

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

Date: 3/10/21

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 3/10/21 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.

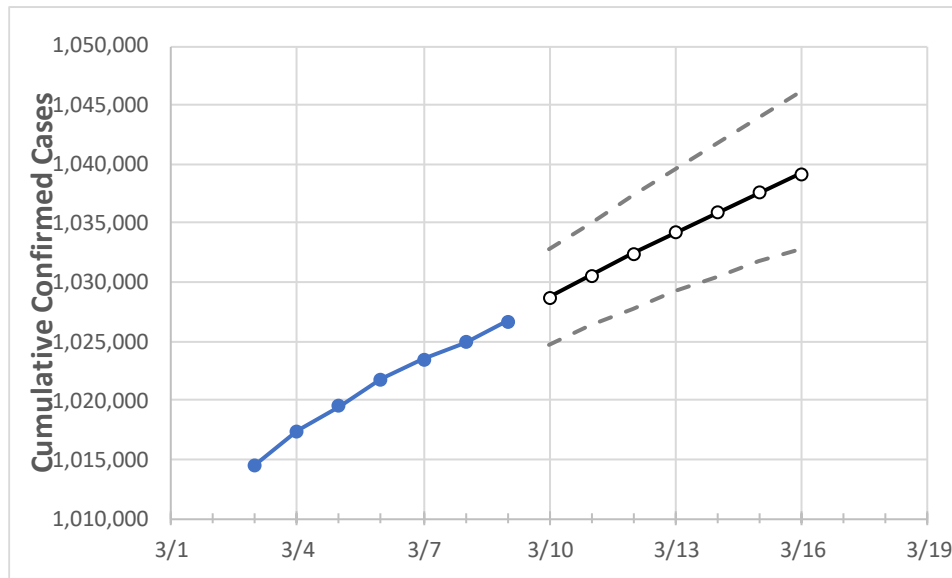
IEM's Modeling Lead

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:						
	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16
Georgia	1,021,778	1,023,487	1,024,931	1,026,692	1,028,684	1,030,567	1,032,394	1,034,191	1,035,902	1,037,568	1,039,186

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:						
	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16
Bartow	13,211	13,233	13,257	13,288	13,315	13,340	13,363	13,386	13,408	13,429	13,448
Carroll	10,627	10,643	10,650	10,660	10,670	10,679	10,687	10,695	10,703	10,709	10,716
Cherokee	27,858	27,924	27,956	28,042	28,104	28,164	28,224	28,281	28,334	28,386	28,439
Clarke	14,261	14,273	14,289	14,306	14,327	14,347	14,367	14,387	14,406	14,424	14,442
Clayton	23,621	23,654	23,706	23,757	23,810	23,859	23,907	23,952	23,993	24,035	24,078
Cobb	70,607	70,781	70,920	71,071	71,235	71,397	71,555	71,713	71,866	72,016	72,167
DeKalb	58,026	58,143	58,234	58,357	58,502	58,646	58,788	58,928	59,067	59,204	59,336
Dougherty	7,097	7,100	7,103	7,113	7,118	7,123	7,127	7,131	7,135	7,139	7,143
Douglas	13,663	13,689	13,704	13,736	13,768	13,799	13,829	13,858	13,887	13,915	13,942
Fulton	87,372	87,609	87,833	88,018	88,294	88,569	88,840	89,115	89,386	89,651	89,920
Gwinnett	93,536	93,720	93,839	94,044	94,226	94,402	94,577	94,748	94,914	95,068	95,223
Hall	25,709	25,728	25,753	25,787	25,815	25,844	25,870	25,897	25,922	25,947	25,970
Henry	22,324	22,398	22,502	22,549	22,651	22,752	22,855	22,956	23,058	23,158	23,259
Lee	2,604	2,610	2,614	2,617	2,621	2,625	2,629	2,633	2,637	2,640	2,644

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:											
	3/6	3/7	3/8	3/9	3/11				3/13				3/15			
Bartow	13,211	13,233	13,257	13,288	13,340	(2,668)	[640]	{320}	13,386	(2,677)	[643]	{321}	13,429	(2,686)	[645]	{322}
Carroll	10,627	10,643	10,650	10,660	10,679	(2,136)	[513]	{256}	10,695	(2,139)	[513]	{257}	10,709	(2,142)	[514]	{257}
Cherokee	27,858	27,924	27,956	28,042	28,164	(5,633)	[1,352]	{676}	28,281	(5,656)	[1,357]	{679}	28,386	(5,677)	[1,363]	{681}
Clarke	14,261	14,273	14,289	14,306	14,347	(2,869)	[689]	{344}	14,387	(2,877)	[691]	{345}	14,424	(2,885)	[692]	{346}
Clayton	23,621	23,654	23,706	23,757	23,859	(4,772)	[1,145]	{573}	23,952	(4,790)	[1,150]	{575}	24,035	(4,807)	[1,154]	{577}
Cobb	70,607	70,781	70,920	71,071	71,397	(14,279)	[3,427]	{1,714}	71,713	(14,343)	[3,442]	{1,721}	72,016	(14,403)	[3,457]	{1,728}
DeKalb	58,026	58,143	58,234	58,357	58,646	(11,729)	[2,815]	{1,407}	58,928	(11,786)	[2,829]	{1,414}	59,204	(11,841)	[2,842]	{1,421}
Dougherty	7,097	7,100	7,103	7,113	7,123	(1,425)	[342]	{171}	7,131	(1,426)	[342]	{171}	7,139	(1,428)	[343]	{171}
Douglas	13,663	13,689	13,704	13,736	13,799	(2,760)	[662]	{331}	13,858	(2,772)	[665]	{333}	13,915	(2,783)	[668]	{334}
Fulton	87,372	87,609	87,833	88,018	88,569	(17,714)	[4,251]	{2,126}	89,115	(17,823)	[4,278]	{2,139}	89,651	(17,930)	[4,303]	{2,152}
Gwinnett	93,536	93,720	93,839	94,044	94,402	(18,880)	[4,531]	{2,266}	94,748	(18,950)	[4,548]	{2,274}	95,068	(19,014)	[4,563]	{2,282}
Hall	25,709	25,728	25,753	25,787	25,844	(5,169)	[1,241]	{620}	25,897	(5,179)	[1,243]	{622}	25,947	(5,189)	[1,245]	{623}
Henry	22,324	22,398	22,502	22,549	22,752	(4,550)	[1,092]	{546}	22,956	(4,591)	[1,102]	{551}	23,158	(4,632)	[1,112]	{556}
Lee	2,604	2,610	2,614	2,617	2,625	(525)	[126]	{63}	2,633	(527)	[126]	{63}	2,640	(528)	[127]	{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.