IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/26/21

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 7/26/21 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
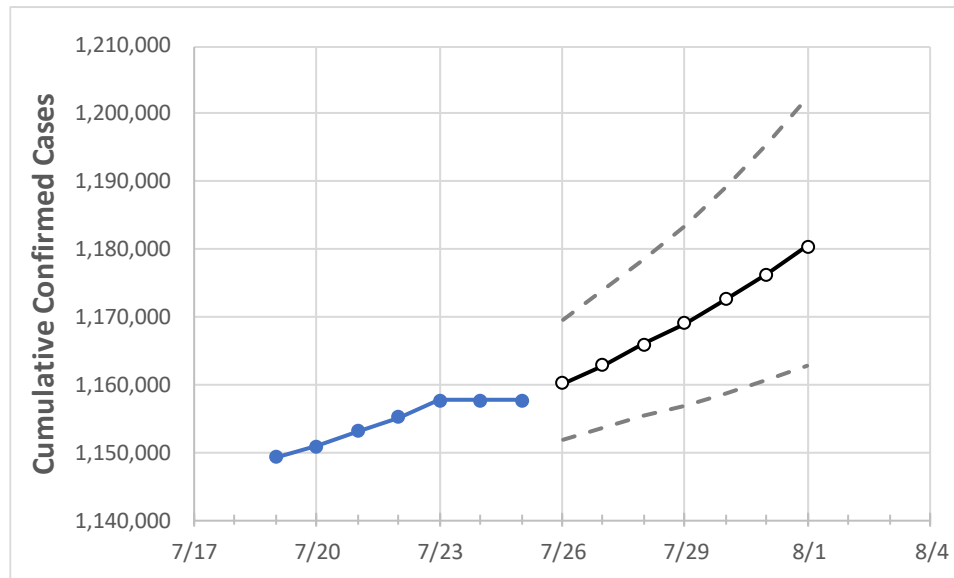
	Actual Confirmed Cases On:				Projected Cases For:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Georgia	1,155,208	1,157,705	1,157,705	1,157,705	1,160,209	1,162,903	1,165,909	1,169,097	1,172,591	1,176,303	1,180,420

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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Bartow	15,239	15,266	15,266	15,266	15,300	15,337	15,377	15,420	15,466	15,517	15,571
Carroll	11,780	11,803	11,803	11,803	11,825	11,850	11,876	11,905	11,935	11,967	12,003
Cherokee	31,951	32,012	32,012	32,012	32,057	32,104	32,154	32,208	32,266	32,330	32,400
Clarke	15,391	15,415	15,415	15,415	15,436	15,459	15,483	15,510	15,538	15,568	15,602
Clayton	28,049	28,123	28,123	28,123	28,185	28,252	28,323	28,400	28,479	28,565	28,659
Cobb	81,669	81,822	81,822	81,822	81,975	82,144	82,322	82,519	82,728	82,951	83,191
DeKalb	68,363	68,508	68,508	68,508	68,655	68,817	68,998	69,193	69,411	69,641	69,897
Dougherty	7,816	7,828	7,828	7,828	7,839	7,851	7,863	7,877	7,891	7,907	7,923
Douglas	15,906	15,944	15,944	15,944	15,983	16,028	16,075	16,126	16,182	16,244	16,311
Fulton	101,131	101,346	101,346	101,346	101,558	101,782	102,029	102,296	102,584	102,894	103,227
Gwinnett	104,683	104,836	104,836	104,836	104,983	105,139	105,306	105,485	105,678	105,889	106,112
Hall	28,138	28,180	28,180	28,180	28,217	28,256	28,298	28,342	28,390	28,442	28,497
Henry	26,604	26,678	26,678	26,678	26,772	26,873	26,985	27,109	27,243	27,391	27,551
Lee	2,852	2,864	2,864	2,864	2,875	2,888	2,901	2,916	2,932	2,950	2,969

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:		
	7/22	7/23	7/24	7/25	7/27	7/29	7/31
Bartow	15,239	15,266	15,266	15,266	15,337 (3,067) [736] {368}	15,420 (3,084) [740] {370}	15,517 (3,103) [745] {372}
Carroll	11,780	11,803	11,803	11,803	11,850 (2,370) [569] {284}	11,905 (2,381) [571] {286}	11,967 (2,393) [574] {287}
Cherokee	31,951	32,012	32,012	32,012	32,104 (6,421) [1,541] {770}	32,208 (6,442) [1,546] {773}	32,330 (6,466) [1,552] {776}
Clarke	15,391	15,415	15,415	15,415	15,459 (3,092) [742] {371}	15,510 (3,102) [744] {372}	15,568 (3,114) [747] {374}
Clayton	28,049	28,123	28,123	28,123	28,252 (5,650) [1,356] {678}	28,400 (5,680) [1,363] {682}	28,565 (5,713) [1,371] {686}
Cobb	81,669	81,822	81,822	81,822	82,144 (16,429) [3,943] {1,971}	82,519 (16,504) [3,961] {1,980}	82,951 (16,590) [3,982] {1,991}
DeKalb	68,363	68,508	68,508	68,508	68,817 (13,763) [3,303] {1,652}	69,193 (13,839) [3,321] {1,661}	69,641 (13,928) [3,343] {1,671}
Dougherty	7,816	7,828	7,828	7,828	7,851 (1,570) [377] {188}	7,877 (1,575) [378] {189}	7,907 (1,581) [380] {190}
Douglas	15,906	15,944	15,944	15,944	16,028 (3,206) [769] {385}	16,126 (3,225) [774] {387}	16,244 (3,249) [780] {390}
Fulton	101,131	101,346	101,346	101,346	101,782 (20,356) [4,886] {2,443}	102,296 (20,459) [4,910] {2,455}	102,894 (20,579) [4,939] {2,469}
Gwinnett	104,683	104,836	104,836	104,836	105,139 (21,028) [5,047] {2,523}	105,485 (21,097) [5,063] {2,532}	105,889 (21,178) [5,083] {2,541}
Hall	28,138	28,180	28,180	28,180	28,256 (5,651) [1,356] {678}	28,342 (5,668) [1,360] {680}	28,442 (5,688) [1,365] {683}
Henry	26,604	26,678	26,678	26,678	26,873 (5,375) [1,290] {645}	27,109 (5,422) [1,301] {651}	27,391 (5,478) [1,315] {657}
Lee	2,852	2,864	2,864	2,864	2,888 (578) [139] {69}	2,916 (583) [140] {70}	2,950 (590) [142] {71}

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.