

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

Date: 5/21/21

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 5/21/21 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.

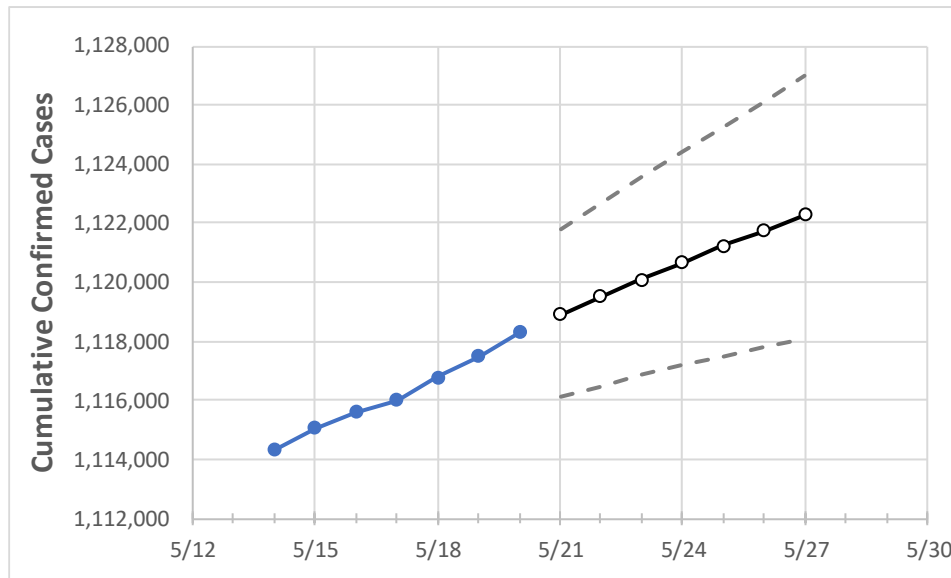
IEM's Modeling Lead

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:						
	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27
Georgia	1,116,008	1,116,775	1,117,475	1,118,308	1,118,919	1,119,509	1,120,091	1,120,660	1,121,230	1,121,760	1,122,280

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:						
	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27
Bartow	14,701	14,708	14,711	14,733	14,740	14,746	14,752	14,759	14,765	14,771	14,777
Carroll	11,409	11,412	11,417	11,424	11,429	11,435	11,440	11,445	11,450	11,454	11,459
Cherokee	31,150	31,170	31,192	31,214	31,231	31,248	31,264	31,280	31,295	31,310	31,324
Clarke	15,086	15,091	15,099	15,104	15,110	15,116	15,121	15,126	15,132	15,137	15,142
Clayton	26,898	26,919	26,941	26,957	26,982	27,006	27,029	27,051	27,073	27,094	27,115
Cobb	78,884	78,950	79,012	79,077	79,125	79,171	79,215	79,258	79,300	79,341	79,381
DeKalb	66,233	66,301	66,350	66,396	66,431	66,464	66,497	66,528	66,557	66,586	66,613
Dougherty	7,601	7,600	7,598	7,597	7,605	7,613	7,621	7,629	7,637	7,645	7,653
Douglas	15,316	15,327	15,339	15,356	15,368	15,381	15,393	15,404	15,416	15,427	15,438
Fulton	97,800	97,858	97,922	97,998	98,054	98,108	98,160	98,212	98,260	98,308	98,352
Gwinnett	101,892	101,951	102,035	102,106	102,152	102,198	102,241	102,282	102,323	102,363	102,401
Hall	27,359	27,369	27,384	27,407	27,421	27,434	27,448	27,460	27,473	27,485	27,496
Henry	25,428	25,445	25,470	25,492	25,511	25,529	25,548	25,566	25,583	25,600	25,616
Lee	2,749	2,750	2,748	2,749	2,751	2,754	2,756	2,758	2,761	2,763	2,765

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:											
	5/17	5/18	5/19	5/20	5/22				5/24				5/26			
Bartow	14,701	14,708	14,711	14,733	14,746	(2,949)	[708]	{354}	14,759	(2,952)	[708]	{354}	14,771	(2,954)	[709]	{355}
Carroll	11,409	11,412	11,417	11,424	11,435	(2,287)	[549]	{274}	11,445	(2,289)	[549]	{275}	11,454	(2,291)	[550]	{275}
Cherokee	31,150	31,170	31,192	31,214	31,248	(6,250)	[1,500]	{750}	31,280	(6,256)	[1,501]	{751}	31,310	(6,262)	[1,503]	{751}
Clarke	15,086	15,091	15,099	15,104	15,116	(3,023)	[726]	{363}	15,126	(3,025)	[726]	{363}	15,137	(3,027)	[727]	{363}
Clayton	26,898	26,919	26,941	26,957	27,006	(5,401)	[1,296]	{648}	27,051	(5,410)	[1,298]	{649}	27,094	(5,419)	[1,301]	{650}
Cobb	78,884	78,950	79,012	79,077	79,171	(15,834)	[3,800]	{1,900}	79,258	(15,852)	[3,804]	{1,902}	79,341	(15,868)	[3,808]	{1,904}
DeKalb	66,233	66,301	66,350	66,396	66,464	(13,293)	[3,190]	{1,595}	66,528	(13,306)	[3,193]	{1,597}	66,586	(13,317)	[3,196]	{1,598}
Dougherty	7,601	7,600	7,598	7,597	7,613	(1,523)	[365]	{183}	7,629	(1,526)	[366]	{183}	7,645	(1,529)	[367]	{183}
Douglas	15,316	15,327	15,339	15,356	15,381	(3,076)	[738]	{369}	15,404	(3,081)	[739]	{370}	15,427	(3,085)	[740]	{370}
Fulton	97,800	97,858	97,922	97,998	98,108	(19,622)	[4,709]	{2,355}	98,212	(19,642)	[4,714]	{2,357}	98,308	(19,662)	[4,719]	{2,359}
Gwinnett	101,892	101,951	102,035	102,106	102,198	(20,440)	[4,906]	{2,453}	102,282	(20,456)	[4,910]	{2,455}	102,363	(20,473)	[4,913]	{2,457}
Hall	27,359	27,369	27,384	27,407	27,434	(5,487)	[1,317]	{658}	27,460	(5,492)	[1,318]	{659}	27,485	(5,497)	[1,319]	{660}
Henry	25,428	25,445	25,470	25,492	25,529	(5,106)	[1,225]	{613}	25,566	(5,113)	[1,227]	{614}	25,600	(5,120)	[1,229]	{614}
Lee	2,749	2,750	2,748	2,749	2,754	(551)	[132]	{66}	2,758	(552)	[132]	{66}	2,763	(553)	[133]	{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.