

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

Date: 3/4/21

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 3/4/21 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.

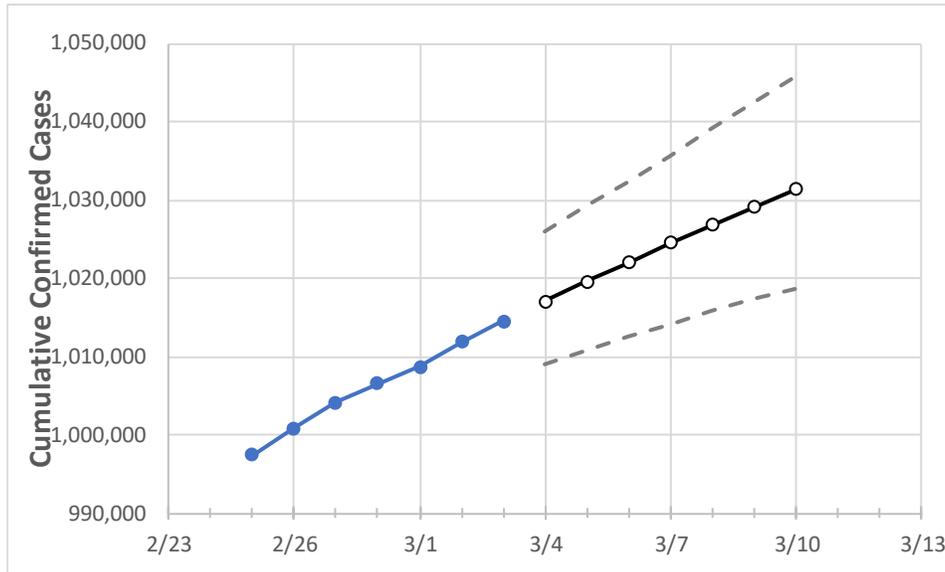
IEM's Modeling Lead

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Georgia	1,006,521	1,008,660	1,011,807	1,014,542	1,017,034	1,019,566	1,021,992	1,024,458	1,026,766	1,029,116	1,031,380

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Bartow	13,003	13,032	13,059	13,097	13,144	13,191	13,236	13,281	13,325	13,369	13,414
Carroll	10,545	10,556	10,576	10,588	10,607	10,625	10,642	10,660	10,677	10,693	10,709
Cherokee	27,369	27,426	27,549	27,624	27,724	27,827	27,928	28,028	28,127	28,224	28,323
Clarke	14,087	14,100	14,141	14,209	14,230	14,250	14,271	14,291	14,311	14,331	14,350
Clayton	23,242	23,301	23,379	23,462	23,536	23,611	23,684	23,755	23,824	23,896	23,963
Cobb	69,453	69,646	69,858	70,055	70,237	70,417	70,595	70,773	70,949	71,120	71,291
DeKalb	56,950	57,093	57,326	57,530	57,702	57,875	58,048	58,218	58,389	58,561	58,735
Dougherty	7,059	7,060	7,066	7,075	7,081	7,087	7,093	7,099	7,104	7,110	7,114
Douglas	13,415	13,442	13,493	13,520	13,553	13,585	13,616	13,646	13,675	13,703	13,729
Fulton	85,589	85,878	86,190	86,477	86,744	87,004	87,265	87,524	87,786	88,043	88,300
Gwinnett	92,195	92,410	92,712	92,926	93,150	93,365	93,577	93,785	93,994	94,198	94,401
Hall	25,511	25,544	25,580	25,611	25,647	25,682	25,717	25,751	25,784	25,818	25,850
Henry	21,680	21,823	21,923	22,037	22,140	22,244	22,349	22,452	22,562	22,674	22,787
Lee	2,578	2,583	2,588	2,593	2,597	2,600	2,604	2,608	2,612	2,615	2,619

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:											
	2/28	3/1	3/2	3/3	3/5				3/7				3/9			
Bartow	13,003	13,032	13,059	13,097	13,191	(2,638)	{633}	{317}	13,281	(2,656)	{637}	{319}	13,369	(2,674)	{642}	{321}
Carroll	10,545	10,556	10,576	10,588	10,625	(2,125)	{510}	{255}	10,660	(2,132)	{512}	{256}	10,693	(2,139)	{513}	{257}
Cherokee	27,369	27,426	27,549	27,624	27,827	(5,565)	{1,336}	{668}	28,028	(5,606)	{1,345}	{673}	28,224	(5,645)	{1,355}	{677}
Clarke	14,087	14,100	14,141	14,209	14,250	(2,850)	{684}	{342}	14,291	(2,858)	{686}	{343}	14,331	(2,866)	{688}	{344}
Clayton	23,242	23,301	23,379	23,462	23,611	(4,722)	{1,133}	{567}	23,755	(4,751)	{1,140}	{570}	23,896	(4,779)	{1,147}	{574}
Cobb	69,453	69,646	69,858	70,055	70,417	(14,083)	{3,380}	{1,690}	70,773	(14,155)	{3,397}	{1,699}	71,120	(14,224)	{3,414}	{1,707}
DeKalb	56,950	57,093	57,326	57,530	57,875	(11,575)	{2,778}	{1,389}	58,218	(11,644)	{2,794}	{1,397}	58,561	(11,712)	{2,811}	{1,405}
Dougherty	7,059	7,060	7,066	7,075	7,087	(1,417)	{340}	{170}	7,099	(1,420)	{341}	{170}	7,110	(1,422)	{341}	{171}
Douglas	13,415	13,442	13,493	13,520	13,585	(2,717)	{652}	{326}	13,646	(2,729)	{655}	{328}	13,703	(2,741)	{658}	{329}
Fulton	85,589	85,878	86,190	86,477	87,004	(17,401)	{4,176}	{2,088}	87,524	(17,505)	{4,201}	{2,101}	88,043	(17,609)	{4,226}	{2,113}
Gwinnett	92,195	92,410	92,712	92,926	93,365	(18,673)	{4,482}	{2,241}	93,785	(18,757)	{4,502}	{2,251}	94,198	(18,840)	{4,521}	{2,261}
Hall	25,511	25,544	25,580	25,611	25,682	(5,136)	{1,233}	{616}	25,751	(5,150)	{1,236}	{618}	25,818	(5,164)	{1,239}	{620}
Henry	21,680	21,823	21,923	22,037	22,244	(4,449)	{1,068}	{534}	22,452	(4,490)	{1,078}	{539}	22,674	(4,535)	{1,088}	{544}
Lee	2,578	2,583	2,588	2,593	2,600	(520)	{125}	{62}	2,608	(522)	{125}	{63}	2,615	(523)	{126}	{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.