

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/17/21**

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 12/17/21 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.**

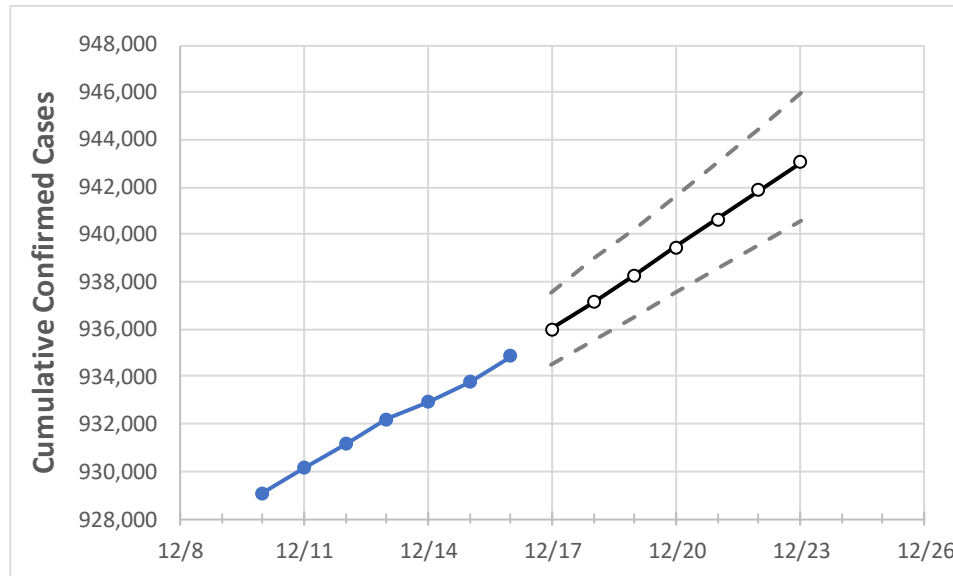
**IEM's Modeling Lead**

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:						
	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23
South Carolina	932,206	932,938	933,754	934,880	936,012	937,140	938,297	939,452	940,640	941,867	943,068

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:						
	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23
Beaufort	27,906	27,923	27,936	27,976	27,999	28,023	28,048	28,073	28,098	28,124	28,151
Charleston	67,609	67,640	67,679	67,746	67,819	67,893	67,969	68,047	68,123	68,203	68,280
Greenville	109,359	109,462	109,573	109,710	109,844	109,985	110,125	110,265	110,410	110,559	110,707
Kershaw	12,622	12,638	12,649	12,662	12,695	12,730	12,765	12,801	12,838	12,877	12,918
Lexington	56,322	56,371	56,410	56,472	56,534	56,597	56,661	56,726	56,791	56,856	56,923
Richland	71,012	71,064	71,089	71,171	71,235	71,301	71,364	71,431	71,499	71,570	71,640
Spartanburg	63,979	64,012	64,070	64,132	64,193	64,254	64,317	64,378	64,442	64,507	64,570
York	49,354	49,419	49,497	49,561	49,661	49,759	49,864	49,968	50,075	50,186	50,298

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:											
	12/13	12/14	12/15	12/16	12/18				12/20				12/22			
Beaufort	27,906	27,923	27,936	27,976	28,023	(5,605)	[1,345]	{673}	28,073	(5,615)	[1,347]	{674}	28,124	(5,625)	[1,350]	{675}
Charleston	67,609	67,640	67,679	67,746	67,893	(13,579)	[3,259]	{1,629}	68,047	(13,609)	[3,266]	{1,633}	68,203	(13,641)	[3,274]	{1,637}
Greenville	109,359	109,462	109,573	109,710	109,985	(21,997)	[5,279]	{2,640}	110,265	(22,053)	[5,293]	{2,646}	110,559	(22,112)	[5,307]	{2,653}
Kershaw	12,622	12,638	12,649	12,662	12,730	(2,546)	[611]	{306}	12,801	(2,560)	[614]	{307}	12,877	(2,575)	[618]	{309}
Lexington	56,322	56,371	56,410	56,472	56,597	(11,319)	[2,717]	{1,358}	56,726	(11,345)	[2,723]	{1,361}	56,856	(11,371)	[2,729]	{1,365}
Richland	71,012	71,064	71,089	71,171	71,301	(14,260)	[3,422]	{1,711}	71,431	(14,286)	[3,429]	{1,714}	71,570	(14,314)	[3,435]	{1,718}
Spartanburg	63,979	64,012	64,070	64,132	64,254	(12,851)	[3,084]	{1,542}	64,378	(12,876)	[3,090]	{1,545}	64,507	(12,901)	[3,096]	{1,548}
York	49,354	49,419	49,497	49,561	49,759	(9,952)	[2,388]	{1,194}	49,968	(9,994)	[2,398]	{1,199}	50,186	(10,037)	[2,409]	{1,204}

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.