

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/21/22**

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 1/21/22 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.

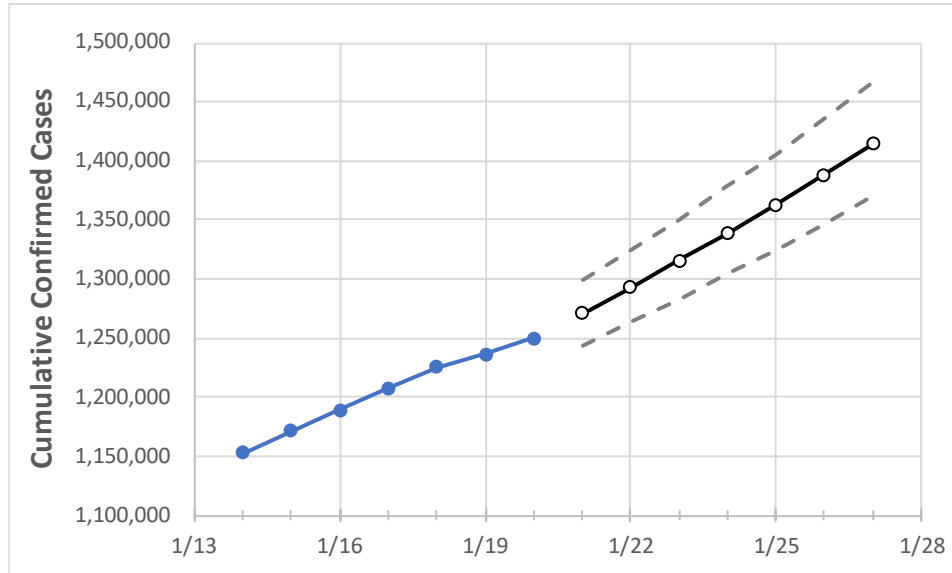
IEM's Modeling Lead

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:							
1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	

South Carolina 1,207,459 1,225,570 1,236,732 1,249,632 1,270,903 1,292,668 1,315,428 1,338,376 1,363,010 1,388,257 1,414,649

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:						
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27
Beaufort	35,343	35,802	36,059	36,375	37,031	37,712	38,396	39,155	39,919	40,718	41,569
Charleston	92,148	93,398	94,092	95,208	96,812	98,449	100,096	101,820	103,570	105,414	107,222
Greenville	143,203	145,770	147,276	148,471	151,035	153,769	156,575	159,441	162,438	165,491	168,610
Kershaw	16,858	17,124	17,270	17,489	17,791	18,094	18,409	18,723	19,054	19,403	19,745
Lexington	76,065	77,360	78,081	79,336	80,866	82,386	83,999	85,612	87,296	89,058	90,878
Richland	100,560	102,249	102,973	104,055	105,919	107,900	109,816	111,828	113,894	115,992	118,164
Spartanburg	79,583	80,708	81,810	82,277	83,722	85,246	86,802	88,465	90,203	91,990	93,874
York	63,239	64,169	64,602	65,395	66,438	67,525	68,650	69,842	71,010	72,286	73,575

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:											
	1/17	1/18	1/19	1/20	1/22				1/24				1/26			
Beaufort	35,343	35,802	36,059	36,375	37,712	(7,542)	[1,810]	{905}	39,155	(7,831)	[1,879]	{940}	40,718	(8,144)	[1,954]	{977}
Charleston	92,148	93,398	94,092	95,208	98,449	(19,690)	[4,726]	{2,363}	101,820	(20,364)	[4,887]	{2,444}	105,414	(21,083)	[5,060]	{2,530}
Greenville	143,203	145,770	147,276	148,471	153,769	(30,754)	[7,381]	{3,690}	159,441	(31,888)	[7,653]	{3,827}	165,491	(33,098)	[7,944]	{3,972}
Kershaw	16,858	17,124	17,270	17,489	18,094	(3,619)	[869]	{434}	18,723	(3,745)	[899]	{449}	19,403	(3,881)	[931]	{466}
Lexington	76,065	77,360	78,081	79,336	82,386	(16,477)	[3,955]	{1,977}	85,612	(17,122)	[4,109]	{2,055}	89,058	(17,812)	[4,275]	{2,137}
Richland	100,560	102,249	102,973	104,055	107,900	(21,580)	[5,179]	{2,590}	111,828	(22,366)	[5,368]	{2,684}	115,992	(23,198)	[5,568]	{2,784}
Spartanburg	79,583	80,708	81,810	82,277	85,246	(17,049)	[4,092]	{2,046}	88,465	(17,693)	[4,246]	{2,123}	91,990	(18,398)	[4,416]	{2,208}
York	63,239	64,169	64,602	65,395	67,525	(13,505)	[3,241]	{1,621}	69,842	(13,968)	[3,352]	{1,676}	72,286	(14,457)	[3,470]	{1,735}

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.