

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

Date: 3/29/21

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 3/29/21 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.

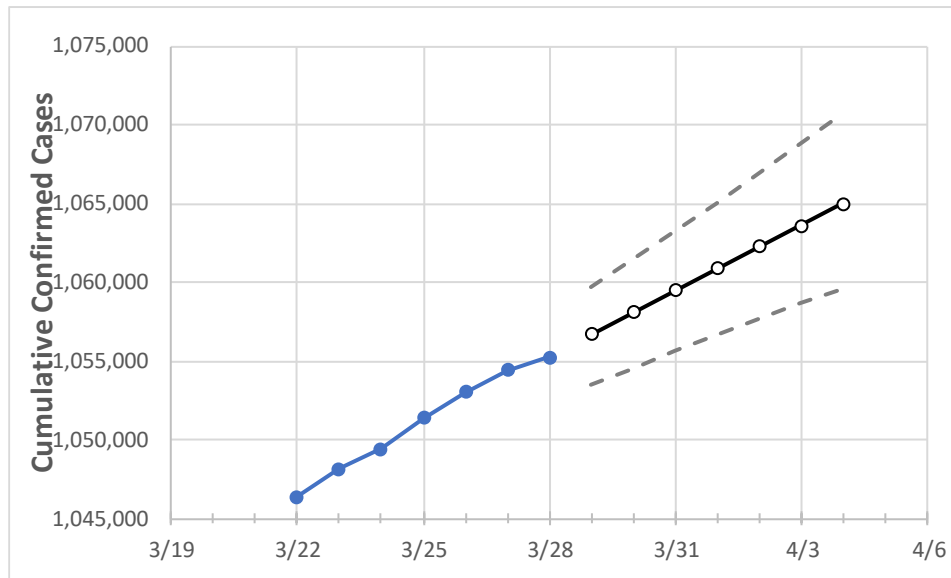
IEM's Modeling Lead

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Georgia	1,051,361	1,053,020	1,054,430	1,055,256	1,056,670	1,058,090	1,059,503	1,060,881	1,062,263	1,063,618	1,064,960

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Bartow	13,795	13,826	13,844	13,855	13,881	13,906	13,931	13,956	13,980	14,003	14,026
Carroll	10,841	10,865	10,883	10,889	10,902	10,916	10,930	10,944	10,958	10,973	10,987
Cherokee	29,137	29,208	29,277	29,316	29,389	29,463	29,538	29,615	29,690	29,767	29,844
Clarke	14,536	14,551	14,564	14,571	14,583	14,595	14,607	14,619	14,631	14,643	14,655
Clayton	24,533	24,571	24,616	24,647	24,696	24,745	24,794	24,844	24,893	24,943	24,994
Cobb	73,225	73,365	73,482	73,568	73,708	73,846	73,984	74,121	74,261	74,402	74,540
DeKalb	60,506	60,674	60,835	60,899	61,043	61,186	61,333	61,474	61,618	61,764	61,912
Dougherty	7,186	7,190	7,217	7,221	7,228	7,235	7,242	7,249	7,256	7,264	7,271
Douglas	14,111	14,148	14,173	14,194	14,220	14,245	14,272	14,299	14,325	14,351	14,377
Fulton	90,857	91,002	91,185	91,302	91,479	91,657	91,835	92,007	92,178	92,349	92,523
Gwinnett	96,112	96,252	96,379	96,486	96,614	96,743	96,869	96,995	97,123	97,244	97,368
Hall	26,203	26,224	26,248	26,271	26,297	26,323	26,349	26,375	26,401	26,428	26,453
Henry	23,425	23,493	23,536	23,561	23,598	23,634	23,667	23,700	23,733	23,765	23,797
Lee	2,652	2,660	2,662	2,662	2,664	2,666	2,668	2,670	2,672	2,673	2,675

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:											
	3/25	3/26	3/27	3/28	3/30				4/1				4/3			
Bartow	13,795	13,826	13,844	13,855	13,906	(2,781)	[667]	{334}	13,956	(2,791)	[670]	{335}	14,003	(2,801)	[672]	{336}
Carroll	10,841	10,865	10,883	10,889	10,916	(2,183)	[524]	{262}	10,944	(2,189)	[525]	{263}	10,973	(2,195)	[527]	{263}
Cherokee	29,137	29,208	29,277	29,316	29,463	(5,893)	[1,414]	{707}	29,615	(5,923)	[1,422]	{711}	29,767	(5,953)	[1,429]	{714}
Clarke	14,536	14,551	14,564	14,571	14,595	(2,919)	[701]	{350}	14,619	(2,924)	[702]	{351}	14,643	(2,929)	[703]	{351}
Clayton	24,533	24,571	24,616	24,647	24,745	(4,949)	[1,188]	{594}	24,844	(4,969)	[1,193]	{596}	24,943	(4,989)	[1,197]	{599}
Cobb	73,225	73,365	73,482	73,568	73,846	(14,769)	[3,545]	{1,772}	74,121	(14,824)	[3,558]	{1,779}	74,402	(14,880)	[3,571]	{1,786}
DeKalb	60,506	60,674	60,835	60,899	61,186	(12,237)	[2,937]	{1,468}	61,474	(12,295)	[2,951]	{1,475}	61,764	(12,353)	[2,965]	{1,482}
Dougherty	7,186	7,190	7,217	7,221	7,235	(1,447)	[347]	{174}	7,249	(1,450)	[348]	{174}	7,264	(1,453)	[349]	{174}
Douglas	14,111	14,148	14,173	14,194	14,245	(2,849)	[684]	{342}	14,299	(2,860)	[686]	{343}	14,351	(2,870)	[689]	{344}
Fulton	90,857	91,002	91,185	91,302	91,657	(18,331)	[4,400]	{2,200}	92,007	(18,401)	[4,416]	{2,208}	92,349	(18,470)	[4,433]	{2,216}
Gwinnett	96,112	96,252	96,379	96,486	96,743	(19,349)	[4,644]	{2,322}	96,995	(19,399)	[4,656]	{2,328}	97,244	(19,449)	[4,668]	{2,334}
Hall	26,203	26,224	26,248	26,271	26,323	(5,265)	[1,264]	{632}	26,375	(5,275)	[1,266]	{633}	26,428	(5,286)	[1,269]	{634}
Henry	23,425	23,493	23,536	23,561	23,634	(4,727)	[1,134]	{567}	23,700	(4,740)	[1,138]	{569}	23,765	(4,753)	[1,141]	{570}
Lee	2,652	2,660	2,662	2,662	2,666	(533)	[128]	{64}	2,670	(534)	[128]	{64}	2,673	(535)	[128]	{64}

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.