IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/16/21

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 8/16/21 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
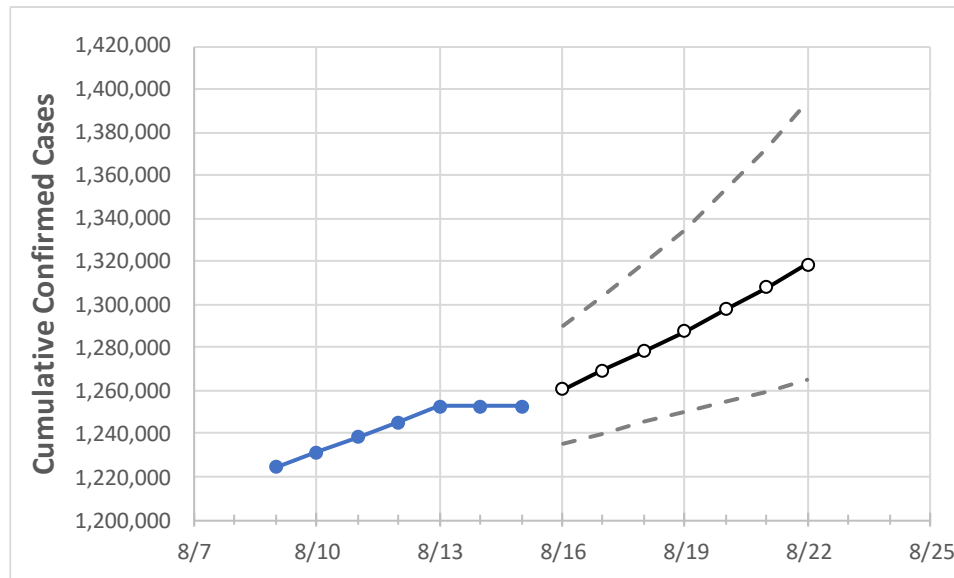
	Actual Confirmed Cases On:				Projected Cases For:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Georgia	1,245,399	1,252,615	1,252,615	1,252,615	1,260,818	1,269,343	1,278,170	1,287,722	1,297,700	1,307,869	1,318,524

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Bartow	16,016	16,059	16,059	16,059	16,136	16,217	16,305	16,397	16,493	16,596	16,705
Carroll	12,718	12,796	12,796	12,796	12,865	12,935	13,006	13,078	13,154	13,229	13,310
Cherokee	33,923	34,121	34,121	34,121	34,337	34,568	34,821	35,095	35,386	35,700	36,033
Clarke	16,148	16,209	16,209	16,209	16,276	16,345	16,418	16,495	16,575	16,659	16,746
Clayton	30,190	30,407	30,407	30,407	30,589	30,781	30,978	31,184	31,404	31,628	31,859
Cobb	86,729	87,171	87,171	87,171	87,629	88,112	88,626	89,152	89,702	90,303	90,930
DeKalb	72,987	73,323	73,323	73,323	73,707	74,104	74,515	74,965	75,404	75,874	76,353
Dougherty	8,610	8,684	8,684	8,684	8,756	8,833	8,914	8,999	9,091	9,183	9,281
Douglas	17,092	17,180	17,180	17,180	17,269	17,363	17,459	17,556	17,659	17,768	17,880
Fulton	108,040	108,430	108,430	108,430	108,926	109,434	109,958	110,481	111,044	111,612	112,186
Gwinnett	109,093	109,357	109,357	109,357	109,690	110,043	110,413	110,787	111,171	111,581	111,997
Hall	29,407	29,499	29,499	29,499	29,618	29,741	29,872	30,008	30,154	30,310	30,471
Henry	28,856	29,058	29,058	29,058	29,267	29,477	29,711	29,963	30,222	30,487	30,771
Lee	3,241	3,270	3,270	3,270	3,303	3,339	3,376	3,414	3,454	3,495	3,538

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:		
	8/12	8/13	8/14	8/15	8/17	8/19	8/21
Bartow	16,016	16,059	16,059	16,059	16,217 (3,243) [778] {389}	16,397 (3,279) [787] {394}	16,596 (3,319) [797] {398}
Carroll	12,718	12,796	12,796	12,796	12,935 (2,587) [621] {310}	13,078 (2,616) [628] {314}	13,229 (2,646) [635] {318}
Cherokee	33,923	34,121	34,121	34,121	34,568 (6,914) [1,659] {830}	35,095 (7,019) [1,685] {842}	35,700 (7,140) [1,714] {857}
Clarke	16,148	16,209	16,209	16,209	16,345 (3,269) [785] {392}	16,495 (3,299) [792] {396}	16,659 (3,332) [800] {400}
Clayton	30,190	30,407	30,407	30,407	30,781 (6,156) [1,477] {739}	31,184 (6,237) [1,497] {748}	31,628 (6,326) [1,518] {759}
Cobb	86,729	87,171	87,171	87,171	88,112 (17,622) [4,229] {2,115}	89,152 (17,830) [4,279] {2,140}	90,303 (18,061) [4,335] {2,167}
DeKalb	72,987	73,323	73,323	73,323	74,104 (14,821) [3,557] {1,779}	74,965 (14,993) [3,598] {1,799}	75,874 (15,175) [3,642] {1,821}
Dougherty	8,610	8,684	8,684	8,684	8,833 (1,767) [424] {212}	8,999 (1,800) [432] {216}	9,183 (1,837) [441] {220}
Douglas	17,092	17,180	17,180	17,180	17,363 (3,473) [833] {417}	17,556 (3,511) [843] {421}	17,768 (3,554) [853] {426}
Fulton	108,040	108,430	108,430	108,430	109,434 (21,887) [5,253] {2,626}	110,481 (22,096) [5,303] {2,652}	111,612 (22,322) [5,357] {2,679}
Gwinnett	109,093	109,357	109,357	109,357	110,043 (22,009) [5,282] {2,641}	110,787 (22,157) [5,318] {2,659}	111,581 (22,316) [5,356] {2,678}
Hall	29,407	29,499	29,499	29,499	29,741 (5,948) [1,428] {714}	30,008 (6,002) [1,440] {720}	30,310 (6,062) [1,455] {727}
Henry	28,856	29,058	29,058	29,058	29,477 (5,895) [1,415] {707}	29,963 (5,993) [1,438] {719}	30,487 (6,097) [1,463] {732}
Lee	3,241	3,270	3,270	3,270	3,339 (668) [160] {80}	3,414 (683) [164] {82}	3,495 (699) [168] {84}

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.