

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

Date: 10/21/20

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 10/21/20 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.

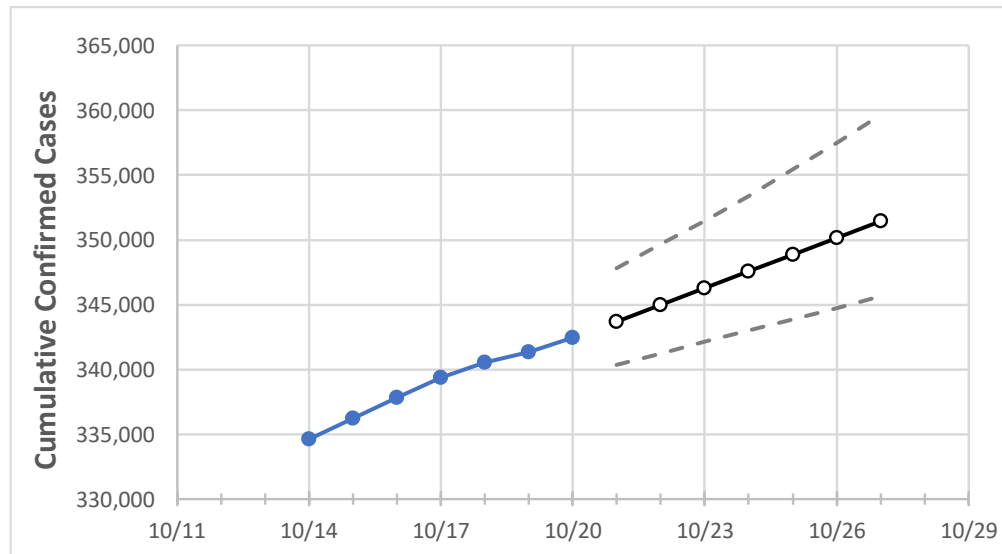
IEM's Modeling Lead

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:						
	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27
Georgia	339,384	340,558	341,310	342,438	343,703	344,974	346,253	347,538	348,831	350,130	351,438

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:						
	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27
Bartow	3,325	3,350	3,367	3,412	3,446	3,481	3,519	3,558	3,600	3,643	3,689
Carroll	3,147	3,170	3,184	3,194	3,218	3,242	3,268	3,293	3,320	3,347	3,375
Cherokee	6,715	6,746	6,756	6,778	6,808	6,838	6,868	6,898	6,928	6,958	6,988
Clarke	5,533	5,551	5,560	5,569	5,584	5,600	5,614	5,629	5,643	5,656	5,670
Clayton	7,799	7,842	7,859	7,897	7,942	7,988	8,033	8,078	8,123	8,167	8,212
Cobb	21,118	21,158	21,196	21,255	21,327	21,400	21,472	21,544	21,617	21,689	21,761
DeKalb	20,182	20,275	20,306	20,394	20,468	20,543	20,618	20,693	20,768	20,844	20,921
Dougherty	3,254	3,262	3,267	3,271	3,277	3,283	3,289	3,295	3,302	3,308	3,315
Douglas	3,933	3,945	3,948	3,960	3,972	3,985	3,996	4,008	4,019	4,030	4,041
Fulton	29,678	29,819	29,885	29,996	30,104	30,213	30,322	30,431	30,542	30,652	30,764
Gwinnett	29,558	29,689	29,748	29,866	29,992	30,120	30,250	30,382	30,516	30,652	30,790
Hall	10,309	10,331	10,345	10,415	10,465	10,515	10,567	10,620	10,674	10,730	10,786
Henry	5,853	5,905	5,936	5,957	5,994	6,031	6,068	6,107	6,146	6,185	6,225
Lee	737	738	739	739	740	741	742	744	745	746	747

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:											
	10/17	10/18	10/19	10/20	10/22				10/24				10/26			
Bartow	3,325	3,350	3,367	3,412	3,481	(696)	[167]	{84}	3,558	(712)	[171]	{85}	3,643	(729)	[175]	{87}
Carroll	3,147	3,170	3,184	3,194	3,242	(648)	[156]	{78}	3,293	(659)	[158]	{79}	3,347	(669)	[161]	{80}
Cherokee	6,715	6,746	6,756	6,778	6,838	(1,368)	[328]	{164}	6,898	(1,380)	[331]	{166}	6,958	(1,392)	[334]	{167}
Clarke	5,533	5,551	5,560	5,569	5,600	(1,120)	[269]	{134}	5,629	(1,126)	[270]	{135}	5,656	(1,131)	[272]	{136}
Clayton	7,799	7,842	7,859	7,897	7,988	(1,598)	[383]	{192}	8,078	(1,616)	[388]	{194}	8,167	(1,633)	[392]	{196}
Cobb	21,118	21,158	21,196	21,255	21,400	(4,280)	[1,027]	{514}	21,544	(4,309)	[1,034]	{517}	21,689	(4,338)	[1,041]	{521}
DeKalb	20,182	20,275	20,306	20,394	20,543	(4,109)	[986]	{493}	20,693	(4,139)	[993]	{497}	20,844	(4,169)	[1,001]	{500}
Dougherty	3,254	3,262	3,267	3,271	3,283	(657)	[158]	{79}	3,295	(659)	[158]	{79}	3,308	(662)	[159]	{79}
Douglas	3,933	3,945	3,948	3,960	3,985	(797)	[191]	{96}	4,008	(802)	[192]	{96}	4,030	(806)	[193]	{97}
Fulton	29,678	29,819	29,885	29,996	30,213	(6,043)	[1,450]	{725}	30,431	(6,086)	[1,461]	{730}	30,652	(6,130)	[1,471]	{736}
Gwinnett	29,558	29,689	29,748	29,866	30,120	(6,024)	[1,446]	{723}	30,382	(6,076)	[1,458]	{729}	30,652	(6,130)	[1,471]	{736}
Hall	10,309	10,331	10,345	10,415	10,515	(2,103)	[505]	{252}	10,620	(2,124)	[510]	{255}	10,730	(2,146)	[515]	{258}
Henry	5,853	5,905	5,936	5,957	6,031	(1,206)	[289]	{145}	6,107	(1,221)	[293]	{147}	6,185	(1,237)	[297]	{148}
Lee	737	738	739	739	741	(148)	[36]	{18}	744	(149)	[36]	{18}	746	(149)	[36]	{18}

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.