

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

Date: 4/6/21

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 4/6/21 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.

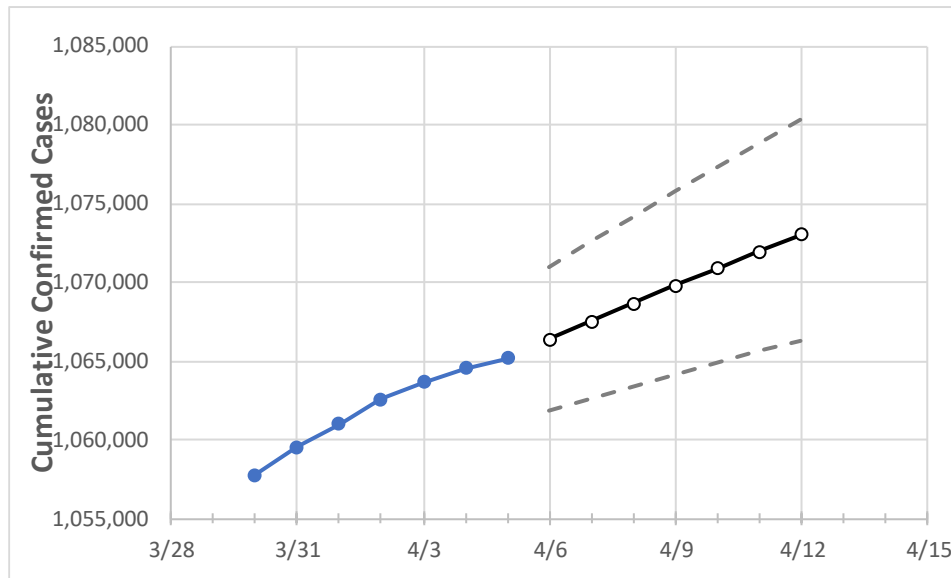
IEM's Modeling Lead

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:						
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12
Georgia	1,062,555	1,063,680	1,064,554	1,065,197	1,066,383	1,067,539	1,068,666	1,069,784	1,070,890	1,071,953	1,072,994

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:						
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12
Bartow	14,002	14,021	14,038	14,054	14,075	14,097	14,118	14,139	14,159	14,179	14,198
Carroll	10,987	10,997	11,003	11,007	11,022	11,038	11,053	11,069	11,085	11,101	11,116
Cherokee	29,644	29,687	29,715	29,755	29,811	29,865	29,919	29,974	30,027	30,081	30,133
Clarke	14,621	14,637	14,651	14,657	14,667	14,678	14,688	14,698	14,708	14,718	14,728
Clayton	24,834	24,884	24,921	24,945	24,983	25,020	25,056	25,092	25,128	25,163	25,197
Cobb	74,344	74,471	74,575	74,644	74,772	74,900	75,025	75,153	75,276	75,401	75,524
DeKalb	61,541	61,635	61,707	61,819	61,931	62,039	62,148	62,254	62,358	62,461	62,565
Dougherty	7,256	7,267	7,269	7,269	7,277	7,284	7,292	7,300	7,307	7,316	7,324
Douglas	14,322	14,349	14,361	14,373	14,395	14,417	14,439	14,460	14,482	14,503	14,524
Fulton	92,081	92,237	92,356	92,437	92,573	92,705	92,837	92,963	93,090	93,215	93,335
Gwinnett	97,109	97,212	97,296	97,354	97,459	97,562	97,664	97,762	97,860	97,955	98,049
Hall	26,388	26,407	26,429	26,444	26,466	26,488	26,509	26,531	26,552	26,572	26,593
Henry	23,756	23,804	23,833	23,853	23,884	23,913	23,942	23,970	23,997	24,024	24,050
Lee	2,667	2,669	2,670	2,670	2,671	2,673	2,674	2,675	2,676	2,678	2,679

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:											
	4/2	4/3	4/4	4/5	4/7				4/9				4/11			
Bartow	14,002	14,021	14,038	14,054	14,097	(2,819)	[677]	{338}	14,139	(2,828)	[679]	{339}	14,179	(2,836)	[681]	{340}
Carroll	10,987	10,997	11,003	11,007	11,038	(2,208)	[530]	{265}	11,069	(2,214)	[531]	{266}	11,101	(2,220)	[533]	{266}
Cherokee	29,644	29,687	29,715	29,755	29,865	(5,973)	[1,434]	{717}	29,974	(5,995)	[1,439]	{719}	30,081	(6,016)	[1,444]	{722}
Clarke	14,621	14,637	14,651	14,657	14,678	(2,936)	[705]	{352}	14,698	(2,940)	[706]	{353}	14,718	(2,944)	[706]	{353}
Clayton	24,834	24,884	24,921	24,945	25,020	(5,004)	[1,201]	{600}	25,092	(5,018)	[1,204]	{602}	25,163	(5,033)	[1,208]	{604}
Cobb	74,344	74,471	74,575	74,644	74,900	(14,980)	[3,595]	{1,798}	75,153	(15,031)	[3,607]	{1,804}	75,401	(15,080)	[3,619]	{1,810}
DeKalb	61,541	61,635	61,707	61,819	62,039	(12,408)	[2,978]	{1,489}	62,254	(12,451)	[2,988]	{1,494}	62,461	(12,492)	[2,998]	{1,499}
Dougherty	7,256	7,267	7,269	7,269	7,284	(1,457)	[350]	{175}	7,300	(1,460)	[350]	{175}	7,316	(1,463)	[351]	{176}
Douglas	14,322	14,349	14,361	14,373	14,417	(2,883)	[692]	{346}	14,460	(2,892)	[694]	{347}	14,503	(2,901)	[696]	{348}
Fulton	92,081	92,237	92,356	92,437	92,705	(18,541)	[4,450]	{2,225}	92,963	(18,593)	[4,462]	{2,231}	93,215	(18,643)	[4,474]	{2,237}
Gwinnett	97,109	97,212	97,296	97,354	97,562	(19,512)	[4,683]	{2,341}	97,762	(19,552)	[4,693]	{2,346}	97,955	(19,591)	[4,702]	{2,351}
Hall	26,388	26,407	26,429	26,444	26,488	(5,298)	[1,271]	{636}	26,531	(5,306)	[1,273]	{637}	26,572	(5,314)	[1,275]	{638}
Henry	23,756	23,804	23,833	23,853	23,913	(4,783)	[1,148]	{574}	23,970	(4,794)	[1,151]	{575}	24,024	(4,805)	[1,153]	{577}
Lee	2,667	2,669	2,670	2,670	2,673	(535)	[128]	{64}	2,675	(535)	[128]	{64}	2,678	(536)	[129]	{64}

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.