

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

Date: 12/15/20

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 12/15/20 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.

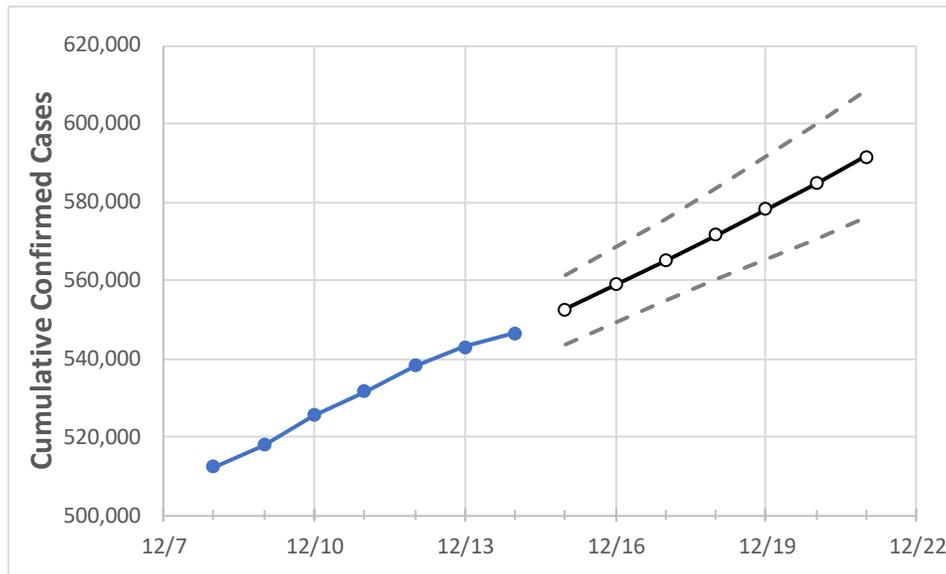
IEM's Modeling Lead

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:						
	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21
Georgia	531,593	538,040	542,838	546,558	552,618	558,796	565,098	571,524	578,076	584,756	591,566

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:						
	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21
Bartow	6,044	6,130	6,196	6,243	6,330	6,420	6,512	6,606	6,703	6,803	6,905
Carroll	6,425	6,481	6,536	6,572	6,640	6,709	6,778	6,848	6,919	6,991	7,063
Cherokee	12,284	12,490	12,600	12,680	12,831	12,983	13,138	13,295	13,454	13,615	13,778
Clarke	8,738	8,805	8,867	8,892	8,963	9,036	9,111	9,187	9,265	9,344	9,425
Clayton	11,808	11,936	12,106	12,209	12,365	12,528	12,699	12,877	13,062	13,256	13,459
Cobb	34,198	34,687	35,101	35,427	35,890	36,368	36,860	37,368	37,892	38,432	38,989
DeKalb	31,061	31,421	31,741	31,935	32,290	32,654	33,028	33,412	33,805	34,209	34,622
Dougherty	4,093	4,143	4,167	4,185	4,226	4,269	4,314	4,362	4,411	4,464	4,519
Douglas	6,602	6,676	6,754	6,809	6,899	6,991	7,086	7,184	7,284	7,386	7,491
Fulton	45,902	46,499	46,896	47,182	47,689	48,206	48,735	49,275	49,827	50,390	50,965
Gwinnett	45,489	46,030	46,579	46,962	47,564	48,184	48,823	49,481	50,159	50,856	51,575
Hall	14,589	14,716	14,833	14,949	15,158	15,378	15,607	15,847	16,099	16,361	16,636
Henry	10,158	10,311	10,459	10,560	10,714	10,872	11,036	11,204	11,377	11,554	11,738
Lee	1,155	1,165	1,167	1,174	1,190	1,207	1,224	1,242	1,261	1,280	1,300

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:											
	12/11	12/12	12/13	12/14	12/16				12/18				12/20			
Bartow	6,044	6,130	6,196	6,243	6,420	(1,284)	[308]	{154}	6,606	(1,321)	[317]	{159}	6,803	(1,361)	[327]	{163}
Carroll	6,425	6,481	6,536	6,572	6,709	(1,342)	[322]	{161}	6,848	(1,370)	[329]	{164}	6,991	(1,398)	[336]	{168}
Cherokee	12,284	12,490	12,600	12,680	12,983	(2,597)	[623]	{312}	13,295	(2,659)	[638]	{319}	13,615	(2,723)	[654]	{327}
Clarke	8,738	8,805	8,867	8,892	9,036	(1,807)	[434]	{217}	9,187	(1,837)	[441]	{220}	9,344	(1,869)	[449]	{224}
Clayton	11,808	11,936	12,106	12,209	12,528	(2,506)	[601]	{301}	12,877	(2,575)	[618]	{309}	13,256	(2,651)	[636]	{318}
Cobb	34,198	34,687	35,101	35,427	36,368	(7,274)	[1,746]	{873}	37,368	(7,474)	[1,794]	{897}	38,432	(7,686)	[1,845]	{922}
DeKalb	31,061	31,421	31,741	31,935	32,654	(6,531)	[1,567]	{784}	33,412	(6,682)	[1,604]	{802}	34,209	(6,842)	[1,642]	{821}
Dougherty	4,093	4,143	4,167	4,185	4,269	(854)	[205]	{102}	4,362	(872)	[209]	{105}	4,464	(893)	[214]	{107}
Douglas	6,602	6,676	6,754	6,809	6,991	(1,398)	[336]	{168}	7,184	(1,437)	[345]	{172}	7,386	(1,477)	[355]	{177}
Fulton	45,902	46,499	46,896	47,182	48,206	(9,641)	[2,314]	{1,157}	49,275	(9,855)	[2,365]	{1,183}	50,390	(10,078)	[2,419]	{1,209}
Gwinnett	45,489	46,030	46,579	46,962	48,184	(9,637)	[2,313]	{1,156}	49,481	(9,896)	[2,375]	{1,188}	50,856	(10,171)	[2,441]	{1,221}
Hall	14,589	14,716	14,833	14,949	15,378	(3,076)	[738]	{369}	15,847	(3,169)	[761]	{380}	16,361	(3,272)	[785]	{393}
Henry	10,158	10,311	10,459	10,560	10,872	(2,174)	[522]	{261}	11,204	(2,241)	[538]	{269}	11,554	(2,311)	[555]	{277}
Lee	1,155	1,165	1,167	1,174	1,207	(241)	[58]	{29}	1,242	(248)	[60]	{30}	1,280	(256)	[61]	{31}

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.