

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

Date: 6/7/21

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 6/7/21 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.

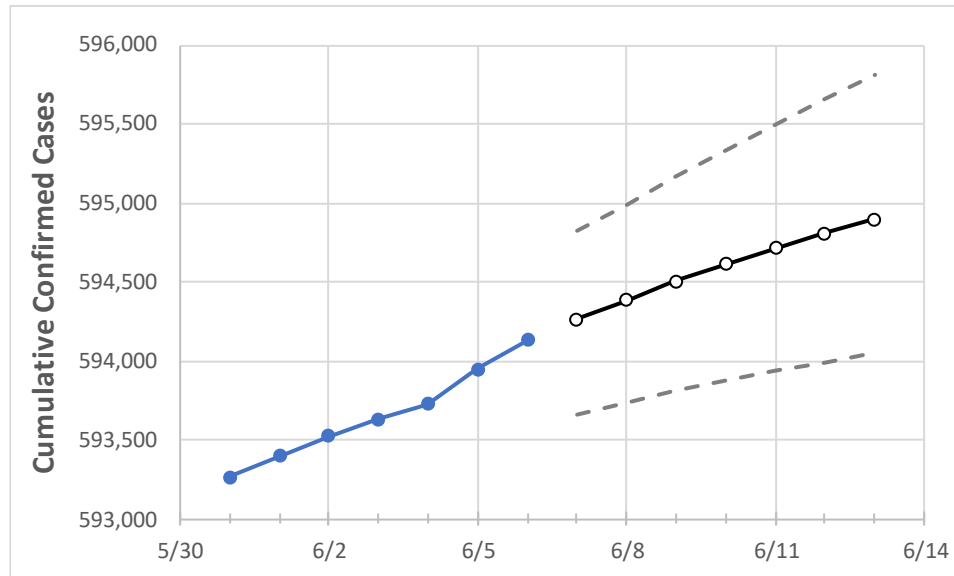
IEM's Modeling Lead

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:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
South Carolina	593,628	593,727	593,948	594,130	594,263	594,386	594,502	594,610	594,711	594,807	594,897

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:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
Beaufort	17,073	17,076	17,079	17,083	17,086	17,090	17,093	17,096	17,099	17,102	17,104
Charleston	43,833	43,846	43,858	43,861	43,871	43,881	43,890	43,898	43,907	43,914	43,922
Greenville	75,212	75,253	75,276	75,292	75,308	75,322	75,336	75,350	75,363	75,375	75,387
Kershaw	7,553	7,548	7,546	7,546	7,548	7,549	7,551	7,553	7,554	7,556	7,557
Lexington	33,673	33,656	33,662	33,675	33,683	33,691	33,698	33,705	33,712	33,719	33,725
Richland	47,174	47,169	47,204	47,236	47,247	47,257	47,266	47,276	47,285	47,293	47,301
Spartanburg	41,827	41,839	41,850	41,871	41,882	41,891	41,900	41,909	41,917	41,925	41,933
York	31,910	31,903	31,916	31,916	31,929	31,941	31,952	31,964	31,974	31,984	31,993

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:											
	6/3	6/4	6/5	6/6	6/8				6/10				6/12			
Beaufort	17,073	17,076	17,079	17,083	17,090	(3,418)	[820]	{410}	17,096	(3,419)	[821]	{410}	17,102	(3,420)	[821]	{410}
Charleston	43,833	43,846	43,858	43,861	43,881	(8,776)	[2,106]	{1,053}	43,898	(8,780)	[2,107]	{1,054}	43,914	(8,783)	[2,108]	{1,054}
Greenville	75,212	75,253	75,276	75,292	75,322	(15,064)	[3,615]	{1,808}	75,350	(15,070)	[3,617]	{1,808}	75,375	(15,075)	[3,618]	{1,809}
Kershaw	7,553	7,548	7,546	7,546	7,549	(1,510)	[362]	{181}	7,553	(1,511)	[363]	{181}	7,556	(1,511)	[363]	{181}
Lexington	33,673	33,656	33,662	33,675	33,691	(6,738)	[1,617]	{809}	33,705	(6,741)	[1,618]	{809}	33,719	(6,744)	[1,618]	{809}
Richland	47,174	47,169	47,204	47,236	47,257	(9,451)	[2,268]	{1,134}	47,276	(9,455)	[2,269]	{1,135}	47,293	(9,459)	[2,270]	{1,135}
Spartanburg	41,827	41,839	41,850	41,871	41,891	(8,378)	[2,011]	{1,005}	41,909	(8,382)	[2,012]	{1,006}	41,925	(8,385)	[2,012]	{1,006}
York	31,910	31,903	31,916	31,916	31,941	(6,388)	[1,533]	{767}	31,964	(6,393)	[1,534]	{767}	31,984	(6,397)	[1,535]	{768}

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.