

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

Date: 1/19/21

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 1/19/21 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.

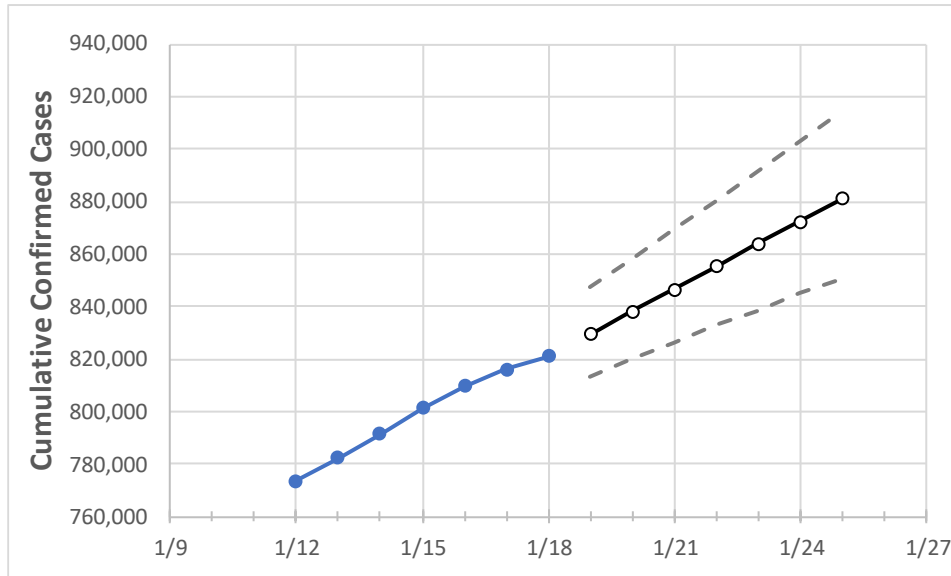
IEM's Modeling Lead

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:						
	1/15	1/16	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25
Georgia	801,130	809,663	815,995	820,952	829,479	838,151	846,648	855,270	863,828	872,400	880,894

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:						
	1/15	1/16	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25
Bartow	9,730	9,858	9,938	10,005	10,117	10,225	10,337	10,447	10,556	10,665	10,777
Carroll	8,620	8,689	8,725	8,777	8,847	8,917	8,987	9,056	9,128	9,199	9,271
Cherokee	20,905	21,192	21,359	21,472	21,742	22,008	22,277	22,546	22,810	23,073	23,336
Clarke	11,766	11,847	11,904	11,947	12,050	12,150	12,252	12,355	12,456	12,557	12,659
Clayton	17,086	17,317	17,475	17,596	17,814	18,035	18,264	18,502	18,746	18,991	19,243
Cobb	54,436	55,120	55,659	56,098	56,779	57,465	58,164	58,852	59,540	60,238	60,922
DeKalb	45,141	45,723	46,206	46,512	47,050	47,591	48,145	48,698	49,244	49,822	50,402
Dougherty	5,821	5,864	5,895	5,902	5,960	6,019	6,079	6,138	6,198	6,259	6,316
Douglas	10,069	10,226	10,330	10,416	10,541	10,666	10,794	10,924	11,049	11,178	11,301
Fulton	67,834	68,716	69,381	70,010	70,779	71,612	72,432	73,271	74,116	74,978	75,863
Gwinnett	70,658	71,503	72,209	72,796	73,759	74,732	75,726	76,763	77,782	78,811	79,880
Hall	21,460	21,653	21,751	21,871	22,070	22,266	22,463	22,659	22,854	23,054	23,249
Henry	16,370	16,575	16,750	16,884	17,098	17,309	17,520	17,735	17,951	18,162	18,384
Lee	2,009	2,036	2,045	2,049	2,078	2,107	2,136	2,164	2,193	2,220	2,249

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:											
	1/15	1/16	1/17	1/18	1/20				1/22				1/24			
Bartow	9,730	9,858	9,938	10,005	10,225	(2,045)	[491]	{245}	10,447	(2,089)	[501]	{251}	10,665	(2,133)	[512]	{256}
Carroll	8,620	8,689	8,725	8,777	8,917	(1,783)	[428]	{214}	9,056	(1,811)	[435]	{217}	9,199	(1,840)	[442]	{221}
Cherokee	20,905	21,192	21,359	21,472	22,008	(4,402)	[1,056]	{528}	22,546	(4,509)	[1,082]	{541}	23,073	(4,615)	[1,108]	{554}
Clarke	11,766	11,847	11,904	11,947	12,150	(2,430)	[583]	{292}	12,355	(2,471)	[593]	{297}	12,557	(2,511)	[603]	{301}
Clayton	17,086	17,317	17,475	17,596	18,035	(3,607)	[866]	{433}	18,502	(3,700)	[888]	{444}	18,991	(3,798)	[912]	{456}
Cobb	54,436	55,120	55,659	56,098	57,465	(11,493)	[2,758]	{1,379}	58,852	(11,770)	[2,825]	{1,412}	60,238	(12,048)	[2,891]	{1,446}
DeKalb	45,141	45,723	46,206	46,512	47,591	(9,518)	[2,284]	{1,142}	48,698	(9,740)	[2,337]	{1,169}	49,822	(9,964)	[2,391]	{1,196}
Dougherty	5,821	5,864	5,895	5,902	6,019	(1,204)	[289]	{144}	6,138	(1,228)	[295]	{147}	6,259	(1,252)	[300]	{150}
Douglas	10,069	10,226	10,330	10,416	10,666	(2,133)	[512]	{256}	10,924	(2,185)	[524]	{262}	11,178	(2,236)	[537]	{268}
Fulton	67,834	68,716	69,381	70,010	71,612	(14,322)	[3,437]	{1,719}	73,271	(14,654)	[3,517]	{1,759}	74,978	(14,996)	[3,599]	{1,799}
Gwinnett	70,658	71,503	72,209	72,796	74,732	(14,946)	[3,587]	{1,794}	76,763	(15,353)	[3,685]	{1,842}	78,811	(15,762)	[3,783]	{1,891}
Hall	21,460	21,653	21,751	21,871	22,266	(4,453)	[1,069]	{534}	22,659	(4,532)	[1,088]	{544}	23,054	(4,611)	[1,107]	{553}
Henry	16,370	16,575	16,750	16,884	17,309	(3,462)	[831]	{415}	17,735	(3,547)	[851]	{426}	18,162	(3,632)	[872]	{436}
Lee	2,009	2,036	2,045	2,049	2,107	(421)	[101]	{51}	2,164	(433)	[104]	{52}	2,220	(444)	[107]	{53}

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.