IEM's AI Modeling: Short-term COVID-19 Projections
Date: 4/8/21

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 4/8/21 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
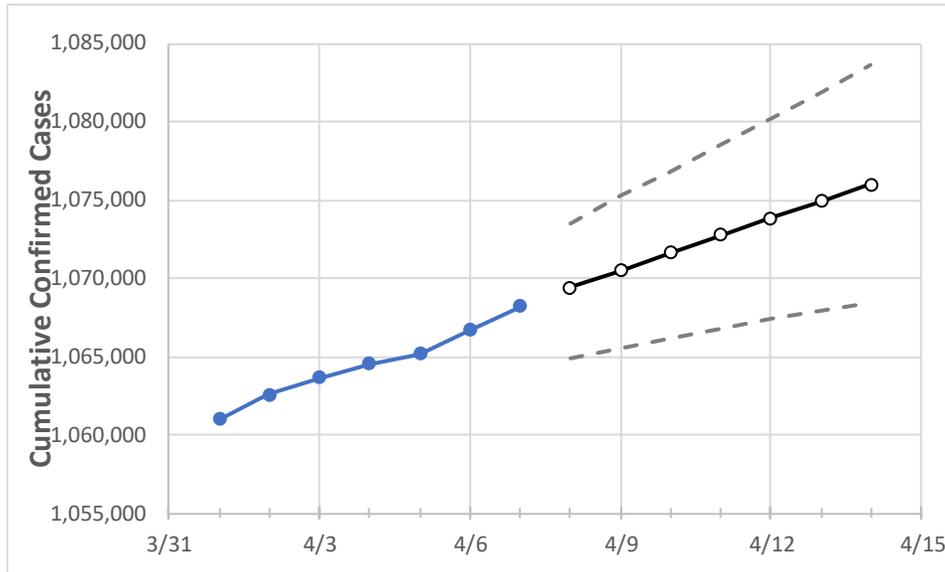
	Actual Confirmed Cases On:				Projected Cases For:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Georgia	1,064,554	1,065,197	1,066,671	1,068,199	1,069,381	1,070,503	1,071,629	1,072,748	1,073,850	1,074,926	1,076,023

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Bartow	14,038	14,054	14,065	14,093	14,114	14,134	14,154	14,174	14,193	14,212	14,230
Carroll	11,003	11,007	11,026	11,038	11,052	11,066	11,081	11,095	11,110	11,124	11,137
Cherokee	29,715	29,755	29,802	29,858	29,904	29,948	29,991	30,033	30,075	30,115	30,151
Clarke	14,651	14,657	14,673	14,688	14,700	14,711	14,723	14,735	14,746	14,758	14,770
Clayton	24,921	24,945	24,991	25,060	25,099	25,138	25,176	25,214	25,251	25,289	25,324
Cobb	74,575	74,644	74,769	74,915	75,040	75,161	75,285	75,406	75,525	75,645	75,763
DeKalb	61,707	61,819	61,930	62,058	62,162	62,262	62,362	62,460	62,556	62,650	62,740
Dougherty	7,269	7,272	7,275	7,286	7,293	7,300	7,307	7,314	7,321	7,329	7,336
Douglas	14,361	14,373	14,401	14,437	14,461	14,484	14,507	14,531	14,554	14,578	14,603
Fulton	92,356	92,437	92,613	92,809	92,947	93,079	93,214	93,341	93,469	93,595	93,719
Gwinnett	97,296	97,354	97,496	97,641	97,747	97,853	97,959	98,063	98,165	98,267	98,368
Hall	26,429	26,444	26,473	26,527	26,554	26,580	26,608	26,634	26,662	26,691	26,719
Henry	23,833	23,853	23,893	23,943	23,976	24,007	24,040	24,071	24,102	24,130	24,159
Lee	2,670	2,670	2,674	2,680	2,682	2,684	2,686	2,687	2,689	2,691	2,693

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:		
	4/4	4/5	4/6	4/7	4/9	4/11	4/13
Bartow	14,038	14,054	14,065	14,093	14,134 (2,827) [678] {339}	14,174 (2,835) [680] {340}	14,212 (2,842) [682] {341}
Carroll	11,003	11,007	11,026	11,038	11,066 (2,213) [531] {266}	11,095 (2,219) [533] {266}	11,124 (2,225) [534] {267}
Cherokee	29,715	29,755	29,802	29,858	29,948 (5,990) [1,438] {719}	30,033 (6,007) [1,442] {721}	30,115 (6,023) [1,446] {723}
Clarke	14,651	14,657	14,673	14,688	14,711 (2,942) [706] {353}	14,735 (2,947) [707] {354}	14,758 (2,952) [708] {354}
Clayton	24,921	24,945	24,991	25,060	25,138 (5,028) [1,207] {603}	25,214 (5,043) [1,210] {605}	25,289 (5,058) [1,214] {607}
Cobb	74,575	74,644	74,769	74,915	75,161 (15,032) [3,608] {1,804}	75,406 (15,081) [3,619] {1,810}	75,645 (15,129) [3,631] {1,815}
DeKalb	61,707	61,819	61,930	62,058	62,262 (12,452) [2,989] {1,494}	62,460 (12,492) [2,998] {1,499}	62,650 (12,530) [3,007] {1,504}
Dougherty	7,269	7,272	7,275	7,286	7,300 (1,460) [350] {175}	7,314 (1,463) [351] {176}	7,329 (1,466) [352] {176}
Douglas	14,361	14,373	14,401	14,437	14,484 (2,897) [695] {348}	14,531 (2,906) [697] {349}	14,578 (2,916) [700] {350}
Fulton	92,356	92,437	92,613	92,809	93,079 (18,616) [4,468] {2,234}	93,341 (18,668) [4,480] {2,240}	93,595 (18,719) [4,493] {2,246}
Gwinnett	97,296	97,354	97,496	97,641	97,853 (19,571) [4,697] {2,348}	98,063 (19,613) [4,707] {2,354}	98,267 (19,653) [4,717] {2,358}
Hall	26,429	26,444	26,473	26,527	26,580 (5,316) [1,276] {638}	26,634 (5,327) [1,278] {639}	26,691 (5,338) [1,281] {641}
Henry	23,833	23,853	23,893	23,943	24,007 (4,801) [1,152] {576}	24,071 (4,814) [1,155] {578}	24,130 (4,826) [1,158] {579}
Lee	2,670	2,670	2,674	2,680	2,684 (537) [129] {64}	2,687 (537) [129] {64}	2,691 (538) [129] {65}

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.