

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

Date: 8/2/21

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 8/2/21 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.

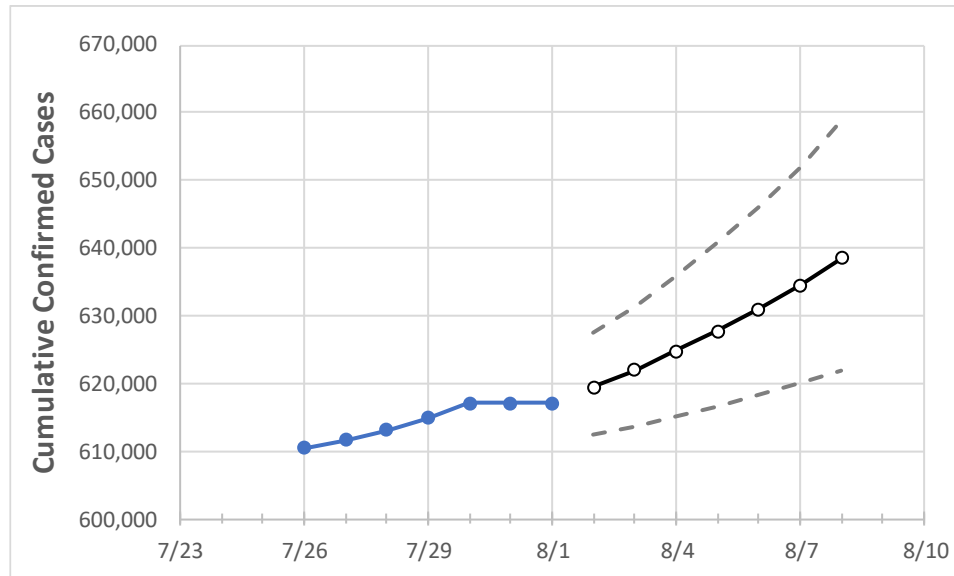
IEM's Modeling Lead

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:						
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8
South Carolina	614,912	617,148	617,148	617,148	619,495	622,013	624,787	627,724	630,998	634,545	638,439

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:						
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8
Beaufort	17,865	17,938	17,938	17,938	18,062	18,198	18,350	18,527	18,719	18,935	19,180
Charleston	45,313	45,495	45,495	45,495	45,650	45,820	46,003	46,204	46,421	46,649	46,896
Greenville	77,021	77,169	77,169	77,169	77,325	77,496	77,681	77,887	78,110	78,354	78,618
Kershaw	7,913	7,946	7,946	7,946	7,991	8,039	8,093	8,150	8,212	8,279	8,353
Lexington	35,318	35,491	35,491	35,491	35,686	35,901	36,132	36,394	36,671	36,983	37,320
Richland	49,437	49,632	49,632	49,632	49,843	50,072	50,326	50,599	50,891	51,209	51,559
Spartanburg	42,828	42,962	42,962	42,962	43,096	43,245	43,412	43,601	43,810	44,043	44,300
York	33,173	33,300	33,300	33,300	33,414	33,536	33,666	33,804	33,954	34,113	34,287

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:											
	7/29	7/30	7/31	8/1	8/3				8/5				8/7			
Beaufort	17,865	17,938	17,938	17,938	18,198	(3,640)	[873]	{437}	18,527	(3,705)	[889]	{445}	18,935	(3,787)	[909]	{454}
Charleston	45,313	45,495	45,495	45,495	45,820	(9,164)	[2,199]	{1,100}	46,204	(9,241)	[2,218]	{1,109}	46,649	(9,330)	[2,239]	{1,120}
Greenville	77,021	77,169	77,169	77,169	77,496	(15,499)	[3,720]	{1,860}	77,887	(15,577)	[3,739]	{1,869}	78,354	(15,671)	[3,761]	{1,880}
Kershaw	7,913	7,946	7,946	7,946	8,039	(1,608)	[386]	{193}	8,150	(1,630)	[391]	{196}	8,279	(1,656)	[397]	{199}
Lexington	35,318	35,491	35,491	35,491	35,901	(7,180)	[1,723]	{862}	36,394	(7,279)	[1,747]	{873}	36,983	(7,397)	[1,775]	{888}
Richland	49,437	49,632	49,632	49,632	50,072	(10,014)	[2,403]	{1,202}	50,599	(10,120)	[2,429]	{1,214}	51,209	(10,242)	[2,458]	{1,229}
Spartanburg	42,828	42,962	42,962	42,962	43,245	(8,649)	[2,076]	{1,038}	43,601	(8,720)	[2,093]	{1,046}	44,043	(8,809)	[2,114]	{1,057}
York	33,173	33,300	33,300	33,300	33,536	(6,707)	[1,610]	{805}	33,804	(6,761)	[1,623]	{811}	34,113	(6,823)	[1,637]	{819}

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.