

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

Date: 2/11/21

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 2/11/21 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.

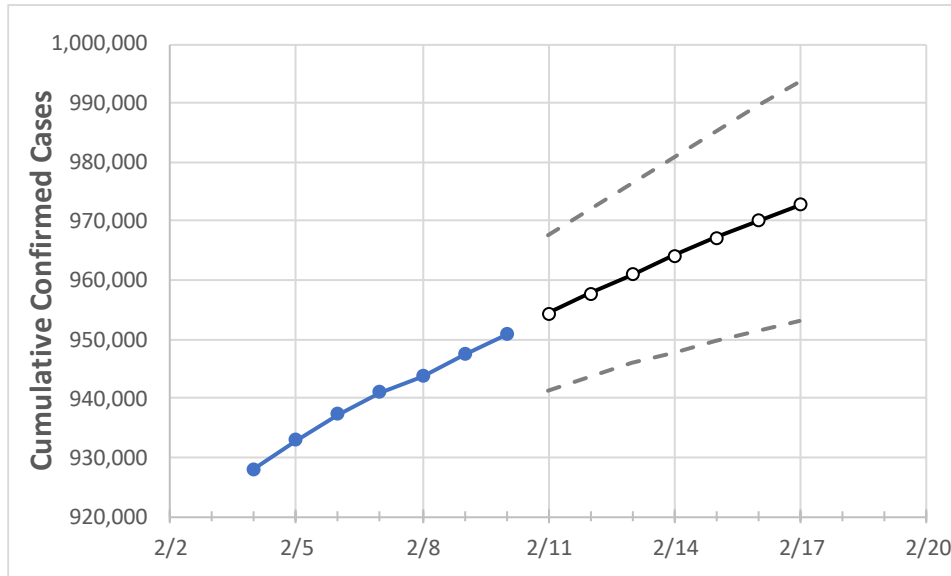
IEM's Modeling Lead

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Georgia	940,991	943,695	947,416	950,906	954,423	957,754	961,022	964,126	967,164	970,038	972,806

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Bartow	11,731	11,776	11,847	11,913	11,974	12,032	12,089	12,145	12,200	12,251	12,301
Carroll	9,964	10,002	10,031	10,057	10,095	10,132	10,168	10,203	10,238	10,270	10,302
Cherokee	25,106	25,156	25,218	25,285	25,376	25,463	25,547	25,627	25,704	25,776	25,845
Clarke	13,427	13,452	13,492	13,550	13,591	13,632	13,670	13,709	13,745	13,780	13,813
Clayton	21,149	21,538	21,602	21,712	21,903	22,097	22,290	22,488	22,681	22,887	23,088
Cobb	65,002	65,173	65,383	65,554	65,798	66,028	66,243	66,457	66,660	66,860	67,042
DeKalb	52,980	53,140	53,433	53,674	53,884	54,082	54,274	54,465	54,647	54,825	54,993
Dougherty	6,787	6,795	6,827	6,846	6,866	6,886	6,904	6,921	6,937	6,952	6,966
Douglas	12,360	12,400	12,460	12,509	12,580	12,648	12,714	12,779	12,843	12,906	12,967
Fulton	79,900	80,151	80,457	80,693	80,965	81,220	81,466	81,705	81,931	82,150	82,361
Gwinnett	86,381	86,590	86,946	87,303	87,598	87,872	88,143	88,398	88,642	88,876	89,101
Hall	24,515	24,535	24,594	24,624	24,676	24,724	24,770	24,813	24,855	24,891	24,928
Henry	19,926	20,010	20,086	20,149	20,235	20,319	20,398	20,476	20,549	20,619	20,687
Lee	2,480	2,479	2,491	2,497	2,506	2,515	2,525	2,534	2,542	2,551	2,559

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:											
	2/7	2/8	2/9	2/10	2/12				2/14				2/16			
Bartow	11,731	11,776	11,847	11,913	12,032	(2,406)	[578]	{289}	12,145	(2,429)	[583]	{291}	12,251	(2,450)	[588]	{294}
Carroll	9,964	10,002	10,031	10,057	10,132	(2,026)	[486]	{243}	10,203	(2,041)	[490]	{245}	10,270	(2,054)	[493]	{246}
Cherokee	25,106	25,156	25,218	25,285	25,463	(5,093)	[1,222]	{611}	25,627	(5,125)	[1,230]	{615}	25,776	(5,155)	[1,237]	{619}
Clarke	13,427	13,452	13,492	13,550	13,632	(2,726)	[654]	{327}	13,709	(2,742)	[658]	{329}	13,780	(2,756)	[661]	{331}
Clayton	21,149	21,538	21,602	21,712	22,097	(4,419)	[1,061]	{530}	22,488	(4,498)	[1,079]	{540}	22,887	(4,577)	[1,099]	{549}
Cobb	65,002	65,173	65,383	65,554	66,028	(13,206)	[3,169]	{1,585}	66,457	(13,291)	[3,190]	{1,595}	66,860	(13,372)	[3,209]	{1,605}
DeKalb	52,980	53,140	53,433	53,674	54,082	(10,816)	[2,596]	{1,298}	54,465	(10,893)	[2,614]	{1,307}	54,825	(10,965)	[2,632]	{1,316}
Dougherty	6,787	6,795	6,827	6,846	6,886	(1,377)	[331]	{165}	6,921	(1,384)	[332]	{166}	6,952	(1,390)	[334]	{167}
Douglas	12,360	12,400	12,460	12,509	12,648	(2,530)	[607]	{304}	12,779	(2,556)	[613]	{307}	12,906	(2,581)	[620]	{310}
Fulton	79,900	80,151	80,457	80,693	81,220	(16,244)	[3,899]	{1,949}	81,705	(16,341)	[3,922]	{1,961}	82,150	(16,430)	[3,943]	{1,972}
Gwinnett	86,381	86,590	86,946	87,303	87,872	(17,574)	[4,218]	{2,109}	88,398	(17,680)	[4,243]	{2,122}	88,876	(17,775)	[4,266]	{2,133}
Hall	24,515	24,535	24,594	24,624	24,724	(4,945)	[1,187]	{593}	24,813	(4,963)	[1,191]	{596}	24,891	(4,978)	[1,195]	{597}
Henry	19,926	20,010	20,086	20,149	20,319	(4,064)	[975]	{488}	20,476	(4,095)	[983]	{491}	20,619	(4,124)	[990]	{495}
Lee	2,480	2,479	2,491	2,497	2,515	(503)	[121]	{60}	2,534	(507)	[122]	{61}	2,551	(510)	[122]	{61}

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.