

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

Date: 2/16/22

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 2/16/22 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.

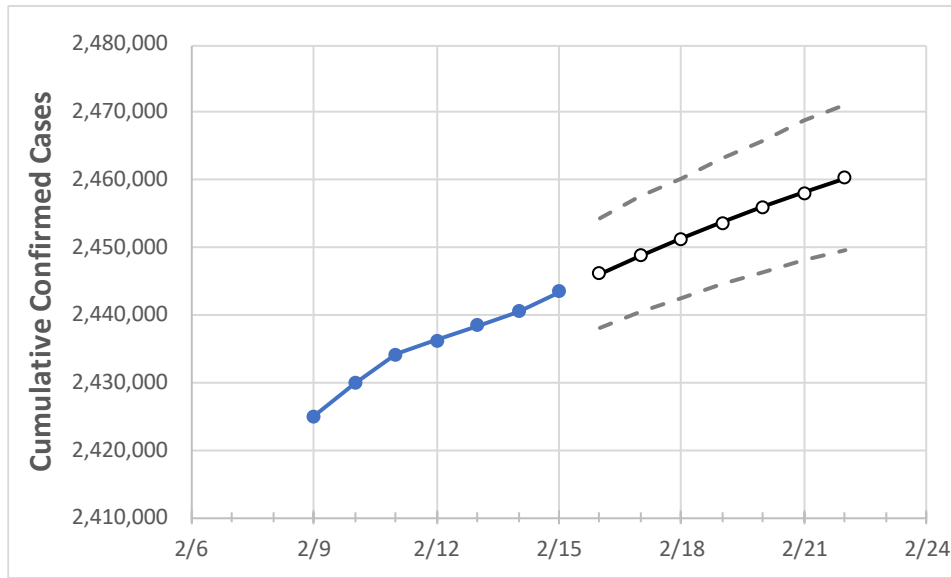
IEM's Modeling Lead

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Georgia	2,436,268	2,438,406	2,440,543	2,443,410	2,446,157	2,448,818	2,451,309	2,453,704	2,456,013	2,458,102	2,460,262	

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Bartow	28,150	28,174	28,198	28,226	28,249	28,269	28,289	28,308	28,326	28,344	28,358	
Carroll	23,357	23,373	23,388	23,402	23,424	23,443	23,462	23,481	23,498	23,515	23,531	
Cherokee	62,118	62,173	62,229	62,264	62,324	62,379	62,434	62,484	62,531	62,578	62,620	
Clarke	29,252	29,268	29,284	29,308	29,330	29,351	29,371	29,388	29,406	29,423	29,439	
Clayton	62,508	62,536	62,565	62,606	62,647	62,684	62,722	62,756	62,788	62,820	62,848	
Cobb	167,333	167,483	167,634	167,864	168,052	168,250	168,414	168,592	168,749	168,904	169,049	
DeKalb	142,226	142,331	142,436	142,666	142,831	142,984	143,131	143,274	143,412	143,536	143,665	
Dougherty	19,135	19,151	19,166	19,192	19,231	19,267	19,306	19,340	19,372	19,405	19,436	
Douglas	34,292	34,314	34,337	34,358	34,390	34,420	34,448	34,476	34,501	34,527	34,551	
Fulton	209,713	209,912	210,111	210,321	210,554	210,767	210,978	211,186	211,373	211,553	211,720	
Gwinnett	202,985	203,125	203,265	203,459	203,665	203,860	204,042	204,212	204,376	204,537	204,674	
Hall	52,500	52,542	52,583	52,625	52,676	52,729	52,773	52,817	52,861	52,901	52,941	
Henry	56,574	56,607	56,639	56,684	56,725	56,763	56,798	56,832	56,866	56,897	56,925	
Lee	7,093	7,099	7,106	7,118	7,134	7,149	7,163	7,176	7,189	7,202	7,213	

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:											
	2/12	2/13	2/14	2/15	2/17			2/19			2/21					
Bartow	28,150	28,174	28,198	28,226	28,269	(5,654)	[1,357]	{678}	28,308	(5,662)	[1,359]	{679}	28,344	(5,669)	[1,361]	{680}
Carroll	23,357	23,373	23,388	23,402	23,443	(4,689)	[1,125]	{563}	23,481	(4,696)	[1,127]	{564}	23,515	(4,703)	[1,129]	{564}
Cherokee	62,118	62,173	62,229	62,264	62,379	(12,476)	[2,994]	{1,497}	62,484	(12,497)	[2,999]	{1,500}	62,578	(12,516)	[3,004]	{1,502}
Clarke	29,252	29,268	29,284	29,308	29,351	(5,870)	[1,409]	{704}	29,388	(5,878)	[1,411]	{705}	29,423	(5,885)	[1,412]	{706}
Clayton	62,508	62,536	62,565	62,606	62,684	(12,537)	[3,009]	{1,504}	62,756	(12,551)	[3,012]	{1,506}	62,820	(12,564)	[3,015]	{1,508}
Cobb	167,333	167,483	167,634	167,864	168,250	(33,650)	[8,076]	{4,038}	168,592	(33,718)	[8,092]	{4,046}	168,904	(33,781)	[8,107]	{4,054}
DeKalb	142,226	142,331	142,436	142,666	142,984	(28,597)	[6,863]	{3,432}	143,274	(28,655)	[6,877]	{3,439}	143,536	(28,707)	[6,890]	{3,445}
Dougherty	19,135	19,151	19,166	19,192	19,267	(3,853)	[925]	{462}	19,340	(3,868)	[928]	{464}	19,405	(3,881)	[931]	{466}
Douglas	34,292	34,314	34,337	34,358	34,420	(6,884)	[1,652]	{826}	34,476	(6,895)	[1,655]	{827}	34,527	(6,905)	[1,657]	{829}
Fulton	209,713	209,912	210,111	210,321	210,767	(42,153)	[10,117]	{5,058}	211,186	(42,237)	[10,137]	{5,068}	211,553	(42,311)	[10,155]	{5,077}
Gwinnett	202,985	203,125	203,265	203,459	203,860	(40,772)	[9,785]	{4,893}	204,212	(40,842)	[9,802]	{4,901}	204,537	(40,907)	[9,818]	{4,909}
Hall	52,500	52,542	52,583	52,625	52,729	(10,546)	[2,531]	{1,266}	52,817	(10,563)	[2,535]	{1,268}	52,901	(10,580)	[2,539]	{1,270}
Henry	56,574	56,607	56,639	56,684	56,763	(11,353)	[2,725]	{1,362}	56,832	(11,366)	[2,728]	{1,364}	56,897	(11,379)	[2,731]	{1,366}
Lee	7,093	7,099	7,106	7,118	7,149	(1,430)	[343]	{172}	7,176	(1,435)	[344]	{172}	7,202	(1,440)	[346]	{173}

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.