IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/11/21

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 10/11/21 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
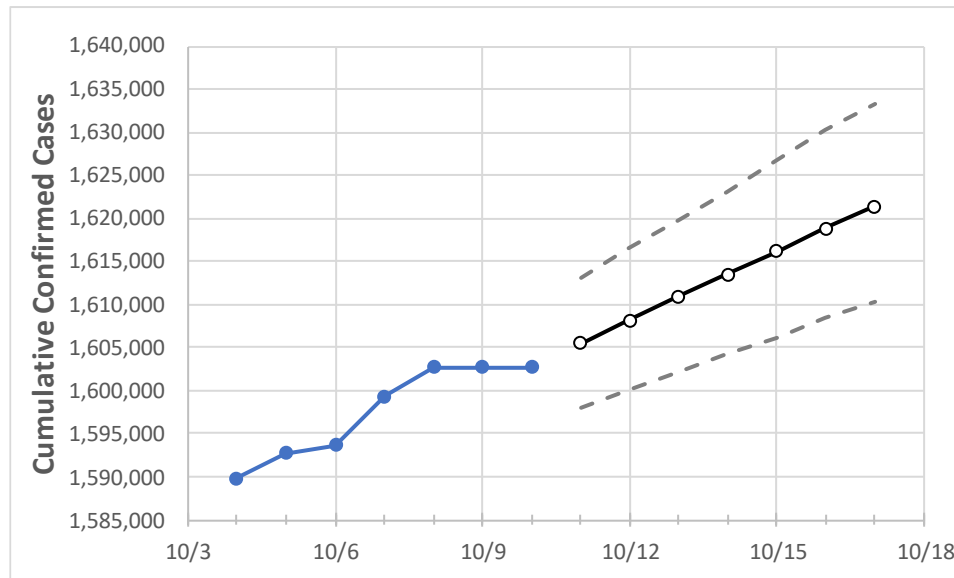
	Actual Confirmed Cases On:				Projected Cases For:						
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17
Georgia	1,599,393	1,602,667	1,602,667	1,602,667	1,605,485	1,608,132	1,610,905	1,613,533	1,616,161	1,618,833	1,621,354

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:						
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17
Bartow	19,987	20,036	20,036	20,036	20,070	20,102	20,136	20,169	20,201	20,234	20,265
Carroll	16,124	16,159	16,159	16,159	16,176	16,192	16,208	16,224	16,239	16,255	16,268
Cherokee	42,576	42,681	42,681	42,681	42,738	42,793	42,848	42,900	42,956	43,007	43,060
Clarke	19,746	19,763	19,763	19,763	19,784	19,804	19,825	19,844	19,862	19,881	19,898
Clayton	38,354	38,422	38,422	38,422	38,486	38,545	38,602	38,661	38,715	38,770	38,823
Cobb	106,784	107,110	107,110	107,110	107,313	107,498	107,669	107,845	108,021	108,212	108,392
DeKalb	89,313	89,474	89,474	89,474	89,690	89,928	90,155	90,369	90,589	90,822	91,040
Dougherty	12,107	12,144	12,144	12,144	12,172	12,200	12,228	12,255	12,282	12,308	12,334
Douglas	21,783	21,856	21,856	21,856	21,895	21,933	21,968	22,004	22,043	22,080	22,111
Fulton	129,453	129,663	129,663	129,663	129,907	130,160	130,394	130,640	130,886	131,117	131,350
Gwinnett	129,982	130,247	130,247	130,247	130,598	130,961	131,305	131,673	132,034	132,403	132,759
Hall	36,882	36,996	36,996	36,996	37,066	37,139	37,207	37,277	37,341	37,410	37,475
Henry	37,210	37,270	37,270	37,270	37,333	37,397	37,456	37,517	37,578	37,636	37,693
Lee	4,575	4,582	4,582	4,582	4,589	4,595	4,601	4,607	4,613	4,619	4,625

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:		
	10/7	10/8	10/9	10/10	10/12	10/14	10/16
Bartow	19,987	20,036	20,036	20,036	20,102 (4,020) [965] {482}	20,169 (4,034) [968] {484}	20,234 (4,047) [971] {486}
Carroll	16,124	16,159	16,159	16,159	16,192 (3,238) [777] {389}	16,224 (3,245) [779] {389}	16,255 (3,251) [780] {390}
Cherokee	42,576	42,681	42,681	42,681	42,793 (8,559) [2,054] {1,027}	42,900 (8,580) [2,059] {1,030}	43,007 (8,601) [2,064] {1,032}
Clarke	19,746	19,763	19,763	19,763	19,804 (3,961) [951] {475}	19,844 (3,969) [952] {476}	19,881 (3,976) [954] {477}
Clayton	38,354	38,422	38,422	38,422	38,545 (7,709) [1,850] {925}	38,661 (7,732) [1,856] {928}	38,770 (7,754) [1,861] {930}
Cobb	106,784	107,110	107,110	107,110	107,498 (21,500) [5,160] {2,580}	107,845 (21,569) [5,177] {2,588}	108,212 (21,642) [5,194] {2,597}
DeKalb	89,313	89,474	89,474	89,474	89,928 (17,986) [4,317] {2,158}	90,369 (18,074) [4,338] {2,169}	90,822 (18,164) [4,359] {2,180}
Dougherty	12,107	12,144	12,144	12,144	12,200 (2,440) [586] {293}	12,255 (2,451) [588] {294}	12,308 (2,462) [591] {295}
Douglas	21,783	21,856	21,856	21,856	21,933 (4,387) [1,053] {526}	22,004 (4,401) [1,056] {528}	22,080 (4,416) [1,060] {530}
Fulton	129,453	129,663	129,663	129,663	130,160 (26,032) [6,248] {3,124}	130,640 (26,128) [6,271] {3,135}	131,117 (26,223) [6,294] {3,147}
Gwinnett	129,982	130,247	130,247	130,247	130,961 (26,192) [6,286] {3,143}	131,673 (26,335) [6,320] {3,160}	132,403 (26,481) [6,355] {3,178}
Hall	36,882	36,996	36,996	36,996	37,139 (7,428) [1,783] {891}	37,277 (7,455) [1,789] {895}	37,410 (7,482) [1,796] {898}
Henry	37,210	37,270	37,270	37,270	37,397 (7,479) [1,795] {898}	37,517 (7,503) [1,801] {900}	37,636 (7,527) [1,807] {903}
Lee	4,575	4,582	4,582	4,582	4,595 (919) [221] {110}	4,607 (921) [221] {111}	4,619 (924) [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.