IEM's AI Modeling: Short-term COVID-19 Projections
Date: 4/20/21

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 4/20/21 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
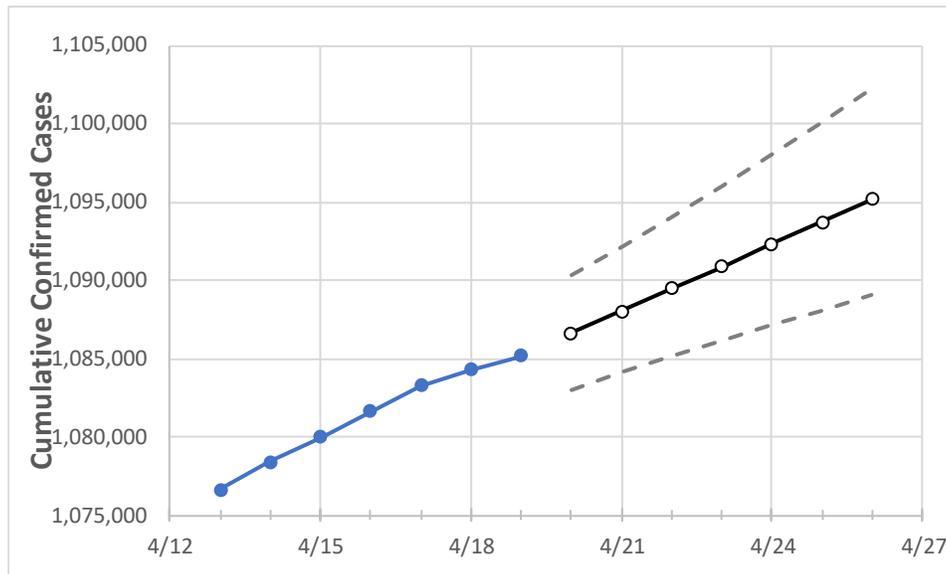
	Actual Confirmed Cases On:				Projected Cases For:						
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26
Georgia	1,081,629	1,083,300	1,084,272	1,085,161	1,086,609	1,088,015	1,089,443	1,090,863	1,092,298	1,093,706	1,095,171

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:						
	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25	4/26
Bartow	14,290	14,305	14,319	14,332	14,351	14,370	14,389	14,408	14,427	14,445	14,463
Carroll	11,159	11,175	11,181	11,184	11,194	11,204	11,213	11,224	11,233	11,243	11,252
Cherokee	30,265	30,285	30,308	30,324	30,357	30,388	30,418	30,450	30,479	30,508	30,536
Clarke	14,804	14,830	14,834	14,842	14,855	14,869	14,882	14,896	14,910	14,924	14,937
Clayton	25,539	25,603	25,657	25,692	25,751	25,809	25,869	25,931	25,994	26,058	26,122
Cobb	76,065	76,229	76,296	76,387	76,506	76,625	76,742	76,856	76,971	77,086	77,203
DeKalb	63,563	63,674	63,742	63,830	63,974	64,116	64,256	64,398	64,540	64,683	64,821
Dougherty	7,343	7,356	7,359	7,361	7,367	7,373	7,380	7,386	7,392	7,398	7,405
Douglas	14,702	14,741	14,766	14,779	14,809	14,840	14,871	14,902	14,932	14,964	14,996
Fulton	94,205	94,364	94,470	94,575	94,718	94,857	94,995	95,135	95,272	95,409	95,543
Gwinnett	98,907	99,091	99,191	99,283	99,428	99,577	99,723	99,874	100,026	100,179	100,327
Hall	26,714	26,733	26,747	26,758	26,777	26,796	26,814	26,833	26,851	26,869	26,886
Henry	24,354	24,420	24,453	24,494	24,542	24,590	24,638	24,686	24,736	24,786	24,836
Lee	2,691	2,692	2,693	2,693	2,694	2,696	2,697	2,698	2,700	2,701	2,702

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:		
	4/16	4/17	4/18	4/19	4/21	4/23	4/25
Bartow	14,290	14,305	14,319	14,332	14,370 (2,874) [690] {345}	14,408 (2,882) [692] {346}	14,445 (2,889) [693] {347}
Carroll	11,159	11,175	11,181	11,184	11,204 (2,241) [538] {269}	11,224 (2,245) [539] {269}	11,243 (2,249) [540] {270}
Cherokee	30,265	30,285	30,308	30,324	30,388 (6,078) [1,459] {729}	30,450 (6,090) [1,462] {731}	30,508 (6,102) [1,464] {732}
Clarke	14,804	14,830	14,834	14,842	14,869 (2,974) [714] {357}	14,896 (2,979) [715] {357}	14,924 (2,985) [716] {358}
Clayton	25,539	25,603	25,657	25,692	25,809 (5,162) [1,239] {619}	25,931 (5,186) [1,245] {622}	26,058 (5,212) [1,251] {625}
Cobb	76,065	76,229	76,296	76,387	76,625 (15,325) [3,678] {1,839}	76,856 (15,371) [3,689] {1,845}	77,086 (15,417) [3,700] {1,850}
DeKalb	63,563	63,674	63,742	63,830	64,116 (12,823) [3,078] {1,539}	64,398 (12,880) [3,091] {1,546}	64,683 (12,937) [3,105] {1,552}
Dougherty	7,343	7,356	7,359	7,361	7,373 (1,475) [354] {177}	7,386 (1,477) [355] {177}	7,398 (1,480) [355] {178}
Douglas	14,702	14,741	14,766	14,779	14,840 (2,968) [712] {356}	14,902 (2,980) [715] {358}	14,964 (2,993) [718] {359}
Fulton	94,205	94,364	94,470	94,575	94,857 (18,971) [4,553] {2,277}	95,135 (19,027) [4,566] {2,283}	95,409 (19,082) [4,580] {2,290}
Gwinnett	98,907	99,091	99,191	99,283	99,577 (19,915) [4,780] {2,390}	99,874 (19,975) [4,794] {2,397}	100,179 (20,036) [4,809] {2,404}
Hall	26,714	26,733	26,747	26,758	26,796 (5,359) [1,286] {643}	26,833 (5,367) [1,288] {644}	26,869 (5,374) [1,290] {645}
Henry	24,354	24,420	24,453	24,494	24,590 (4,918) [1,180] {590}	24,686 (4,937) [1,185] {592}	24,786 (4,957) [1,190] {595}
Lee	2,691	2,692	2,693	2,693	2,696 (539) [129] {65}	2,698 (540) [130] {65}	2,701 (540) [130] {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.