

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/21/20**

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 12/21/20 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.

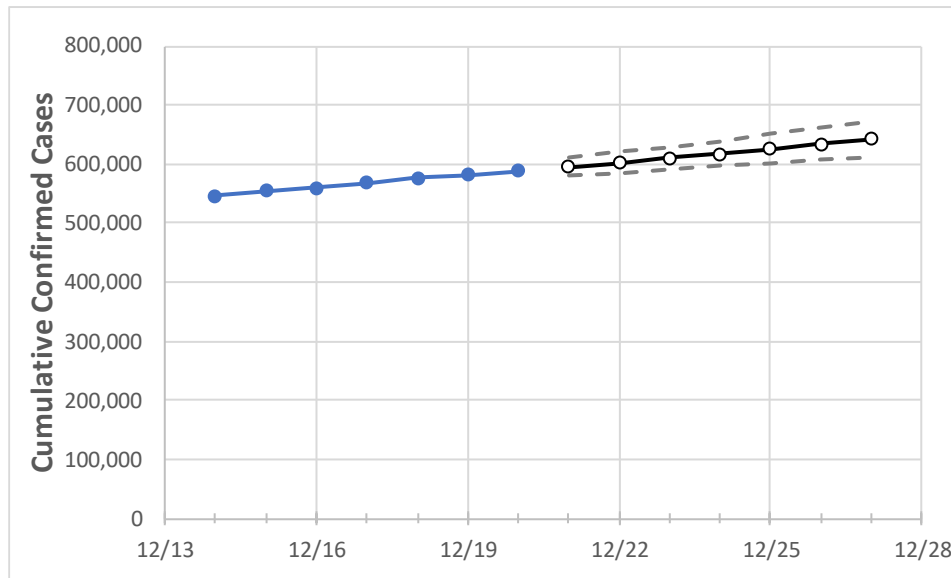
IEM's Modeling Lead

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:						
	12/17	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27
Georgia	568,396	576,537	582,300	587,918	595,153	602,569	610,170	617,958	625,936	634,106	642,471

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 20%, and are often within 10%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	12/17	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27
Bartow	6,599	6,703	6,780	6,830	6,933	7,038	7,146	7,257	7,371	7,487	7,606
Carroll	6,772	6,866	6,904	6,943	7,006	7,070	7,133	7,196	7,258	7,321	7,382
Cherokee	13,311	13,562	13,741	13,913	14,127	14,349	14,578	14,815	15,060	15,313	15,574
Clarke	9,131	9,224	9,286	9,337	9,411	9,487	9,563	9,641	9,720	9,800	9,881
Clayton	12,621	12,761	12,863	12,960	13,104	13,251	13,401	13,554	13,710	13,869	14,031
Cobb	36,985	37,583	38,123	38,585	39,175	39,786	40,419	41,075	41,753	42,456	43,182
DeKalb	32,997	33,361	33,717	34,026	34,388	34,757	35,132	35,514	35,901	36,296	36,697
Dougherty	4,290	4,331	4,341	4,375	4,411	4,448	4,486	4,525	4,564	4,604	4,644
Douglas	7,087	7,158	7,228	7,350	7,447	7,547	7,649	7,753	7,859	7,968	8,079
Fulton	49,072	49,716	50,078	50,599	51,188	51,790	52,406	53,035	53,678	54,336	55,007
Gwinnett	48,941	49,541	50,023	50,561	51,202	51,856	52,525	53,209	53,907	54,619	55,346
Hall	15,641	15,963	16,211	16,304	16,532	16,769	17,013	17,265	17,525	17,793	18,070
Henry	11,036	11,251	11,404	11,531	11,707	11,888	12,074	12,266	12,463	12,666	12,874
Lee	1,259	1,274	1,286	1,294	1,312	1,330	1,348	1,367	1,387	1,407	1,427

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:											
	12/17	12/18	12/19	12/20	12/22				12/24				12/26			
Bartow	6,599	6,703	6,780	6,830	7,038	(1,408)	[338]	{169}	7,257	(1,451)	[348]	{174}	7,487	(1,497)	[359]	{180}
Carroll	6,772	6,866	6,904	6,943	7,070	(1,414)	[339]	{170}	7,196	(1,439)	[345]	{173}	7,321	(1,464)	[351]	{176}
Cherokee	13,311	13,562	13,741	13,913	14,349	(2,870)	[689]	{344}	14,815	(2,963)	[711]	{356}	15,313	(3,063)	[735]	{368}
Clarke	9,131	9,224	9,286	9,337	9,487	(1,897)	[455]	{228}	9,641	(1,928)	[463]	{231}	9,800	(1,960)	[470]	{235}
Clayton	12,621	12,761	12,863	12,960	13,251	(2,650)	[636]	{318}	13,554	(2,711)	[651]	{325}	13,869	(2,774)	[666]	{333}
Cobb	36,985	37,583	38,123	38,585	39,786	(7,957)	[1,910]	{955}	41,075	(8,215)	[1,972]	{986}	42,456	(8,491)	[2,038]	{1,019}
DeKalb	32,997	33,361	33,717	34,026	34,757	(6,951)	[1,668]	{834}	35,514	(7,103)	[1,705]	{852}	36,296	(7,259)	[1,742]	{871}
Dougherty	4,290	4,331	4,341	4,375	4,448	(890)	[214]	{107}	4,525	(905)	[217]	{109}	4,604	(921)	[221]	{110}
Douglas	7,087	7,158	7,228	7,350	7,547	(1,509)	[362]	{181}	7,753	(1,551)	[372]	{186}	7,968	(1,594)	[382]	{191}
Fulton	49,072	49,716	50,078	50,599	51,790	(10,358)	[2,486]	{1,243}	53,035	(10,607)	[2,546]	{1,273}	54,336	(10,867)	[2,608]	{1,304}
Gwinnett	48,941	49,541	50,023	50,561	51,856	(10,371)	[2,489]	{1,245}	53,209	(10,642)	[2,554]	{1,277}	54,619	(10,924)	[2,622]	{1,311}
Hall	15,641	15,963	16,211	16,304	16,769	(3,354)	[805]	{402}	17,265	(3,453)	[829]	{414}	17,793	(3,559)	[854]	{427}
Henry	11,036	11,251	11,404	11,531	11,888	(2,378)	[571]	{285}	12,266	(2,453)	[589]	{294}	12,666	(2,533)	[608]	{304}
Lee	1,259	1,274	1,286	1,294	1,330	(266)	[64]	{32}	1,367	(273)	[66]	{33}	1,407	(281)	[68]	{34}

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.