IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/18/21

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 8/18/21 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
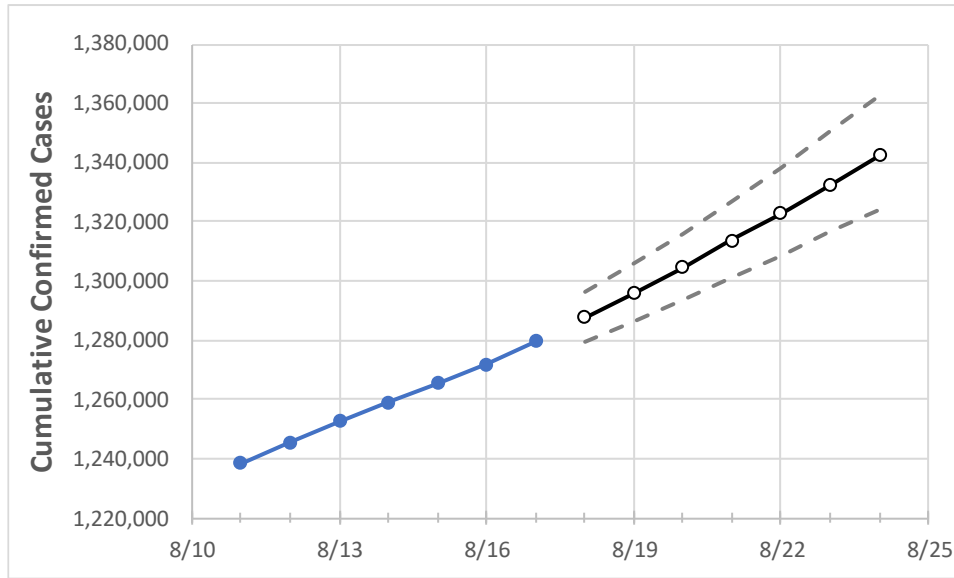
	Actual Confirmed Cases On:				Projected Cases For:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Georgia	1,259,081	1,265,548	1,272,014	1,279,653	1,287,699	1,295,974	1,304,735	1,313,589	1,322,824	1,332,422	1,342,421

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Bartow	16,105	16,152	16,198	16,257	16,321	16,387	16,455	16,523	16,596	16,672	16,749
Carroll	12,866	12,935	13,005	13,089	13,164	13,245	13,325	13,407	13,493	13,581	13,673
Cherokee	34,333	34,545	34,757	34,974	35,229	35,503	35,794	36,107	36,445	36,806	37,191
Clarke	16,264	16,318	16,373	16,437	16,505	16,576	16,649	16,724	16,804	16,885	16,970
Clayton	30,577	30,748	30,918	31,006	31,187	31,373	31,568	31,771	31,980	32,201	32,432
Cobb	87,600	88,029	88,458	88,884	89,378	89,892	90,429	90,995	91,577	92,193	92,841
DeKalb	73,639	73,954	74,270	74,572	74,927	75,295	75,673	76,066	76,469	76,877	77,292
Dougherty	8,727	8,769	8,812	8,925	8,998	9,076	9,157	9,240	9,329	9,421	9,516
Douglas	17,263	17,346	17,429	17,537	17,632	17,733	17,838	17,945	18,059	18,174	18,292
Fulton	108,895	109,359	109,824	110,264	110,734	111,220	111,714	112,211	112,716	113,234	113,760
Gwinnett	109,684	110,010	110,337	110,676	111,038	111,407	111,783	112,172	112,575	113,000	113,434
Hall	29,577	29,654	29,732	29,855	29,965	30,077	30,196	30,318	30,444	30,575	30,711
Henry	29,240	29,422	29,604	29,765	29,976	30,195	30,423	30,663	30,917	31,182	31,453
Lee	3,285	3,299	3,314	3,337	3,364	3,390	3,417	3,446	3,474	3,503	3,534

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:		
	8/14	8/15	8/16	8/17	8/19	8/21	8/23
Bartow	16,105	16,152	16,198	16,257	16,387 (3,277) [787] {393}	16,523 (3,305) [793] {397}	16,672 (3,334) [800] {400}
Carroll	12,866	12,935	13,005	13,089	13,245 (2,649) [636] {318}	13,407 (2,681) [644] {322}	13,581 (2,716) [652] {326}
Cherokee	34,333	34,545	34,757	34,974	35,503 (7,101) [1,704] {852}	36,107 (7,221) [1,733] {867}	36,806 (7,361) [1,767] {883}
Clarke	16,264	16,318	16,373	16,437	16,576 (3,315) [796] {398}	16,724 (3,345) [803] {401}	16,885 (3,377) [810] {405}
Clayton	30,577	30,748	30,918	31,006	31,373 (6,275) [1,506] {753}	31,771 (6,354) [1,525] {763}	32,201 (6,440) [1,546] {773}
Cobb	87,600	88,029	88,458	88,884	89,892 (17,978) [4,315] {2,157}	90,995 (18,199) [4,368] {2,184}	92,193 (18,439) [4,425] {2,213}
DeKalb	73,639	73,954	74,270	74,572	75,295 (15,059) [3,614] {1,807}	76,066 (15,213) [3,651] {1,826}	76,877 (15,375) [3,690] {1,845}
Dougherty	8,727	8,769	8,812	8,925	9,076 (1,815) [436] {218}	9,240 (1,848) [443] {222}	9,421 (1,884) [452] {226}
Douglas	17,263	17,346	17,429	17,537	17,733 (3,547) [851] {426}	17,945 (3,589) [861] {431}	18,174 (3,635) [872] {436}
Fulton	108,895	109,359	109,824	110,264	111,220 (22,244) [5,339] {2,669}	112,211 (22,442) [5,386] {2,693}	113,234 (22,647) [5,435] {2,718}
Gwinnett	109,684	110,010	110,337	110,676	111,407 (22,281) [5,348] {2,674}	112,172 (22,434) [5,384] {2,692}	113,000 (22,600) [5,424] {2,712}
Hall	29,577	29,654	29,732	29,855	30,077 (6,015) [1,444] {722}	30,318 (6,064) [1,455] {728}	30,575 (6,115) [1,468] {734}
Henry	29,240	29,422	29,604	29,765	30,195 (6,039) [1,449] {725}	30,663 (6,133) [1,472] {736}	31,182 (6,236) [1,497] {748}
Lee	3,285	3,299	3,314	3,337	3,390 (678) [163] {81}	3,446 (689) [165] {83}	3,503 (701) [168] {84}

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.