

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

Date: 11/24/20

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 11/24/20 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.

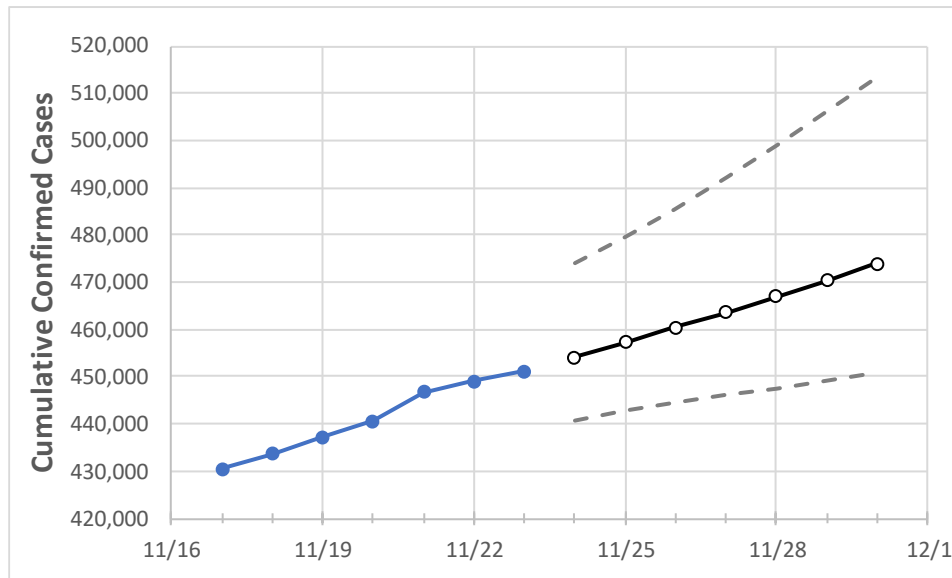
IEM's Modeling Lead

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:					
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Georgia	440,591	446,804	449,132	451,056	454,118	457,246	460,441	463,705	467,038	470,442	473,917

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 20%, and are often within 10%, of actual confirmed cases.

Georgia Counties

	Actual Confirmed Cases On:					Projected Cases For:					
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Bartow	4,762	4,872	4,910	4,933	4,981	5,030	5,080	5,132	5,186	5,241	5,298
Carroll	5,158	5,259	5,296	5,327	5,381	5,437	5,494	5,552	5,611	5,671	5,733
Cherokee	9,602	9,895	10,010	10,047	10,154	10,265	10,379	10,496	10,618	10,743	10,872
Clarke	7,602	7,687	7,696	7,721	7,749	7,776	7,804	7,832	7,859	7,887	7,915
Clayton	9,956	10,085	10,130	10,149	10,196	10,242	10,289	10,336	10,382	10,429	10,476
Cobb	27,899	28,464	28,637	28,764	28,992	29,229	29,473	29,726	29,987	30,258	30,537
DeKalb	25,917	26,296	26,489	26,592	26,803	27,019	27,240	27,467	27,701	27,940	28,185
Dougherty	3,637	3,649	3,651	3,655	3,661	3,666	3,672	3,677	3,683	3,689	3,694
Douglas	5,253	5,388	5,427	5,448	5,490	5,534	5,579	5,626	5,674	5,724	5,776
Fulton	37,930	38,578	38,774	38,981	39,237	39,499	39,767	40,041	40,321	40,609	40,902
Gwinnett	37,236	37,766	37,946	38,123	38,364	38,608	38,858	39,111	39,369	39,632	39,900
Hall	12,035	12,152	12,197	12,231	12,287	12,345	12,403	12,463	12,524	12,586	12,649
Henry	8,064	8,224	8,262	8,309	8,366	8,423	8,482	8,541	8,601	8,661	8,723
Lee	907	912	914	918	922	927	931	936	942	947	953

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:											
	11/20	11/21	11/22	11/23	11/25				11/27				11/29			
Bartow	4,762	4,872	4,910	4,933	5,030	(1,006)	[241]	{121}	5,132	(1,026)	[246]	{123}	5,241	(1,048)	[252]	{126}
Carroll	5,158	5,259	5,296	5,327	5,437	(1,087)	[261]	{130}	5,552	(1,110)	[266]	{133}	5,671	(1,134)	[272]	{136}
Cherokee	9,602	9,895	10,010	10,047	10,265	(2,053)	[493]	{246}	10,496	(2,099)	[504]	{252}	10,743	(2,149)	[516]	{258}
Clarke	7,602	7,687	7,696	7,721	7,776	(1,555)	[373]	{187}	7,832	(1,566)	[376]	{188}	7,887	(1,577)	[379]	{189}
Clayton	9,956	10,085	10,130	10,149	10,242	(2,048)	[492]	{246}	10,336	(2,067)	[496]	{248}	10,429	(2,086)	[501]	{250}
Cobb	27,899	28,464	28,637	28,764	29,229	(5,846)	[1,403]	{701}	29,726	(5,945)	[1,427]	{713}	30,258	(6,052)	[1,452]	{726}
DeKalb	25,917	26,296	26,489	26,592	27,019	(5,404)	[1,297]	{648}	27,467	(5,493)	[1,318]	{659}	27,940	(5,588)	[1,341]	{671}
Dougherty	3,637	3,649	3,651	3,655	3,666	(733)	[176]	{88}	3,677	(735)	[177]	{88}	3,689	(738)	[177]	{89}
Douglas	5,253	5,388	5,427	5,448	5,534	(1,107)	[266]	{133}	5,626	(1,125)	[270]	{135}	5,724	(1,145)	[275]	{137}
Fulton	37,930	38,578	38,774	38,981	39,499	(7,900)	[1,896]	{948}	40,041	(8,008)	[1,922]	{961}	40,609	(8,122)	[1,949]	{975}
Gwinnett	37,236	37,766	37,946	38,123	38,608	(7,722)	[1,853]	{927}	39,111	(7,822)	[1,877]	{939}	39,632	(7,926)	[1,902]	{951}
Hall	12,035	12,152	12,197	12,231	12,345	(2,469)	[593]	{296}	12,463	(2,493)	[598]	{299}	12,586	(2,517)	[604]	{302}
Henry	8,064	8,224	8,262	8,309	8,423	(1,685)	[404]	{202}	8,541	(1,708)	[410]	{205}	8,661	(1,732)	[416]	{208}
Lee	907	912	914	918	927	(185)	[44]	{22}	936	(187)	[45]	{22}	947	(189)	[45]	{23}

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.