

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

Date: 4/9/21

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 4/9/21 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.

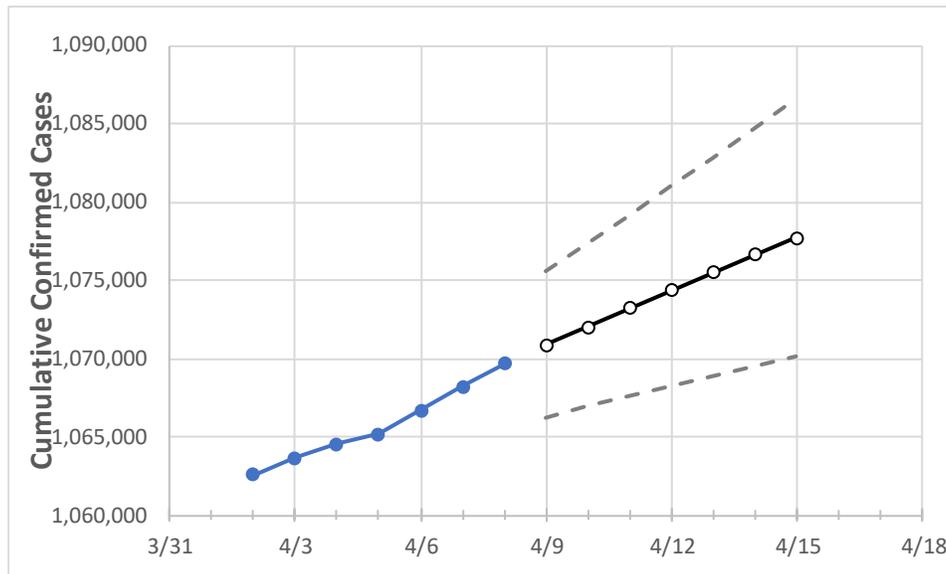
IEM's Modeling Lead

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:						
	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15
Georgia	1,065,197	1,066,671	1,068,199	1,069,689	1,070,875	1,072,027	1,073,184	1,074,349	1,075,504	1,076,636	1,077,729

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:						
	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15
Bartow	14,054	14,065	14,093	14,109	14,129	14,148	14,167	14,186	14,204	14,222	14,239
Carroll	11,007	11,026	11,038	11,071	11,088	11,104	11,122	11,139	11,156	11,174	11,192
Cherokee	29,755	29,802	29,858	29,911	29,955	30,000	30,045	30,088	30,130	30,171	30,210
Clarke	14,657	14,673	14,688	14,696	14,708	14,719	14,731	14,742	14,754	14,765	14,777
Clayton	24,945	24,991	25,060	25,122	25,162	25,202	25,243	25,282	25,321	25,360	25,398
Cobb	74,644	74,769	74,915	75,070	75,192	75,318	75,440	75,564	75,688	75,810	75,926
DeKalb	61,819	61,930	62,058	62,179	62,285	62,387	62,490	62,591	62,690	62,787	62,885
Dougherty	7,272	7,275	7,286	7,292	7,299	7,306	7,312	7,319	7,326	7,332	7,339
Douglas	14,373	14,401	14,437	14,465	14,489	14,514	14,539	14,564	14,588	14,612	14,637
Fulton	92,437	92,613	92,809	92,989	93,128	93,268	93,408	93,547	93,684	93,818	93,951
Gwinnett	97,354	97,496	97,641	97,767	97,878	97,991	98,097	98,205	98,313	98,420	98,526
Hall	26,444	26,473	26,527	26,553	26,581	26,609	26,638	26,667	26,696	26,726	26,756
Henry	23,853	23,893	23,943	23,988	24,023	24,057	24,090	24,124	24,156	24,188	24,219
Lee	2,670	2,674	2,680	2,681	2,683	2,684	2,686	2,687	2,689	2,690	2,692

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:											
	4/5	4/6	4/7	4/8	4/10				4/12				4/14			
Bartow	14,054	14,065	14,093	14,109	14,148	(2,830)	[679]	{340}	14,186	(2,837)	[681]	{340}	14,222	(2,844)	[683]	{341}
Carroll	11,007	11,026	11,038	11,071	11,104	(2,221)	[533]	{267}	11,139	(2,228)	[535]	{267}	11,174	(2,235)	[536]	{268}
Cherokee	29,755	29,802	29,858	29,911	30,000	(6,000)	[1,440]	{720}	30,088	(6,018)	[1,444]	{722}	30,171	(6,034)	[1,448]	{724}
Clarke	14,657	14,673	14,688	14,696	14,719	(2,944)	[707]	{353}	14,742	(2,948)	[708]	{354}	14,765	(2,953)	[709]	{354}
Clayton	24,945	24,991	25,060	25,122	25,202	(5,040)	[1,210]	{605}	25,282	(5,056)	[1,214]	{607}	25,360	(5,072)	[1,217]	{609}
Cobb	74,644	74,769	74,915	75,070	75,318	(15,064)	[3,615]	{1,808}	75,564	(15,113)	[3,627]	{1,814}	75,810	(15,162)	[3,639]	{1,819}
DeKalb	61,819	61,930	62,058	62,179	62,387	(12,477)	[2,995]	{1,497}	62,591	(12,518)	[3,004]	{1,502}	62,787	(12,557)	[3,014]	{1,507}
Dougherty	7,272	7,275	7,286	7,292	7,306	(1,461)	[351]	{175}	7,319	(1,464)	[351]	{176}	7,332	(1,466)	[352]	{176}
Douglas	14,373	14,401	14,437	14,465	14,514	(2,903)	[697]	{348}	14,564	(2,913)	[699]	{350}	14,612	(2,922)	[701]	{351}
Fulton	92,437	92,613	92,809	92,989	93,268	(18,654)	[4,477]	{2,238}	93,547	(18,709)	[4,490]	{2,245}	93,818	(18,764)	[4,503]	{2,252}
Gwinnett	97,354	97,496	97,641	97,767	97,991	(19,598)	[4,704]	{2,352}	98,205	(19,641)	[4,714]	{2,357}	98,420	(19,684)	[4,724]	{2,362}
Hall	26,444	26,473	26,527	26,553	26,609	(5,322)	[1,277]	{639}	26,667	(5,333)	[1,280]	{640}	26,726	(5,345)	[1,283]	{641}
Henry	23,853	23,893	23,943	23,988	24,057	(4,811)	[1,155]	{577}	24,124	(4,825)	[1,158]	{579}	24,188	(4,838)	[1,161]	{581}
Lee	2,670	2,674	2,680	2,681	2,684	(537)	[129]	{64}	2,687	(537)	[129]	{64}	2,690	(538)	[129]	{65}

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.