

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

Date: 5/3/21

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 5/3/21 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.

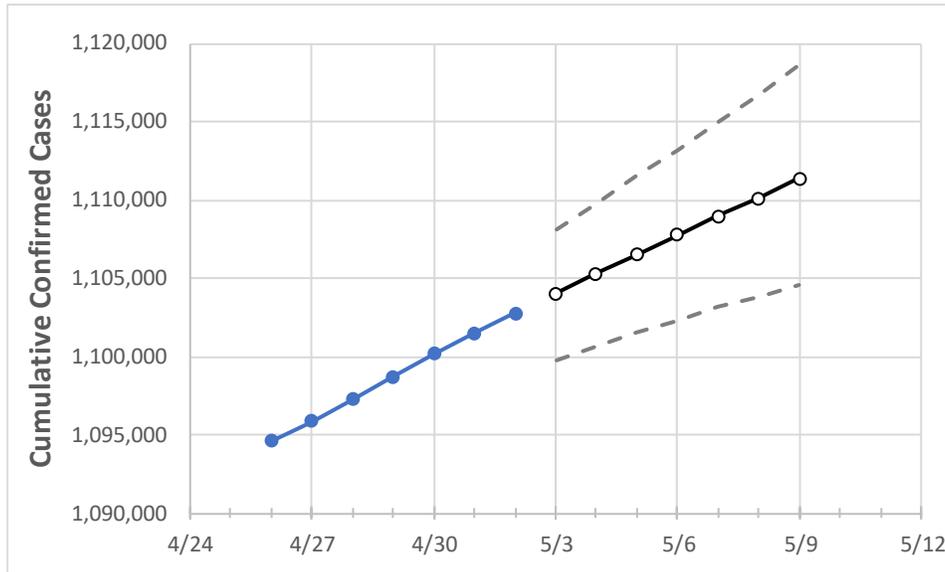
IEM's Modeling Lead

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Georgia	1,098,723	1,100,187	1,101,487	1,102,789	1,104,041	1,105,293	1,106,506	1,107,744	1,108,955	1,110,137	1,111,368

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Bartow	14,533	14,555	14,569	14,580	14,596	14,612	14,628	14,643	14,659	14,674	14,689
Carroll	11,271	11,280	11,285	11,288	11,295	11,302	11,308	11,315	11,321	11,327	11,333
Cherokee	30,668	30,706	30,739	30,763	30,790	30,817	30,845	30,871	30,898	30,924	30,950
Clarke	14,946	14,959	14,967	14,975	14,984	14,992	15,002	15,010	15,019	15,027	15,034
Clayton	26,234	26,285	26,329	26,357	26,405	26,453	26,501	26,549	26,598	26,646	26,694
Cobb	77,500	77,635	77,742	77,809	77,907	78,007	78,109	78,204	78,301	78,396	78,489
DeKalb	64,736	64,817	64,924	65,431	65,559	65,690	65,824	65,960	66,100	66,238	66,378
Dougherty	7,481	7,491	7,495	7,496	7,506	7,516	7,526	7,537	7,548	7,559	7,570
Douglas	15,001	15,021	15,046	15,060	15,079	15,097	15,115	15,133	15,150	15,168	15,185
Fulton	96,014	96,158	96,305	96,443	96,579	96,710	96,844	96,975	97,107	97,239	97,369
Gwinnett	100,594	100,704	100,815	100,888	101,000	101,113	101,219	101,328	101,441	101,551	101,658
Hall	27,001	27,026	27,045	27,062	27,084	27,107	27,129	27,151	27,173	27,196	27,219
Henry	24,927	24,964	25,000	25,025	25,063	25,102	25,140	25,177	25,214	25,252	25,289
Lee	2,709	2,711	2,713	2,714	2,716	2,718	2,719	2,721	2,723	2,725	2,727

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:											
	4/29	4/30	5/1	5/2	5/4				5/6				5/8			
Bartow	14,533	14,555	14,569	14,580	14,612	(2,922)	[701]	{351}	14,643	(2,929)	[703]	{351}	14,674	(2,935)	[704]	{352}
Carroll	11,271	11,280	11,285	11,288	11,302	(2,260)	[542]	{271}	11,315	(2,263)	[543]	{272}	11,327	(2,265)	[544]	{272}
Cherokee	30,668	30,706	30,739	30,763	30,817	(6,163)	[1,479]	{740}	30,871	(6,174)	[1,482]	{741}	30,924	(6,185)	[1,484]	{742}
Clarke	14,946	14,959	14,967	14,975	14,992	(2,998)	[720]	{360}	15,010	(3,002)	[721]	{360}	15,027	(3,005)	[721]	{361}
Clayton	26,234	26,285	26,329	26,357	26,453	(5,291)	[1,270]	{635}	26,549	(5,310)	[1,274]	{637}	26,646	(5,329)	[1,279]	{640}
Cobb	77,500	77,635	77,742	77,809	78,007	(15,601)	[3,744]	{1,872}	78,204	(15,641)	[3,754]	{1,877}	78,396	(15,679)	[3,763]	{1,881}
DeKalb	64,736	64,817	64,924	65,431	65,690	(13,138)	[3,153]	{1,577}	65,960	(13,192)	[3,166]	{1,583}	66,238	(13,248)	[3,179]	{1,590}
Dougherty	7,481	7,491	7,495	7,496	7,516	(1,503)	[361]	{180}	7,537	(1,507)	[362]	{181}	7,559	(1,512)	[363]	{181}
Douglas	15,001	15,021	15,046	15,060	15,097	(3,019)	[725]	{362}	15,133	(3,027)	[726]	{363}	15,168	(3,034)	[728]	{364}
Fulton	96,014	96,158	96,305	96,443	96,710	(19,342)	[4,642]	{2,321}	96,975	(19,395)	[4,655]	{2,327}	97,239	(19,448)	[4,667]	{2,334}
Gwinnett	100,594	100,704	100,815	100,888	101,113	(20,223)	[4,853]	{2,427}	101,328	(20,266)	[4,864]	{2,432}	101,551	(20,310)	[4,874]	{2,437}
Hall	27,001	27,026	27,045	27,062	27,107	(5,421)	[1,301]	{651}	27,151	(5,430)	[1,303]	{652}	27,196	(5,439)	[1,305]	{653}
Henry	24,927	24,964	25,000	25,025	25,102	(5,020)	[1,205]	{602}	25,177	(5,035)	[1,208]	{604}	25,252	(5,050)	[1,212]	{606}
Lee	2,709	2,711	2,713	2,714	2,718	(544)	[130]	{65}	2,721	(544)	[131]	{65}	2,725	(545)	[131]	{65}

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.