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

Date: 3/18/22

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 3/18/22 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.

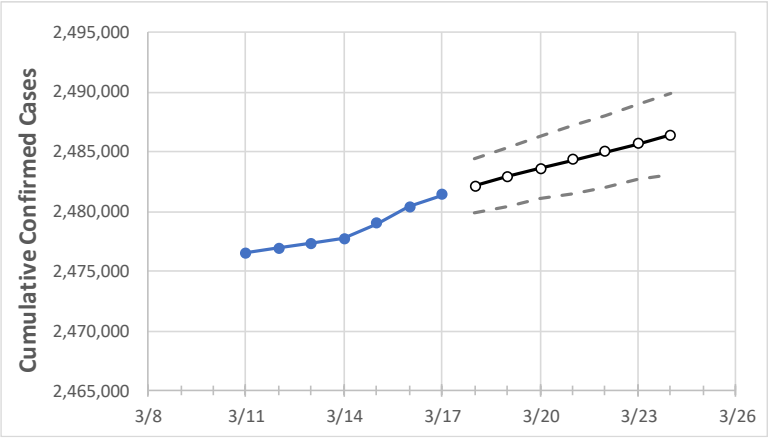
IEM's Modeling Lead

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Georgia	2,477,737	2,478,986	2,480,368	2,481,419	2,482,159	2,482,899	2,483,603	2,484,336	2,485,011	2,485,697	2,486,376

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Bartow	28,840	28,855	28,861	28,871	28,881	28,891	28,900	28,909	28,918	28,926	28,935
Carroll	23,611	23,610	23,613	23,618	23,620	23,621	23,623	23,624	23,626	23,627	23,628
Cherokee	62,736	62,728	62,732	62,736	62,742	62,747	62,753	62,758	62,762	62,767	62,771
Clarke	29,519	29,522	29,527	29,538	29,541	29,544	29,547	29,551	29,553	29,556	29,559
Clayton	63,245	63,261	63,275	63,286	63,295	63,303	63,311	63,319	63,327	63,334	63,341
Cobb	169,906	169,949	170,009	170,072	170,113	170,152	170,192	170,228	170,267	170,302	170,339
DeKalb	144,908	144,971	145,016	145,071	145,110	145,148	145,184	145,219	145,255	145,289	145,323
Dougherty	19,383	19,386	19,393	19,396	19,399	19,402	19,405	19,407	19,410	19,413	19,415
Douglas	34,640	34,648	34,653	34,661	34,665	34,669	34,673	34,676	34,680	34,683	34,686
Fulton	212,978	213,043	213,117	213,176	213,222	213,265	213,308	213,350	213,391	213,431	213,471
Gwinnett	205,744	205,765	205,823	205,869	205,902	205,933	205,963	205,991	206,020	206,047	206,074
Hall	53,089	53,099	53,109	53,108	53,112	53,116	53,119	53,123	53,126	53,129	53,132
Henry	57,427	57,452	57,464	57,474	57,484	57,494	57,504	57,512	57,522	57,530	57,538
Lee	7,201	7,201	7,204	7,205	7,206	7,207	7,208	7,209	7,209	7,210	7,211

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:		
	3/14	3/15	3/16	3/17	3/19	3/21	3/23
Bartow	28,840	28,855	28,861	28,871	28,891 (5,778) [1,387] {693}	28,909 (5,782) [1,388] {694}	28,926 (5,785) [1,388] {694}
Carroll	23,611	23,610	23,613	23,618	23,621 (4,724) [1,134] {567}	23,624 (4,725) [1,134] {567}	23,627 (4,725) [1,134] {567}
Cherokee	62,736	62,728	62,732	62,736	62,747 (12,549) [3,012] {1,506}	62,758 (12,552) [3,012] {1,506}	62,767 (12,553) [3,013] {1,506}
Clarke	29,519	29,522	29,527	29,538	29,544 (5,909) [1,418] {709}	29,551 (5,910) [1,418] {709}	29,556 (5,911) [1,419] {709}
Clayton	63,245	63,261	63,275	63,286	63,303 (12,661) [3,039] {1,519}	63,319 (12,664) [3,039] {1,520}	63,334 (12,667) [3,040] {1,520}
Cobb	169,906	169,949	170,009	170,072	170,152 (34,030) [8,167] {4,084}	170,228 (34,046) [8,171] {4,085}	170,302 (34,060) [8,175] {4,087}
DeKalb	144,908	144,971	145,016	145,071	145,148 (29,030) [6,967] {3,484}	145,219 (29,044) [6,970] {3,485}	145,289 (29,058) [6,974] {3,487}
Dougherty	19,383	19,386	19,393	19,396	19,402 (3,880) [931] {466}	19,407 (3,881) [932] {466}	19,413 (3,883) [932] {466}
Douglas	34,640	34,648	34,653	34,661	34,669 (6,934) [1,664] {832}	34,676 (6,935) [1,664] {832}	34,683 (6,937) [1,665] {832}
Fulton	212,978	213,043	213,117	213,176	213,265 (42,653) [10,237] {5,118}	213,350 (42,670) [10,241] {5,120}	213,431 (42,686) [10,245] {5,122}
Gwinnett	205,744	205,765	205,823	205,869	205,933 (41,187) [9,885] {4,942}	205,991 (41,198) [9,888] {4,944}	206,047 (41,209) [9,890] {4,945}
Hall	53,089	53,099	53,109	53,108	53,116 (10,623) [2,550] {1,275}	53,123 (10,625) [2,550] {1,275}	53,129 (10,626) [2,550] {1,275}
Henry	57,427	57,452	57,464	57,474	57,494 (11,499) [2,760] {1,380}	57,512 (11,502) [2,761] {1,380}	57,530 (11,506) [2,761] {1,381}
Lee	7,201	7,201	7,204	7,205	7,207 (1,441) [346] {173}	7,209 (1,442) [346] {173}	7,210 (1,442) [346] {173}

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.