IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/16/21

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 7/16/21 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
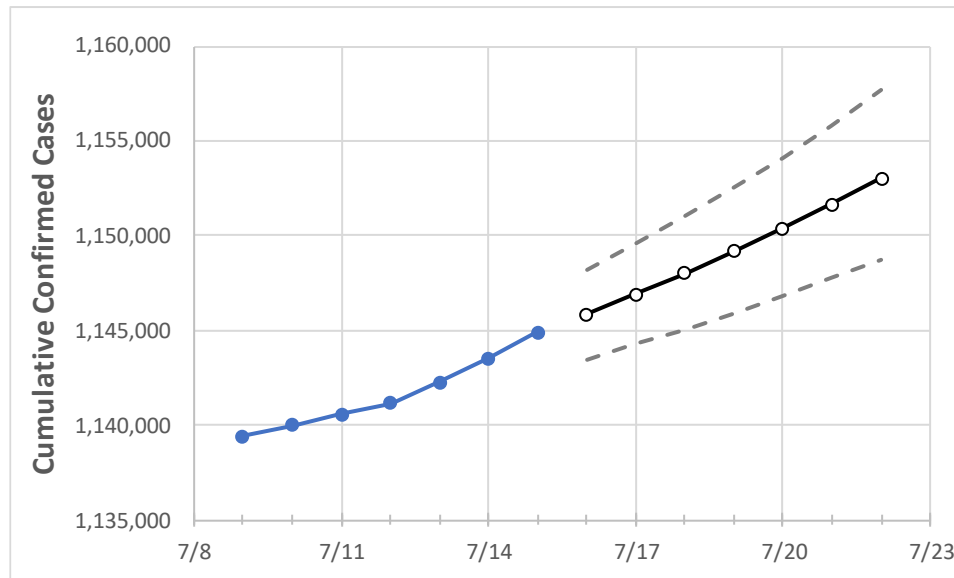
	Actual Confirmed Cases On:				Projected Cases For:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Georgia	1,141,159	1,142,268	1,143,528	1,144,890	1,145,871	1,146,914	1,148,022	1,149,174	1,150,399	1,151,675	1,153,027

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:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Bartow	15,036	15,048	15,067	15,088	15,101	15,115	15,130	15,146	15,163	15,181	15,200
Carroll	11,649	11,658	11,673	11,683	11,694	11,705	11,717	11,730	11,743	11,757	11,772
Cherokee	31,687	31,703	31,736	31,756	31,773	31,791	31,809	31,829	31,849	31,870	31,892
Clarke	15,281	15,289	15,304	15,315	15,326	15,338	15,350	15,364	15,378	15,393	15,409
Clayton	27,695	27,721	27,749	27,779	27,805	27,832	27,862	27,893	27,925	27,960	27,997
Cobb	80,738	80,801	80,899	80,978	81,042	81,111	81,185	81,261	81,341	81,428	81,515
DeKalb	67,592	67,643	67,710	67,765	67,812	67,861	67,914	67,972	68,030	68,093	68,157
Dougherty	7,747	7,757	7,758	7,762	7,765	7,769	7,772	7,776	7,779	7,783	7,786
Douglas	15,699	15,707	15,723	15,736	15,748	15,760	15,773	15,787	15,801	15,816	15,832
Fulton	99,962	100,056	100,168	100,260	100,344	100,432	100,526	100,624	100,726	100,834	100,949
Gwinnett	103,809	103,883	103,973	104,059	104,131	104,209	104,289	104,375	104,467	104,563	104,666
Hall	27,935	27,952	27,969	27,984	27,999	28,015	28,032	28,049	28,068	28,086	28,105
Henry	26,138	26,164	26,195	26,231	26,262	26,294	26,329	26,367	26,407	26,451	26,499
Lee	2,794	2,802	2,809	2,817	2,823	2,829	2,836	2,844	2,852	2,861	2,871

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:		
	7/12	7/13	7/14	7/15	7/17	7/19	7/21
Bartow	15,036	15,048	15,067	15,088	15,115 (3,023) [726] {363}	15,146 (3,029) [727] {364}	15,181 (3,036) [729] {364}
Carroll	11,649	11,658	11,673	11,683	11,705 (2,341) [562] {281}	11,730 (2,346) [563] {282}	11,757 (2,351) [564] {282}
Cherokee	31,687	31,703	31,736	31,756	31,791 (6,358) [1,526] {763}	31,829 (6,366) [1,528] {764}	31,870 (6,374) [1,530] {765}
Clarke	15,281	15,289	15,304	15,315	15,338 (3,068) [736] {368}	15,364 (3,073) [737] {369}	15,393 (3,079) [739] {369}
Clayton	27,695	27,721	27,749	27,779	27,832 (5,566) [1,336] {668}	27,893 (5,579) [1,339] {669}	27,960 (5,592) [1,342] {671}
Cobb	80,738	80,801	80,899	80,978	81,111 (16,222) [3,893] {1,947}	81,261 (16,252) [3,901] {1,950}	81,428 (16,286) [3,909] {1,954}
DeKalb	67,592	67,643	67,710	67,765	67,861 (13,572) [3,257] {1,629}	67,972 (13,594) [3,263] {1,631}	68,093 (13,619) [3,268] {1,634}
Dougherty	7,747	7,757	7,758	7,762	7,769 (1,554) [373] {186}	7,776 (1,555) [373] {187}	7,783 (1,557) [374] {187}
Douglas	15,699	15,707	15,723	15,736	15,760 (3,152) [756] {378}	15,787 (3,157) [758] {379}	15,816 (3,163) [759] {380}
Fulton	99,962	100,056	100,168	100,260	100,432 (20,086) [4,821] {2,410}	100,624 (20,125) [4,830] {2,415}	100,834 (20,167) [4,840] {2,420}
Gwinnett	103,809	103,883	103,973	104,059	104,209 (20,842) [5,002] {2,501}	104,375 (20,875) [5,010] {2,505}	104,563 (20,913) [5,019] {2,510}
Hall	27,935	27,952	27,969	27,984	28,015 (5,603) [1,345] {672}	28,049 (5,610) [1,346] {673}	28,086 (5,617) [1,348] {674}
Henry	26,138	26,164	26,195	26,231	26,294 (5,259) [1,262] {631}	26,367 (5,273) [1,266] {633}	26,451 (5,290) [1,270] {635}
Lee	2,794	2,802	2,809	2,817	2,829 (566) [136] {68}	2,844 (569) [137] {68}	2,861 (572) [137] {69}

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.