

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

Date: 12/8/20

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 12/8/20 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.

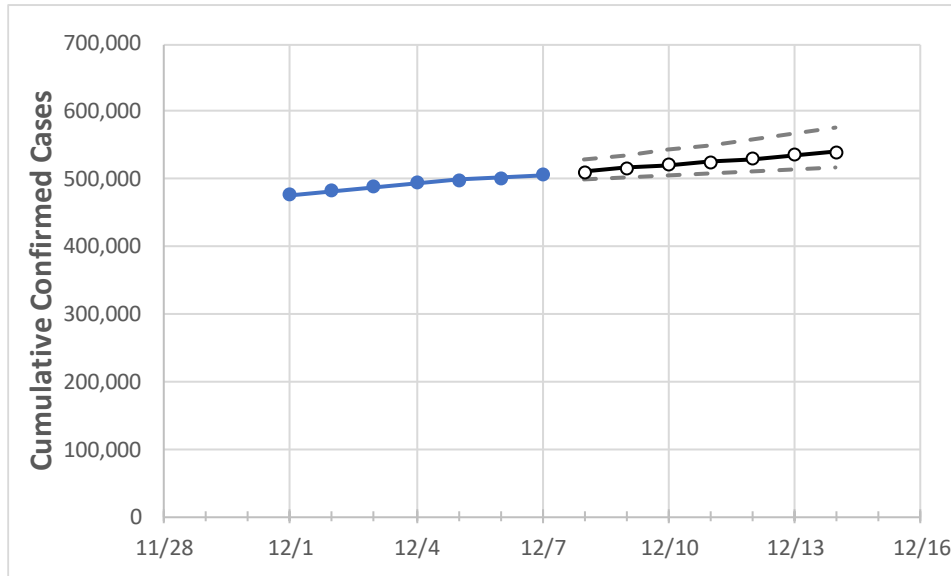
IEM's Modeling Lead

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:							
	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	
Georgia	494,354	499,371	501,405	506,690	511,139	515,718	520,430	525,279	530,268	535,400	540,680	

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:							
	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	
Bartow	5,489	5,553	5,594	5,660	5,720	5,782	5,846	5,911	5,978	6,047	6,118	
Carroll	5,914	5,973	5,980	6,063	6,110	6,157	6,205	6,253	6,300	6,348	6,397	
Cherokee	11,379	11,485	11,548	11,660	11,778	11,899	12,022	12,148	12,276	12,407	12,541	
Clarke	8,276	8,373	8,389	8,433	8,483	8,535	8,588	8,643	8,700	8,759	8,819	
Clayton	10,953	11,051	11,117	11,187	11,265	11,345	11,428	11,513	11,600	11,689	11,782	
Cobb	31,690	31,984	32,108	32,429	32,709	32,997	33,293	33,597	33,908	34,228	34,556	
DeKalb	28,943	29,265	29,482	29,705	29,951	30,204	30,464	30,731	31,006	31,288	31,578	
Dougherty	3,880	3,900	3,906	3,947	3,966	3,987	4,009	4,033	4,058	4,085	4,113	
Douglas	6,049	6,122	6,173	6,239	6,302	6,367	6,434	6,504	6,576	6,651	6,728	
Fulton	42,719	43,169	43,415	43,802	44,197	44,604	45,024	45,458	45,906	46,368	46,844	
Gwinnett	42,016	42,427	42,632	43,025	43,421	43,829	44,250	44,684	45,131	45,592	46,067	
Hall	13,384	13,559	13,596	13,761	13,890	14,025	14,166	14,313	14,467	14,628	14,796	
Henry	9,273	9,435	9,488	9,605	9,710	9,820	9,933	10,051	10,173	10,299	10,430	
Lee	1,038	1,048	1,050	1,066	1,075	1,086	1,096	1,107	1,119	1,132	1,145	

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	5,489	5,553	5,594	5,660	5,782	(1,156)	[278]	{139}	5,911	(1,182)	[284]	{142}	6,047	(1,209)	[290]	{145}
Carroll	5,914	5,973	5,980	6,063	6,157	(1,231)	[296]	{148}	6,253	(1,251)	[300]	{150}	6,348	(1,270)	[305]	{152}
Cherokee	11,379	11,485	11,548	11,660	11,899	(2,380)	[571]	{286}	12,148	(2,430)	[583]	{292}	12,407	(2,481)	[596]	{298}
Clarke	8,276	8,373	8,389	8,433	8,535	(1,707)	[410]	{205}	8,643	(1,729)	[415]	{207}	8,759	(1,752)	[420]	{210}
Clayton	10,953	11,051	11,117	11,187	11,345	(2,269)	[545]	{272}	11,513	(2,303)	[553]	{276}	11,689	(2,338)	[561]	{281}
Cobb	31,690	31,984	32,108	32,429	32,997	(6,599)	[1,584]	{792}	33,597	(6,719)	[1,613]	{806}	34,228	(6,846)	[1,643]	{821}
DeKalb	28,943	29,265	29,482	29,705	30,204	(6,041)	[1,450]	{725}	30,731	(6,146)	[1,475]	{738}	31,288	(6,258)	[1,502]	{751}
Dougherty	3,880	3,900	3,906	3,947	3,987	(797)	[191]	{96}	4,033	(807)	[194]	{97}	4,085	(817)	[196]	{98}
Douglas	6,049	6,122	6,173	6,239	6,367	(1,273)	[306]	{153}	6,504	(1,301)	[312]	{156}	6,651	(1,330)	[319]	{160}
Fulton	42,719	43,169	43,415	43,802	44,604	(8,921)	[2,141]	{1,070}	45,458	(9,092)	[2,182]	{1,091}	46,368	(9,274)	[2,226]	{1,113}
Gwinnett	42,016	42,427	42,632	43,025	43,829	(8,766)	[2,104]	{1,052}	44,684	(8,937)	[2,145]	{1,072}	45,592	(9,118)	[2,188]	{1,094}
Hall	13,384	13,559	13,596	13,761	14,025	(2,805)	[673]	{337}	14,313	(2,863)	[687]	{344}	14,628	(2,926)	[702]	{351}
Henry	9,273	9,435	9,488	9,605	9,820	(1,964)	[471]	{236}	10,051	(2,010)	[482]	{241}	10,299	(2,060)	[494]	{247}
Lee	1,038	1,048	1,050	1,066	1,086	(217)	[52]	{26}	1,107	(221)	[53]	{27}	1,132	(226)	[54]	{27}

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.