IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/13/21

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 <u>not</u> 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 9/13/21 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
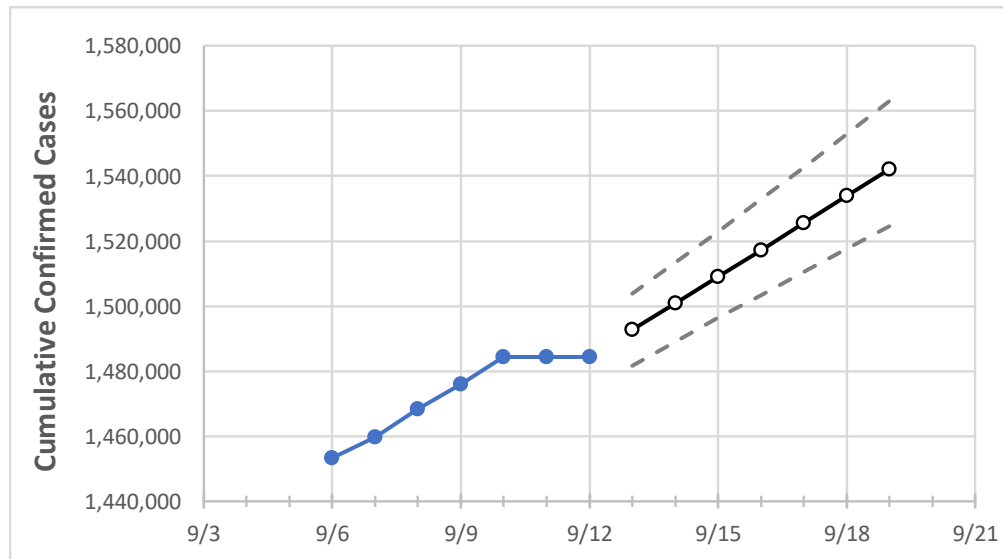
	Actual Confirmed Cases On:				Projected Cases For:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Georgia	1,475,996	1,484,274	1,484,274	1,484,274	1,492,678	1,500,827	1,509,027	1,517,182	1,525,628	1,533,939	1,542,194

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Bartow	18,467	18,584	18,584	18,584	18,695	18,806	18,919	19,034	19,146	19,262	19,380
Carroll	15,071	15,123	15,123	15,123	15,209	15,290	15,375	15,455	15,539	15,627	15,709
Cherokee	39,716	39,952	39,952	39,952	40,160	40,368	40,575	40,778	40,987	41,190	41,397
Clarke	18,553	18,629	18,629	18,629	18,738	18,845	18,946	19,051	19,162	19,270	19,379
Clayton	34,905	35,078	35,078	35,078	35,229	35,383	35,533	35,680	35,831	35,983	36,135
Cobb	99,273	99,824	99,824	99,824	100,278	100,744	101,193	101,641	102,108	102,564	103,033
DeKalb	82,185	82,561	82,561	82,561	82,914	83,268	83,613	83,975	84,329	84,687	85,051
Dougherty	10,884	10,978	10,978	10,978	11,073	11,169	11,263	11,355	11,450	11,547	11,640
Douglas	20,093	20,217	20,217	20,217	20,335	20,452	20,571	20,690	20,810	20,928	21,048
Fulton	120,806	121,375	121,375	121,375	121,865	122,388	122,883	123,382	123,895	124,436	124,929
Gwinnett	119,473	119,890	119,890	119,890	120,337	120,783	121,229	121,686	122,135	122,608	123,078
Hall	33,746	33,990	33,990	33,990	34,232	34,478	34,729	34,986	35,249	35,515	35,789
Henry	34,444	34,572	34,572	34,572	34,742	34,908	35,071	35,235	35,399	35,559	35,723
Lee	4,257	4,287	4,287	4,287	4,328	4,369	4,408	4,450	4,490	4,533	4,571

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:		
	9/9	9/10	9/11	9/12	9/14	9/16	9/18
Bartow	18,467	18,584	18,584	18,584	18,806 (3,761) [903] {451}	19,034 (3,807) [914] {457}	19,262 (3,852) [925] {462}
Carroll	15,071	15,123	15,123	15,123	15,290 (3,058) [734] {367}	15,455 (3,091) [742] {371}	15,627 (3,125) [750] {375}
Cherokee	39,716	39,952	39,952	39,952	40,368 (8,074) [1,938] {969}	40,778 (8,156) [1,957] {979}	41,190 (8,238) [1,977] {989}
Clarke	18,553	18,629	18,629	18,629	18,845 (3,769) [905] {452}	19,051 (3,810) [914] {457}	19,270 (3,854) [925] {462}
Clayton	34,905	35,078	35,078	35,078	35,383 (7,077) [1,698] {849}	35,680 (7,136) [1,713] {856}	35,983 (7,197) [1,727] {864}
Cobb	99,273	99,824	99,824	99,824	100,744 (20,149) [4,836] {2,418}	101,641 (20,328) [4,879] {2,439}	102,564 (20,513) [4,923] {2,462}
DeKalb	82,185	82,561	82,561	82,561	83,268 (16,654) [3,997] {1,998}	83,975 (16,795) [4,031] {2,015}	84,687 (16,937) [4,065] {2,032}
Dougherty	10,884	10,978	10,978	10,978	11,169 (2,234) [536] {268}	11,355 (2,271) [545] {273}	11,547 (2,309) [554] {277}
Douglas	20,093	20,217	20,217	20,217	20,452 (4,090) [982] {491}	20,690 (4,138) [993] {497}	20,928 (4,186) [1,005] {502}
Fulton	120,806	121,375	121,375	121,375	122,388 (24,478) [5,875] {2,937}	123,382 (24,676) [5,922] {2,961}	124,436 (24,887) [5,973] {2,986}
Gwinnett	119,473	119,890	119,890	119,890	120,783 (24,157) [5,798] {2,899}	121,686 (24,337) [5,841] {2,920}	122,608 (24,522) [5,885] {2,943}
Hall	33,746	33,990	33,990	33,990	34,478 (6,896) [1,655] {827}	34,986 (6,997) [1,679] {840}	35,515 (7,103) [1,705] {852}
Henry	34,444	34,572	34,572	34,572	34,908 (6,982) [1,676] {838}	35,235 (7,047) [1,691] {846}	35,559 (7,112) [1,707] {853}
Lee	4,257	4,287	4,287	4,287	4,369 (874) [210] {105}	4,450 (890) [214] {107}	4,533 (907) [218] {109}

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.