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

Date: 1/6/21

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 1/6/21 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.

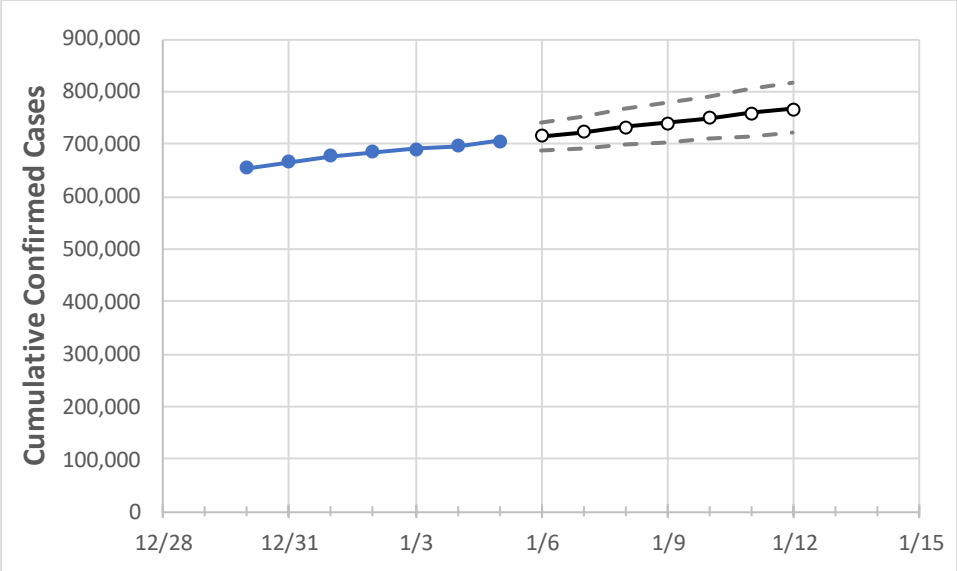
IEM's Modeling Lead

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:						
	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12
Georgia	685,122	690,900	696,063	706,154	714,569	723,047	731,766	740,396	749,411	758,414	767,481

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:						
	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12
Bartow	8,135	8,234	8,315	8,430	8,538	8,647	8,758	8,871	8,984	9,096	9,206
Carroll	7,754	7,799	7,837	7,891	7,946	8,005	8,060	8,115	8,171	8,226	8,282
Cherokee	17,050	17,267	17,440	17,791	18,091	18,396	18,716	19,036	19,364	19,698	20,044
Clarke	10,291	10,388	10,432	10,546	10,627	10,711	10,797	10,883	10,970	11,060	11,152
Clayton	14,756	14,864	14,963	15,120	15,269	15,418	15,570	15,719	15,872	16,025	16,176
Cobb	45,705	46,159	46,617	47,325	47,933	48,561	49,188	49,827	50,485	51,138	51,809
DeKalb	39,134	39,333	39,499	40,055	40,458	40,868	41,290	41,701	42,133	42,549	42,970
Dougherty	4,846	4,865	4,941	5,014	5,059	5,108	5,158	5,209	5,262	5,317	5,371
Douglas	8,539	8,650	8,688	8,840	8,937	9,037	9,131	9,233	9,337	9,439	9,542
Fulton	58,438	58,829	59,255	59,999	60,631	61,264	61,908	62,543	63,183	63,843	64,507
Gwinnett	59,163	59,683	60,074	61,138	61,882	62,663	63,469	64,272	65,126	65,958	66,812
Hall	18,770	18,854	19,018	19,248	19,432	19,615	19,795	19,975	20,150	20,332	20,513
Henry	13,847	13,967	14,067	14,287	14,478	14,669	14,867	15,062	15,260	15,469	15,667
Lee	1,578	1,585	1,604	1,650	1,677	1,706	1,736	1,767	1,798	1,830	1,862

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:		
	1/2	1/3	1/4	1/5	1/7	1/9	1/11
Bartow	8,135	8,234	8,315	8,430	8,647 (1,729) [415] {208}	8,871 (1,774) [426] {213}	9,096 (1,819) [437] {218}
Carroll	7,754	7,799	7,837	7,891	8,005 (1,601) [384] {192}	8,115 (1,623) [390] {195}	8,226 (1,645) [395] {197}
Cherokee	17,050	17,267	17,440	17,791	18,396 (3,679) [883] {442}	19,036 (3,807) [914] {457}	19,698 (3,940) [946] {473}
Clarke	10,291	10,388	10,432	10,546	10,711 (2,142) [514] {257}	10,883 (2,177) [522] {261}	11,060 (2,212) [531] {265}
Clayton	14,756	14,864	14,963	15,120	15,418 (3,084) [740] {370}	15,719 (3,144) [755] {377}	16,025 (3,205) [769] {385}
Cobb	45,705	46,159	46,617	47,325	48,561 (9,712) [2,331] {1,165}	49,827 (9,965) [2,392] {1,196}	51,138 (10,228) [2,455] {1,227}
DeKalb	39,134	39,333	39,499	40,055	40,868 (8,174) [1,962] {981}	41,701 (8,340) [2,002] {1,001}	42,549 (8,510) [2,042] {1,021}
Dougherty	4,846	4,865	4,941	5,014	5,108 (1,022) [245] {123}	5,209 (1,042) [250] {125}	5,317 (1,063) [255] {128}
Douglas	8,539	8,650	8,688	8,840	9,037 (1,807) [434] {217}	9,233 (1,847) [443] {222}	9,439 (1,888) [453] {227}
Fulton	58,438	58,829	59,255	59,999	61,264 (12,253) [2,941] {1,470}	62,543 (12,509) [3,002] {1,501}	63,843 (12,769) [3,064] {1,532}
Gwinnett	59,163	59,683	60,074	61,138	62,663 (12,533) [3,008] {1,504}	64,272 (12,854) [3,085] {1,543}	65,958 (13,192) [3,166] {1,583}
Hall	18,770	18,854	19,018	19,248	19,615 (3,923) [942] {471}	19,975 (3,995) [959] {479}	20,332 (4,066) [976] {488}
Henry	13,847	13,967	14,067	14,287	14,669 (2,934) [704] {352}	15,062 (3,012) [723] {361}	15,469 (3,094) [743] {371}
Lee	1,578	1,585	1,604	1,650	1,706 (341) [82] {41}	1,767 (353) [85] {42}	1,830 (366) [88] {44}

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.