IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/6/21

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 10/6/21 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
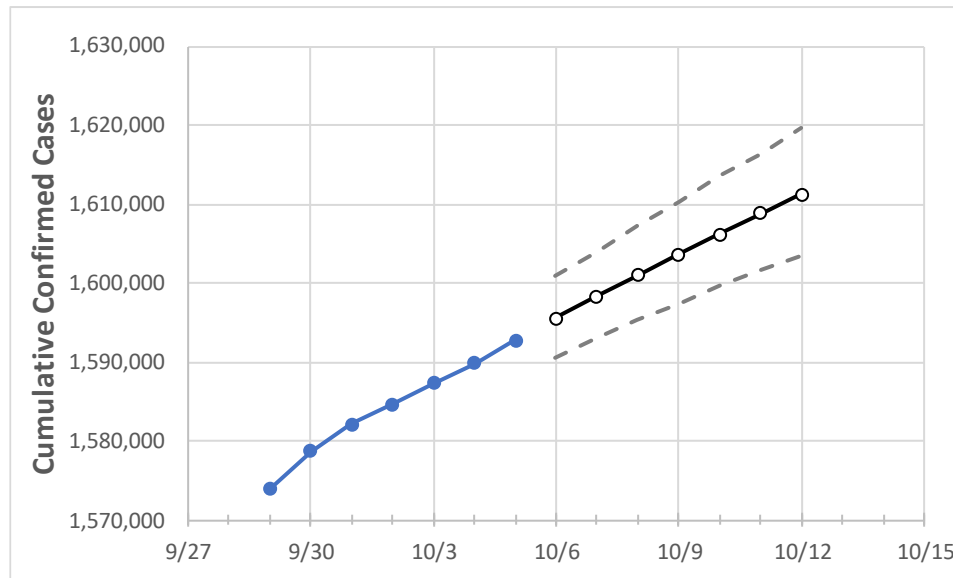
	Actual Confirmed Cases On:				Projected Cases For:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Georgia	1,584,661	1,587,259	1,589,857	1,592,731	1,595,563	1,598,321	1,601,009	1,603,655	1,606,215	1,608,805	1,611,284

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Bartow	19,811	19,842	19,873	19,907	19,943	19,977	20,010	20,043	20,076	20,108	20,139
Carroll	16,031	16,046	16,061	16,087	16,105	16,122	16,138	16,154	16,169	16,184	16,198
Cherokee	42,269	42,320	42,370	42,420	42,476	42,529	42,580	42,632	42,681	42,728	42,772
Clarke	19,626	19,649	19,673	19,687	19,710	19,732	19,754	19,775	19,795	19,814	19,834
Clayton	38,031	38,081	38,130	38,206	38,274	38,339	38,403	38,464	38,525	38,584	38,641
Cobb	105,658	105,791	105,925	106,065	106,214	106,356	106,496	106,633	106,758	106,894	107,018
DeKalb	88,171	88,389	88,606	88,840	89,063	89,289	89,503	89,717	89,937	90,156	90,370
Dougherty	11,975	12,003	12,031	12,055	12,086	12,116	12,145	12,175	12,203	12,232	12,259
Douglas	21,556	21,588	21,620	21,651	21,684	21,715	21,745	21,774	21,803	21,831	21,859
Fulton	128,305	128,524	128,743	128,940	129,162	129,374	129,579	129,795	129,999	130,196	130,402
Gwinnett	128,193	128,558	128,924	129,254	129,620	129,981	130,336	130,701	131,074	131,449	131,807
Hall	36,514	36,579	36,644	36,728	36,801	36,873	36,943	37,009	37,076	37,140	37,205
Henry	36,877	36,942	37,007	37,070	37,138	37,207	37,271	37,335	37,399	37,462	37,522
Lee	4,539	4,544	4,548	4,555	4,562	4,569	4,575	4,582	4,588	4,594	4,600

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:		
	10/2	10/3	10/4	10/5	10/7	10/9	10/11
Bartow	19,811	19,842	19,873	19,907	19,977 (3,995) [959] {479}	20,043 (4,009) [962] {481}	20,108 (4,022) [965] {483}
Carroll	16,031	16,046	16,061	16,087	16,122 (3,224) [774] {387}	16,154 (3,231) [775] {388}	16,184 (3,237) [777] {388}
Cherokee	42,269	42,320	42,370	42,420	42,529 (8,506) [2,041] {1,021}	42,632 (8,526) [2,046] {1,023}	42,728 (8,546) [2,051] {1,025}
Clarke	19,626	19,649	19,673	19,687	19,732 (3,946) [947] {474}	19,775 (3,955) [949] {475}	19,814 (3,963) [951] {476}
Clayton	38,031	38,081	38,130	38,206	38,339 (7,668) [1,840] {920}	38,464 (7,693) [1,846] {923}	38,584 (7,717) [1,852] {926}
Cobb	105,658	105,791	105,925	106,065	106,356 (21,271) [5,105] {2,553}	106,633 (21,327) [5,118] {2,559}	106,894 (21,379) [5,131] {2,565}
DeKalb	88,171	88,389	88,606	88,840	89,289 (17,858) [4,286] {2,143}	89,717 (17,943) [4,306] {2,153}	90,156 (18,031) [4,328] {2,164}
Dougherty	11,975	12,003	12,031	12,055	12,116 (2,423) [582] {291}	12,175 (2,435) [584] {292}	12,232 (2,446) [587] {294}
Douglas	21,556	21,588	21,620	21,651	21,715 (4,343) [1,042] {521}	21,774 (4,355) [1,045] {523}	21,831 (4,366) [1,048] {524}
Fulton	128,305	128,524	128,743	128,940	129,374 (25,875) [6,210] {3,105}	129,795 (25,959) [6,230] {3,115}	130,196 (26,039) [6,249] {3,125}
Gwinnett	128,193	128,558	128,924	129,254	129,981 (25,996) [6,239] {3,120}	130,701 (26,140) [6,274] {3,137}	131,449 (26,290) [6,310] {3,155}
Hall	36,514	36,579	36,644	36,728	36,873 (7,375) [1,770] {885}	37,009 (7,402) [1,776] {888}	37,140 (7,428) [1,783] {891}
Henry	36,877	36,942	37,007	37,070	37,207 (7,441) [1,786] {893}	37,335 (7,467) [1,792] {896}	37,462 (7,492) [1,798] {899}
Lee	4,539	4,544	4,548	4,555	4,569 (914) [219] {110}	4,582 (916) [220] {110}	4,594 (919) [221] {110}

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.