IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/9/21

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 2/9/21 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
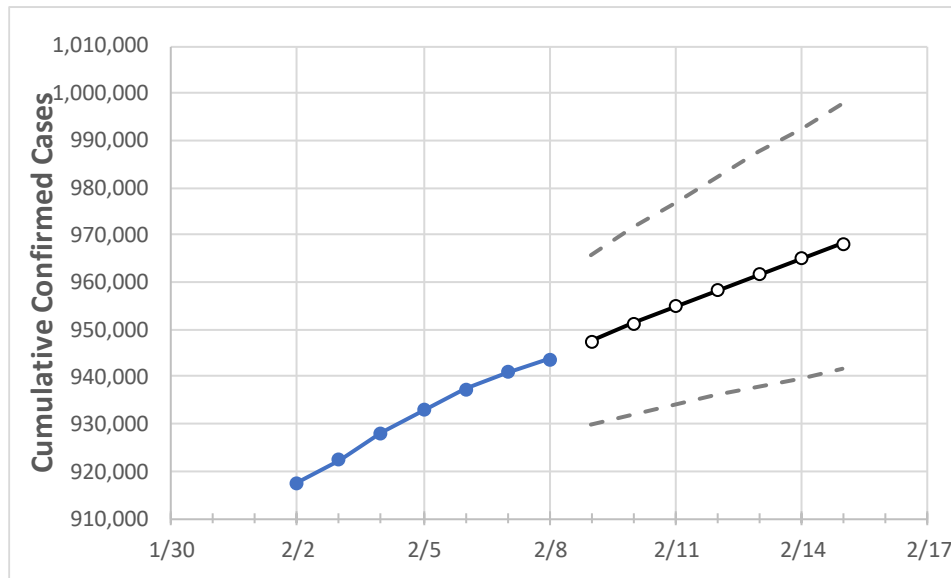
	Actual Confirmed Cases On:				Projected Cases For:						
	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15
Georgia	932,912	937,402	940,991	943,695	947,519	951,268	954,823	958,290	961,692	964,960	968,116

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:						
	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15
Bartow	11,617	11,680	11,731	11,776	11,839	11,904	11,965	12,023	12,077	12,134	12,188
Carroll	9,860	9,905	9,964	10,002	10,047	10,089	10,132	10,174	10,216	10,255	10,294
Cherokee	24,889	24,986	25,106	25,156	25,263	25,367	25,464	25,564	25,657	25,745	25,833
Clarke	13,330	13,393	13,427	13,452	13,497	13,539	13,582	13,622	13,662	13,700	13,737
Clayton	20,451	20,839	21,149	21,538	21,780	22,023	22,275	22,533	22,796	23,081	23,361
Cobb	64,445	64,749	65,002	65,173	65,451	65,721	65,987	66,241	66,485	66,723	66,955
DeKalb	52,546	52,801	52,980	53,140	53,358	53,558	53,759	53,949	54,137	54,315	54,482
Dougherty	6,738	6,777	6,787	6,795	6,819	6,842	6,865	6,886	6,907	6,927	6,948
Douglas	12,201	12,299	12,360	12,400	12,481	12,559	12,636	12,709	12,782	12,854	12,926
Fulton	79,178	79,522	79,900	80,151	80,450	80,739	81,015	81,279	81,531	81,775	82,010
Gwinnett	85,678	86,079	86,381	86,590	86,908	87,199	87,480	87,744	87,999	88,238	88,466
Hall	24,404	24,455	24,515	24,535	24,592	24,649	24,701	24,751	24,797	24,843	24,884
Henry	19,713	19,840	19,926	20,010	20,109	20,203	20,290	20,381	20,469	20,552	20,634
Lee	2,459	2,477	2,480	2,479	2,490	2,502	2,513	2,524	2,534	2,543	2,553

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:		
	2/5	2/6	2/7	2/8	2/10	2/12	2/14
Bartow	11,617	11,680	11,731	11,776	11,904 (2,381) [571] {286}	12,023 (2,405) [577] {289}	12,134 (2,427) [582] {291}
Carroll	9,860	9,905	9,964	10,002	10,089 (2,018) [484] {242}	10,174 (2,035) [488] {244}	10,255 (2,051) [492] {246}
Cherokee	24,889	24,986	25,106	25,156	25,367 (5,073) [1,218] {609}	25,564 (5,113) [1,227] {614}	25,745 (5,149) [1,236] {618}
Clarke	13,330	13,393	13,427	13,452	13,539 (2,708) [650] {325}	13,622 (2,724) [654] {327}	13,700 (2,740) [658] {329}
Clayton	20,451	20,839	21,149	21,538	22,023 (4,405) [1,057] {529}	22,533 (4,507) [1,082] {541}	23,081 (4,616) [1,108] {554}
Cobb	64,445	64,749	65,002	65,173	65,721 (13,144) [3,155] {1,577}	66,241 (13,248) [3,180] {1,590}	66,723 (13,345) [3,203] {1,601}
DeKalb	52,546	52,801	52,980	53,140	53,558 (10,712) [2,571] {1,285}	53,949 (10,790) [2,590] {1,295}	54,315 (10,863) [2,607] {1,304}
Dougherty	6,738	6,777	6,787	6,795	6,842 (1,368) [328] {164}	6,886 (1,377) [331] {165}	6,927 (1,385) [333] {166}
Douglas	12,201	12,299	12,360	12,400	12,559 (2,512) [603] {301}	12,709 (2,542) [610] {305}	12,854 (2,571) [617] {309}
Fulton	79,178	79,522	79,900	80,151	80,739 (16,148) [3,875] {1,938}	81,279 (16,256) [3,901] {1,951}	81,775 (16,355) [3,925] {1,963}
Gwinnett	85,678	86,079	86,381	86,590	87,199 (17,440) [4,186] {2,093}	87,744 (17,549) [4,212] {2,106}	88,238 (17,648) [4,235] {2,118}
Hall	24,404	24,455	24,515	24,535	24,649 (4,930) [1,183] {592}	24,751 (4,950) [1,188] {594}	24,843 (4,969) [1,192] {596}
Henry	19,713	19,840	19,926	20,010	20,203 (4,041) [970] {485}	20,381 (4,076) [978] {489}	20,552 (4,110) [987] {493}
Lee	2,459	2,477	2,480	2,479	2,502 (500) [120] {60}	2,524 (505) [121] {61}	2,543 (509) [122] {61}

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.