

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

Date: 2/16/22

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 2/16/22 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.**

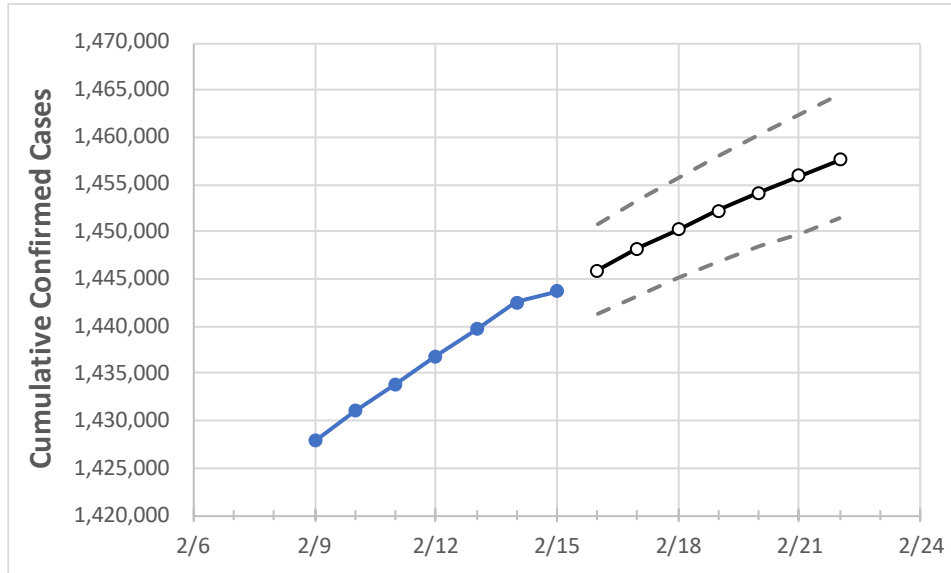
### IEM's Modeling Lead

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	

South Carolina 1,436,807 1,439,676 1,442,546 1,443,723 1,445,955 1,448,200 1,450,257 1,452,276 1,454,170 1,455,917 1,457,657

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:							
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
Beaufort	41,990	42,076	42,162	42,188	42,263	42,334	42,404	42,472	42,532	42,594	42,650	
Charleston	109,543	109,727	109,912	109,971	110,123	110,264	110,394	110,518	110,633	110,746	110,847	
Greenville	169,707	169,934	170,161	170,273	170,487	170,682	170,864	171,034	171,196	171,348	171,492	
Kershaw	20,628	20,695	20,763	20,785	20,833	20,881	20,923	20,965	21,009	21,044	21,082	
Lexington	93,487	93,692	93,897	93,977	94,145	94,305	94,448	94,594	94,726	94,854	94,966	
Richland	118,259	118,509	118,759	118,849	119,054	119,260	119,454	119,635	119,800	119,971	120,127	
Spartanburg	92,780	92,921	93,061	93,109	93,249	93,377	93,500	93,615	93,725	93,836	93,930	
York	75,663	75,845	76,026	76,129	76,291	76,436	76,573	76,708	76,840	76,960	77,076	

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:											
	2/12	2/13	2/14	2/15	2/17			2/19			2/21					
Beaufort	41,990	42,076	42,162	42,188	42,334	(8,467)	[2,032]	{1,016}	42,472	(8,494)	[2,039]	{1,019}	42,594	(8,519)	[2,045]	{1,022}
Charleston	109,543	109,727	109,912	109,971	110,264	(22,053)	[5,293]	{2,646}	110,518	(22,104)	[5,305]	{2,652}	110,746	(22,149)	[5,316]	{2,658}
Greenville	169,707	169,934	170,161	170,273	170,682	(34,136)	[8,193]	{4,096}	171,034	(34,207)	[8,210]	{4,105}	171,348	(34,270)	[8,225]	{4,112}
Kershaw	20,628	20,695	20,763	20,785	20,881	(4,176)	[1,002]	{501}	20,965	(4,193)	[1,006]	{503}	21,044	(4,209)	[1,010]	{505}
Lexington	93,487	93,692	93,897	93,977	94,305	(18,861)	[4,527]	{2,263}	94,594	(18,919)	[4,541]	{2,270}	94,854	(18,971)	[4,553]	{2,277}
Richland	118,259	118,509	118,759	118,849	119,260	(23,852)	[5,724]	{2,862}	119,635	(23,927)	[5,742]	{2,871}	119,971	(23,994)	[5,759]	{2,879}
Spartanburg	92,780	92,921	93,061	93,109	93,377	(18,675)	[4,482]	{2,241}	93,615	(18,723)	[4,494]	{2,247}	93,836	(18,767)	[4,504]	{2,252}
York	75,663	75,845	76,026	76,129	76,436	(15,287)	[3,669]	{1,834}	76,708	(15,342)	[3,682]	{1,841}	76,960	(15,392)	[3,694]	{1,847}

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.