IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/9/21

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 <u>not</u> 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 3/9/21 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
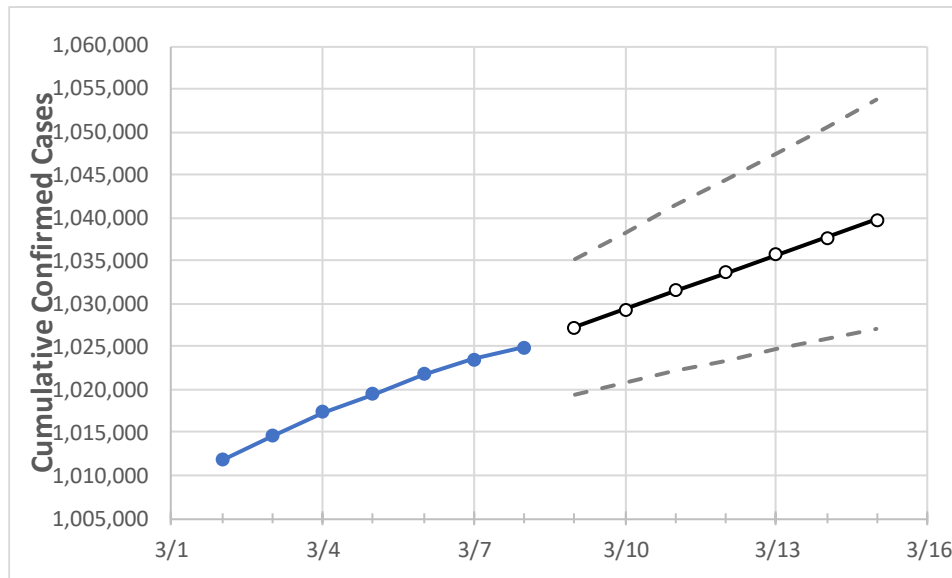
	Actual Confirmed Cases On:				Projected Cases For:						
	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15
Georgia	1,019,509	1,021,778	1,023,487	1,024,931	1,027,204	1,029,336	1,031,499	1,033,625	1,035,720	1,037,740	1,039,736

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:						
	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15
Bartow	13,156	13,211	13,233	13,257	13,285	13,312	13,338	13,362	13,386	13,409	13,431
Carroll	10,611	10,627	10,643	10,650	10,661	10,670	10,679	10,688	10,696	10,703	10,711
Cherokee	27,786	27,858	27,924	27,956	28,019	28,081	28,141	28,200	28,254	28,305	28,355
Clarke	14,256	14,261	14,273	14,289	14,311	14,334	14,355	14,376	14,396	14,418	14,438
Clayton	23,572	23,621	23,654	23,706	23,762	23,816	23,868	23,919	23,968	24,015	24,060
Cobb	70,417	70,607	70,781	70,920	71,089	71,254	71,418	71,583	71,743	71,900	72,053
DeKalb	57,841	58,026	58,143	58,234	58,383	58,527	58,672	58,813	58,956	59,091	59,230
Dougherty	7,092	7,097	7,100	7,103	7,109	7,113	7,118	7,122	7,126	7,130	7,134
Douglas	13,602	13,663	13,689	13,704	13,737	13,768	13,799	13,829	13,858	13,887	13,917
Fulton	87,076	87,372	87,609	87,833	88,128	88,424	88,723	89,018	89,312	89,613	89,907
Gwinnett	93,360	93,536	93,720	93,839	94,041	94,243	94,442	94,634	94,822	95,011	95,194
Hall	25,682	25,709	25,728	25,753	25,783	25,812	25,840	25,868	25,894	25,920	25,944
Henry	22,238	22,324	22,398	22,502	22,619	22,738	22,858	22,980	23,102	23,225	23,350
Lee	2,603	2,604	2,610	2,610	2,614	2,619	2,624	2,628	2,633	2,637	2,641

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:		
	3/5	3/6	3/7	3/8	3/10	3/12	3/14
Bartow	13,156	13,211	13,233	13,257	13,312 (2,662) [639] {319}	13,362 (2,672) [641] {321}	13,409 (2,682) [644] {322}
Carroll	10,611	10,627	10,643	10,650	10,670 (2,134) [512] {256}	10,688 (2,138) [513] {257}	10,703 (2,141) [514] {257}
Cherokee	27,786	27,858	27,924	27,956	28,081 (5,616) [1,348] {674}	28,200 (5,640) [1,354] {677}	28,305 (5,661) [1,359] {679}
Clarke	14,256	14,261	14,273	14,289	14,334 (2,867) [688] {344}	14,376 (2,875) [690] {345}	14,418 (2,884) [692] {346}
Clayton	23,572	23,621	23,654	23,706	23,816 (4,763) [1,143] {572}	23,919 (4,784) [1,148] {574}	24,015 (4,803) [1,153] {576}
Cobb	70,417	70,607	70,781	70,920	71,254 (14,251) [3,420] {1,710}	71,583 (14,317) [3,436] {1,718}	71,900 (14,380) [3,451] {1,726}
DeKalb	57,841	58,026	58,143	58,234	58,527 (11,705) [2,809] {1,405}	58,813 (11,763) [2,823] {1,412}	59,091 (11,818) [2,836] {1,418}
Dougherty	7,092	7,097	7,100	7,103	7,113 (1,423) [341] {171}	7,122 (1,424) [342] {171}	7,130 (1,426) [342] {171}
Douglas	13,602	13,663	13,689	13,704	13,768 (2,754) [661] {330}	13,829 (2,766) [664] {332}	13,887 (2,777) [667] {333}
Fulton	87,076	87,372	87,609	87,833	88,424 (17,685) [4,244] {2,122}	89,018 (17,804) [4,273] {2,136}	89,613 (17,923) [4,301] {2,151}
Gwinnett	93,360	93,536	93,720	93,839	94,243 (18,849) [4,524] {2,262}	94,634 (18,927) [4,542] {2,271}	95,011 (19,002) [4,561] {2,280}
Hall	25,682	25,709	25,728	25,753	25,812 (5,162) [1,239] {619}	25,868 (5,174) [1,242] {621}	25,920 (5,184) [1,244] {622}
Henry	22,238	22,324	22,398	22,502	22,738 (4,548) [1,091] {546}	22,980 (4,596) [1,103] {552}	23,225 (4,645) [1,115] {557}
Lee	2,603	2,604	2,610	2,610	2,619 (524) [126] {63}	2,628 (526) [126] {63}	2,637 (527) [127] {63}

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.