

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

Date: 4/26/21

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 4/26/21 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.

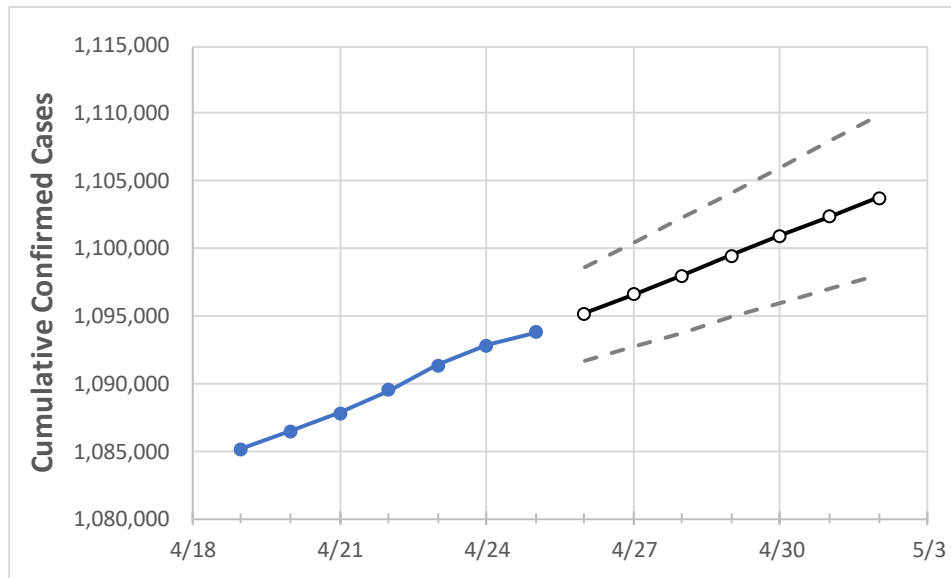
IEM's Modeling Lead

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:						
	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2
Georgia	1,089,497	1,091,339	1,092,852	1,093,768	1,095,192	1,096,617	1,098,031	1,099,488	1,100,927	1,102,363	1,103,781

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:						
	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2
Bartow	14,416	14,450	14,464	14,478	14,500	14,521	14,542	14,563	14,584	14,605	14,626
Carroll	11,201	11,216	11,223	11,232	11,240	11,248	11,256	11,264	11,272	11,280	11,288
Cherokee	30,422	30,471	30,501	30,515	30,543	30,571	30,599	30,626	30,652	30,677	30,701
Clarke	14,873	14,893	14,898	14,908	14,920	14,933	14,945	14,958	14,970	14,983	14,996
Clayton	25,856	25,928	25,985	26,011	26,067	26,124	26,181	26,238	26,295	26,355	26,413
Cobb	76,713	76,901	77,015	77,087	77,199	77,313	77,423	77,535	77,647	77,757	77,869
DeKalb	64,105	64,230	64,327	64,399	64,507	64,613	64,715	64,815	64,913	65,008	65,105
Dougherty	7,400	7,412	7,435	7,440	7,451	7,462	7,474	7,485	7,497	7,509	7,521
Douglas	14,844	14,880	14,905	14,925	14,951	14,978	15,003	15,028	15,055	15,081	15,107
Fulton	95,006	95,213	95,406	95,516	95,660	95,807	95,950	96,093	96,239	96,381	96,528
Gwinnett	99,724	99,904	100,061	100,158	100,308	100,458	100,611	100,763	100,917	101,073	101,229
Hall	26,838	26,862	26,893	26,909	26,930	26,952	26,973	26,995	27,016	27,037	27,058
Henry	24,637	24,706	24,748	24,776	24,823	24,871	24,920	24,968	25,017	25,066	25,116
Lee	2,696	2,699	2,703	2,703	2,704	2,705	2,707	2,708	2,709	2,711	2,712

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:											
	4/22	4/23	4/24	4/25	4/27				4/29				5/1			
Bartow	14,416	14,450	14,464	14,478	14,521	(2,904)	[697]	{349}	14,563	(2,913)	[699]	{350}	14,605	(2,921)	[701]	{351}
Carroll	11,201	11,216	11,223	11,232	11,248	(2,250)	[540]	{270}	11,264	(2,253)	[541]	{270}	11,280	(2,256)	[541]	{271}
Cherokee	30,422	30,471	30,501	30,515	30,571	(6,114)	[1,467]	{734}	30,626	(6,125)	[1,470]	{735}	30,677	(6,135)	[1,472]	{736}
Clarke	14,873	14,893	14,898	14,908	14,933	(2,987)	[717]	{358}	14,958	(2,992)	[718]	{359}	14,983	(2,997)	[719]	{360}
Clayton	25,856	25,928	25,985	26,011	26,124	(5,225)	[1,254]	{627}	26,238	(5,248)	[1,259]	{630}	26,355	(5,271)	[1,265]	{633}
Cobb	76,713	76,901	77,015	77,087	77,313	(15,463)	[3,711]	{1,856}	77,535	(15,507)	[3,722]	{1,861}	77,757	(15,551)	[3,732]	{1,866}
DeKalb	64,105	64,230	64,327	64,399	64,613	(12,923)	[3,101]	{1,551}	64,815	(12,963)	[3,111]	{1,556}	65,008	(13,002)	[3,120]	{1,560}
Dougherty	7,400	7,412	7,435	7,440	7,462	(1,492)	[358]	{179}	7,485	(1,497)	[359]	{180}	7,509	(1,502)	[360]	{180}
Douglas	14,844	14,880	14,905	14,925	14,978	(2,996)	[719]	{359}	15,028	(3,006)	[721]	{361}	15,081	(3,016)	[724]	{362}
Fulton	95,006	95,213	95,406	95,516	95,807	(19,161)	[4,599]	{2,299}	96,093	(19,219)	[4,612]	{2,306}	96,381	(19,276)	[4,626]	{2,313}
Gwinnett	99,724	99,904	100,061	100,158	100,458	(20,092)	[4,822]	{2,411}	100,763	(20,153)	[4,837]	{2,418}	101,073	(20,215)	[4,851]	{2,426}
Hall	26,838	26,862	26,893	26,909	26,952	(5,390)	[1,294]	{647}	26,995	(5,399)	[1,296]	{648}	27,037	(5,407)	[1,298]	{649}
Henry	24,637	24,706	24,748	24,776	24,871	(4,974)	[1,194]	{597}	24,968	(4,994)	[1,198]	{599}	25,066	(5,013)	[1,203]	{602}
Lee	2,696	2,699	2,703	2,703	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.