IEM's AI Modeling: Short-term COVID-19 Projections

Date: 4/19/21

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 4/19/21 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.

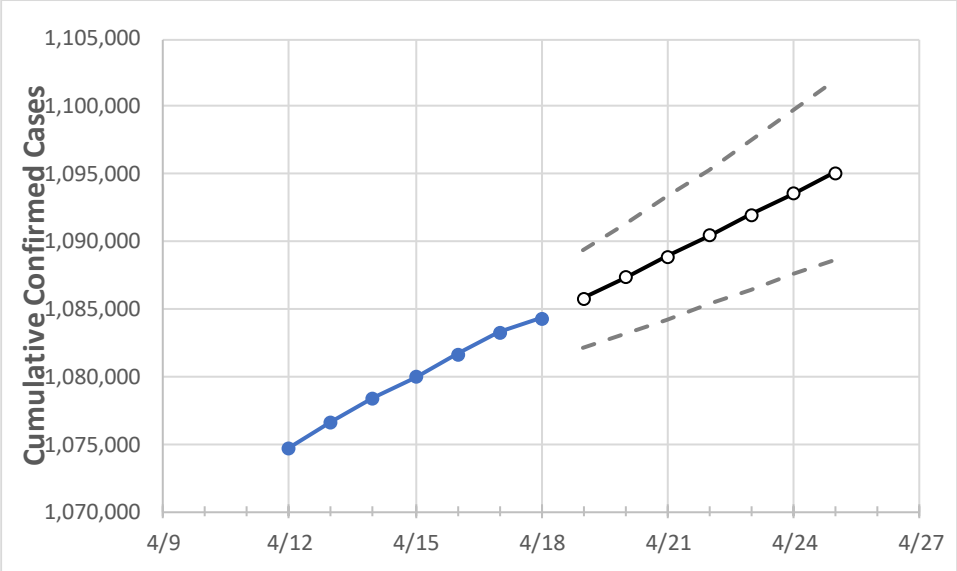
IEM's Modeling Lead

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:						
	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25
Georgia	1,079,979	1,081,629	1,083,300	1,084,272	1,085,787	1,087,308	1,088,870	1,090,416	1,091,999	1,093,553	1,095,116

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:						
	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	4/23	4/24	4/25
Bartow	14,268	14,290	14,305	14,319	14,339	14,359	14,379	14,399	14,418	14,438	14,459
Carroll	11,147	11,159	11,175	11,181	11,192	11,203	11,215	11,225	11,237	11,248	11,260
Cherokee	30,216	30,265	30,285	30,308	30,344	30,379	30,413	30,447	30,480	30,513	30,545
Clarke	14,792	14,804	14,830	14,834	14,848	14,863	14,877	14,892	14,907	14,922	14,937
Clayton	25,474	25,539	25,603	25,657	25,717	25,778	25,838	25,904	25,967	26,033	26,100
Cobb	75,940	76,065	76,229	76,296	76,417	76,538	76,657	76,780	76,900	77,024	77,139
DeKalb	63,454	63,563	63,674	63,742	63,898	64,055	64,212	64,369	64,528	64,688	64,850
Dougherty	7,332	7,343	7,356	7,359	7,365	7,372	7,379	7,386	7,394	7,401	7,408
Douglas	14,664	14,702	14,741	14,766	14,799	14,833	14,867	14,902	14,938	14,974	15,012
Fulton	94,021	94,205	94,364	94,470	94,618	94,767	94,914	95,061	95,205	95,354	95,499
Gwinnett	98,705	98,907	99,091	99,191	99,347	99,502	99,662	99,824	99,993	100,162	100,335
Hall	26,679	26,714	26,733	26,747	26,767	26,787	26,807	26,827	26,847	26,866	26,885
Henry	24,296	24,354	24,420	24,453	24,501	24,550	24,599	24,649	24,699	24,749	24,801
Lee	2,690	2,691	2,692	2,693	2,694	2,696	2,697	2,698	2,700	2,701	2,703

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:		
	4/15	4/16	4/17	4/18	4/20	4/22	4/24
Bartow	14,268	14,290	14,305	14,319	14,359 (2,872) [689] {345}	14,399 (2,880) [691] {346}	14,438 (2,888) [693] {347}
Carroll	11,147	11,159	11,175	11,181	11,203 (2,241) [538] {269}	11,225 (2,245) [539] {269}	11,248 (2,250) [540] {270}
Cherokee	30,216	30,265	30,285	30,308	30,379 (6,076) [1,458] {729}	30,447 (6,089) [1,461] {731}	30,513 (6,103) [1,465] {732}
Clarke	14,792	14,804	14,830	14,834	14,863 (2,973) [713] {357}	14,892 (2,978) [715] {357}	14,922 (2,984) [716] {358}
Clayton	25,474	25,539	25,603	25,657	25,778 (5,156) [1,237] {619}	25,904 (5,181) [1,243] {622}	26,033 (5,207) [1,250] {625}
Cobb	75,940	76,065	76,229	76,296	76,538 (15,308) [3,674] {1,837}	76,780 (15,356) [3,685] {1,843}	77,024 (15,405) [3,697] {1,849}
DeKalb	63,454	63,563	63,674	63,742	64,055 (12,811) [3,075] {1,537}	64,369 (12,874) [3,090] {1,545}	64,688 (12,938) [3,105] {1,553}
Dougherty	7,332	7,343	7,356	7,359	7,372 (1,474) [354] {177}	7,386 (1,477) [355] {177}	7,401 (1,480) [355] {178}
Douglas	14,664	14,702	14,741	14,766	14,833 (2,967) [712] {356}	14,902 (2,980) [715] {358}	14,974 (2,995) [719] {359}
Fulton	94,021	94,205	94,364	94,470	94,767 (18,953) [4,549] {2,274}	95,061 (19,012) [4,563] {2,281}	95,354 (19,071) [4,577] {2,288}
Gwinnett	98,705	98,907	99,091	99,191	99,502 (19,900) [4,776] {2,388}	99,824 (19,965) [4,792] {2,396}	100,162 (20,032) [4,808] {2,404}
Hall	26,679	26,714	26,733	26,747	26,787 (5,357) [1,286] {643}	26,827 (5,365) [1,288] {644}	26,866 (5,373) [1,290] {645}
Henry	24,296	24,354	24,420	24,453	24,550 (4,910) [1,178] {589}	24,649 (4,930) [1,183] {592}	24,749 (4,950) [1,188] {594}
Lee	2,690	2,691	2,692	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.