

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

Date: 3/1/21

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 3/1/21 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.

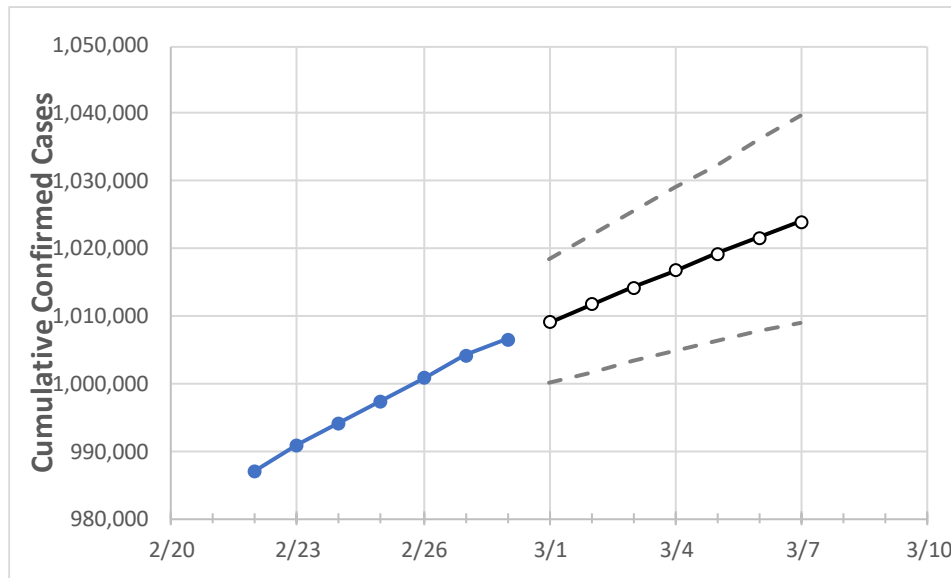
IEM's Modeling Lead

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:						
	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7
Georgia	997,388	1,000,822	1,004,187	1,006,521	1,009,100	1,011,633	1,014,185	1,016,702	1,019,184	1,021,646	1,024,026

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:						
	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7
Bartow	12,839	12,905	12,969	13,003	13,063	13,122	13,178	13,238	13,296	13,356	13,413
Carroll	10,479	10,509	10,534	10,545	10,567	10,589	10,611	10,632	10,652	10,672	10,691
Cherokee	27,124	27,233	27,311	27,369	27,487	27,606	27,722	27,842	27,963	28,084	28,200
Clarke	14,024	14,048	14,071	14,087	14,107	14,126	14,144	14,163	14,181	14,197	14,212
Clayton	23,022	23,124	23,191	23,242	23,313	23,381	23,449	23,516	23,580	23,642	23,704
Cobb	68,897	69,090	69,273	69,453	69,624	69,788	69,948	70,108	70,260	70,404	70,553
DeKalb	56,458	56,643	56,814	56,950	57,113	57,279	57,439	57,601	57,757	57,915	58,074
Dougherty	7,035	7,042	7,055	7,059	7,066	7,073	7,080	7,086	7,092	7,098	7,103
Douglas	13,299	13,355	13,386	13,415	13,451	13,487	13,521	13,554	13,586	13,618	13,648
Fulton	84,623	85,040	85,312	85,589	85,832	86,076	86,318	86,553	86,786	87,023	87,260
Gwinnett	91,412	91,710	91,962	92,195	92,421	92,644	92,866	93,078	93,294	93,510	93,721
Hall	25,361	25,434	25,464	25,511	25,552	25,591	25,630	25,669	25,706	25,743	25,780
Henry	21,277	21,425	21,568	21,680	21,763	21,846	21,930	22,014	22,100	22,184	22,269
Lee	2,567	2,576	2,579	2,578	2,581	2,585	2,588	2,591	2,594	2,596	2,599

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:											
	2/25	2/26	2/27	2/28	3/2				3/4				3/6			
Bartow	12,839	12,905	12,969	13,003	13,122	(2,624)	[630]	{315}	13,238	(2,648)	[635]	{318}	13,356	(2,671)	[641]	{321}
Carroll	10,479	10,509	10,534	10,545	10,589	(2,118)	[508]	{254}	10,632	(2,126)	[510]	{255}	10,672	(2,134)	[512]	{256}
Cherokee	27,124	27,233	27,311	27,369	27,606	(5,521)	[1,325]	{663}	27,842	(5,568)	[1,336]	{668}	28,084	(5,617)	[1,348]	{674}
Clarke	14,024	14,048	14,071	14,087	14,126	(2,825)	[678]	{339}	14,163	(2,833)	[680]	{340}	14,197	(2,839)	[681]	{341}
Clayton	23,022	23,124	23,191	23,242	23,381	(4,676)	[1,122]	{561}	23,516	(4,703)	[1,129]	{564}	23,642	(4,728)	[1,135]	{567}
Cobb	68,897	69,090	69,273	69,453	69,788	(13,958)	[3,350]	{1,675}	70,108	(14,022)	[3,365]	{1,683}	70,404	(14,081)	[3,379]	{1,690}
DeKalb	56,458	56,643	56,814	56,950	57,279	(11,456)	[2,749]	{1,375}	57,601	(11,520)	[2,765]	{1,382}	57,915	(11,583)	[2,780]	{1,390}
Dougherty	7,035	7,042	7,055	7,059	7,073	(1,415)	[340]	{170}	7,086	(1,417)	[340]	{170}	7,098	(1,420)	[341]	{170}
Douglas	13,299	13,355	13,386	13,415	13,487	(2,697)	[647]	{324}	13,554	(2,711)	[651]	{325}	13,618	(2,724)	[654]	{327}
Fulton	84,623	85,040	85,312	85,589	86,076	(17,215)	[4,132]	{2,066}	86,553	(17,311)	[4,155]	{2,077}	87,023	(17,405)	[4,177]	{2,089}
Gwinnett	91,412	91,710	91,962	92,195	92,644	(18,529)	[4,447]	{2,223}	93,078	(18,616)	[4,468]	{2,234}	93,510	(18,702)	[4,488]	{2,244}
Hall	25,361	25,434	25,464	25,511	25,591	(5,118)	[1,228]	{614}	25,669	(5,134)	[1,232]	{616}	25,743	(5,149)	[1,236]	{618}
Henry	21,277	21,425	21,568	21,680	21,846	(4,369)	[1,049]	{524}	22,014	(4,403)	[1,057]	{528}	22,184	(4,437)	[1,065]	{532}
Lee	2,567	2,576	2,579	2,578	2,585	(517)	[124]	{62}	2,591	(518)	[124]	{62}	2,596	(519)	[125]	{62}

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.