

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

Date: 10/20/21

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 10/20/21 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.

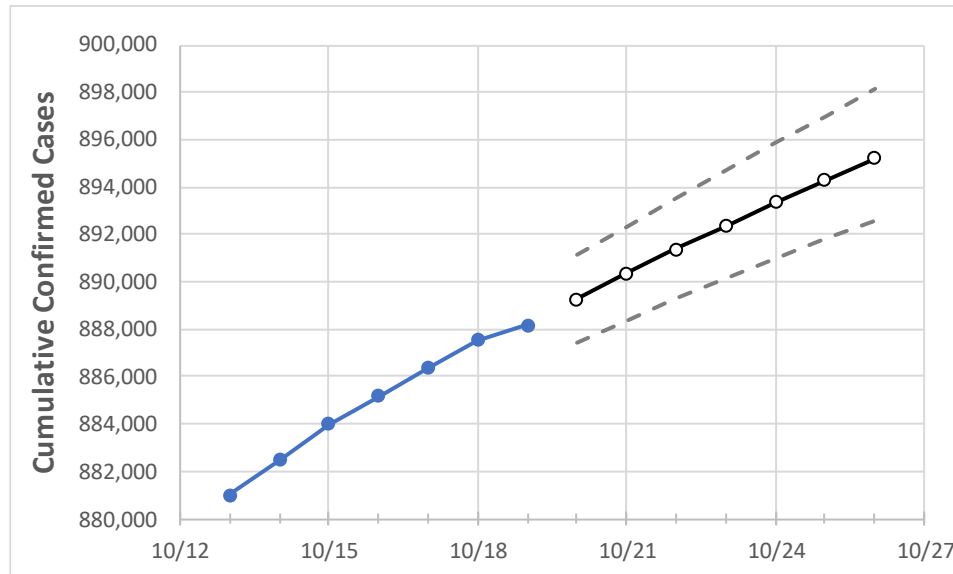
IEM's Modeling Lead

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.

South Carolina State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
South Carolina	885,166	886,351	887,535	888,189	889,286	890,357	891,364	892,370	893,345	894,291	895,206

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.

South Carolina Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Beaufort	26,964	26,994	27,023	27,033	27,059	27,085	27,110	27,134	27,158	27,181	27,203
Charleston	64,467	64,535	64,602	64,634	64,693	64,752	64,806	64,860	64,912	64,963	65,012
Greenville	103,439	103,588	103,736	103,841	103,988	104,132	104,271	104,409	104,546	104,680	104,808
Kershaw	11,817	11,833	11,849	11,860	11,875	11,890	11,904	11,918	11,932	11,945	11,957
Lexington	53,692	53,756	53,820	53,848	53,906	53,964	54,018	54,073	54,123	54,179	54,229
Richland	68,155	68,236	68,317	68,372	68,443	68,514	68,581	68,649	68,713	68,777	68,836
Spartanburg	60,919	61,003	61,086	61,139	61,214	61,286	61,355	61,422	61,488	61,552	61,613
York	46,133	46,210	46,288	46,325	46,385	46,444	46,501	46,556	46,611	46,666	46,716

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.

South Carolina Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	10/16	10/17	10/18	10/19	10/21				10/23				10/25			
Beaufort	26,964	26,994	27,023	27,033	27,085	(5,417)	[1,300]	{650}	27,134	(5,427)	[1,302]	{651}	27,181	(5,436)	[1,305]	{652}
Charleston	64,467	64,535	64,602	64,634	64,752	(12,950)	[3,108]	{1,554}	64,860	(12,972)	[3,113]	{1,557}	64,963	(12,993)	[3,118]	{1,559}
Greenville	103,439	103,588	103,736	103,841	104,132	(20,826)	[4,998]	{2,499}	104,409	(20,882)	[5,012]	{2,506}	104,680	(20,936)	[5,025]	{2,512}
Kershaw	11,817	11,833	11,849	11,860	11,890	(2,378)	[571]	{285}	11,918	(2,384)	[572]	{286}	11,945	(2,389)	[573]	{287}
Lexington	53,692	53,756	53,820	53,848	53,964	(10,793)	[2,590]	{1,295}	54,073	(10,815)	[2,595]	{1,298}	54,179	(10,836)	[2,601]	{1,300}
Richland	68,155	68,236	68,317	68,372	68,514	(13,703)	[3,289]	{1,644}	68,649	(13,730)	[3,295]	{1,648}	68,777	(13,755)	[3,301]	{1,651}
Spartanburg	60,919	61,003	61,086	61,139	61,286	(12,257)	[2,942]	{1,471}	61,422	(12,284)	[2,948]	{1,474}	61,552	(12,310)	[2,954]	{1,477}
York	46,133	46,210	46,288	46,325	46,444	(9,289)	[2,229]	{1,115}	46,556	(9,311)	[2,235]	{1,117}	46,666	(9,333)	[2,240]	{1,120}

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.