IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/14/21

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 7/14/21 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
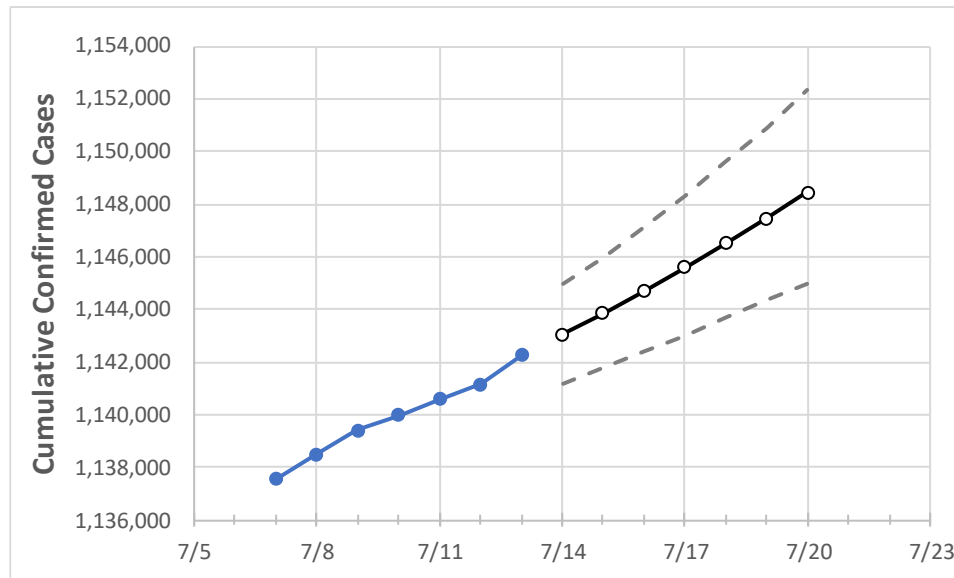
	Actual Confirmed Cases On:				Projected Cases For:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Georgia	1,139,984	1,140,571	1,141,159	1,142,268	1,143,043	1,143,853	1,144,692	1,145,592	1,146,514	1,147,453	1,148,453

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Bartow	15,023	15,030	15,036	15,048	15,057	15,065	15,075	15,084	15,094	15,104	15,114
Carroll	11,635	11,642	11,649	11,658	11,666	11,675	11,684	11,694	11,703	11,714	11,724
Cherokee	31,666	31,676	31,687	31,703	31,715	31,727	31,740	31,752	31,765	31,778	31,792
Clarke	15,270	15,276	15,281	15,289	15,298	15,307	15,316	15,327	15,337	15,349	15,362
Clayton	27,660	27,677	27,695	27,721	27,739	27,757	27,775	27,794	27,814	27,834	27,854
Cobb	80,652	80,695	80,738	80,801	80,853	80,907	80,963	81,021	81,081	81,144	81,207
DeKalb	67,535	67,563	67,592	67,643	67,678	67,714	67,752	67,792	67,833	67,876	67,921
Dougherty	7,743	7,745	7,747	7,757	7,761	7,764	7,768	7,772	7,776	7,780	7,784
Douglas	15,680	15,689	15,699	15,707	15,716	15,725	15,734	15,743	15,753	15,763	15,774
Fulton	99,848	99,905	99,962	100,056	100,124	100,194	100,265	100,340	100,421	100,503	100,588
Gwinnett	103,718	103,764	103,809	103,883	103,941	104,002	104,066	104,132	104,200	104,272	104,346
Hall	27,915	27,925	27,935	27,952	27,966	27,980	27,995	28,011	28,027	28,043	28,060
Henry	26,092	26,115	26,138	26,164	26,186	26,210	26,235	26,262	26,291	26,321	26,353
Lee	2,792	2,793	2,794	2,802	2,806	2,809	2,813	2,817	2,822	2,826	2,831

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:		
	7/10	7/11	7/12	7/13	7/15	7/17	7/19
Bartow	15,023	15,030	15,036	15,048	15,065 (3,013) [723] {362}	15,084 (3,017) [724] {362}	15,104 (3,021) [725] {362}
Carroll	11,635	11,642	11,649	11,658	11,675 (2,335) [560] {280}	11,694 (2,339) [561] {281}	11,714 (2,343) [562] {281}
Cherokee	31,666	31,676	31,687	31,703	31,727 (6,345) [1,523] {761}	31,752 (6,350) [1,524] {762}	31,778 (6,356) [1,525] {763}
Clarke	15,270	15,276	15,281	15,289	15,307 (3,061) [735] {367}	15,327 (3,065) [736] {368}	15,349 (3,070) [737] {368}
Clayton	27,660	27,677	27,695	27,721	27,757 (5,551) [1,332] {666}	27,794 (5,559) [1,334] {667}	27,834 (5,567) [1,336] {668}
Cobb	80,652	80,695	80,738	80,801	80,907 (16,181) [3,884] {1,942}	81,021 (16,204) [3,889] {1,944}	81,144 (16,229) [3,895] {1,947}
DeKalb	67,535	67,563	67,592	67,643	67,714 (13,543) [3,250] {1,625}	67,792 (13,558) [3,254] {1,627}	67,876 (13,575) [3,258] {1,629}
Dougherty	7,743	7,745	7,747	7,757	7,764 (1,553) [373] {186}	7,772 (1,554) [373] {187}	7,780 (1,556) [373] {187}
Douglas	15,680	15,689	15,699	15,707	15,725 (3,145) [755] {377}	15,743 (3,149) [756] {378}	15,763 (3,153) [757] {378}
Fulton	99,848	99,905	99,962	100,056	100,194 (20,039) [4,809] {2,405}	100,340 (20,068) [4,816] {2,408}	100,503 (20,101) [4,824] {2,412}
Gwinnett	103,718	103,764	103,809	103,883	104,002 (20,800) [4,992] {2,496}	104,132 (20,826) [4,998] {2,499}	104,272 (20,854) [5,005] {2,503}
Hall	27,915	27,925	27,935	27,952	27,980 (5,596) [1,343] {672}	28,011 (5,602) [1,345] {672}	28,043 (5,609) [1,346] {673}
Henry	26,092	26,115	26,138	26,164	26,210 (5,242) [1,258] {629}	26,262 (5,252) [1,261] {630}	26,321 (5,264) [1,263] {632}
Lee	2,792	2,793	2,794	2,802	2,809 (562) [135] {67}	2,817 (563) [135] {68}	2,826 (565) [136] {68}

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.