

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

Date: 8/9/21

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 8/9/21 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.

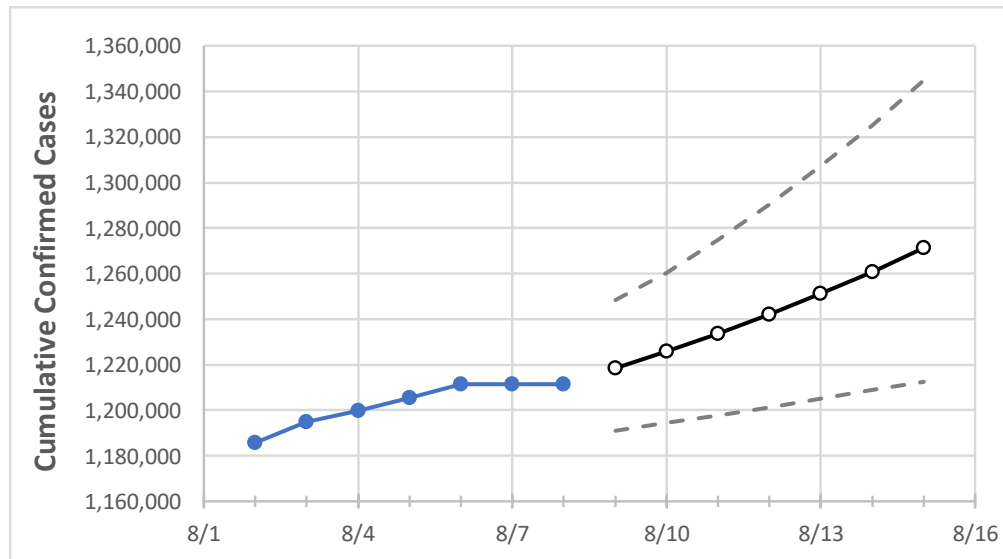
IEM's Modeling Lead

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:					
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Georgia	1,205,434	1,211,439	1,211,439	1,211,439	1,218,314	1,225,681	1,233,485	1,242,048	1,251,061	1,260,851	1,271,458

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Bartow	15,627	15,689	15,689	15,689	15,733	15,777	15,824	15,872	15,924	15,975	16,031
Carroll	12,358	12,406	12,406	12,406	12,478	12,557	12,642	12,731	12,826	12,927	13,037
Cherokee	32,994	33,099	33,099	33,099	33,236	33,389	33,548	33,716	33,902	34,098	34,310
Clarke	15,837	15,863	15,863	15,863	15,926	15,992	16,065	16,143	16,231	16,326	16,429
Clayton	29,319	29,437	29,437	29,437	29,587	29,746	29,908	30,083	30,269	30,470	30,683
Cobb	84,582	84,848	84,848	84,848	85,223	85,626	86,039	86,483	86,953	87,455	87,989
DeKalb	70,997	71,380	71,380	71,380	71,733	72,111	72,516	72,941	73,405	73,884	74,405
Dougherty	8,255	8,302	8,302	8,302	8,378	8,461	8,555	8,655	8,768	8,890	9,025
Douglas	16,627	16,700	16,700	16,700	16,787	16,876	16,970	17,071	17,177	17,295	17,413
Fulton	105,255	105,675	105,675	105,675	106,185	106,738	107,310	107,926	108,570	109,263	110,014
Gwinnett	107,213	107,566	107,566	107,566	107,873	108,196	108,538	108,891	109,274	109,677	110,102
Hall	28,838	28,918	28,918	28,918	29,014	29,118	29,226	29,344	29,472	29,609	29,759
Henry	27,835	28,003	28,003	28,003	28,134	28,268	28,412	28,562	28,722	28,888	29,061
Lee	3,081	3,105	3,105	3,105	3,146	3,190	3,239	3,291	3,351	3,414	3,484

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:											
	8/5	8/6	8/7	8/8	8/10				8/12				8/14			
Bartow	15,627	15,689	15,689	15,689	15,777	(3,155)	[757]	{379}	15,872	(3,174)	[762]	{381}	15,975	(3,195)	[767]	{383}
Carroll	12,358	12,406	12,406	12,406	12,557	(2,511)	[603]	{301}	12,731	(2,546)	[611]	{306}	12,927	(2,585)	[620]	{310}
Cherokee	32,994	33,099	33,099	33,099	33,389	(6,678)	[1,603]	{801}	33,716	(6,743)	[1,618]	{809}	34,098	(6,820)	[1,637]	{818}
Clarke	15,837	15,863	15,863	15,863	15,992	(3,198)	[768]	{384}	16,143	(3,229)	[775]	{387}	16,326	(3,265)	[784]	{392}
Clayton	29,319	29,437	29,437	29,437	29,746	(5,949)	[1,428]	{714}	30,083	(6,017)	[1,444]	{722}	30,470	(6,094)	[1,463]	{731}
Cobb	84,582	84,848	84,848	84,848	85,626	(17,125)	[4,110]	{2,055}	86,483	(17,297)	[4,151]	{2,076}	87,455	(17,491)	[4,198]	{2,099}
DeKalb	70,997	71,380	71,380	71,380	72,111	(14,422)	[3,461]	{1,731}	72,941	(14,588)	[3,501]	{1,751}	73,884	(14,777)	[3,546]	{1,773}
Dougherty	8,255	8,302	8,302	8,302	8,461	(1,692)	[406]	{203}	8,655	(1,731)	[415]	{208}	8,890	(1,778)	[427]	{213}
Douglas	16,627	16,700	16,700	16,700	16,876	(3,375)	[810]	{405}	17,071	(3,414)	[819]	{410}	17,295	(3,459)	[830]	{415}
Fulton	105,255	105,675	105,675	105,675	106,738	(21,348)	[5,123]	{2,562}	107,926	(21,585)	[5,180]	{2,590}	109,263	(21,853)	[5,245]	{2,622}
Gwinnett	107,213	107,566	107,566	107,566	108,196	(21,639)	[5,193]	{2,597}	108,891	(21,778)	[5,227]	{2,613}	109,677	(21,935)	[5,264]	{2,632}
Hall	28,838	28,918	28,918	28,918	29,118	(5,824)	[1,398]	{699}	29,344	(5,869)	[1,409]	{704}	29,609	(5,922)	[1,421]	{711}
Henry	27,835	28,003	28,003	28,003	28,268	(5,654)	[1,357]	{678}	28,562	(5,712)	[1,371]	{685}	28,888	(5,778)	[1,387]	{693}
Lee	3,081	3,105	3,105	3,105	3,190	(638)	[153]	{77}	3,291	(658)	[158]	{79}	3,414	(683)	[164]	{82}

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.