IEM's AI Modeling: Short-term COVID-19 Projections
Date: 4/29/21

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 4/29/21 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
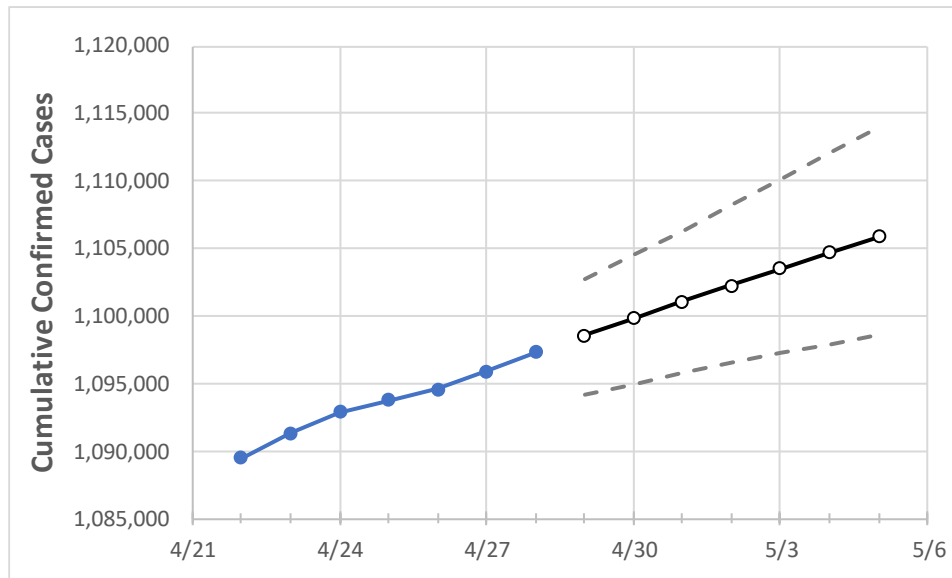
	Actual Confirmed Cases On:				Projected Cases For:						
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5
Georgia	1,093,768	1,094,580	1,095,879	1,097,279	1,098,541	1,099,807	1,101,068	1,102,265	1,103,484	1,104,680	1,105,891

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:						
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5
Bartow	14,478	14,488	14,496	14,517	14,536	14,554	14,571	14,589	14,607	14,625	14,642
Carroll	11,232	11,235	11,258	11,265	11,273	11,279	11,287	11,294	11,301	11,308	11,315
Cherokee	30,515	30,549	30,584	30,613	30,637	30,661	30,684	30,707	30,730	30,751	30,773
Clarke	14,908	14,912	14,926	14,937	14,946	14,956	14,965	14,974	14,984	14,993	15,001
Clayton	26,011	26,038	26,103	26,155	26,205	26,254	26,304	26,354	26,402	26,451	26,500
Cobb	77,087	77,146	77,250	77,368	77,465	77,561	77,656	77,749	77,841	77,933	78,024
DeKalb	64,399	64,458	64,555	64,639	64,711	64,778	64,844	64,907	64,967	65,023	65,079
Dougherty	7,440	7,445	7,459	7,466	7,477	7,488	7,499	7,511	7,523	7,536	7,549
Douglas	14,925	14,939	14,955	14,985	15,007	15,027	15,048	15,069	15,089	15,108	15,128
Fulton	95,516	95,613	95,727	95,852	95,982	96,112	96,243	96,374	96,499	96,624	96,748
Gwinnett	100,158	100,225	100,356	100,478	100,604	100,730	100,857	100,981	101,106	101,232	101,355
Hall	26,909	26,916	26,949	26,977	27,000	27,023	27,046	27,070	27,093	27,116	27,140
Henry	24,776	24,799	24,840	24,882	24,926	24,968	25,012	25,057	25,101	25,145	25,186
Lee	2,703	2,702	2,706	2,708	2,710	2,712	2,714	2,717	2,719	2,721	2,723

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:		
	4/25	4/26	4/27	4/28	4/30	5/2	5/4
Bartow	14,478	14,488	14,496	14,517	14,554 (2,911) [699] {349}	14,589 (2,918) [700] {350}	14,625 (2,925) [702] {351}
Carroll	11,232	11,235	11,258	11,265	11,279 (2,256) [541] {271}	11,294 (2,259) [542] {271}	11,308 (2,262) [543] {271}
Cherokee	30,515	30,549	30,584	30,613	30,661 (6,132) [1,472] {736}	30,707 (6,141) [1,474] {737}	30,751 (6,150) [1,476] {738}
Clarke	14,908	14,912	14,926	14,937	14,956 (2,991) [718] {359}	14,974 (2,995) [719] {359}	14,993 (2,999) [720] {360}
Clayton	26,011	26,038	26,103	26,155	26,254 (5,251) [1,260] {630}	26,354 (5,271) [1,265] {632}	26,451 (5,290) [1,270] {635}
Cobb	77,087	77,146	77,250	77,368	77,561 (15,512) [3,723] {1,861}	77,749 (15,550) [3,732] {1,866}	77,933 (15,587) [3,741] {1,870}
DeKalb	64,399	64,458	64,555	64,639	64,778 (12,956) [3,109] {1,555}	64,907 (12,981) [3,116] {1,558}	65,023 (13,005) [3,121] {1,561}
Dougherty	7,440	7,445	7,459	7,466	7,488 (1,498) [359] {180}	7,511 (1,502) [361] {180}	7,536 (1,507) [362] {181}
Douglas	14,925	14,939	14,955	14,985	15,027 (3,005) [721] {361}	15,069 (3,014) [723] {362}	15,108 (3,022) [725] {363}
Fulton	95,516	95,613	95,727	95,852	96,112 (19,222) [4,613] {2,307}	96,374 (19,275) [4,626] {2,313}	96,624 (19,325) [4,638] {2,319}
Gwinnett	100,158	100,225	100,356	100,478	100,730 (20,146) [4,835] {2,418}	100,981 (20,196) [4,847] {2,424}	101,232 (20,246) [4,859] {2,430}
Hall	26,909	26,916	26,949	26,977	27,023 (5,405) [1,297] {649}	27,070 (5,414) [1,299] {650}	27,116 (5,423) [1,302] {651}
Henry	24,776	24,799	24,840	24,882	24,968 (4,994) [1,198] {599}	25,057 (5,011) [1,203] {601}	25,145 (5,029) [1,207] {603}
Lee	2,703	2,702	2,706	2,708	2,712 (542) [130] {65}	2,717 (543) [130] {65}	2,721 (544) [131] {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.