

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

Date: 4/7/21

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 4/7/21 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.

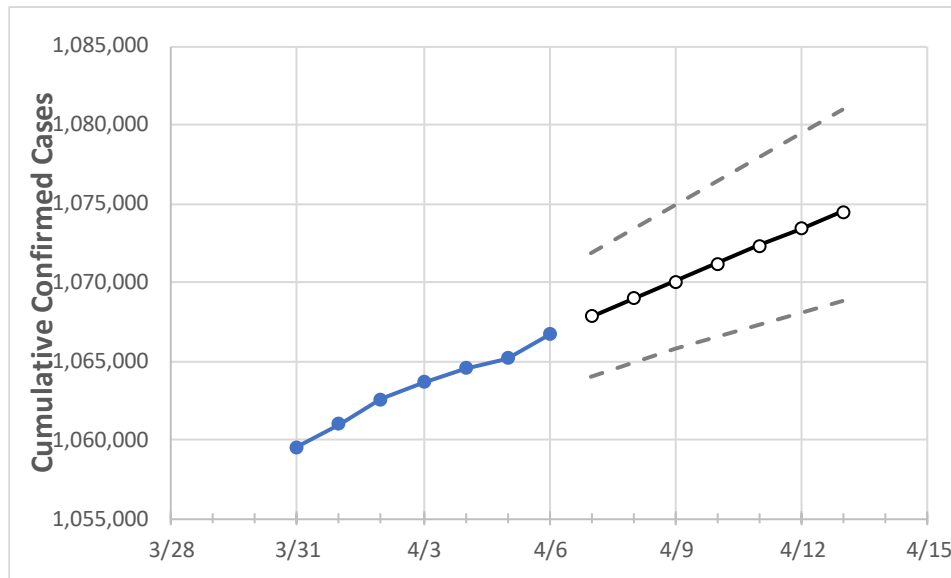
IEM's Modeling Lead

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:							
	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	
Georgia	1,063,680	1,064,554	1,065,197	1,066,671	1,067,816	1,068,963	1,070,072	1,071,207	1,072,321	1,073,418	1,074,487	

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:							
	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	
Bartow	14,021	14,038	14,054	14,065	14,085	14,105	14,124	14,142	14,161	14,179	14,196	
Carroll	10,997	11,003	11,007	11,026	11,042	11,058	11,075	11,091	11,108	11,125	11,141	
Cherokee	29,687	29,715	29,755	29,802	29,856	29,910	29,962	30,014	30,064	30,113	30,162	
Clarke	14,637	14,651	14,657	14,673	14,684	14,695	14,705	14,716	14,726	14,737	14,747	
Clayton	24,884	24,921	24,945	24,991	25,029	25,067	25,104	25,141	25,178	25,216	25,252	
Cobb	74,471	74,575	74,644	74,769	74,897	75,022	75,149	75,273	75,394	75,514	75,633	
DeKalb	61,635	61,707	61,819	61,930	62,044	62,157	62,272	62,382	62,488	62,597	62,706	
Dougherty	7,267	7,269	7,272	7,275	7,282	7,288	7,295	7,302	7,308	7,315	7,322	
Douglas	14,349	14,361	14,373	14,401	14,424	14,447	14,469	14,492	14,514	14,536	14,557	
Fulton	92,237	92,356	92,437	92,613	92,750	92,885	93,018	93,146	93,275	93,401	93,524	
Gwinnett	97,212	97,296	97,354	97,496	97,601	97,706	97,811	97,911	98,012	98,110	98,209	
Hall	26,407	26,429	26,444	26,473	26,495	26,517	26,539	26,560	26,582	26,602	26,623	
Henry	23,804	23,833	23,853	23,893	23,925	23,956	23,987	24,017	24,047	24,074	24,102	
Lee	2,669	2,670	2,670	2,674	2,676	2,677	2,679	2,680	2,682	2,683	2,685	

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:											
	4/3	4/4	4/5	4/6	4/8				4/10				4/12			
Bartow	14,021	14,038	14,054	14,065	14,105	(2,821)	[677]	{339}	14,142	(2,828)	[679]	{339}	14,179	(2,836)	[681]	{340}
Carroll	10,997	11,003	11,007	11,026	11,058	(2,212)	[531]	{265}	11,091	(2,218)	[532]	{266}	11,125	(2,225)	[534]	{267}
Cherokee	29,687	29,715	29,755	29,802	29,910	(5,982)	[1,436]	{718}	30,014	(6,003)	[1,441]	{720}	30,113	(6,023)	[1,445]	{723}
Clarke	14,637	14,651	14,657	14,673	14,695	(2,939)	[705]	{353}	14,716	(2,943)	[706]	{353}	14,737	(2,947)	[707]	{354}
Clayton	24,884	24,921	24,945	24,991	25,067	(5,013)	[1,203]	{602}	25,141	(5,028)	[1,207]	{603}	25,216	(5,043)	[1,210]	{605}
Cobb	74,471	74,575	74,644	74,769	75,022	(15,004)	[3,601]	{1,801}	75,273	(15,055)	[3,613]	{1,807}	75,514	(15,103)	[3,625]	{1,812}
DeKalb	61,635	61,707	61,819	61,930	62,157	(12,431)	[2,984]	{1,492}	62,382	(12,476)	[2,994]	{1,497}	62,597	(12,519)	[3,005]	{1,502}
Dougherty	7,267	7,269	7,272	7,275	7,288	(1,458)	[350]	{175}	7,302	(1,460)	[350]	{175}	7,315	(1,463)	[351]	{176}
Douglas	14,349	14,361	14,373	14,401	14,447	(2,889)	[693]	{347}	14,492	(2,898)	[696]	{348}	14,536	(2,907)	[698]	{349}
Fulton	92,237	92,356	92,437	92,613	92,885	(18,577)	[4,458]	{2,229}	93,146	(18,629)	[4,471]	{2,235}	93,401	(18,680)	[4,483]	{2,242}
Gwinnett	97,212	97,296	97,354	97,496	97,706	(19,541)	[4,690]	{2,345}	97,911	(19,582)	[4,700]	{2,350}	98,110	(19,622)	[4,709]	{2,355}
Hall	26,407	26,429	26,444	26,473	26,517	(5,303)	[1,273]	{636}	26,560	(5,312)	[1,275]	{637}	26,602	(5,320)	[1,277]	{638}
Henry	23,804	23,833	23,853	23,893	23,956	(4,791)	[1,150]	{575}	24,017	(4,803)	[1,153]	{576}	24,074	(4,815)	[1,156]	{578}
Lee	2,669	2,670	2,670	2,674	2,677	(535)	[129]	{64}	2,680	(536)	[129]	{64}	2,683	(537)	[129]	{64}

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.