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

Date: 10/20/21

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 10/20/21 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.

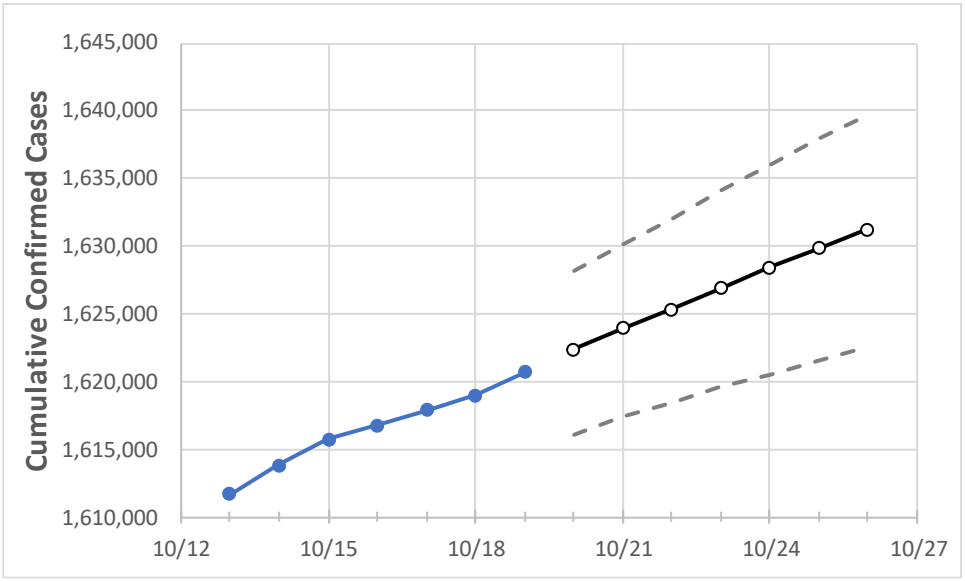
IEM's Modeling Lead

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:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Georgia	1,616,804	1,617,910	1,619,015	1,620,694	1,622,375	1,623,910	1,625,364	1,626,878	1,628,418	1,629,846	1,631,236

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:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Bartow	20,215	20,229	20,243	20,253	20,274	20,294	20,312	20,332	20,350	20,369	20,386
Carroll	16,241	16,247	16,253	16,267	16,278	16,287	16,296	16,306	16,315	16,325	16,333
Cherokee	42,976	43,004	43,031	43,059	43,097	43,132	43,166	43,201	43,234	43,266	43,299
Clarke	19,872	19,881	19,890	19,911	19,923	19,934	19,946	19,958	19,969	19,979	19,990
Clayton	38,821	38,846	38,870	38,906	38,942	38,982	39,017	39,053	39,087	39,121	39,154
Cobb	107,966	108,058	108,149	108,252	108,389	108,516	108,624	108,756	108,876	109,006	109,115
DeKalb	90,421	90,476	90,530	90,637	90,746	90,841	90,938	91,037	91,128	91,225	91,312
Dougherty	12,282	12,295	12,307	12,316	12,331	12,345	12,359	12,372	12,386	12,398	12,411
Douglas	22,068	22,086	22,103	22,118	22,144	22,172	22,199	22,223	22,250	22,278	22,301
Fulton	130,699	130,791	130,882	130,991	131,129	131,250	131,371	131,495	131,606	131,721	131,834
Gwinnett	131,720	131,791	131,862	132,017	132,181	132,333	132,486	132,630	132,778	132,923	133,060
Hall	37,408	37,440	37,472	37,541	37,588	37,641	37,685	37,731	37,774	37,821	37,862
Henry	37,613	37,642	37,670	37,708	37,743	37,781	37,814	37,848	37,882	37,915	37,946
Lee	4,620	4,626	4,631	4,636	4,641	4,645	4,649	4,654	4,658	4,662	4,666

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:		
	10/16	10/17	10/18	10/19	10/21	10/23	10/25
Bartow	20,215	20,229	20,243	20,253	20,294 (4,059) [974] {487}	20,332 (4,066) [976] {488}	20,369 (4,074) [978] {489}
Carroll	16,241	16,247	16,253	16,267	16,287 (3,257) [782] {391}	16,306 (3,261) [783] {391}	16,325 (3,265) [784] {392}
Cherokee	42,976	43,004	43,031	43,059	43,132 (8,626) [2,070] {1,035}	43,201 (8,640) [2,074] {1,037}	43,266 (8,653) [2,077] {1,038}
Clarke	19,872	19,881	19,890	19,911	19,934 (3,987) [957] {478}	19,958 (3,992) [958] {479}	19,979 (3,996) [959] {479}
Clayton	38,821	38,846	38,870	38,906	38,982 (7,796) [1,871] {936}	39,053 (7,811) [1,875] {937}	39,121 (7,824) [1,878] {939}
Cobb	107,966	108,058	108,149	108,252	108,516 (21,703) [5,209] {2,604}	108,756 (21,751) [5,220] {2,610}	109,006 (21,801) [5,232] {2,616}
DeKalb	90,421	90,476	90,530	90,637	90,841 (18,168) [4,360] {2,180}	91,037 (18,207) [4,370] {2,185}	91,225 (18,245) [4,379] {2,189}
Dougherty	12,282	12,295	12,307	12,316	12,345 (2,469) [593] {296}	12,372 (2,474) [594] {297}	12,398 (2,480) [595] {298}
Douglas	22,068	22,086	22,103	22,118	22,172 (4,434) [1,064] {532}	22,223 (4,445) [1,067] {533}	22,278 (4,456) [1,069] {535}
Fulton	130,699	130,791	130,882	130,991	131,250 (26,250) [6,300] {3,150}	131,495 (26,299) [6,312] {3,156}	131,721 (26,344) [6,323] {3,161}
Gwinnett	131,720	131,791	131,862	132,017	132,333 (26,467) [6,352] {3,176}	132,630 (26,526) [6,366] {3,183}	132,923 (26,585) [6,380] {3,190}
Hall	37,408	37,440	37,472	37,541	37,641 (7,528) [1,807] {903}	37,731 (7,546) [1,811] {906}	37,821 (7,564) [1,815] {908}
Henry	37,613	37,642	37,670	37,708	37,781 (7,556) [1,813] {907}	37,848 (7,570) [1,817] {908}	37,915 (7,583) [1,820] {910}
Lee	4,620	4,626	4,631	4,636	4,645 (929) [223] {111}	4,654 (931) [223] {112}	4,662 (932) [224] {112}

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.