

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

Date: 9/24/21

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 9/24/21 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.

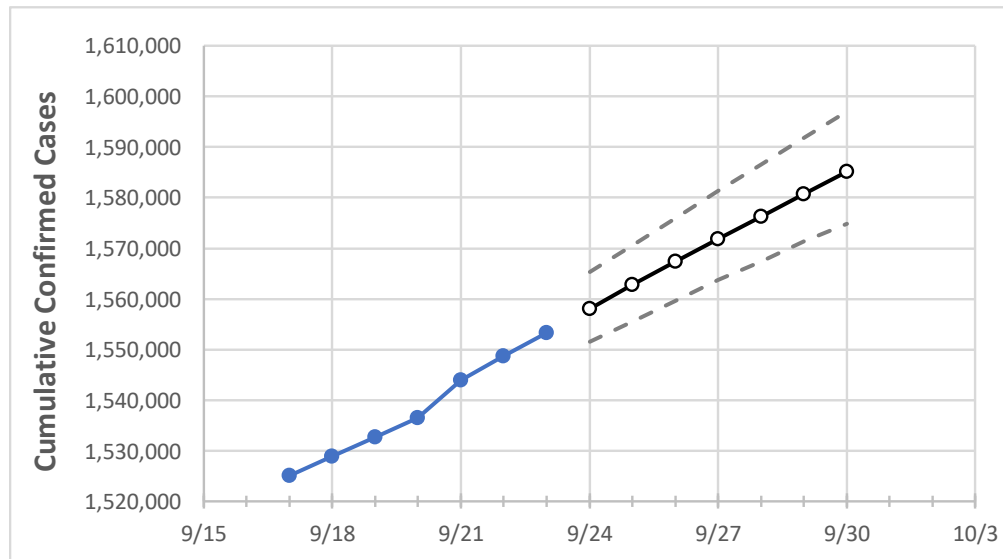
IEM's Modeling Lead

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Georgia	1,536,467	1,543,960	1,548,683	1,553,236	1,558,003	1,562,783	1,567,382	1,571,875	1,576,300	1,580,709	1,585,085

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Bartow	19,266	19,331	19,368	19,412	19,470	19,524	19,581	19,634	19,687	19,742	19,792
Carroll	15,694	15,723	15,768	15,806	15,849	15,892	15,933	15,973	16,013	16,053	16,092
Cherokee	41,291	41,391	41,505	41,592	41,705	41,815	41,918	42,029	42,130	42,232	42,334
Clarke	19,196	19,235	19,286	19,332	19,384	19,433	19,482	19,531	19,580	19,628	19,673
Clayton	36,290	36,919	37,031	37,135	37,286	37,438	37,592	37,738	37,898	38,061	38,232
Cobb	102,894	103,324	103,590	104,001	104,311	104,632	104,928	105,230	105,527	105,827	106,119
DeKalb	85,016	85,632	85,875	86,194	86,480	86,760	87,048	87,326	87,616	87,904	88,192
Dougherty	11,529	11,563	11,590	11,631	11,671	11,711	11,749	11,786	11,823	11,859	11,893
Douglas	21,007	21,057	21,117	21,186	21,249	21,310	21,370	21,428	21,485	21,543	21,597
Fulton	124,868	125,829	126,067	126,038	126,457	126,848	127,239	127,656	128,052	128,462	128,857
Gwinnett	123,170	124,389	124,756	125,042	125,459	125,876	126,292	126,693	127,126	127,559	127,982
Hall	35,366	35,478	35,616	35,737	35,874	36,013	36,147	36,282	36,421	36,552	36,686
Henry	35,776	35,940	36,025	36,118	36,219	36,321	36,417	36,516	36,611	36,706	36,798
Lee	4,419	4,427	4,444	4,457	4,468	4,478	4,488	4,497	4,506	4,515	4,524

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:											
	9/20	9/21	9/22	9/23	9/25				9/27				9/29			
Bartow	19,266	19,331	19,368	19,412	19,524	(3,905)	[937]	{469}	19,634	(3,927)	[942]	{471}	19,742	(3,948)	[948]	{474}
Carroll	15,694	15,723	15,768	15,806	15,892	(3,178)	[763]	{381}	15,973	(3,195)	[767]	{383}	16,053	(3,211)	[771]	{385}
Cherokee	41,291	41,391	41,505	41,592	41,815	(8,363)	[2,007]	{1,004}	42,029	(8,406)	[2,017]	{1,009}	42,232	(8,446)	[2,027]	{1,014}
Clarke	19,196	19,235	19,286	19,332	19,433	(3,887)	[933]	{466}	19,531	(3,906)	[938]	{469}	19,628	(3,926)	[942]	{471}
Clayton	36,290	36,919	37,031	37,135	37,438	(7,488)	[1,797]	{899}	37,738	(7,548)	[1,811]	{906}	38,061	(7,612)	[1,827]	{913}
Cobb	102,894	103,324	103,590	104,001	104,632	(20,926)	[5,022]	{2,511}	105,230	(21,046)	[5,051]	{2,526}	105,827	(21,165)	[5,080]	{2,540}
DeKalb	85,016	85,632	85,875	86,194	86,760	(17,352)	[4,164]	{2,082}	87,326	(17,465)	[4,192]	{2,096}	87,904	(17,581)	[4,219]	{2,110}
Dougherty	11,529	11,563	11,590	11,631	11,711	(2,342)	[562]	{281}	11,786	(2,357)	[566]	{283}	11,859	(2,372)	[569]	{285}
Douglas	21,007	21,057	21,117	21,186	21,310	(4,262)	[1,023]	{511}	21,428	(4,286)	[1,029]	{514}	21,543	(4,309)	[1,034]	{517}
Fulton	124,868	125,829	126,067	126,038	126,848	(25,370)	[6,089]	{3,044}	127,656	(25,531)	[6,127]	{3,064}	128,462	(25,692)	[6,166]	{3,083}
Gwinnett	123,170	124,389	124,756	125,042	125,876	(25,175)	[6,042]	{3,021}	126,693	(25,339)	[6,081]	{3,041}	127,559	(25,512)	[6,123]	{3,061}
Hall	35,366	35,478	35,616	35,737	36,013	(7,203)	[1,729]	{864}	36,282	(7,256)	[1,742]	{871}	36,552	(7,310)	[1,755]	{877}
Henry	35,776	35,940	36,025	36,118	36,321	(7,264)	[1,743]	{872}	36,516	(7,303)	[1,753]	{876}	36,706	(7,341)	[1,762]	{881}
Lee	4,419	4,427	4,444	4,457	4,478	(896)	[215]	{107}	4,497	(899)	[216]	{108}	4,515	(903)	[217]	{108}

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.