

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

Date: 5/5/21

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 5/5/21 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.

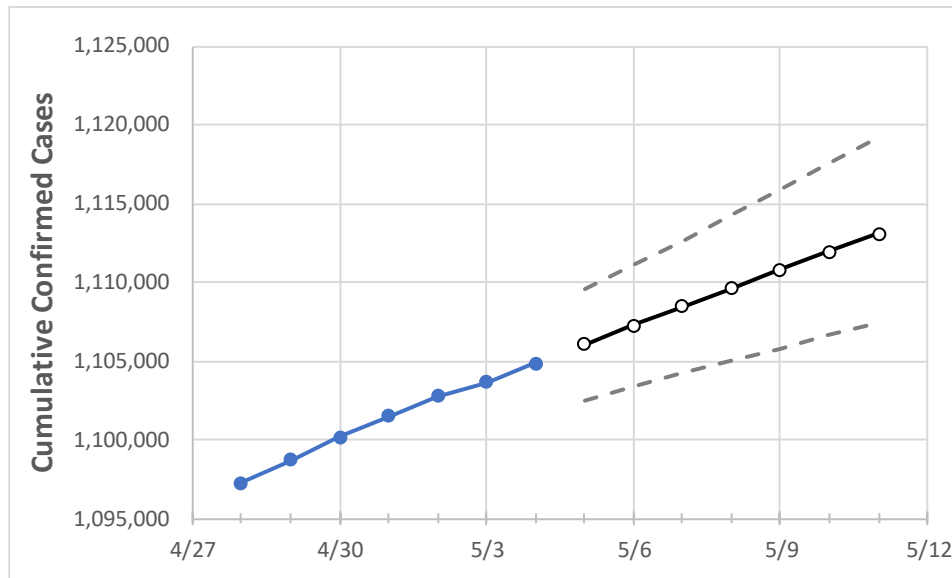
IEM's Modeling Lead

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:						
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11
Georgia	1,101,487	1,102,789	1,103,659	1,104,837	1,106,063	1,107,261	1,108,456	1,109,626	1,110,774	1,111,928	1,113,076

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:							
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	
Bartow	14,569	14,580	14,587	14,591	14,605	14,619	14,632	14,645	14,658	14,670	14,682	
Carroll	11,285	11,288	11,300	11,311	11,319	11,326	11,334	11,341	11,348	11,356	11,363	
Cherokee	30,739	30,763	30,789	30,824	30,854	30,882	30,910	30,938	30,966	30,994	31,021	
Clarke	14,967	14,975	14,979	14,994	15,003	15,012	15,021	15,031	15,040	15,048	15,057	
Clayton	26,329	26,357	26,388	26,426	26,471	26,516	26,562	26,607	26,651	26,695	26,739	
Cobb	77,742	77,809	77,892	77,997	78,095	78,191	78,286	78,379	78,475	78,567	78,656	
DeKalb	64,924	65,431	65,483	65,589	65,717	65,844	65,972	66,102	66,235	66,368	66,501	
Dougherty	7,495	7,496	7,501	7,519	7,530	7,541	7,551	7,562	7,574	7,586	7,597	
Douglas	15,046	15,060	15,071	15,088	15,105	15,122	15,139	15,155	15,171	15,186	15,202	
Fulton	96,305	96,443	96,559	96,669	96,799	96,926	97,053	97,177	97,300	97,428	97,552	
Gwinnett	100,815	100,888	100,985	101,091	101,199	101,305	101,407	101,509	101,608	101,707	101,805	
Hall	27,045	27,062	27,080	27,102	27,124	27,146	27,168	27,190	27,211	27,233	27,254	
Henry	25,000	25,025	25,057	25,092	25,128	25,166	25,202	25,238	25,273	25,309	25,344	
Lee	2,713	2,714	2,716	2,718	2,720	2,722	2,723	2,726	2,728	2,730	2,732	

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:											
	5/1	5/2	5/3	5/4	5/6				5/8				5/10			
Bartow	14,569	14,580	14,587	14,591	14,619	(2,924)	[702]	{351}	14,645	(2,929)	[703]	{351}	14,670	(2,934)	[704]	{352}
Carroll	11,285	11,288	11,300	11,311	11,326	(2,265)	[544]	{272}	11,341	(2,268)	[544]	{272}	11,356	(2,271)	[545]	{273}
Cherokee	30,739	30,763	30,789	30,824	30,882	(6,176)	[1,482]	{741}	30,938	(6,188)	[1,485]	{743}	30,994	(6,199)	[1,488]	{744}
Clarke	14,967	14,975	14,979	14,994	15,012	(3,002)	[721]	{360}	15,031	(3,006)	[721]	{361}	15,048	(3,010)	[722]	{361}
Clayton	26,329	26,357	26,388	26,426	26,516	(5,303)	[1,273]	{636}	26,607	(5,321)	[1,277]	{639}	26,695	(5,339)	[1,281]	{641}
Cobb	77,742	77,809	77,892	77,997	78,191	(15,638)	[3,753]	{1,877}	78,379	(15,676)	[3,762]	{1,881}	78,567	(15,713)	[3,771]	{1,886}
DeKalb	64,924	65,431	65,483	65,589	65,844	(13,169)	[3,160]	{1,580}	66,102	(13,220)	[3,173]	{1,586}	66,368	(13,274)	[3,186]	{1,593}
Dougherty	7,495	7,496	7,501	7,519	7,541	(1,508)	[362]	{181}	7,562	(1,512)	[363]	{181}	7,586	(1,517)	[364]	{182}
Douglas	15,046	15,060	15,071	15,088	15,122	(3,024)	[726]	{363}	15,155	(3,031)	[727]	{364}	15,186	(3,037)	[729]	{364}
Fulton	96,305	96,443	96,559	96,669	96,926	(19,385)	[4,652]	{2,326}	97,177	(19,435)	[4,665]	{2,332}	97,428	(19,486)	[4,677]	{2,338}
Gwinnett	100,815	100,888	100,985	101,091	101,305	(20,261)	[4,863]	{2,431}	101,509	(20,302)	[4,872]	{2,436}	101,707	(20,341)	[4,882]	{2,441}
Hall	27,045	27,062	27,080	27,102	27,146	(5,429)	[1,303]	{652}	27,190	(5,438)	[1,305]	{653}	27,233	(5,447)	[1,307]	{654}
Henry	25,000	25,025	25,057	25,092	25,166	(5,033)	[1,208]	{604}	25,238	(5,048)	[1,211]	{606}	25,309	(5,062)	[1,215]	{607}
Lee	2,713	2,714	2,716	2,718	2,722	(544)	[131]	{65}	2,726	(545)	[131]	{65}	2,730	(546)	[131]	{66}

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.