

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 4/13/21**

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 4/13/21 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.

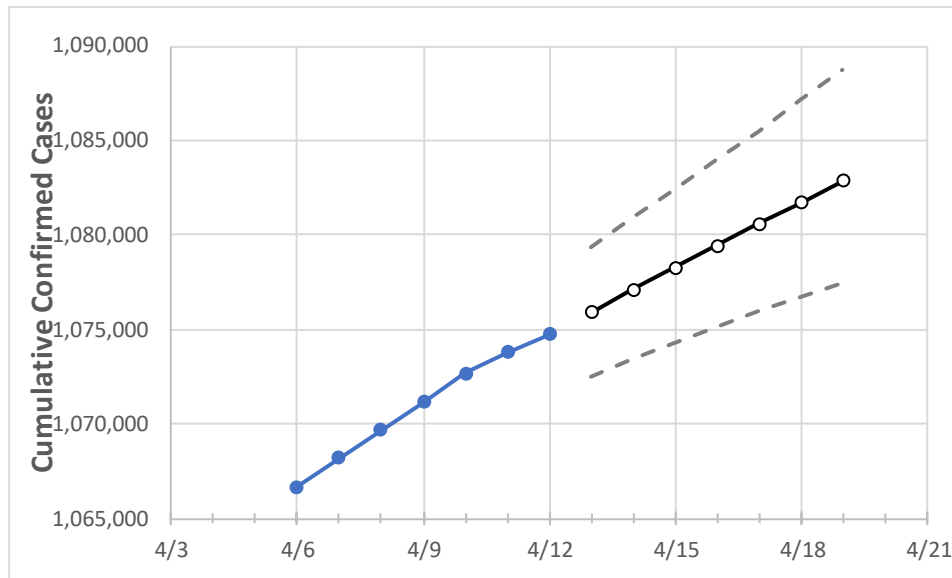
IEM's Modeling Lead

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:						
	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19
Georgia	1,071,130	1,072,700	1,073,792	1,074,731	1,075,909	1,077,088	1,078,257	1,079,420	1,080,574	1,081,721	1,082,884

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:						
	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19
Bartow	14,124	14,148	14,157	14,174	14,191	14,207	14,223	14,240	14,255	14,271	14,286
Carroll	11,081	11,086	11,094	11,100	11,113	11,125	11,138	11,151	11,163	11,175	11,188
Cherokee	29,958	30,002	30,022	30,045	30,083	30,118	30,153	30,186	30,218	30,249	30,278
Clarke	14,714	14,720	14,726	14,731	14,741	14,750	14,760	14,769	14,778	14,788	14,797
Clayton	25,163	25,214	25,239	25,266	25,304	25,343	25,382	25,418	25,455	25,493	25,530
Cobb	75,195	75,327	75,405	75,487	75,599	75,711	75,820	75,930	76,037	76,143	76,247
DeKalb	62,325	62,493	62,695	62,887	63,045	63,207	63,371	63,539	63,710	63,886	64,066
Dougherty	7,296	7,298	7,299	7,304	7,309	7,314	7,319	7,323	7,328	7,332	7,337
Douglas	14,501	14,533	14,558	14,569	14,593	14,617	14,642	14,666	14,690	14,715	14,740
Fulton	93,158	93,318	93,440	93,561	93,699	93,839	93,975	94,111	94,245	94,378	94,507
Gwinnett	97,881	98,039	98,180	98,240	98,347	98,457	98,564	98,670	98,774	98,879	98,982
Hall	26,572	26,579	26,599	26,614	26,636	26,657	26,679	26,700	26,721	26,741	26,761
Henry	24,034	24,103	24,139	24,164	24,201	24,238	24,275	24,312	24,349	24,386	24,422
Lee	2,684	2,686	2,688	2,687	2,689	2,691	2,694	2,696	2,698	2,700	2,702

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:											
	4/9	4/10	4/11	4/12	4/14				4/16				4/18			
Bartow	14,124	14,148	14,157	14,174	14,207	(2,841)	[682]	{341}	14,240	(2,848)	[683]	{342}	14,271	(2,854)	[685]	{343}
Carroll	11,081	11,086	11,094	11,100	11,125	(2,225)	[534]	{267}	11,151	(2,230)	[535]	{268}	11,175	(2,235)	[536]	{268}
Cherokee	29,958	30,002	30,022	30,045	30,118	(6,024)	[1,446]	{723}	30,186	(6,037)	[1,449]	{724}	30,249	(6,050)	[1,452]	{726}
Clarke	14,714	14,720	14,726	14,731	14,750	(2,950)	[708]	{354}	14,769	(2,954)	[709]	{354}	14,788	(2,958)	[710]	{355}
Clayton	25,163	25,214	25,239	25,266	25,343	(5,069)	[1,216]	{608}	25,418	(5,084)	[1,220]	{610}	25,493	(5,099)	[1,224]	{612}
Cobb	75,195	75,327	75,405	75,487	75,711	(15,142)	[3,634]	{1,817}	75,930	(15,186)	[3,645]	{1,822}	76,143	(15,229)	[3,655]	{1,827}
DeKalb	62,325	62,493	62,695	62,887	63,207	(12,641)	[3,034]	{1,517}	63,539	(12,708)	[3,050]	{1,525}	63,886	(12,777)	[3,067]	{1,533}
Dougherty	7,296	7,298	7,299	7,304	7,314	(1,463)	[351]	{176}	7,323	(1,465)	[352]	{176}	7,332	(1,466)	[352]	{176}
Douglas	14,501	14,533	14,558	14,569	14,617	(2,923)	[702]	{351}	14,666	(2,933)	[704]	{352}	14,715	(2,943)	[706]	{353}
Fulton	93,158	93,318	93,440	93,561	93,839	(18,768)	[4,504]	{2,252}	94,111	(18,822)	[4,517]	{2,259}	94,378	(18,876)	[4,530]	{2,265}
Gwinnett	97,881	98,039	98,180	98,240	98,457	(19,691)	[4,726]	{2,363}	98,670	(19,734)	[4,736]	{2,368}	98,879	(19,776)	[4,746]	{2,373}
Hall	26,572	26,579	26,599	26,614	26,657	(5,331)	[1,280]	{640}	26,700	(5,340)	[1,282]	{641}	26,741	(5,348)	[1,284]	{642}
Henry	24,034	24,103	24,139	24,164	24,238	(4,848)	[1,163]	{582}	24,312	(4,862)	[1,167]	{583}	24,386	(4,877)	[1,171]	{585}
Lee	2,684	2,686	2,688	2,687	2,691	(538)	[129]	{65}	2,696	(539)	[129]	{65}	2,700	(540)	[130]	{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.