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

Date: 11/3/21

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 11/3/21 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.

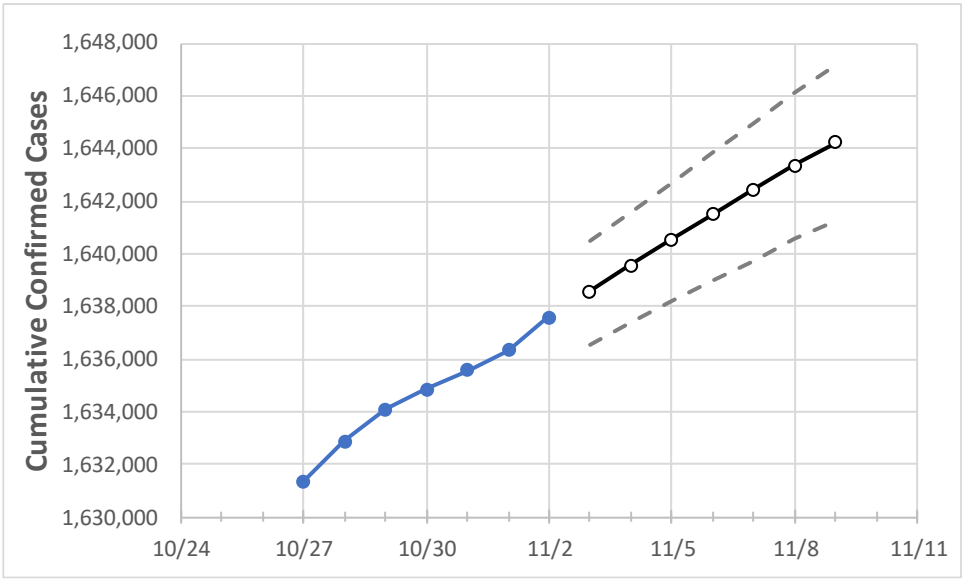
IEM's Modeling Lead

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:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Georgia	1,634,837	1,635,581	1,636,325	1,637,571	1,638,566	1,639,567	1,640,538	1,641,477	1,642,433	1,643,363	1,644,239

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:						
	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9
Bartow	20,415	20,425	20,435	20,450	20,461	20,472	20,482	20,493	20,504	20,513	20,524
Carroll	16,364	16,372	16,379	16,389	16,396	16,404	16,411	16,418	16,425	16,432	16,438
Cherokee	43,832	43,849	43,867	43,885	43,943	43,998	44,039	44,102	44,137	44,204	44,249
Clarke	20,037	20,045	20,052	20,062	20,072	20,081	20,089	20,098	20,107	20,116	20,124
Clayton	39,288	39,314	39,341	39,379	39,408	39,437	39,464	39,492	39,520	39,548	39,573
Cobb	109,278	109,342	109,407	109,482	109,559	109,635	109,712	109,785	109,861	109,936	110,007
DeKalb	91,496	91,547	91,597	91,681	91,741	91,801	91,861	91,917	91,974	92,029	92,085
Dougherty	12,403	12,408	12,412	12,419	12,424	12,430	12,435	12,440	12,445	12,449	12,454
Douglas	22,265	22,275	22,285	22,295	22,305	22,314	22,323	22,332	22,341	22,349	22,358
Fulton	131,966	132,035	132,103	132,172	132,245	132,315	132,385	132,455	132,523	132,594	132,659
Gwinnett	133,195	133,271	133,346	133,448	133,532	133,612	133,689	133,765	133,838	133,914	133,987
Hall	38,000	38,027	38,055	38,086	38,119	38,151	38,183	38,215	38,244	38,275	38,305
Henry	38,130	38,150	38,171	38,192	38,221	38,249	38,276	38,304	38,330	38,357	38,382
Lee	4,689	4,694	4,698	4,699	4,703	4,707	4,711	4,715	4,718	4,722	4,726

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:		
	10/30	10/31	11/1	11/2	11/4	11/6	11/8
Bartow	20,415	20,425	20,435	20,450	20,472 (4,094) [983] {491}	20,493 (4,099) [984] {492}	20,513 (4,103) [985] {492}
Carroll	16,364	16,372	16,379	16,389	16,404 (3,281) [787] {394}	16,418 (3,284) [788] {394}	16,432 (3,286) [789] {394}
Cherokee	43,832	43,849	43,867	43,885	43,998 (8,800) [2,112] {1,056}	44,102 (8,820) [2,117] {1,058}	44,204 (8,841) [2,122] {1,061}
Clarke	20,037	20,045	20,052	20,062	20,081 (4,016) [964] {482}	20,098 (4,020) [965] {482}	20,116 (4,023) [966] {483}
Clayton	39,288	39,314	39,341	39,379	39,437 (7,887) [1,893] {946}	39,492 (7,898) [1,896] {948}	39,548 (7,910) [1,898] {949}
Cobb	109,278	109,342	109,407	109,482	109,635 (21,927) [5,262] {2,631}	109,785 (21,957) [5,270] {2,635}	109,936 (21,987) [5,277] {2,638}
DeKalb	91,496	91,547	91,597	91,681	91,801 (18,360) [4,406] {2,203}	91,917 (18,383) [4,412] {2,206}	92,029 (18,406) [4,417] {2,209}
Dougherty	12,403	12,408	12,412	12,419	12,430 (2,486) [597] {298}	12,440 (2,488) [597] {299}	12,449 (2,490) [598] {299}
Douglas	22,265	22,275	22,285	22,295	22,314 (4,463) [1,071] {536}	22,332 (4,466) [1,072] {536}	22,349 (4,470) [1,073] {536}
Fulton	131,966	132,035	132,103	132,172	132,315 (26,463) [6,351] {3,176}	132,455 (26,491) [6,358] {3,179}	132,594 (26,519) [6,365] {3,182}
Gwinnett	133,195	133,271	133,346	133,448	133,612 (26,722) [6,413] {3,207}	133,765 (26,753) [6,421] {3,210}	133,914 (26,783) [6,428] {3,214}
Hall	38,000	38,027	38,055	38,086	38,151 (7,630) [1,831] {916}	38,215 (7,643) [1,834] {917}	38,275 (7,655) [1,837] {919}
Henry	38,130	38,150	38,171	38,192	38,249 (7,650) [1,836] {918}	38,304 (7,661) [1,839] {919}	38,357 (7,671) [1,841] {921}
Lee	4,689	4,694	4,698	4,699	4,707 (941) [226] {113}	4,715 (943) [226] {113}	4,722 (944) [227] {113}

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.