

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/29/21**

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 12/29/21 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.**

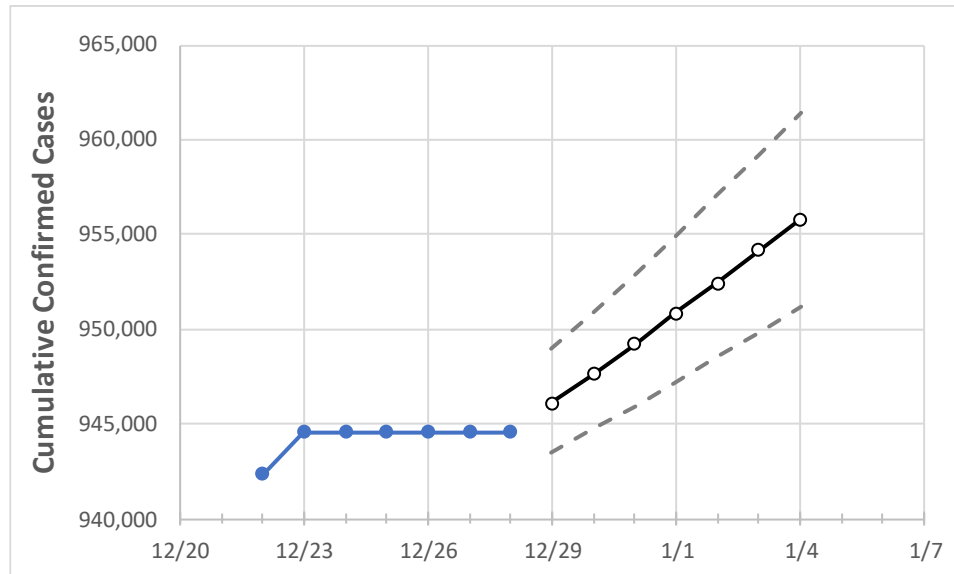
**IEM's Modeling Lead**

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
South Carolina	944,574	944,574	944,574	944,574	946,115	947,634	949,223	950,835	952,419	954,153	955,826

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
Beaufort	28,185	28,185	28,185	28,185	28,222	28,262	28,302	28,343	28,385	28,430	28,474
Charleston	68,566	68,566	68,566	68,566	68,711	68,859	69,013	69,171	69,332	69,501	69,674
Greenville	110,808	110,808	110,808	110,808	110,979	111,150	111,325	111,502	111,680	111,866	112,050
Kershaw	12,822	12,822	12,822	12,822	12,841	12,862	12,882	12,903	12,923	12,943	12,963
Lexington	57,092	57,092	57,092	57,092	57,189	57,290	57,395	57,498	57,607	57,715	57,829
Richland	72,050	72,050	72,050	72,050	72,232	72,430	72,619	72,831	73,048	73,277	73,517
Spartanburg	64,630	64,630	64,630	64,630	64,706	64,780	64,860	64,936	65,015	65,093	65,174
York	50,178	50,178	50,178	50,178	50,263	50,348	50,435	50,519	50,604	50,691	50,777

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:											
	12/25	12/26	12/27	12/28	12/30				1/1				1/3			
Beaufort	28,185	28,185	28,185	28,185	28,262	(5,652)	[1,357]	{678}	28,343	(5,669)	[1,360]	{680}	28,430	(5,686)	[1,365]	{682}
Charleston	68,566	68,566	68,566	68,566	68,859	(13,772)	[3,305]	{1,653}	69,171	(13,834)	[3,320]	{1,660}	69,501	(13,900)	[3,336]	{1,668}
Greenville	110,808	110,808	110,808	110,808	111,150	(22,230)	[5,335]	{2,668}	111,502	(22,300)	[5,352]	{2,676}	111,866	(22,373)	[5,370]	{2,685}
Kershaw	12,822	12,822	12,822	12,822	12,862	(2,572)	[617]	{309}	12,903	(2,581)	[619]	{310}	12,943	(2,589)	[621]	{311}
Lexington	57,092	57,092	57,092	57,092	57,290	(11,458)	[2,750]	{1,375}	57,498	(11,500)	[2,760]	{1,380}	57,715	(11,543)	[2,770]	{1,385}
Richland	72,050	72,050	72,050	72,050	72,430	(14,486)	[3,477]	{1,738}	72,831	(14,566)	[3,496]	{1,748}	73,277	(14,655)	[3,517]	{1,759}
Spartanburg	64,630	64,630	64,630	64,630	64,780	(12,956)	[3,109]	{1,555}	64,936	(12,987)	[3,117]	{1,558}	65,093	(13,019)	[3,124]	{1,562}
York	50,178	50,178	50,178	50,178	50,348	(10,070)	[2,417]	{1,208}	50,519	(10,104)	[2,425]	{1,212}	50,691	(10,138)	[2,433]	{1,217}

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.