

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

Date: 6/3/21

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 6/3/21 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.

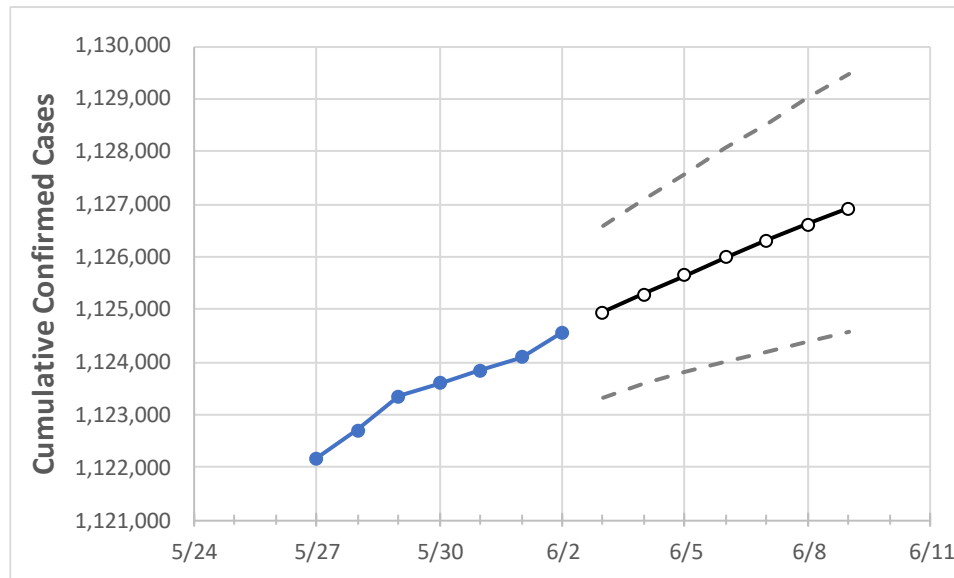
IEM's Modeling Lead

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:						
	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9
Georgia	1,123,604	1,123,841	1,124,080	1,124,571	1,124,944	1,125,294	1,125,650	1,125,984	1,126,313	1,126,619	1,126,915

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:						
	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9
Bartow	14,801	14,803	14,804	14,809	14,815	14,820	14,825	14,830	14,834	14,839	14,844
Carroll	11,476	11,478	11,481	11,483	11,486	11,490	11,493	11,496	11,499	11,502	11,504
Cherokee	31,345	31,354	31,363	31,378	31,387	31,396	31,405	31,414	31,421	31,429	31,436
Clarke	15,139	15,140	15,141	15,143	15,145	15,148	15,150	15,151	15,153	15,155	15,157
Clayton	27,142	27,151	27,162	27,174	27,186	27,197	27,209	27,220	27,230	27,240	27,250
Cobb	79,500	79,522	79,535	79,568	79,596	79,622	79,647	79,673	79,697	79,719	79,741
DeKalb	66,706	66,717	66,733	66,742	66,762	66,780	66,797	66,814	66,829	66,844	66,858
Dougherty	7,637	7,640	7,642	7,651	7,654	7,658	7,661	7,665	7,668	7,671	7,674
Douglas	15,459	15,464	15,469	15,478	15,485	15,492	15,499	15,505	15,511	15,518	15,523
Fulton	98,390	98,416	98,435	98,464	98,493	98,519	98,545	98,569	98,593	98,616	98,639
Gwinnett	102,545	102,567	102,594	102,631	102,664	102,697	102,728	102,759	102,789	102,817	102,844
Hall	27,499	27,504	27,510	27,519	27,525	27,532	27,538	27,543	27,549	27,554	27,559
Henry	25,664	25,671	25,677	25,690	25,702	25,713	25,724	25,735	25,745	25,755	25,764
Lee	2,751	2,752	2,753	2,754	2,755	2,756	2,757	2,758	2,759	2,760	2,761

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:											
	5/30	5/31	6/1	6/2	6/4				6/6				6/8			
Bartow	14,801	14,803	14,804	14,809	14,820	(2,964)	[711]	{356}	14,830	(2,966)	[712]	{356}	14,839	(2,968)	[712]	{356}
Carroll	11,476	11,478	11,481	11,483	11,490	(2,298)	[552]	{276}	11,496	(2,299)	[552]	{276}	11,502	(2,300)	[552]	{276}
Cherokee	31,345	31,354	31,363	31,378	31,396	(6,279)	[1,507]	{754}	31,414	(6,283)	[1,508]	{754}	31,429	(6,286)	[1,509]	{754}
Clarke	15,139	15,140	15,141	15,143	15,148	(3,030)	[727]	{364}	15,151	(3,030)	[727]	{364}	15,155	(3,031)	[727]	{364}
Clayton	27,142	27,151	27,162	27,174	27,197	(5,439)	[1,305]	{653}	27,220	(5,444)	[1,307]	{653}	27,240	(5,448)	[1,308]	{654}
Cobb	79,500	79,522	79,535	79,568	79,622	(15,924)	[3,822]	{1,911}	79,673	(15,935)	[3,824]	{1,912}	79,719	(15,944)	[3,827]	{1,913}
DeKalb	66,706	66,717	66,733	66,742	66,780	(13,356)	[3,205]	{1,603}	66,814	(13,363)	[3,207]	{1,604}	66,844	(13,369)	[3,209]	{1,604}
Dougherty	7,637	7,640	7,642	7,651	7,658	(1,532)	[368]	{184}	7,665	(1,533)	[368]	{184}	7,671	(1,534)	[368]	{184}
Douglas	15,459	15,464	15,469	15,478	15,492	(3,098)	[744]	{372}	15,505	(3,101)	[744]	{372}	15,518	(3,104)	[745]	{372}
Fulton	98,390	98,416	98,435	98,464	98,519	(19,704)	[4,729]	{2,364}	98,569	(19,714)	[4,731]	{2,366}	98,616	(19,723)	[4,734]	{2,367}
Gwinnett	102,545	102,567	102,594	102,631	102,697	(20,539)	[4,929]	{2,465}	102,759	(20,552)	[4,932]	{2,466}	102,817	(20,563)	[4,935]	{2,468}
Hall	27,499	27,504	27,510	27,519	27,532	(5,506)	[1,322]	{661}	27,543	(5,509)	[1,322]	{661}	27,554	(5,511)	[1,323]	{661}
Henry	25,664	25,671	25,677	25,690	25,713	(5,143)	[1,234]	{617}	25,735	(5,147)	[1,235]	{618}	25,755	(5,151)	[1,236]	{618}
Lee	2,751	2,752	2,753	2,754	2,756	(551)	[132]	{66}	2,758	(552)	[132]	{66}	2,760	(552)	[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.