM's Modeling Lead

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:						
	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2
Georgia	983,747	985,505	987,041	990,821	993,221	995,515	997,752	999,897	1,002,004	1,004,000	1,005,937

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:						
	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2
Bartow	12,546	12,577	12,611	12,701	12,752	12,802	12,853	12,903	12,951	13,000	13,048
Carroll	10,332	10,358	10,383	10,418	10,439	10,459	10,478	10,496	10,514	10,532	10,549
Cherokee	26,446	26,494	26,592	26,797	26,893	26,985	27,075	27,164	27,254	27,343	27,428
Clarke	13,891	13,905	13,914	13,945	13,967	13,988	14,008	14,027	14,045	14,062	14,079
Clayton	22,558	22,605	22,644	22,753	22,816	22,879	22,936	22,993	23,046	23,100	23,151
Cobb	67,977	68,087	68,282	68,506	68,672	68,837	68,992	69,141	69,293	69,438	69,577
DeKalb	55,504	55,659	55,772	56,014	56,164	56,309	56,451	56,588	56,722	56,854	56,985
Dougherty	6,970	6,978	6,983	6,995	7,003	7,010	7,016	7,023	7,029	7,035	7,041
Douglas	13,084	13,113	13,149	13,210	13,250	13,290	13,327	13,363	13,399	13,433	13,467
Fulton	83,346	83,547	83,698	83,962	84,158	84,348	84,536	84,715	84,886	85,058	85,225
Gwinnett	90,142	90,299	90,437	90,706	90,895	91,080	91,257	91,425	91,588	91,746	91,895
Hall	25,129	25,153	25,180	25,239	25,270	25,300	25,329	25,358	25,385	25,412	25,438
Henry	20,918	20,952	20,993	21,080	21,134	21,187	21,237	21,288	21,334	21,380	21,425
Lee	2,537	2,538	2,539	2,545	2,547	2,550	2,552	2,553	2,555	2,557	2,558

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:											
	2/20	2/21	2/22	2/23	2/25				2/27				3/1			
Bartow	12,546	12,577	12,611	12,701	12,802	(2,560)	[614]	{307}	12,903	(2,581)	[619]	{310}	13,000	(2,600)	[624]	{312}
Carroll	10,332	10,358	10,383	10,418	10,459	(2,092)	[502]	{251}	10,496	(2,099)	[504]	{252}	10,532	(2,106)	[506]	{253}
Cherokee	26,446	26,494	26,592	26,797	26,985	(5,397)	[1,295]	{648}	27,164	(5,433)	[1,304]	{652}	27,343	(5,469)	[1,312]	{656}
Clarke	13,891	13,905	13,914	13,945	13,988	(2,798)	[671]	{336}	14,027	(2,805)	[673]	{337}	14,062	(2,812)	[675]	{337}
Clayton	22,558	22,605	22,644	22,753	22,879	(4,576)	[1,098]	{549}	22,993	(4,599)	[1,104]	{552}	23,100	(4,620)	[1,109]	{554}
Cobb	67,977	68,087	68,282	68,506	68,837	(13,767)	[3,304]	{1,652}	69,141	(13,828)	[3,319]	{1,659}	69,438	(13,888)	[3,333]	{1,667}
DeKalb	55,504	55,659	55,772	56,014	56,309	(11,262)	[2,703]	{1,351}	56,588	(11,318)	[2,716]	{1,358}	56,854	(11,371)	[2,729]	{1,364}
Dougherty	6,970	6,978	6,983	6,995	7,010	(1,402)	[336]	{168}	7,023	(1,405)	[337]	{169}	7,035	(1,407)	[338]	{169}
Douglas	13,084	13,113	13,149	13,210	13,290	(2,658)	[638]	{319}	13,363	(2,673)	[641]	{321}	13,433	(2,687)	[645]	{322}
Fulton	83,346	83,547	83,698	83,962	84,348	(16,870)	[4,049]	{2,024}	84,715	(16,943)	[4,066]	{2,033}	85,058	(17,012)	[4,083]	{2,041}
Gwinnett	90,142	90,299	90,437	90,706	91,080	(18,216)	[4,372]	{2,186}	91,425	(18,285)	[4,388]	{2,194}	91,746	(18,349)	[4,404]	{2,202}
Hall	25,129	25,153	25,180	25,239	25,300	(5,060)	[1,214]	{607}	25,358	(5,072)	[1,217]	{609}	25,412	(5,082)	[1,220]	{610}
Henry	20,918	20,952	20,993	21,080	21,187	(4,237)	[1,017]	{508}	21,288	(4,258)	[1,022]	{511}	21,380	(4,276)	[1,026]	{513}
Lee	2,537	2,538	2,539	2,545	2,550	(510)	[122]	{61}	2,553	(511)	[123]	{61}	2,557	(511)	[123]	{61}

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.