

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

Date: 4/16/21

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 4/16/21 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.

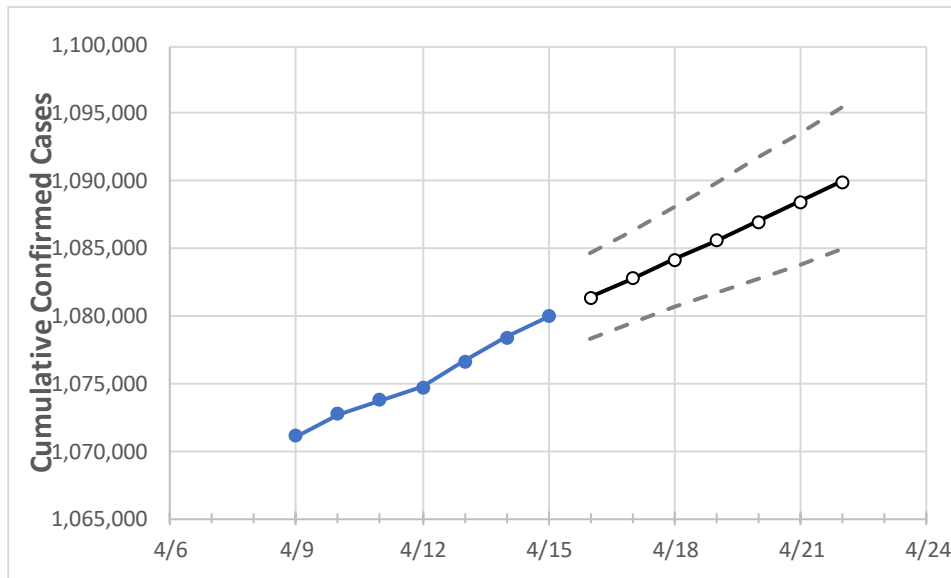
IEM's Modeling Lead

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:						
	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22

Georgia 1,074,731 1,076,644 1,078,379 1,079,979 1,081,385 1,082,782 1,084,169 1,085,594 1,087,010 1,088,457 1,089,924

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:						
	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22
Bartow	14,174	14,215	14,242	14,268	14,288	14,308	14,327	14,347	14,367	14,386	14,405
Carroll	11,100	11,113	11,124	11,147	11,160	11,173	11,186	11,199	11,212	11,225	11,238
Cherokee	30,045	30,102	30,176	30,216	30,255	30,293	30,330	30,365	30,401	30,438	30,472
Clarke	14,731	14,760	14,776	14,792	14,806	14,820	14,834	14,849	14,864	14,878	14,894
Clayton	25,266	25,362	25,423	25,474	25,520	25,568	25,614	25,660	25,707	25,755	25,804
Cobb	75,487	75,634	75,798	75,940	76,061	76,181	76,300	76,418	76,538	76,654	76,776
DeKalb	62,887	63,075	63,256	63,454	63,631	63,815	64,007	64,204	64,402	64,602	64,810
Dougherty	7,304	7,315	7,323	7,332	7,338	7,343	7,349	7,355	7,361	7,367	7,373
Douglas	14,569	14,587	14,626	14,664	14,691	14,718	14,746	14,775	14,803	14,833	14,861
Fulton	93,561	93,755	93,886	94,021	94,161	94,301	94,439	94,577	94,713	94,847	94,981
Gwinnett	98,240	98,416	98,582	98,705	98,830	98,956	99,082	99,205	99,334	99,460	99,590
Hall	26,614	26,639	26,661	26,679	26,700	26,720	26,740	26,760	26,780	26,800	26,819
Henry	24,164	24,206	24,259	24,296	24,333	24,371	24,408	24,445	24,481	24,518	24,554
Lee	2,687	2,688	2,689	2,690	2,692	2,694	2,696	2,697	2,699	2,701	2,703

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:											
	4/12	4/13	4/14	4/15	4/17				4/19				4/21			
Bartow	14,174	14,215	14,242	14,268	14,308	(2,862)	[687]	{343}	14,347	(2,869)	[689]	{344}	14,386	(2,877)	[691]	{345}
Carroll	11,100	11,113	11,124	11,147	11,173	(2,235)	[536]	{268}	11,199	(2,240)	[538]	{269}	11,225	(2,245)	[539]	{269}
Cherokee	30,045	30,102	30,176	30,216	30,293	(6,059)	[1,454]	{727}	30,365	(6,073)	[1,458]	{729}	30,438	(6,088)	[1,461]	{731}
Clarke	14,731	14,760	14,776	14,792	14,820	(2,964)	[711]	{356}	14,849	(2,970)	[713]	{356}	14,878	(2,976)	[714]	{357}
Clayton	25,266	25,362	25,423	25,474	25,568	(5,114)	[1,227]	{614}	25,660	(5,132)	[1,232]	{616}	25,755	(5,151)	[1,236]	{618}
Cobb	75,487	75,634	75,798	75,940	76,181	(15,236)	[3,657]	{1,828}	76,418	(15,284)	[3,668]	{1,834}	76,654	(15,331)	[3,679]	{1,840}
DeKalb	62,887	63,075	63,256	63,454	63,815	(12,763)	[3,063]	{1,532}	64,204	(12,841)	[3,082]	{1,541}	64,602	(12,920)	[3,101]	{1,550}
Dougherty	7,304	7,315	7,323	7,332	7,343	(1,469)	[352]	{176}	7,355	(1,471)	[353]	{177}	7,367	(1,473)	[354]	{177}
Douglas	14,569	14,587	14,626	14,664	14,718	(2,944)	[706]	{353}	14,775	(2,955)	[709]	{355}	14,833	(2,967)	[712]	{356}
Fulton	93,561	93,755	93,886	94,021	94,301	(18,860)	[4,526]	{2,263}	94,577	(18,915)	[4,540]	{2,270}	94,847	(18,969)	[4,553]	{2,276}
Gwinnett	98,240	98,416	98,582	98,705	98,956	(19,791)	[4,750]	{2,375}	99,205	(19,841)	[4,762]	{2,381}	99,460	(19,892)	[4,774]	{2,387}
Hall	26,614	26,639	26,661	26,679	26,720	(5,344)	[1,283]	{641}	26,760	(5,352)	[1,284]	{642}	26,800	(5,360)	[1,286]	{643}
Henry	24,164	24,206	24,259	24,296	24,371	(4,874)	[1,170]	{585}	24,445	(4,889)	[1,173]	{587}	24,518	(4,904)	[1,177]	{588}
Lee	2,687	2,688	2,689	2,690	2,694	(539)	[129]	{65}	2,697	(539)	[129]	{65}	2,701	(540)	[130]	{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.