

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

Date: 7/7/21

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 7/7/21 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.

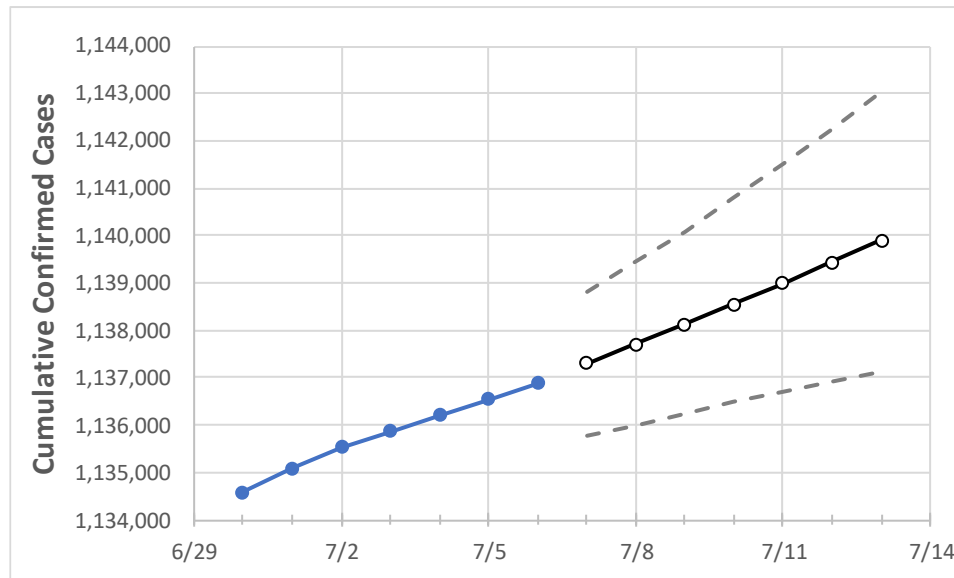
IEM's Modeling Lead

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Georgia	1,135,868	1,136,210	1,136,551	1,136,893	1,137,297	1,137,706	1,138,131	1,138,558	1,138,989	1,139,447	1,139,894

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Bartow	14,975	14,979	14,983	14,987	14,991	14,996	15,000	15,004	15,009	15,013	15,017
Carroll	11,587	11,593	11,598	11,603	11,608	11,613	11,617	11,622	11,627	11,632	11,638
Cherokee	31,598	31,607	31,616	31,625	31,635	31,645	31,656	31,666	31,677	31,688	31,699
Clarke	15,219	15,223	15,228	15,232	15,236	15,239	15,242	15,246	15,249	15,253	15,257
Clayton	27,557	27,568	27,580	27,591	27,602	27,614	27,625	27,636	27,647	27,658	27,669
Cobb	80,366	80,388	80,410	80,432	80,459	80,486	80,514	80,543	80,573	80,602	80,632
DeKalb	67,348	67,366	67,383	67,400	67,413	67,425	67,437	67,449	67,460	67,471	67,481
Dougherty	7,726	7,728	7,729	7,731	7,734	7,737	7,740	7,743	7,746	7,749	7,752
Douglas	15,637	15,640	15,642	15,645	15,650	15,655	15,660	15,665	15,670	15,675	15,680
Fulton	99,485	99,520	99,555	99,590	99,626	99,664	99,703	99,742	99,781	99,821	99,861
Gwinnett	103,412	103,434	103,455	103,476	103,503	103,530	103,558	103,585	103,614	103,643	103,672
Hall	27,833	27,840	27,846	27,853	27,860	27,867	27,875	27,882	27,890	27,897	27,905
Henry	25,987	25,998	26,008	26,019	26,026	26,033	26,039	26,046	26,053	26,059	26,065
Lee	2,771	2,772	2,773	2,774	2,775	2,776	2,777	2,778	2,779	2,780	2,782

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:											
	7/3	7/4	7/5	7/6	7/8				7/10				7/12			
Bartow	14,975	14,979	14,983	14,987	14,996	(2,999)	[720]	{360}	15,004	(3,001)	[720]	{360}	15,013	(3,003)	[721]	{360}
Carroll	11,587	11,593	11,598	11,603	11,613	(2,323)	[557]	{279}	11,622	(2,324)	[558]	{279}	11,632	(2,326)	[558]	{279}
Cherokee	31,598	31,607	31,616	31,625	31,645	(6,329)	[1,519]	{759}	31,666	(6,333)	[1,520]	{760}	31,688	(6,338)	[1,521]	{761}
Clarke	15,219	15,223	15,228	15,232	15,239	(3,048)	[731]	{366}	15,246	(3,049)	[732]	{366}	15,253	(3,051)	[732]	{366}
Clayton	27,557	27,568	27,580	27,591	27,614	(5,523)	[1,325]	{663}	27,636	(5,527)	[1,327]	{663}	27,658	(5,532)	[1,328]	{664}
Cobb	80,366	80,388	80,410	80,432	80,486	(16,097)	[3,863]	{1,932}	80,543	(16,109)	[3,866]	{1,933}	80,602	(16,120)	[3,869]	{1,934}
DeKalb	67,348	67,366	67,383	67,400	67,425	(13,485)	[3,236]	{1,618}	67,449	(13,490)	[3,238]	{1,619}	67,471	(13,494)	[3,239]	{1,619}
Dougherty	7,726	7,728	7,729	7,731	7,737	(1,547)	[371]	{186}	7,743	(1,549)	[372]	{186}	7,749	(1,550)	[372]	{186}
Douglas	15,637	15,640	15,642	15,645	15,655	(3,131)	[751]	{376}	15,665	(3,133)	[752]	{376}	15,675	(3,135)	[752]	{376}
Fulton	99,485	99,520	99,555	99,590	99,664	(19,933)	[4,784]	{2,392}	99,742	(19,948)	[4,788]	{2,394}	99,821	(19,964)	[4,791]	{2,396}
Gwinnett	103,412	103,434	103,455	103,476	103,530	(20,706)	[4,969]	{2,485}	103,585	(20,717)	[4,972]	{2,486}	103,643	(20,729)	[4,975]	{2,487}
Hall	27,833	27,840	27,846	27,853	27,867	(5,573)	[1,338]	{669}	27,882	(5,576)	[1,338]	{669}	27,897	(5,579)	[1,339]	{670}
Henry	25,987	25,998	26,008	26,019	26,033	(5,207)	[1,250]	{625}	26,046	(5,209)	[1,250]	{625}	26,059	(5,212)	[1,251]	{625}
Lee	2,771	2,772	2,773	2,774	2,776	(555)	[133]	{67}	2,778	(556)	[133]	{67}	2,780	(556)	[133]	{67}

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.