

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/5/21**

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 11/5/21 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.

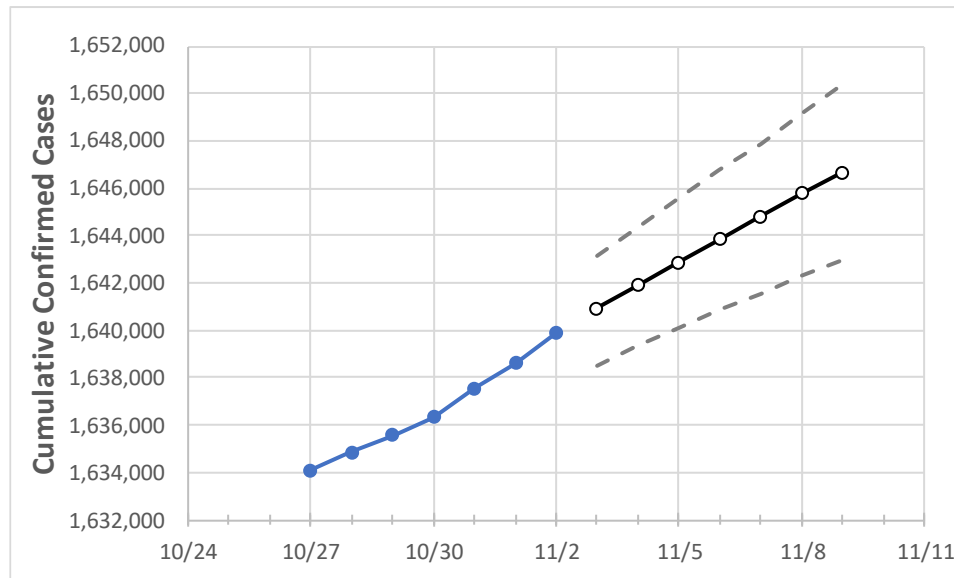
IEM's Modeling Lead

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:							
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9	
Georgia	1,636,325	1,637,571	1,638,606	1,639,896	1,640,918	1,641,905	1,642,882	1,643,848	1,644,810	1,645,773	1,646,674	

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:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Bartow	20,435	20,450	20,476	20,493	20,507	20,521	20,535	20,549	20,562	20,576	20,590
Carroll	16,379	16,389	16,403	16,408	16,416	16,423	16,431	16,438	16,445	16,453	16,460
Cherokee	43,867	43,885	43,915	43,941	43,991	44,037	44,096	44,146	44,205	44,254	44,309
Clarke	20,052	20,062	20,096	20,116	20,128	20,139	20,151	20,163	20,175	20,186	20,197
Clayton	39,341	39,379	39,412	39,443	39,474	39,503	39,533	39,562	39,590	39,619	39,648
Cobb	109,407	109,482	109,561	109,655	109,738	109,820	109,901	109,985	110,064	110,145	110,225
DeKalb	91,597	91,681	91,778	91,865	91,933	91,999	92,068	92,132	92,196	92,268	92,329
Dougherty	12,412	12,419	12,428	12,440	12,445	12,450	12,455	12,460	12,465	12,470	12,474
Douglas	22,285	22,295	22,314	22,335	22,346	22,357	22,366	22,377	22,386	22,396	22,405
Fulton	132,103	132,172	132,290	132,397	132,482	132,567	132,652	132,735	132,822	132,905	132,986
Gwinnett	133,346	133,448	133,530	133,669	133,756	133,842	133,925	134,011	134,096	134,176	134,253
Hall	38,055	38,086	38,119	38,147	38,175	38,202	38,229	38,254	38,280	38,306	38,330
Henry	38,171	38,192	38,222	38,244	38,273	38,300	38,327	38,354	38,380	38,407	38,434
Lee	4,698	4,699	4,709	4,713	4,716	4,719	4,722	4,725	4,728	4,731	4,734

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:											
	10/30	10/31	11/1	11/2	11/4				11/6				11/8			
Bartow	20,435	20,450	20,476	20,493	20,521	(4,104)	[985]	{493}	20,549	(4,110)	[986]	{493}	20,576	(4,115)	[988]	{494}
Carroll	16,379	16,389	16,403	16,408	16,423	(3,285)	[788]	{394}	16,438	(3,288)	[789]	{395}	16,453	(3,291)	[790]	{395}
Cherokee	43,867	43,885	43,915	43,941	44,037	(8,807)	[2,114]	{1,057}	44,146	(8,829)	[2,119]	{1,059}	44,254	(8,851)	[2,124]	{1,062}
Clarke	20,052	20,062	20,096	20,116	20,139	(4,028)	[967]	{483}	20,163	(4,033)	[968]	{484}	20,186	(4,037)	[969]	{484}
Clayton	39,341	39,379	39,412	39,443	39,503	(7,901)	[1,896]	{948}	39,562	(7,912)	[1,899]	{949}	39,619	(7,924)	[1,902]	{951}
Cobb	109,407	109,482	109,561	109,655	109,820	(21,964)	[5,271]	{2,636}	109,985	(21,997)	[5,279]	{2,640}	110,145	(22,029)	[5,287]	{2,643}
DeKalb	91,597	91,681	91,778	91,865	91,999	(18,400)	[4,416]	{2,208}	92,132	(18,426)	[4,422]	{2,211}	92,268	(18,454)	[4,429]	{2,214}
Dougherty	12,412	12,419	12,428	12,440	12,450	(2,490)	[598]	{299}	12,460	(2,492)	[598]	{299}	12,470	(2,494)	[599]	{299}
Douglas	22,285	22,295	22,314	22,335	22,357	(4,471)	[1,073]	{537}	22,377	(4,475)	[1,074]	{537}	22,396	(4,479)	[1,075]	{538}
Fulton	132,103	132,172	132,290	132,397	132,567	(26,513)	[6,363]	{3,182}	132,735	(26,547)	[6,371]	{3,186}	132,905	(26,581)	[6,379]	{3,190}
Gwinnett	133,346	133,448	133,530	133,669	133,842	(26,768)	[6,424]	{3,212}	134,011	(26,802)	[6,433]	{3,216}	134,176	(26,835)	[6,440]	{3,220}
Hall	38,055	38,086	38,119	38,147	38,202	(7,640)	[1,834]	{917}	38,254	(7,651)	[1,836]	{918}	38,306	(7,661)	[1,839]	{919}
Henry	38,171	38,192	38,222	38,244	38,300	(7,660)	[1,838]	{919}	38,354	(7,671)	[1,841]	{920}	38,407	(7,681)	[1,844]	{922}
Lee	4,698	4,699	4,709	4,713	4,719	(944)	[227]	{113}	4,725	(945)	[227]	{113}	4,731	(946)	[227]	{114}

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.