

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

Date: 5/24/21

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 5/24/21 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.

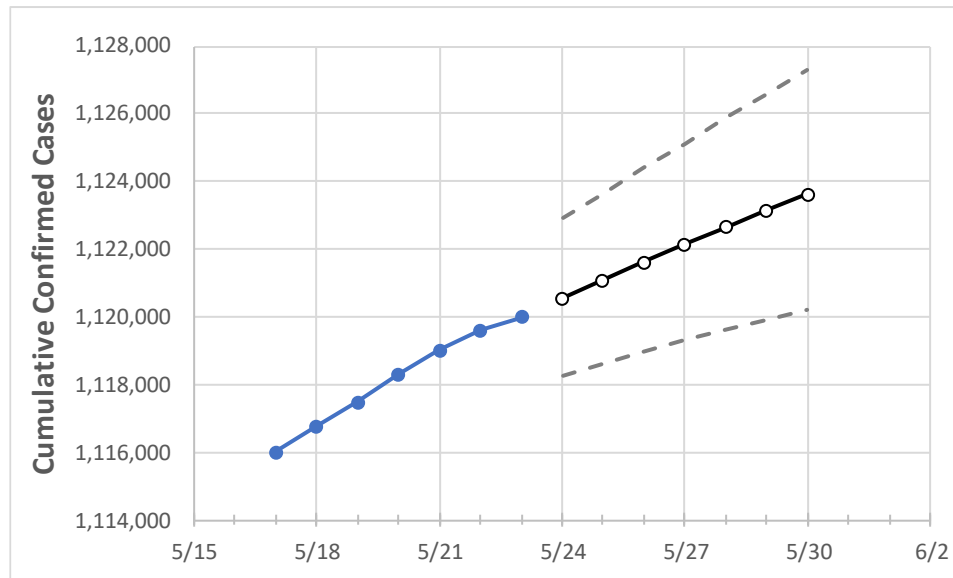
IEM's Modeling Lead

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:						
	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30
Georgia	1,118,308	1,119,012	1,119,614	1,119,979	1,120,543	1,121,094	1,121,620	1,122,150	1,122,658	1,123,136	1,123,615

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:						
	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30
Bartow	14,733	14,743	14,749	14,756	14,763	14,770	14,777	14,784	14,791	14,798	14,804
Carroll	11,424	11,433	11,441	11,441	11,447	11,452	11,458	11,463	11,469	11,474	11,478
Cherokee	31,214	31,232	31,251	31,259	31,275	31,290	31,304	31,319	31,333	31,346	31,359
Clarke	15,104	15,107	15,109	15,109	15,113	15,118	15,122	15,127	15,131	15,135	15,139
Clayton	26,957	26,975	26,994	27,012	27,032	27,052	27,071	27,091	27,108	27,127	27,143
Cobb	79,077	79,138	79,180	79,223	79,268	79,309	79,350	79,390	79,426	79,464	79,500
DeKalb	66,396	66,439	66,462	66,489	66,520	66,550	66,579	66,607	66,633	66,658	66,683
Dougherty	7,597	7,602	7,603	7,604	7,609	7,613	7,618	7,622	7,627	7,631	7,635
Douglas	15,356	15,369	15,389	15,400	15,412	15,425	15,437	15,448	15,459	15,471	15,482
Fulton	97,998	98,062	98,120	98,170	98,223	98,272	98,321	98,368	98,413	98,458	98,499
Gwinnett	102,106	102,152	102,205	102,237	102,280	102,322	102,361	102,403	102,442	102,480	102,517
Hall	27,407	27,416	27,424	27,430	27,440	27,451	27,460	27,470	27,479	27,488	27,498
Henry	25,492	25,505	25,523	25,537	25,554	25,571	25,586	25,602	25,617	25,631	25,645
Lee	2,749	2,748	2,749	2,745	2,747	2,749	2,751	2,752	2,754	2,756	2,758

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:											
	5/20	5/21	5/22	5/23	5/25				5/27				5/29			
Bartow	14,733	14,743	14,749	14,756	14,770	(2,954)	[709]	{354}	14,784	(2,957)	[710]	{355}	14,798	(2,960)	[710]	{355}
Carroll	11,424	11,433	11,441	11,441	11,452	(2,290)	[550]	{275}	11,463	(2,293)	[550]	{275}	11,474	(2,295)	[551]	{275}
Cherokee	31,214	31,232	31,251	31,259	31,290	(6,258)	[1,502]	{751}	31,319	(6,264)	[1,503]	{752}	31,346	(6,269)	[1,505]	{752}
Clarke	15,104	15,107	15,109	15,109	15,118	(3,024)	[726]	{363}	15,127	(3,025)	[726]	{363}	15,135	(3,027)	[726]	{363}
Clayton	26,957	26,975	26,994	27,012	27,052	(5,410)	[1,299]	{649}	27,091	(5,418)	[1,300]	{650}	27,127	(5,425)	[1,302]	{651}
Cobb	79,077	79,138	79,180	79,223	79,309	(15,862)	[3,807]	{1,903}	79,390	(15,878)	[3,811]	{1,905}	79,464	(15,893)	[3,814]	{1,907}
DeKalb	66,396	66,439	66,462	66,489	66,550	(13,310)	[3,194]	{1,597}	66,607	(13,321)	[3,197]	{1,599}	66,658	(13,332)	[3,200]	{1,600}
Dougherty	7,597	7,602	7,603	7,604	7,613	(1,523)	[365]	{183}	7,622	(1,524)	[366]	{183}	7,631	(1,526)	[366]	{183}
Douglas	15,356	15,369	15,389	15,400	15,425	(3,085)	[740]	{370}	15,448	(3,090)	[742]	{371}	15,471	(3,094)	[743]	{371}
Fulton	97,998	98,062	98,120	98,170	98,272	(19,654)	[4,717]	{2,359}	98,368	(19,674)	[4,722]	{2,361}	98,458	(19,692)	[4,726]	{2,363}
Gwinnett	102,106	102,152	102,205	102,237	102,322	(20,464)	[4,911]	{2,456}	102,403	(20,481)	[4,915]	{2,458}	102,480	(20,496)	[4,919]	{2,460}
Hall	27,407	27,416	27,424	27,430	27,451	(5,490)	[1,318]	{659}	27,470	(5,494)	[1,319]	{659}	27,488	(5,498)	[1,319]	{660}
Henry	25,492	25,505	25,523	25,537	25,571	(5,114)	[1,227]	{614}	25,602	(5,120)	[1,229]	{614}	25,631	(5,126)	[1,230]	{615}
Lee	2,749	2,748	2,749	2,745	2,749	(550)	[132]	{66}	2,752	(550)	[132]	{66}	2,756	(551)	[132]	{66}

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.