

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/10/21**

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 12/10/21 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.

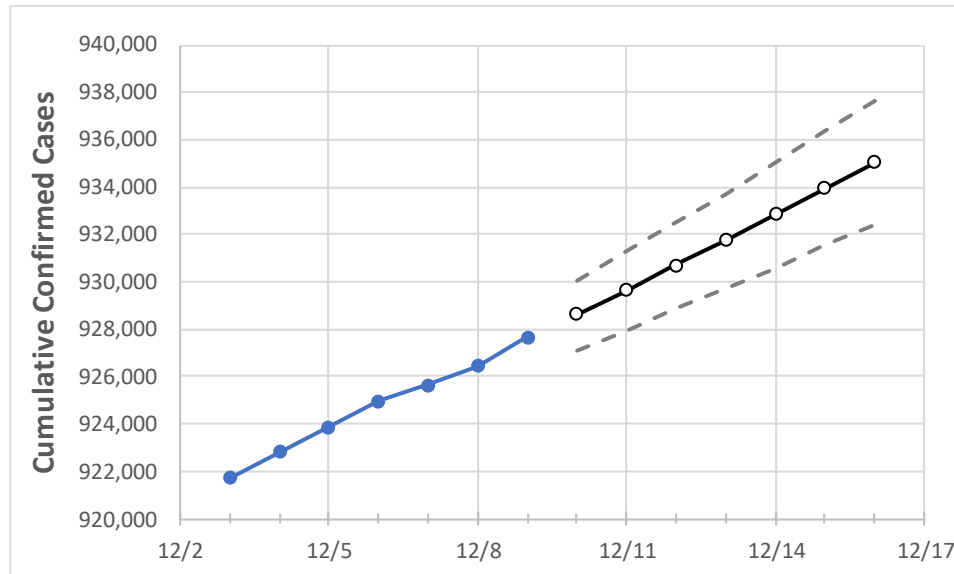
IEM's Modeling Lead

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:						
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
South Carolina	924,958	925,629	926,454	927,649	928,649	929,663	930,713	931,749	932,855	933,952	935,058

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:						
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
Beaufort	27,780	27,793	27,808	27,824	27,842	27,861	27,879	27,899	27,919	27,939	27,959
Charleston	67,126	67,170	67,206	67,289	67,356	67,424	67,495	67,565	67,635	67,709	67,783
Greenville	108,497	108,588	108,705	108,855	108,972	109,092	109,214	109,340	109,465	109,594	109,719
Kershaw	12,433	12,450	12,477	12,506	12,535	12,565	12,597	12,631	12,665	12,703	12,741
Lexington	55,883	55,921	55,958	56,039	56,102	56,165	56,229	56,292	56,358	56,426	56,494
Richland	70,622	70,663	70,701	70,767	70,819	70,873	70,927	70,981	71,039	71,096	71,151
Spartanburg	63,570	63,610	63,670	63,752	63,813	63,871	63,931	63,992	64,053	64,118	64,181
York	48,726	48,783	48,876	48,961	49,042	49,126	49,209	49,296	49,387	49,477	49,568

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:											
	12/6	12/7	12/8	12/9	12/11				12/13				12/15			
Beaufort	27,780	27,793	27,808	27,824	27,861	(5,572)	[1,337]	{669}	27,899	(5,580)	[1,339]	{670}	27,939	(5,588)	[1,341]	{671}
Charleston	67,126	67,170	67,206	67,289	67,424	(13,485)	[3,236]	{1,618}	67,565	(13,513)	[3,243]	{1,622}	67,709	(13,542)	[3,250]	{1,625}
Greenville	108,497	108,588	108,705	108,855	109,092	(21,818)	[5,236]	{2,618}	109,340	(21,868)	[5,248]	{2,624}	109,594	(21,919)	[5,260]	{2,630}
Kershaw	12,433	12,450	12,477	12,506	12,565	(2,513)	[603]	{302}	12,631	(2,526)	[606]	{303}	12,703	(2,541)	[610]	{305}
Lexington	55,883	55,921	55,958	56,039	56,165	(11,233)	[2,696]	{1,348}	56,292	(11,258)	[2,702]	{1,351}	56,426	(11,285)	[2,708]	{1,354}
Richland	70,622	70,663	70,701	70,767	70,873	(14,175)	[3,402]	{1,701}	70,981	(14,196)	[3,407]	{1,704}	71,096	(14,219)	[3,413]	{1,706}
Spartanburg	63,570	63,610	63,670	63,752	63,871	(12,774)	[3,066]	{1,533}	63,992	(12,798)	[3,072]	{1,536}	64,118	(12,824)	[3,078]	{1,539}
York	48,726	48,783	48,876	48,961	49,126	(9,825)	[2,358]	{1,179}	49,296	(9,859)	[2,366]	{1,183}	49,477	(9,895)	[2,375]	{1,187}

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.