

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

Date: 9/1/21

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 9/1/21 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.

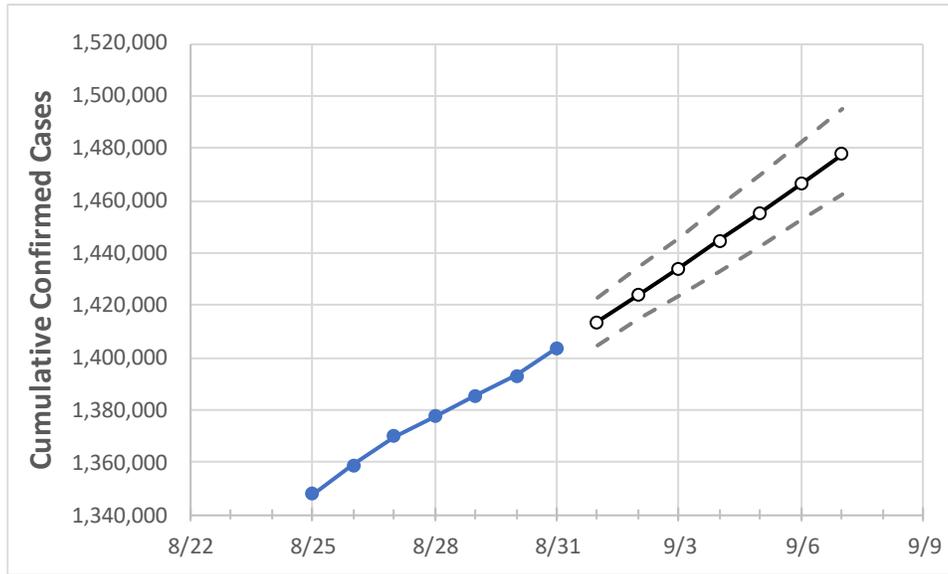
IEM's Modeling Lead

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:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7

Georgia 1,377,638 1,385,349 1,393,061 1,403,582 1,413,559 1,423,741 1,434,048 1,444,547 1,455,368 1,466,425 1,477,648

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:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Bartow	17,285	17,362	17,439	17,596	17,711	17,835	17,958	18,090	18,215	18,355	18,497
Carroll	14,048	14,127	14,207	14,349	14,455	14,561	14,675	14,787	14,902	15,018	15,139
Cherokee	37,239	37,414	37,589	37,888	38,128	38,373	38,620	38,869	39,127	39,390	39,659
Clarke	17,425	17,497	17,568	17,666	17,773	17,886	17,998	18,113	18,236	18,359	18,488
Clayton	33,024	33,194	33,363	33,510	33,689	33,865	34,043	34,221	34,402	34,583	34,765
Cobb	93,979	94,383	94,786	95,333	95,834	96,344	96,848	97,360	97,886	98,411	98,949
DeKalb	78,180	78,468	78,756	79,070	79,411	79,751	80,096	80,438	80,795	81,145	81,499
Dougherty	9,834	9,913	9,993	10,190	10,305	10,424	10,544	10,669	10,797	10,932	11,068
Douglas	18,742	18,843	18,943	19,094	19,227	19,359	19,497	19,634	19,778	19,924	20,072
Fulton	115,218	115,649	116,079	116,588	117,061	117,535	118,014	118,499	118,989	119,487	119,975
Gwinnett	114,668	114,973	115,279	115,780	116,197	116,617	117,038	117,479	117,923	118,365	118,830
Hall	31,474	31,628	31,783	31,965	32,156	32,348	32,547	32,754	32,969	33,187	33,418
Henry	32,202	32,429	32,655	32,902	33,156	33,409	33,666	33,933	34,201	34,476	34,751
Lee	3,787	3,831	3,875	3,962	4,019	4,079	4,142	4,206	4,272	4,342	4,411

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:											
	8/28	8/29	8/30	8/31	9/2			9/4			9/6					
Bartow	17,285	17,362	17,439	17,596	17,835	(3,567)	[856]	{428}	18,090	(3,618)	[868]	{434}	18,355	(3,671)	[881]	{441}
Carroll	14,048	14,127	14,207	14,349	14,561	(2,912)	[699]	{349}	14,787	(2,957)	[710]	{355}	15,018	(3,004)	[721]	{360}
Cherokee	37,239	37,414	37,589	37,888	38,373	(7,675)	[1,842]	{921}	38,869	(7,774)	[1,866]	{933}	39,390	(7,878)	[1,891]	{945}
Clarke	17,425	17,497	17,568	17,666	17,886	(3,577)	[859]	{429}	18,113	(3,623)	[869]	{435}	18,359	(3,672)	[881]	{441}
Clayton	33,024	33,194	33,363	33,510	33,865	(6,773)	[1,626]	{813}	34,221	(6,844)	[1,643]	{821}	34,583	(6,917)	[1,660]	{830}
Cobb	93,979	94,383	94,786	95,333	96,344	(19,269)	[4,624]	{2,312}	97,360	(19,472)	[4,673]	{2,337}	98,411	(19,682)	[4,724]	{2,362}
DeKalb	78,180	78,468	78,756	79,070	79,751	(15,950)	[3,828]	{1,914}	80,438	(16,088)	[3,861]	{1,931}	81,145	(16,229)	[3,895]	{1,947}
Dougherty	9,834	9,913	9,993	10,190	10,424	(2,085)	[500]	{250}	10,669	(2,134)	[512]	{256}	10,932	(2,186)	[525]	{262}
Douglas	18,742	18,843	18,943	19,094	19,359	(3,872)	[929]	{465}	19,634	(3,927)	[942]	{471}	19,924	(3,985)	[956]	{478}
Fulton	115,218	115,649	116,079	116,588	117,535	(23,507)	[5,642]	{2,821}	118,499	(23,700)	[5,688]	{2,844}	119,487	(23,897)	[5,735]	{2,868}
Gwinnett	114,668	114,973	115,279	115,780	116,617	(23,323)	[5,598]	{2,799}	117,479	(23,496)	[5,639]	{2,820}	118,365	(23,673)	[5,682]	{2,841}
Hall	31,474	31,628	31,783	31,965	32,348	(6,470)	[1,553]	{776}	32,754	(6,551)	[1,572]	{786}	33,187	(6,637)	[1,593]	{796}
Henry	32,202	32,429	32,655	32,902	33,409	(6,682)	[1,604]	{802}	33,933	(6,787)	[1,629]	{814}	34,476	(6,895)	[1,655]	{827}
Lee	3,787	3,831	3,875	3,962	4,079	(816)	[196]	{98}	4,206	(841)	[202]	{101}	4,342	(868)	[208]	{104}

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.