

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

Date: 2/18/21

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 2/18/21 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.

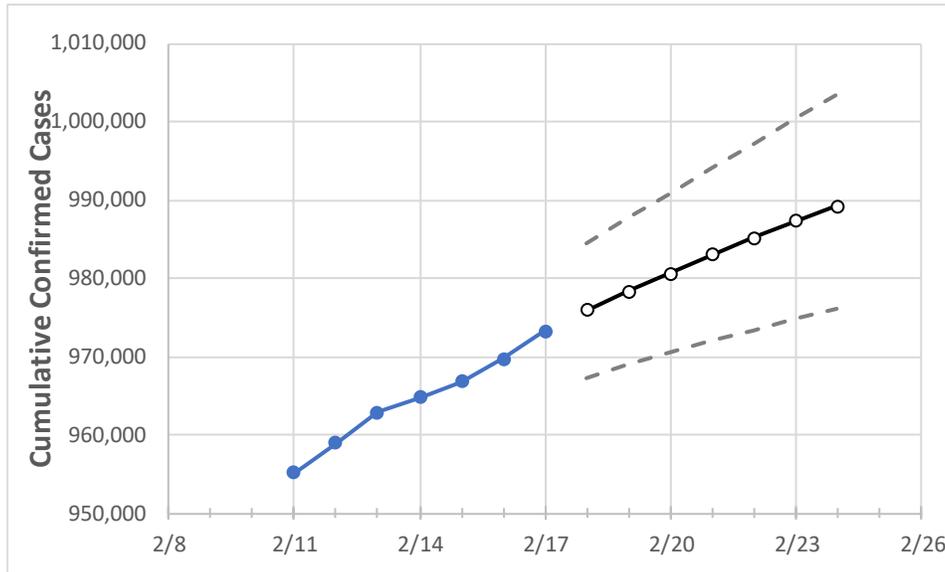
IEM's Modeling Lead

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:							
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	
Georgia	964,737	966,807	969,702	973,247	975,846	978,302	980,620	982,942	985,195	987,277	989,257	

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:							
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	
Bartow	12,166	12,190	12,252	12,320	12,370	12,420	12,468	12,515	12,562	12,609	12,653	
Carroll	10,185	10,209	10,222	10,243	10,267	10,289	10,311	10,332	10,352	10,371	10,387	
Cherokee	25,714	25,812	25,906	26,051	26,131	26,209	26,285	26,357	26,427	26,498	26,568	
Clarke	13,701	13,733	13,764	13,800	13,830	13,858	13,887	13,915	13,940	13,966	13,989	
Clayton	22,068	22,127	22,196	22,265	22,382	22,490	22,597	22,704	22,804	22,905	23,001	
Cobb	66,632	66,805	66,980	67,268	67,454	67,629	67,799	67,963	68,124	68,271	68,416	
DeKalb	54,510	54,603	54,691	54,913	55,066	55,214	55,353	55,493	55,628	55,756	55,877	
Dougherty	6,908	6,916	6,919	6,945	6,956	6,967	6,977	6,986	6,995	7,003	7,011	
Douglas	12,794	12,832	12,872	12,914	12,961	13,005	13,049	13,091	13,130	13,168	13,205	
Fulton	81,871	82,063	82,276	82,534	82,755	82,962	83,165	83,357	83,542	83,714	83,888	
Gwinnett	88,564	88,737	89,010	89,315	89,542	89,763	89,971	90,164	90,345	90,526	90,694	
Hall	24,855	24,890	24,931	24,993	25,026	25,056	25,085	25,112	25,139	25,163	25,185	
Henry	20,481	20,547	20,594	20,660	20,715	20,769	20,818	20,866	20,910	20,951	20,992	
Lee	2,520	2,520	2,527	2,533	2,538	2,542	2,546	2,550	2,554	2,556	2,560	

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:											
	2/14	2/15	2/16	2/17	2/19				2/21				2/23			
Bartow	12,166	12,190	12,252	12,320	12,420	(2,484)	[596]	{298}	12,515	(2,503)	[601]	{300}	12,609	(2,522)	[605]	{303}
Carroll	10,185	10,209	10,222	10,243	10,289	(2,058)	[494]	{247}	10,332	(2,066)	[496]	{248}	10,371	(2,074)	[498]	{249}
Cherokee	25,714	25,812	25,906	26,051	26,209	(5,242)	[1,258]	{629}	26,357	(5,271)	[1,265]	{633}	26,498	(5,300)	[1,272]	{636}
Clarke	13,701	13,733	13,764	13,800	13,858	(2,772)	[665]	{333}	13,915	(2,783)	[668]	{334}	13,966	(2,793)	[670]	{335}
Clayton	22,068	22,127	22,196	22,265	22,490	(4,498)	[1,080]	{540}	22,704	(4,541)	[1,090]	{545}	22,905	(4,581)	[1,099]	{550}
Cobb	66,632	66,805	66,980	67,268	67,629	(13,526)	[3,246]	{1,623}	67,963	(13,593)	[3,262]	{1,631}	68,271	(13,654)	[3,277]	{1,639}
DeKalb	54,510	54,603	54,691	54,913	55,214	(11,043)	[2,650]	{1,325}	55,493	(11,099)	[2,664]	{1,332}	55,756	(11,151)	[2,676]	{1,338}
Dougherty	6,908	6,916	6,919	6,945	6,967	(1,393)	[334]	{167}	6,986	(1,397)	[335]	{168}	7,003	(1,401)	[336]	{168}
Douglas	12,794	12,832	12,872	12,914	13,005	(2,601)	[624]	{312}	13,091	(2,618)	[628]	{314}	13,168	(2,634)	[632]	{316}
Fulton	81,871	82,063	82,276	82,534	82,962	(16,592)	[3,982]	{1,991}	83,357	(16,671)	[4,001]	{2,001}	83,714	(16,743)	[4,018]	{2,009}
Gwinnett	88,564	88,737	89,010	89,315	89,763	(17,953)	[4,309]	{2,154}	90,164	(18,033)	[4,328]	{2,164}	90,526	(18,105)	[4,345]	{2,173}
Hall	24,855	24,890	24,931	24,993	25,056	(5,011)	[1,203]	{601}	25,112	(5,022)	[1,205]	{603}	25,163	(5,033)	[1,208]	{604}
Henry	20,481	20,547	20,594	20,660	20,769	(4,154)	[997]	{498}	20,866	(4,173)	[1,002]	{501}	20,951	(4,190)	[1,006]	{503}
Lee	2,520	2,520	2,527	2,533	2,542	(508)	[122]	{61}	2,550	(510)	[122]	{61}	2,556	(511)	[123]	{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.