

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

Date: 3/18/21

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 3/18/21 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.**

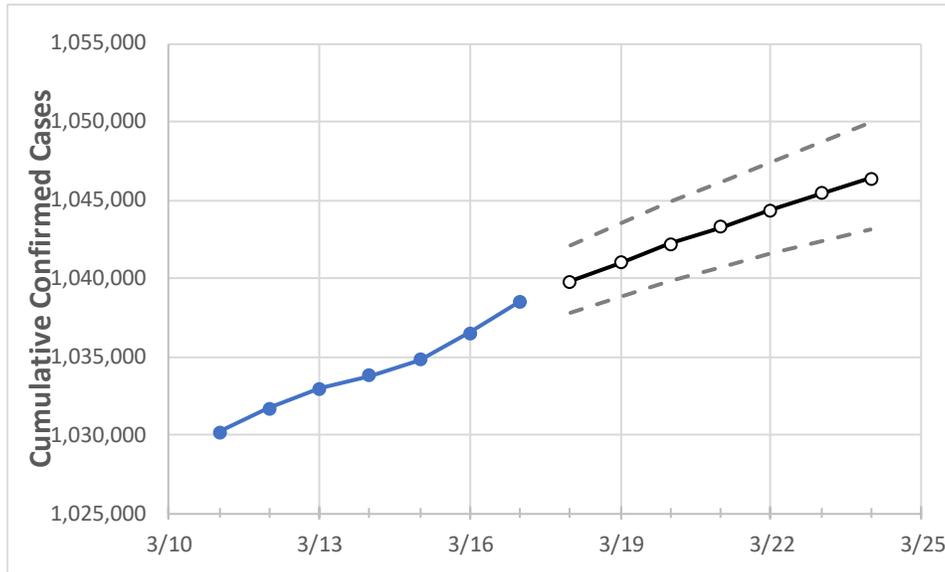
### IEM's Modeling Lead

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Georgia	1,033,786	1,034,763	1,036,506	1,038,550	1,039,806	1,041,005	1,042,164	1,043,281	1,044,364	1,045,400	1,046,366

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Bartow	13,437	13,458	13,485	13,525	13,550	13,575	13,599	13,622	13,645	13,667	13,689
Carroll	10,707	10,715	10,724	10,742	10,750	10,757	10,764	10,770	10,777	10,783	10,789
Cherokee	28,301	28,332	28,401	28,518	28,569	28,618	28,667	28,715	28,761	28,806	28,851
Clarke	14,398	14,406	14,418	14,437	14,451	14,464	14,476	14,488	14,501	14,513	14,525
Clayton	23,985	24,020	24,067	24,117	24,154	24,190	24,226	24,260	24,293	24,325	24,356
Cobb	71,615	71,712	71,831	71,968	72,072	72,171	72,266	72,358	72,448	72,534	72,616
DeKalb	58,891	59,001	59,194	59,391	59,508	59,627	59,741	59,854	59,964	60,079	60,190
Dougherty	7,137	7,139	7,140	7,145	7,149	7,153	7,156	7,160	7,163	7,166	7,169
Douglas	13,849	13,868	13,879	13,899	13,919	13,938	13,956	13,974	13,991	14,007	14,023
Fulton	88,786	88,902	89,094	89,302	89,462	89,619	89,774	89,920	90,065	90,207	90,344
Gwinnett	94,593	94,676	94,809	94,989	95,097	95,198	95,299	95,396	95,491	95,578	95,661
Hall	25,900	25,914	25,945	25,983	26,004	26,025	26,045	26,065	26,083	26,101	26,118
Henry	22,861	22,917	23,001	23,062	23,130	23,194	23,259	23,321	23,384	23,447	23,506
Lee	2,634	2,634	2,635	2,637	2,639	2,642	2,644	2,646	2,648	2,650	2,652

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:											
	3/14	3/15	3/16	3/17	3/19			3/21			3/23					
Bartow	13,437	13,458	13,485	13,525	13,575	(2,715)	{652}	{326}	13,622	(2,724)	{654}	{327}	13,667	(2,733)	{656}	{328}
Carroll	10,707	10,715	10,724	10,742	10,757	(2,151)	{516}	{258}	10,770	(2,154)	{517}	{258}	10,783	(2,157)	{518}	{259}
Cherokee	28,301	28,332	28,401	28,518	28,618	(5,724)	{1,374}	{687}	28,715	(5,743)	{1,378}	{689}	28,806	(5,761)	{1,383}	{691}
Clarke	14,398	14,406	14,418	14,437	14,464	(2,893)	{694}	{347}	14,488	(2,898)	{695}	{348}	14,513	(2,903)	{697}	{348}
Clayton	23,985	24,020	24,067	24,117	24,190	(4,838)	{1,161}	{581}	24,260	(4,852)	{1,164}	{582}	24,325	(4,865)	{1,168}	{584}
Cobb	71,615	71,712	71,831	71,968	72,171	(14,434)	{3,464}	{1,732}	72,358	(14,472)	{3,473}	{1,737}	72,534	(14,507)	{3,482}	{1,741}
DeKalb	58,891	59,001	59,194	59,391	59,627	(11,925)	{2,862}	{1,431}	59,854	(11,971)	{2,873}	{1,436}	60,079	(12,016)	{2,884}	{1,442}
Dougherty	7,137	7,139	7,140	7,145	7,153	(1,431)	{343}	{172}	7,160	(1,432)	{344}	{172}	7,166	(1,433)	{344}	{172}
Douglas	13,849	13,868	13,879	13,899	13,938	(2,788)	{669}	{335}	13,974	(2,795)	{671}	{335}	14,007	(2,801)	{672}	{336}
Fulton	88,786	88,902	89,094	89,302	89,619	(17,924)	{4,302}	{2,151}	89,920	(17,984)	{4,316}	{2,158}	90,207	(18,041)	{4,330}	{2,165}
Gwinnett	94,593	94,676	94,809	94,989	95,198	(19,040)	{4,570}	{2,285}	95,396	(19,079)	{4,579}	{2,290}	95,578	(19,116)	{4,588}	{2,294}
Hall	25,900	25,914	25,945	25,983	26,025	(5,205)	{1,249}	{625}	26,065	(5,213)	{1,251}	{626}	26,101	(5,220)	{1,253}	{626}
Henry	22,861	22,917	23,001	23,062	23,194	(4,639)	{1,113}	{557}	23,321	(4,664)	{1,119}	{560}	23,447	(4,689)	{1,125}	{563}
Lee	2,634	2,634	2,635	2,637	2,642	(528)	{127}	{63}	2,646	(529)	{127}	{64}	2,650	(530)	{127}	{64}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.