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

Date: 11/17/21

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 11/17/21 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.

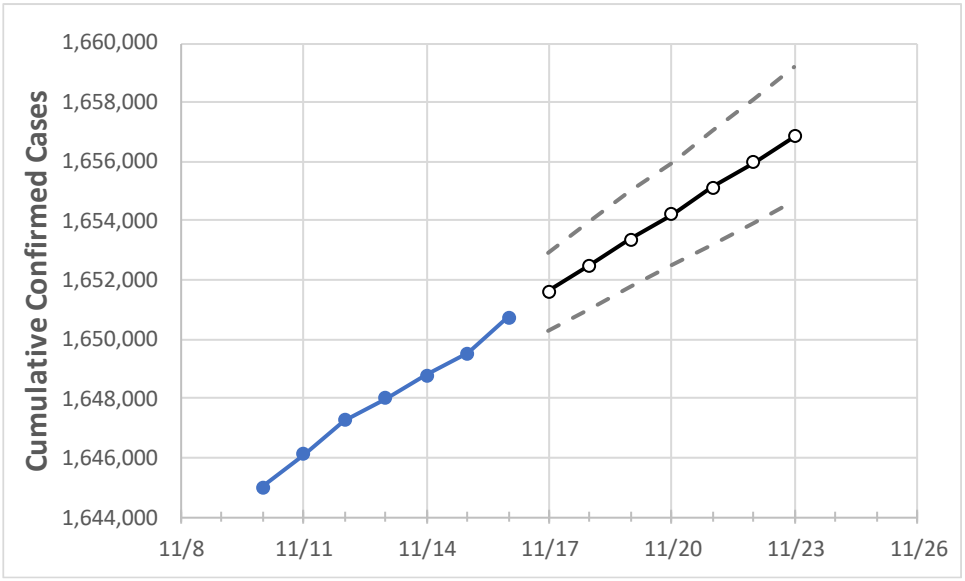
IEM's Modeling Lead

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Georgia	1,648,017	1,648,768	1,649,520	1,650,756	1,651,630	1,652,499	1,653,370	1,654,223	1,655,127	1,655,975	1,656,842

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Bartow	20,596	20,609	20,621	20,630	20,642	20,653	20,665	20,676	20,688	20,699	20,710
Carroll	16,476	16,481	16,487	16,493	16,500	16,507	16,514	16,521	16,528	16,535	16,541
Cherokee	44,129	44,150	44,170	44,192	44,214	44,235	44,256	44,277	44,299	44,320	44,342
Clarke	20,215	20,221	20,228	20,235	20,246	20,258	20,269	20,280	20,292	20,303	20,314
Clayton	39,710	39,727	39,744	39,774	39,801	39,827	39,854	39,878	39,903	39,929	39,955
Cobb	110,453	110,524	110,596	110,690	110,779	110,869	110,960	111,049	111,138	111,233	111,325
DeKalb	92,425	92,481	92,537	92,617	92,680	92,744	92,806	92,869	92,931	92,996	93,056
Dougherty	12,489	12,491	12,494	12,502	12,507	12,512	12,517	12,522	12,526	12,531	12,536
Douglas	22,464	22,476	22,488	22,501	22,516	22,531	22,546	22,562	22,577	22,593	22,609
Fulton	133,089	133,168	133,246	133,350	133,435	133,519	133,604	133,690	133,779	133,860	133,948
Gwinnett	134,456	134,543	134,630	134,832	134,933	135,034	135,136	135,236	135,341	135,445	135,551
Hall	38,449	38,476	38,504	38,577	38,612	38,646	38,678	38,712	38,747	38,783	38,814
Henry	38,475	38,493	38,511	38,556	38,580	38,601	38,623	38,645	38,668	38,689	38,711
Lee	4,747	4,749	4,752	4,755	4,758	4,762	4,765	4,768	4,771	4,774	4,777

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:		
	11/13	11/14	11/15	11/16	11/18	11/20	11/22
Bartow	20,596	20,609	20,621	20,630	20,653 (4,131) [991] {496}	20,676 (4,135) [992] {496}	20,699 (4,140) [994] {497}
Carroll	16,476	16,481	16,487	16,493	16,507 (3,301) [792] {396}	16,521 (3,304) [793] {396}	16,535 (3,307) [794] {397}
Cherokee	44,129	44,150	44,170	44,192	44,235 (8,847) [2,123] {1,062}	44,277 (8,855) [2,125] {1,063}	44,320 (8,864) [2,127] {1,064}
Clarke	20,215	20,221	20,228	20,235	20,258 (4,052) [972] {486}	20,280 (4,056) [973] {487}	20,303 (4,061) [975] {487}
Clayton	39,710	39,727	39,744	39,774	39,827 (7,965) [1,912] {956}	39,878 (7,976) [1,914] {957}	39,929 (7,986) [1,917] {958}
Cobb	110,453	110,524	110,596	110,690	110,869 (22,174) [5,322] {2,661}	111,049 (22,210) [5,330] {2,665}	111,233 (22,247) [5,339] {2,670}
DeKalb	92,425	92,481	92,537	92,617	92,744 (18,549) [4,452] {2,226}	92,869 (18,574) [4,458] {2,229}	92,996 (18,599) [4,464] {2,232}
Dougherty	12,489	12,491	12,494	12,502	12,512 (2,502) [601] {300}	12,522 (2,504) [601] {301}	12,531 (2,506) [601] {301}
Douglas	22,464	22,476	22,488	22,501	22,531 (4,506) [1,082] {541}	22,562 (4,512) [1,083] {541}	22,593 (4,519) [1,084] {542}
Fulton	133,089	133,168	133,246	133,350	133,519 (26,704) [6,409] {3,204}	133,690 (26,738) [6,417] {3,209}	133,860 (26,772) [6,425] {3,213}
Gwinnett	134,456	134,543	134,630	134,832	135,034 (27,007) [6,482] {3,241}	135,236 (27,047) [6,491] {3,246}	135,445 (27,089) [6,501] {3,251}
Hall	38,449	38,476	38,504	38,577	38,646 (7,729) [1,855] {927}	38,712 (7,742) [1,858] {929}	38,783 (7,757) [1,862] {931}
Henry	38,475	38,493	38,511	38,556	38,601 (7,720) [1,853] {926}	38,645 (7,729) [1,855] {927}	38,689 (7,738) [1,857] {929}
Lee	4,747	4,749	4,752	4,755	4,762 (952) [229] {114}	4,768 (954) [229] {114}	4,774 (955) [229] {115}

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.