

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/8/21**

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 12/8/21 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.

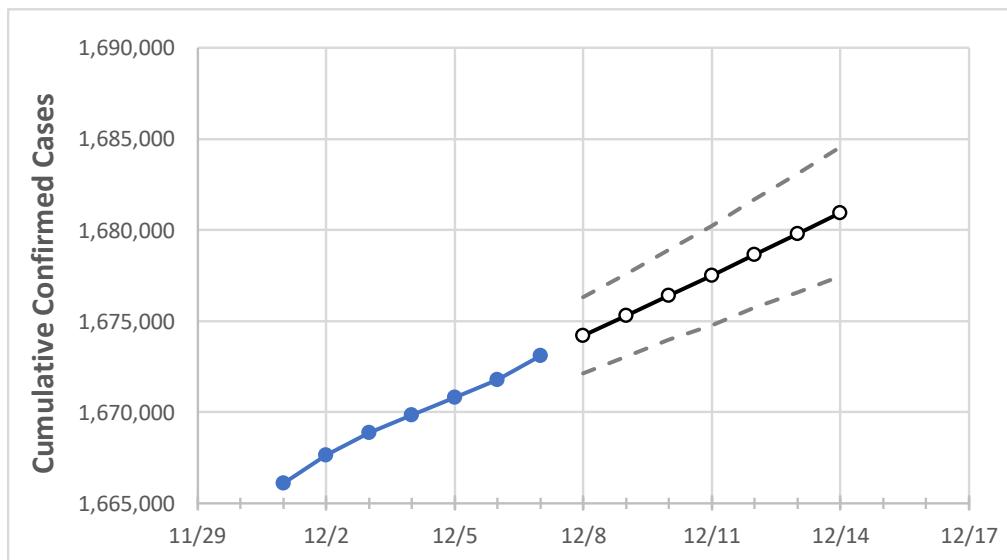
IEM's Modeling Lead

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:							
	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	
Georgia	1,669,846	1,670,816	1,671,787	1,673,082	1,674,184	1,675,289	1,676,384	1,677,519	1,678,644	1,679,789	1,680,950	

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:							
	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	
Bartow	20,946	20,955	20,965	20,981	20,993	21,004	21,016	21,027	21,039	21,050	21,062	
Carroll	16,692	16,704	16,715	16,721	16,733	16,746	16,758	16,771	16,784	16,797	16,811	
Cherokee	44,678	44,711	44,743	44,772	44,807	44,844	44,881	44,919	44,958	44,997	45,037	
Clarke	20,405	20,416	20,426	20,441	20,451	20,462	20,472	20,483	20,494	20,505	20,516	
Clayton	40,291	40,329	40,367	40,446	40,490	40,540	40,586	40,637	40,688	40,742	40,795	
Cobb	112,481	112,568	112,655	112,733	112,828	112,922	113,017	113,112	113,206	113,302	113,396	
DeKalb	93,781	93,838	93,894	93,977	94,041	94,108	94,172	94,237	94,303	94,367	94,433	
Dougherty	12,553	12,556	12,559	12,561	12,564	12,567	12,570	12,573	12,576	12,579	12,582	
Douglas	22,765	22,781	22,798	22,816	22,831	22,847	22,862	22,877	22,893	22,909	22,924	
Fulton	135,212	135,322	135,432	135,562	135,678	135,795	135,914	136,040	136,162	136,283	136,412	
Gwinnett	136,823	136,916	137,010	137,119	137,222	137,325	137,428	137,531	137,632	137,738	137,842	
Hall	39,223	39,256	39,289	39,334	39,373	39,414	39,454	39,496	39,537	39,580	39,622	
Henry	39,101	39,141	39,180	39,217	39,259	39,303	39,346	39,392	39,440	39,487	39,535	
Lee	4,796	4,797	4,798	4,803	4,805	4,807	4,809	4,811	4,812	4,814	4,816	

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:			
	12/4	12/5	12/6	12/7	12/9	12/11	12/13	
Bartow	20,946	20,955	20,965	20,981	21,004 (4,201) [1,008] {504}	21,027 (4,205) [1,009] {505}	21,050 (4,210) [1,010] {505}	
Carroll	16,692	16,704	16,715	16,721	16,746 (3,349) [804] {402}	16,771 (3,354) [805] {403}	16,797 (3,359) [806] {403}	
Cherokee	44,678	44,711	44,743	44,772	44,844 (8,969) [2,153] {1,076}	44,919 (8,984) [2,156] {1,078}	44,997 (8,999) [2,160] {1,080}	
Clarke	20,405	20,416	20,426	20,441	20,462 (4,092) [982] {491}	20,483 (4,097) [983] {492}	20,505 (4,101) [984] {492}	
Clayton	40,291	40,329	40,367	40,446	40,540 (8,108) [1,946] {973}	40,637 (8,127) [1,951] {975}	40,742 (8,148) [1,956] {978}	
Cobb	112,481	112,568	112,655	112,733	112,922 (22,584) [5,420] {2,710}	113,112 (22,622) [5,429] {2,715}	113,302 (22,660) [5,438] {2,719}	
DeKalb	93,781	93,838	93,894	93,977	94,108 (18,822) [4,517] {2,259}	94,237 (18,847) [4,523] {2,262}	94,367 (18,873) [4,530] {2,265}	
Dougherty	12,553	12,556	12,559	12,561	12,567 (2,513) [603] {302}	12,573 (2,515) [604] {302}	12,579 (2,516) [604] {302}	
Douglas	22,765	22,781	22,798	22,816	22,847 (4,569) [1,097] {548}	22,877 (4,575) [1,098] {549}	22,909 (4,582) [1,100] {550}	
Fulton	135,212	135,322	135,432	135,562	135,795 (27,159) [6,518] {3,259}	136,040 (27,208) [6,530] {3,265}	136,283 (27,257) [6,542] {3,271}	
Gwinnett	136,823	136,916	137,010	137,119	137,325 (27,465) [6,592] {3,296}	137,531 (27,506) [6,601] {3,301}	137,738 (27,548) [6,611] {3,306}	
Hall	39,223	39,256	39,289	39,334	39,414 (7,883) [1,892] {946}	39,496 (7,899) [1,896] {948}	39,580 (7,916) [1,900] {950}	
Henry	39,101	39,141	39,180	39,217	39,303 (7,861) [1,887] {943}	39,392 (7,878) [1,891] {945}	39,487 (7,897) [1,895] {948}	
Lee	4,796	4,797	4,798	4,803	4,807 (961) [231] {115}	4,811 (962) [231] {115}	4,814 (963) [231] {116}	

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.