

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

Date: 3/3/21

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 3/3/21 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.

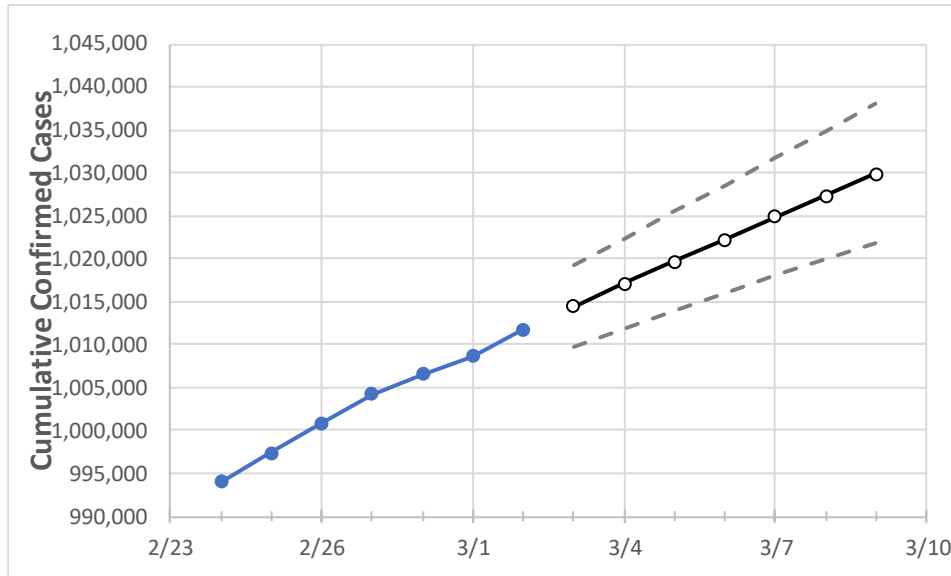
IEM's Modeling Lead

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:					
	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	
Georgia	1,004,187	1,006,521	1,008,660	1,011,807	1,014,491	1,017,098	1,019,695	1,022,279	1,024,891	1,027,372	1,029,892	

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:					
	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	
Bartow	12,969	13,003	13,032	13,059	13,111	13,162	13,213	13,263	13,312	13,359	13,406	
Carroll	10,534	10,545	10,556	10,576	10,596	10,616	10,634	10,652	10,670	10,688	10,704	
Cherokee	27,311	27,369	27,426	27,549	27,658	27,767	27,876	27,982	28,091	28,199	28,304	
Clarke	14,071	14,087	14,100	14,141	14,160	14,180	14,199	14,217	14,235	14,252	14,269	
Clayton	23,191	23,242	23,301	23,379	23,453	23,525	23,599	23,671	23,742	23,814	23,882	
Cobb	69,273	69,453	69,646	69,858	70,027	70,198	70,367	70,525	70,686	70,839	70,989	
DeKalb	56,814	56,950	57,093	57,326	57,495	57,664	57,833	57,998	58,165	58,328	58,493	
Dougherty	7,055	7,059	7,060	7,066	7,073	7,079	7,085	7,091	7,096	7,102	7,107	
Douglas	13,386	13,415	13,442	13,493	13,528	13,561	13,593	13,626	13,656	13,686	13,715	
Fulton	85,312	85,589	85,878	86,190	86,449	86,705	86,962	87,220	87,468	87,721	87,981	
Gwinnett	91,962	92,195	92,410	92,712	92,942	93,166	93,385	93,601	93,818	94,032	94,237	
Hall	25,464	25,511	25,544	25,580	25,618	25,656	25,694	25,732	25,769	25,806	25,842	
Henry	21,568	21,680	21,823	21,923	22,022	22,123	22,221	22,322	22,428	22,529	22,633	
Lee	2,579	2,578	2,583	2,588	2,592	2,595	2,599	2,602	2,606	2,609	2,612	

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:											
	2/27	2/28	3/1	3/2	3/4				3/6				3/8			
Bartow	12,969	13,003	13,032	13,059	13,162	(2,632)	[632]	{316}	13,263	(2,653)	[637]	{318}	13,359	(2,672)	[641]	{321}
Carroll	10,534	10,545	10,556	10,576	10,616	(2,123)	[510]	{255}	10,652	(2,130)	[511]	{256}	10,688	(2,138)	[513]	{257}
Cherokee	27,311	27,369	27,426	27,549	27,767	(5,553)	[1,333]	{666}	27,982	(5,596)	[1,343]	{672}	28,199	(5,640)	[1,354]	{677}
Clarke	14,071	14,087	14,100	14,141	14,180	(2,836)	[681]	{340}	14,217	(2,843)	[682]	{341}	14,252	(2,850)	[684]	{342}
Clayton	23,191	23,242	23,301	23,379	23,525	(4,705)	[1,129]	{565}	23,671	(4,734)	[1,136]	{568}	23,814	(4,763)	[1,143]	{572}
Cobb	69,273	69,453	69,646	69,858	70,198	(14,040)	[3,369]	{1,685}	70,525	(14,105)	[3,385]	{1,693}	70,839	(14,168)	[3,400]	{1,700}
DeKalb	56,814	56,950	57,093	57,326	57,664	(11,533)	[2,768]	{1,384}	57,998	(11,600)	[2,784]	{1,392}	58,328	(11,666)	[2,800]	{1,400}
Dougherty	7,055	7,059	7,060	7,066	7,079	(1,416)	[340]	{170}	7,091	(1,418)	[340]	{170}	7,102	(1,420)	[341]	{170}
Douglas	13,386	13,415	13,442	13,493	13,561	(2,712)	[651]	{325}	13,626	(2,725)	[654]	{327}	13,686	(2,737)	[657]	{328}
Fulton	85,312	85,589	85,878	86,190	86,705	(17,341)	[4,162]	{2,081}	87,220	(17,444)	[4,187]	{2,093}	87,721	(17,544)	[4,211]	{2,105}
Gwinnett	91,962	92,195	92,410	92,712	93,166	(18,633)	[4,472]	{2,236}	93,601	(18,720)	[4,493]	{2,246}	94,032	(18,806)	[4,514]	{2,257}
Hall	25,464	25,511	25,544	25,580	25,656	(5,131)	[1,231]	{616}	25,732	(5,146)	[1,235]	{618}	25,806	(5,161)	[1,239]	{619}
Henry	21,568	21,680	21,823	21,923	22,123	(4,425)	[1,062]	{531}	22,322	(4,464)	[1,071]	{536}	22,529	(4,506)	[1,081]	{541}
Lee	2,579	2,578	2,583	2,588	2,595	(519)	[125]	{62}	2,602	(520)	[125]	{62}	2,609	(522)	[125]	{63}

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.