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

Date: 2/17/21

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 2/17/21 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.

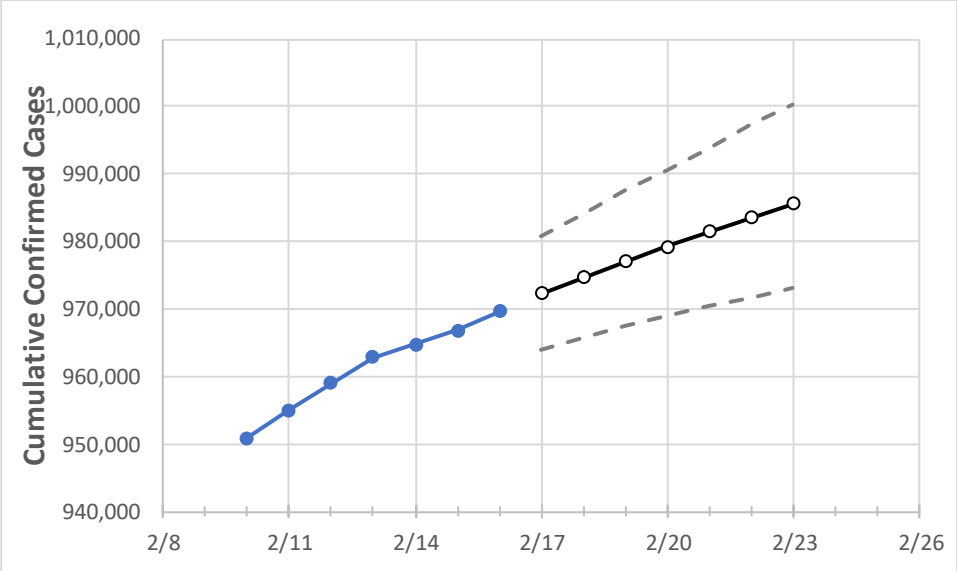
IEM's Modeling Lead

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:						
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23
Georgia	962,808	964,737	966,807	969,702	972,281	974,711	977,008	979,284	981,444	983,464	985,545

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:						
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23
Bartow	12,129	12,166	12,190	12,252	12,302	12,351	12,397	12,443	12,488	12,531	12,572
Carroll	10,166	10,185	10,209	10,222	10,248	10,272	10,297	10,320	10,340	10,360	10,379
Cherokee	25,670	25,714	25,812	25,906	25,978	26,047	26,114	26,176	26,236	26,295	26,352
Clarke	13,671	13,701	13,733	13,764	13,795	13,823	13,851	13,877	13,903	13,928	13,951
Clayton	22,025	22,068	22,127	22,196	22,315	22,432	22,545	22,658	22,771	22,871	22,971
Cobb	66,498	66,632	66,805	66,980	67,157	67,327	67,488	67,641	67,784	67,928	68,062
DeKalb	54,377	54,510	54,603	54,691	54,855	55,007	55,153	55,295	55,435	55,565	55,689
Dougherty	6,904	6,908	6,916	6,919	6,929	6,938	6,947	6,956	6,964	6,971	6,978
Douglas	12,745	12,794	12,832	12,872	12,919	12,965	13,009	13,051	13,090	13,129	13,167
Fulton	81,670	81,871	82,063	82,276	82,494	82,706	82,910	83,104	83,291	83,474	83,647
Gwinnett	88,324	88,564	88,737	89,010	89,230	89,440	89,636	89,822	90,003	90,178	90,345
Hall	24,821	24,855	24,890	24,931	24,962	24,993	25,023	25,050	25,078	25,103	25,125
Henry	20,428	20,481	20,547	20,594	20,651	20,707	20,758	20,808	20,856	20,900	20,941
Lee	2,519	2,520	2,520	2,527	2,532	2,536	2,540	2,544	2,548	2,551	2,554

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:		
	2/13	2/14	2/15	2/16	2/18	2/20	2/22
Bartow	12,129	12,166	12,190	12,252	12,351 (2,470) [593] {296}	12,443 (2,489) [597] {299}	12,531 (2,506) [601] {301}
Carroll	10,166	10,185	10,209	10,222	10,272 (2,054) [493] {247}	10,320 (2,064) [495] {248}	10,360 (2,072) [497] {249}
Cherokee	25,670	25,714	25,812	25,906	26,047 (5,209) [1,250] {625}	26,176 (5,235) [1,256] {628}	26,295 (5,259) [1,262] {631}
Clarke	13,671	13,701	13,733	13,764	13,823 (2,765) [664] {332}	13,877 (2,775) [666] {333}	13,928 (2,786) [669] {334}
Clayton	22,025	22,068	22,127	22,196	22,432 (4,486) [1,077] {538}	22,658 (4,532) [1,088] {544}	22,871 (4,574) [1,098] {549}
Cobb	66,498	66,632	66,805	66,980	67,327 (13,465) [3,232] {1,616}	67,641 (13,528) [3,247] {1,623}	67,928 (13,586) [3,261] {1,630}
DeKalb	54,377	54,510	54,603	54,691	55,007 (11,001) [2,640] {1,320}	55,295 (11,059) [2,654] {1,327}	55,565 (11,113) [2,667] {1,334}
Dougherty	6,904	6,908	6,916	6,919	6,938 (1,388) [333] {167}	6,956 (1,391) [334] {167}	6,971 (1,394) [335] {167}
Douglas	12,745	12,794	12,832	12,872	12,965 (2,593) [622] {311}	13,051 (2,610) [626] {313}	13,129 (2,626) [630] {315}
Fulton	81,670	81,871	82,063	82,276	82,706 (16,541) [3,970] {1,985}	83,104 (16,621) [3,989] {1,995}	83,474 (16,695) [4,007] {2,003}
Gwinnett	88,324	88,564	88,737	89,010	89,440 (17,888) [4,293] {2,147}	89,822 (17,964) [4,311] {2,156}	90,178 (18,036) [4,329] {2,164}
Hall	24,821	24,855	24,890	24,931	24,993 (4,999) [1,200] {600}	25,050 (5,010) [1,202] {601}	25,103 (5,021) [1,205] {602}
Henry	20,428	20,481	20,547	20,594	20,707 (4,141) [994] {497}	20,808 (4,162) [999] {499}	20,900 (4,180) [1,003] {502}
Lee	2,519	2,520	2,520	2,527	2,536 (507) [122] {61}	2,544 (509) [122] {61}	2,551 (510) [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.