

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 4/15/21**

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 4/15/21 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.

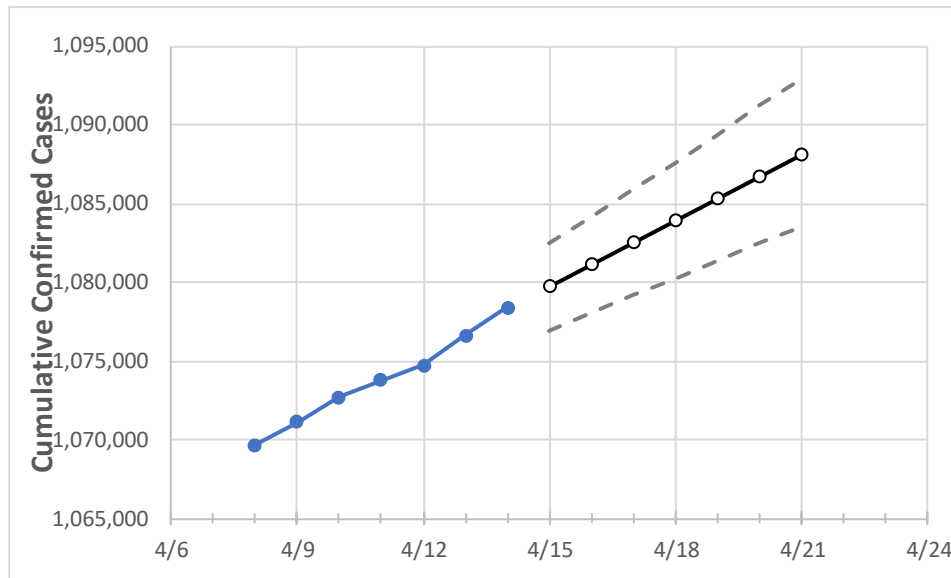
IEM's Modeling Lead

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:						
	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21
Georgia	1,073,792	1,074,731	1,076,644	1,078,379	1,079,755	1,081,123	1,082,508	1,083,901	1,085,289	1,086,691	1,088,080

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:						
	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21
Bartow	14,157	14,174	14,215	14,242	14,261	14,280	14,299	14,318	14,337	14,356	14,374
Carroll	11,094	11,100	11,113	11,124	11,136	11,148	11,159	11,171	11,182	11,195	11,206
Cherokee	30,022	30,045	30,102	30,176	30,216	30,255	30,294	30,332	30,370	30,407	30,443
Clarke	14,726	14,731	14,760	14,776	14,789	14,802	14,816	14,830	14,843	14,857	14,871
Clayton	25,239	25,266	25,362	25,423	25,468	25,514	25,560	25,606	25,652	25,699	25,745
Cobb	75,405	75,487	75,634	75,798	75,920	76,040	76,160	76,274	76,393	76,512	76,630
DeKalb	62,695	62,887	63,075	63,256	63,425	63,599	63,775	63,956	64,141	64,331	64,525
Dougherty	7,299	7,304	7,315	7,323	7,329	7,334	7,340	7,346	7,351	7,357	7,362
Douglas	14,558	14,569	14,587	14,626	14,651	14,677	14,702	14,727	14,753	14,780	14,806
Fulton	93,440	93,561	93,755	93,886	94,032	94,177	94,318	94,461	94,602	94,743	94,885
Gwinnett	98,180	98,240	98,416	98,582	98,708	98,833	98,961	99,088	99,214	99,340	99,470
Hall	26,599	26,614	26,639	26,661	26,682	26,703	26,723	26,745	26,765	26,786	26,807
Henry	24,139	24,164	24,206	24,259	24,298	24,337	24,375	24,413	24,451	24,489	24,527
Lee	2,688	2,687	2,688	2,688	2,690	2,692	2,694	2,696	2,699	2,701	2,703

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:											
	4/11	4/12	4/13	4/14	4/16				4/18				4/20			
Bartow	14,157	14,174	14,215	14,242	14,280	(2,856)	[685]	{343}	14,318	(2,864)	[687]	{344}	14,356	(2,871)	[689]	{345}
Carroll	11,094	11,100	11,113	11,124	11,148	(2,230)	[535]	{268}	11,171	(2,234)	[536]	{268}	11,195	(2,239)	[537]	{269}
Cherokee	30,022	30,045	30,102	30,176	30,255	(6,051)	[1,452]	{726}	30,332	(6,066)	[1,456]	{728}	30,407	(6,081)	[1,460]	{730}
Clarke	14,726	14,731	14,760	14,776	14,802	(2,960)	[711]	{355}	14,830	(2,966)	[712]	{356}	14,857	(2,971)	[713]	{357}
Clayton	25,239	25,266	25,362	25,423	25,514	(5,103)	[1,225]	{612}	25,606	(5,121)	[1,229]	{615}	25,699	(5,140)	[1,234]	{617}
Cobb	75,405	75,487	75,634	75,798	76,040	(15,208)	[3,650]	{1,825}	76,274	(15,255)	[3,661]	{1,831}	76,512	(15,302)	[3,673]	{1,836}
DeKalb	62,695	62,887	63,075	63,256	63,599	(12,720)	[3,053]	{1,526}	63,956	(12,791)	[3,070]	{1,535}	64,331	(12,866)	[3,088]	{1,544}
Dougherty	7,299	7,304	7,315	7,323	7,334	(1,467)	[352]	{176}	7,346	(1,469)	[353]	{176}	7,357	(1,471)	[353]	{177}
Douglas	14,558	14,569	14,587	14,626	14,677	(2,935)	[704]	{352}	14,727	(2,945)	[707]	{353}	14,780	(2,956)	[709]	{355}
Fulton	93,440	93,561	93,755	93,886	94,177	(18,835)	[4,520]	{2,260}	94,461	(18,892)	[4,534]	{2,267}	94,743	(18,949)	[4,548]	{2,274}
Gwinnett	98,180	98,240	98,416	98,582	98,833	(19,767)	[4,744]	{2,372}	99,088	(19,818)	[4,756]	{2,378}	99,340	(19,868)	[4,768]	{2,384}
Hall	26,599	26,614	26,639	26,661	26,703	(5,341)	[1,282]	{641}	26,745	(5,349)	[1,284]	{642}	26,786	(5,357)	[1,286]	{643}
Henry	24,139	24,164	24,206	24,259	24,337	(4,867)	[1,168]	{584}	24,413	(4,883)	[1,172]	{586}	24,489	(4,898)	[1,175]	{588}
Lee	2,688	2,687	2,688	2,688	2,692	(538)	[129]	{65}	2,696	(539)	[129]	{65}	2,701	(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.