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

Date: 10/8/21

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 10/8/21 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.

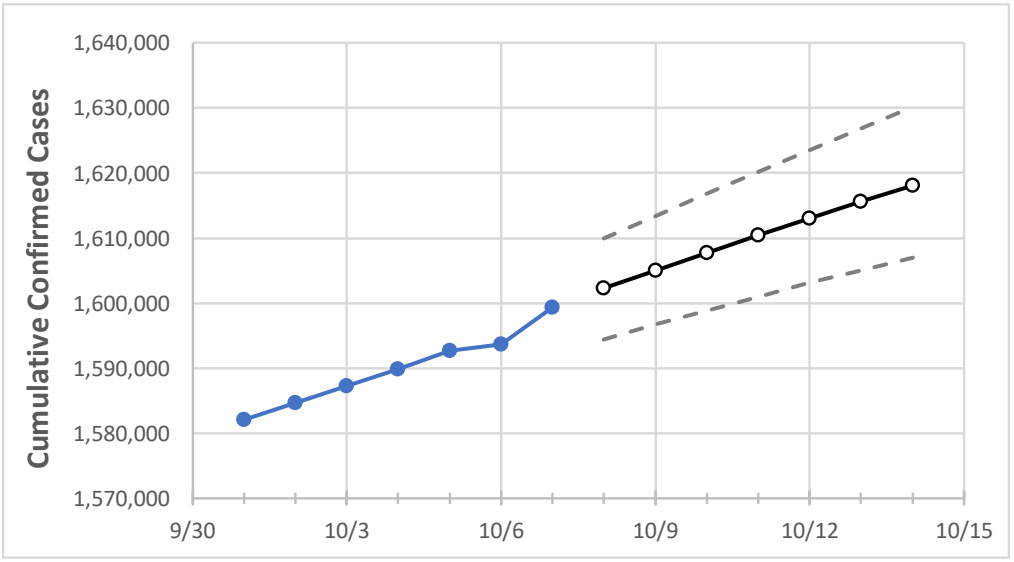
IEM's Modeling Lead

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Georgia	1,589,857	1,592,731	1,593,640	1,599,393	1,602,271	1,604,972	1,607,718	1,610,381	1,612,963	1,615,662	1,618,119

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Bartow	19,873	19,907	19,912	19,987	20,022	20,054	20,086	20,119	20,151	20,181	20,211
Carroll	16,061	16,087	16,090	16,124	16,141	16,157	16,173	16,189	16,203	16,218	16,231
Cherokee	42,370	42,420	42,432	42,576	42,631	42,686	42,738	42,789	42,838	42,887	42,933
Clarke	19,673	19,687	19,693	19,746	19,769	19,792	19,814	19,835	19,854	19,875	19,895
Clayton	38,130	38,206	38,235	38,354	38,419	38,484	38,546	38,607	38,665	38,724	38,779
Cobb	105,925	106,065	106,110	106,784	106,955	107,118	107,267	107,423	107,583	107,735	107,874
DeKalb	88,606	88,840	88,917	89,313	89,534	89,763	89,978	90,197	90,406	90,640	90,847
Dougherty	12,031	12,055	12,064	12,107	12,136	12,164	12,192	12,219	12,245	12,272	12,298
Douglas	21,620	21,651	21,657	21,783	21,816	21,847	21,879	21,909	21,942	21,972	22,000
Fulton	128,743	128,940	128,902	129,453	129,702	129,964	130,189	130,448	130,675	130,935	131,177
Gwinnett	128,924	129,254	129,281	129,982	130,336	130,687	131,054	131,404	131,773	132,133	132,502
Hall	36,644	36,728	36,746	36,882	36,950	37,018	37,083	37,149	37,213	37,277	37,341
Henry	37,007	37,070	37,079	37,210	37,275	37,342	37,405	37,467	37,526	37,588	37,643
Lee	4,548	4,555	4,560	4,575	4,582	4,589	4,595	4,602	4,608	4,615	4,621

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:		
	10/4	10/5	10/6	10/7	10/9	10/11	10/13
Bartow	19,873	19,907	19,912	19,987	20,054 (4,011) [963] {481}	20,119 (4,024) [966] {483}	20,181 (4,036) [969] {484}
Carroll	16,061	16,087	16,090	16,124	16,157 (3,231) [776] {388}	16,189 (3,238) [777] {389}	16,218 (3,244) [778] {389}
Cherokee	42,370	42,420	42,432	42,576	42,686 (8,537) [2,049] {1,024}	42,789 (8,558) [2,054] {1,027}	42,887 (8,577) [2,059] {1,029}
Clarke	19,673	19,687	19,693	19,746	19,792 (3,958) [950] {475}	19,835 (3,967) [952] {476}	19,875 (3,975) [954] {477}
Clayton	38,130	38,206	38,235	38,354	38,484 (7,697) [1,847] {924}	38,607 (7,721) [1,853] {927}	38,724 (7,745) [1,859] {929}
Cobb	105,925	106,065	106,110	106,784	107,118 (21,424) [5,142] {2,571}	107,423 (21,485) [5,156] {2,578}	107,735 (21,547) [5,171] {2,586}
DeKalb	88,606	88,840	88,917	89,313	89,763 (17,953) [4,309] {2,154}	90,197 (18,039) [4,329] {2,165}	90,640 (18,128) [4,351] {2,175}
Dougherty	12,031	12,055	12,064	12,107	12,164 (2,433) [584] {292}	12,219 (2,444) [587] {293}	12,272 (2,454) [589] {295}
Douglas	21,620	21,651	21,657	21,783	21,847 (4,369) [1,049] {524}	21,909 (4,382) [1,052] {526}	21,972 (4,394) [1,055] {527}
Fulton	128,743	128,940	128,902	129,453	129,964 (25,993) [6,238] {3,119}	130,448 (26,090) [6,261] {3,131}	130,935 (26,187) [6,285] {3,142}
Gwinnett	128,924	129,254	129,281	129,982	130,687 (26,137) [6,273] {3,136}	131,404 (26,281) [6,307] {3,154}	132,133 (26,427) [6,342] {3,171}
Hall	36,644	36,728	36,746	36,882	37,018 (7,404) [1,777] {888}	37,149 (7,430) [1,783] {892}	37,277 (7,455) [1,789] {895}
Henry	37,007	37,070	37,079	37,210	37,342 (7,468) [1,792] {896}	37,467 (7,493) [1,798] {899}	37,588 (7,518) [1,804] {902}
Lee	4,548	4,555	4,560	4,575	4,589 (918) [220] {110}	4,602 (920) [221] {110}	4,615 (923) [222] {111}

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.