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

Date: 12/2/20

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 12/2/20 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.

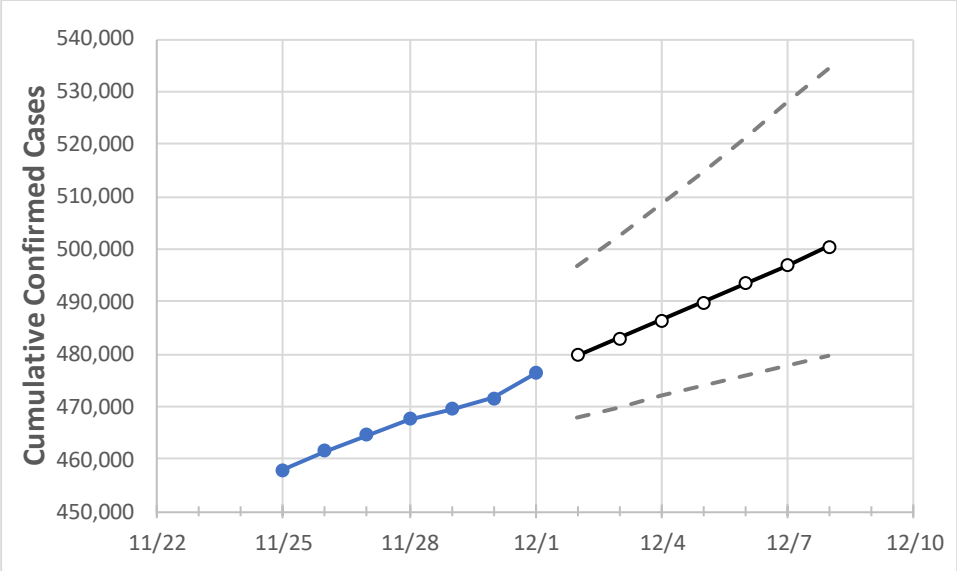
IEM's Modeling Lead

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:						
	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7	12/8
Georgia	467,564	469,516	471,563	476,405	479,683	483,015	486,404	489,848	493,350	496,911	500,529

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 20%, and are often within 10%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7	12/8
Bartow	5,134	5,169	5,211	5,282	5,328	5,375	5,422	5,471	5,519	5,568	5,618
Carroll	5,570	5,612	5,645	5,692	5,741	5,790	5,839	5,889	5,939	5,989	6,039
Cherokee	10,572	10,616	10,680	10,837	10,931	11,026	11,121	11,218	11,316	11,415	11,515
Clarke	7,925	7,941	7,979	8,032	8,069	8,106	8,144	8,182	8,221	8,261	8,301
Clayton	10,463	10,483	10,515	10,585	10,631	10,677	10,722	10,768	10,813	10,858	10,904
Cobb	29,833	29,937	30,075	30,411	30,622	30,835	31,051	31,271	31,493	31,718	31,946
DeKalb	27,465	27,548	27,645	27,876	28,033	28,190	28,347	28,503	28,658	28,813	28,968
Dougherty	3,706	3,710	3,713	3,773	3,781	3,790	3,799	3,808	3,818	3,828	3,838
Douglas	5,682	5,703	5,722	5,816	5,859	5,903	5,948	5,993	6,039	6,086	6,133
Fulton	40,486	40,630	40,794	41,231	41,515	41,803	42,097	42,395	42,698	43,005	43,318
Gwinnett	39,510	39,694	39,906	40,332	40,625	40,923	41,227	41,536	41,851	42,171	42,497
Hall	12,635	12,678	12,759	12,907	12,992	13,080	13,170	13,264	13,361	13,461	13,565
Henry	8,687	8,716	8,758	8,887	8,959	9,033	9,108	9,185	9,263	9,344	9,426
Lee	954	956	959	985	991	997	1,004	1,011	1,018	1,025	1,033

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:		
	11/28	11/29	11/30	12/1	12/3	12/5	12/7
Bartow	5,134	5,169	5,211	5,282	5,375 (1,075) [258] {129}	5,471 (1,094) [263] {131}	5,568 (1,114) [267] {134}
Carroll	5,570	5,612	5,645	5,692	5,790 (1,158) [278] {139}	5,889 (1,178) [283] {141}	5,989 (1,198) [287] {144}
Cherokee	10,572	10,616	10,680	10,837	11,026 (2,205) [529] {265}	11,218 (2,244) [538] {269}	11,415 (2,283) [548] {274}
Clarke	7,925	7,941	7,979	8,032	8,106 (1,621) [389] {195}	8,182 (1,636) [393] {196}	8,261 (1,652) [397] {198}
Clayton	10,463	10,483	10,515	10,585	10,677 (2,135) [512] {256}	10,768 (2,154) [517] {258}	10,858 (2,172) [521] {261}
Cobb	29,833	29,937	30,075	30,411	30,835 (6,167) [1,480] {740}	31,271 (6,254) [1,501] {750}	31,718 (6,344) [1,522] {761}
DeKalb	27,465	27,548	27,645	27,876	28,190 (5,638) [1,353] {677}	28,503 (5,701) [1,368] {684}	28,813 (5,763) [1,383] {692}
Dougherty	3,706	3,710	3,713	3,773	3,790 (758) [182] {91}	3,808 (762) [183] {91}	3,828 (766) [184] {92}
Douglas	5,682	5,703	5,722	5,816	5,903 (1,181) [283] {142}	5,993 (1,199) [288] {144}	6,086 (1,217) [292] {146}
Fulton	40,486	40,630	40,794	41,231	41,803 (8,361) [2,007] {1,003}	42,395 (8,479) [2,035] {1,017}	43,005 (8,601) [2,064] {1,032}
Gwinnett	39,510	39,694	39,906	40,332	40,923 (8,185) [1,964] {982}	41,536 (8,307) [1,994] {997}	42,171 (8,434) [2,024] {1,012}
Hall	12,635	12,678	12,759	12,907	13,080 (2,616) [628] {314}	13,264 (2,653) [637] {318}	13,461 (2,692) [646] {323}
Henry	8,687	8,716	8,758	8,887	9,033 (1,807) [434] {217}	9,185 (1,837) [441] {220}	9,344 (1,869) [449] {224}
Lee	954	956	959	985	997 (199) [48] {24}	1,011 (202) [49] {24}	1,025 (205) [49] {25}

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.