

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

Date: 4/27/21

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 4/27/21 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.

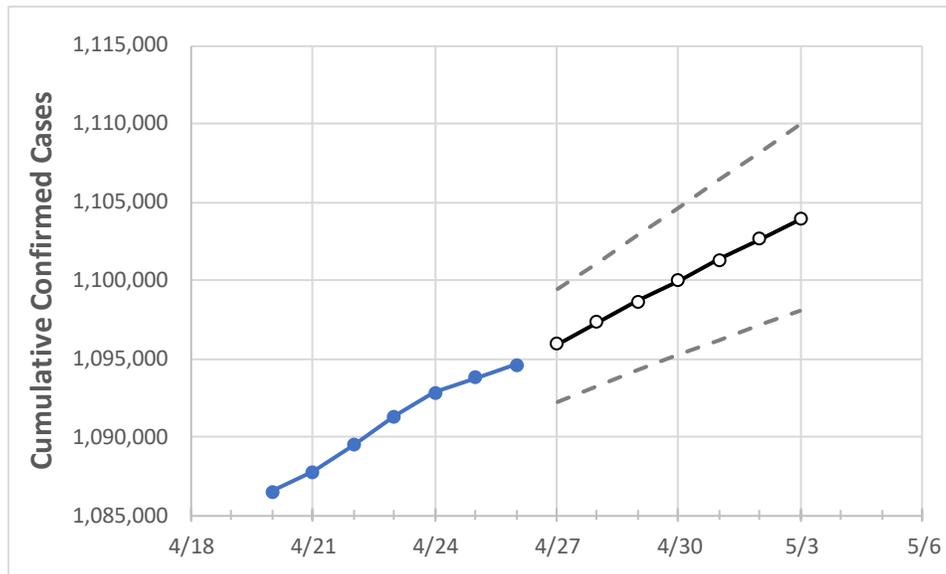
IEM's Modeling Lead

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:						
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3

Georgia 1,091,339 1,092,852 1,093,768 1,094,580 1,095,956 1,097,306 1,098,644 1,099,979 1,101,280 1,102,623 1,103,929

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:						
	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3
Bartow	14,450	14,464	14,478	14,488	14,508	14,528	14,547	14,567	14,586	14,606	14,626
Carroll	11,216	11,223	11,232	11,235	11,243	11,250	11,258	11,265	11,272	11,279	11,286
Cherokee	30,471	30,501	30,515	30,549	30,576	30,604	30,631	30,658	30,684	30,710	30,735
Clarke	14,893	14,898	14,908	14,912	14,923	14,935	14,947	14,958	14,970	14,981	14,993
Clayton	25,928	25,985	26,011	26,038	26,091	26,144	26,198	26,251	26,305	26,359	26,413
Cobb	76,901	77,015	77,087	77,146	77,254	77,361	77,469	77,573	77,674	77,775	77,875
DeKalb	64,230	64,327	64,399	64,458	64,561	64,660	64,756	64,850	64,944	65,036	65,127
Dougherty	7,412	7,435	7,440	7,445	7,455	7,466	7,476	7,487	7,497	7,509	7,520
Douglas	14,880	14,905	14,925	14,939	14,964	14,988	15,012	15,037	15,061	15,085	15,110
Fulton	95,213	95,406	95,516	95,613	95,752	95,888	96,025	96,159	96,296	96,433	96,565
Gwinnett	99,904	100,061	100,158	100,225	100,363	100,500	100,640	100,780	100,918	101,058	101,200
Hall	26,862	26,893	26,909	26,916	26,936	26,955	26,974	26,994	27,013	27,033	27,051
Henry	24,706	24,748	24,776	24,799	24,844	24,886	24,931	24,977	25,023	25,069	25,114
Lee	2,699	2,703	2,703	2,702	2,704	2,705	2,707	2,708	2,710	2,711	2,713

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:											
	4/23	4/24	4/25	4/26	4/28				4/30				5/2			
Bartow	14,450	14,464	14,478	14,488	14,528	(2,906)	[697]	{349}	14,567	(2,913)	[699]	{350}	14,606	(2,921)	[701]	{351}
Carroll	11,216	11,223	11,232	11,235	11,250	(2,250)	[540]	{270}	11,265	(2,253)	[541]	{270}	11,279	(2,256)	[541]	{271}
Cherokee	30,471	30,501	30,515	30,549	30,604	(6,121)	[1,469]	{734}	30,658	(6,132)	[1,472]	{736}	30,710	(6,142)	[1,474]	{737}
Clarke	14,893	14,898	14,908	14,912	14,935	(2,987)	[717]	{358}	14,958	(2,992)	[718]	{359}	14,981	(2,996)	[719]	{360}
Clayton	25,928	25,985	26,011	26,038	26,144	(5,229)	[1,255]	{627}	26,251	(5,250)	[1,260]	{630}	26,359	(5,272)	[1,265]	{633}
Cobb	76,901	77,015	77,087	77,146	77,361	(15,472)	[3,713]	{1,857}	77,573	(15,515)	[3,723]	{1,862}	77,775	(15,555)	[3,733]	{1,867}
DeKalb	64,230	64,327	64,399	64,458	64,660	(12,932)	[3,104]	{1,552}	64,850	(12,970)	[3,113]	{1,556}	65,036	(13,007)	[3,122]	{1,561}
Dougherty	7,412	7,435	7,440	7,445	7,466	(1,493)	[358]	{179}	7,487	(1,497)	[359]	{180}	7,509	(1,502)	[360]	{180}
Douglas	14,880	14,905	14,925	14,939	14,988	(2,998)	[719]	{360}	15,037	(3,007)	[722]	{361}	15,085	(3,017)	[724]	{362}
Fulton	95,213	95,406	95,516	95,613	95,888	(19,178)	[4,603]	{2,301}	96,159	(19,232)	[4,616]	{2,308}	96,433	(19,287)	[4,629]	{2,314}
Gwinnett	99,904	100,061	100,158	100,225	100,500	(20,100)	[4,824]	{2,412}	100,780	(20,156)	[4,837]	{2,419}	101,058	(20,212)	[4,851]	{2,425}
Hall	26,862	26,893	26,909	26,916	26,955	(5,391)	[1,294]	{647}	26,994	(5,399)	[1,296]	{648}	27,033	(5,407)	[1,298]	{649}
Henry	24,706	24,748	24,776	24,799	24,886	(4,977)	[1,195]	{597}	24,977	(4,995)	[1,199]	{599}	25,069	(5,014)	[1,203]	{602}
Lee	2,699	2,703	2,703	2,702	2,705	(541)	[130]	{65}	2,708	(542)	[130]	{65}	2,711	(542)	[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.