

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

Date: 7/9/21

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 7/9/21 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.

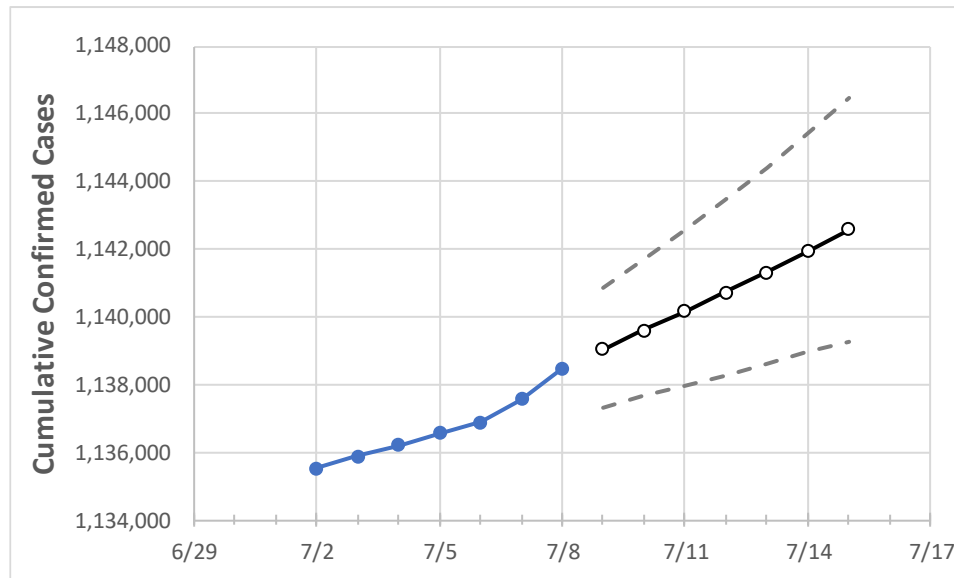
IEM's Modeling Lead

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Georgia	1,136,551	1,136,893	1,137,560	1,138,492	1,139,036	1,139,588	1,140,152	1,140,726	1,141,326	1,141,949	1,142,580

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Bartow	14,983	14,987	14,995	15,009	15,015	15,022	15,029	15,036	15,043	15,051	15,058
Carroll	11,598	11,603	11,610	11,620	11,626	11,633	11,640	11,647	11,655	11,663	11,671
Cherokee	31,616	31,625	31,640	31,650	31,661	31,673	31,685	31,697	31,709	31,722	31,736
Clarke	15,228	15,232	15,242	15,259	15,268	15,277	15,286	15,297	15,309	15,321	15,335
Clayton	27,580	27,591	27,605	27,627	27,642	27,657	27,671	27,686	27,702	27,719	27,735
Cobb	80,410	80,432	80,490	80,560	80,599	80,639	80,680	80,724	80,769	80,814	80,862
DeKalb	67,383	67,400	67,423	67,447	67,463	67,478	67,493	67,508	67,523	67,538	67,553
Dougherty	7,729	7,731	7,732	7,735	7,738	7,740	7,743	7,746	7,748	7,751	7,754
Douglas	15,642	15,645	15,648	15,656	15,661	15,666	15,671	15,677	15,682	15,687	15,692
Fulton	99,555	99,590	99,632	99,714	99,762	99,811	99,864	99,917	99,973	100,031	100,090
Gwinnett	103,455	103,476	103,518	103,604	103,644	103,685	103,728	103,773	103,820	103,869	103,921
Hall	27,846	27,853	27,880	27,896	27,907	27,920	27,932	27,944	27,957	27,972	27,986
Henry	26,008	26,019	26,031	26,048	26,059	26,070	26,081	26,093	26,105	26,117	26,129
Lee	2,773	2,774	2,776	2,778	2,779	2,780	2,782	2,783	2,784	2,786	2,787

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:											
	7/5	7/6	7/7	7/8	7/10				7/12				7/14			
Bartow	14,983	14,987	14,995	15,009	15,022	(3,004)	[721]	{361}	15,036	(3,007)	[722]	{361}	15,051	(3,010)	[722]	{361}
Carroll	11,598	11,603	11,610	11,620	11,633	(2,327)	[558]	{279}	11,647	(2,329)	[559]	{280}	11,663	(2,333)	[560]	{280}
Cherokee	31,616	31,625	31,640	31,650	31,673	(6,335)	[1,520]	{760}	31,697	(6,339)	[1,521]	{761}	31,722	(6,344)	[1,523]	{761}
Clarke	15,228	15,232	15,242	15,259	15,277	(3,055)	[733]	{367}	15,297	(3,059)	[734]	{367}	15,321	(3,064)	[735]	{368}
Clayton	27,580	27,591	27,605	27,627	27,657	(5,531)	[1,328]	{664}	27,686	(5,537)	[1,329]	{664}	27,719	(5,544)	[1,330]	{665}
Cobb	80,410	80,432	80,490	80,560	80,639	(16,128)	[3,871]	{1,935}	80,724	(16,145)	[3,875]	{1,937}	80,814	(16,163)	[3,879]	{1,940}
DeKalb	67,383	67,400	67,423	67,447	67,478	(13,496)	[3,239]	{1,619}	67,508	(13,502)	[3,240]	{1,620}	67,538	(13,508)	[3,242]	{1,621}
Dougherty	7,729	7,731	7,732	7,735	7,740	(1,548)	[372]	{186}	7,746	(1,549)	[372]	{186}	7,751	(1,550)	[372]	{186}
Douglas	15,642	15,645	15,648	15,656	15,666	(3,133)	[752]	{376}	15,677	(3,135)	[752]	{376}	15,687	(3,137)	[753]	{376}
Fulton	99,555	99,590	99,632	99,714	99,811	(19,962)	[4,791]	{2,395}	99,917	(19,983)	[4,796]	{2,398}	100,031	(20,006)	[4,801]	{2,401}
Gwinnett	103,455	103,476	103,518	103,604	103,685	(20,737)	[4,977]	{2,488}	103,773	(20,755)	[4,981]	{2,491}	103,869	(20,774)	[4,986]	{2,493}
Hall	27,846	27,853	27,880	27,896	27,920	(5,584)	[1,340]	{670}	27,944	(5,589)	[1,341]	{671}	27,972	(5,594)	[1,343]	{671}
Henry	26,008	26,019	26,031	26,048	26,070	(5,214)	[1,251]	{626}	26,093	(5,219)	[1,252]	{626}	26,117	(5,223)	[1,254]	{627}
Lee	2,773	2,774	2,776	2,778	2,780	(556)	[133]	{67}	2,783	(557)	[134]	{67}	2,786	(557)	[134]	{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.