

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

Date: 11/22/21

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 11/22/21 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.

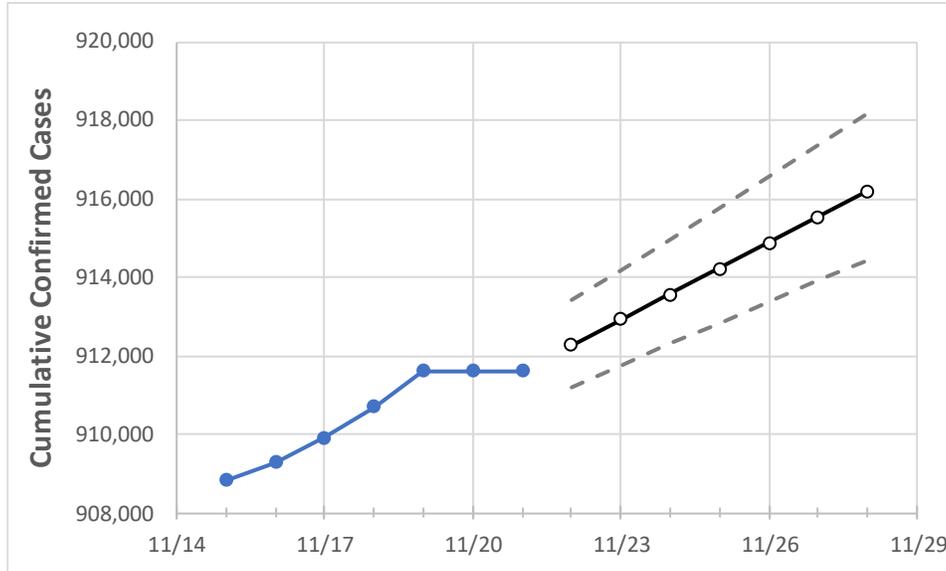
IEM's Modeling Lead

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:					
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	

South Carolina	910,690	911,624	911,624	911,624	912,266	912,936	913,573	914,230	914,886	915,538	916,184
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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:							
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	
Beaufort	27,496	27,522	27,522	27,522	27,534	27,546	27,557	27,569	27,580	27,591	27,603	
Charleston	66,122	66,186	66,186	66,186	66,230	66,273	66,314	66,356	66,399	66,443	66,483	
Greenville	106,768	106,890	106,890	106,890	106,971	107,053	107,132	107,211	107,293	107,372	107,453	
Kershaw	12,150	12,161	12,161	12,161	12,169	12,176	12,184	12,191	12,199	12,207	12,214	
Lexington	54,993	55,046	55,046	55,046	55,078	55,110	55,141	55,172	55,204	55,237	55,266	
Richland	69,802	69,864	69,864	69,864	69,901	69,939	69,978	70,015	70,052	70,092	70,130	
Spartanburg	62,667	62,731	62,731	62,731	62,770	62,810	62,849	62,888	62,927	62,965	63,005	
York	47,652	47,721	47,721	47,721	47,774	47,826	47,879	47,931	47,984	48,041	48,095	

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:											
	11/18	11/19	11/20	11/21	11/23				11/25				11/27			
Beaufort	27,496	27,522	27,522	27,522	27,546	(5,509)	[1,322]	{661}	27,569	(5,514)	[1,323]	{662}	27,591	(5,518)	[1,324]	{662}
Charleston	66,122	66,186	66,186	66,186	66,273	(13,255)	[3,181]	{1,591}	66,356	(13,271)	[3,185]	{1,593}	66,443	(13,289)	[3,189]	{1,595}
Greenville	106,768	106,890	106,890	106,890	107,053	(21,411)	[5,139]	{2,569}	107,211	(21,442)	[5,146]	{2,573}	107,372	(21,474)	[5,154]	{2,577}
Kershaw	12,150	12,161	12,161	12,161	12,176	(2,435)	[584]	{292}	12,191	(2,438)	[585]	{293}	12,207	(2,441)	[586]	{293}
Lexington	54,993	55,046	55,046	55,046	55,110	(11,022)	[2,645]	{1,323}	55,172	(11,034)	[2,648]	{1,324}	55,237	(11,047)	[2,651]	{1,326}
Richland	69,802	69,864	69,864	69,864	69,939	(13,988)	[3,357]	{1,679}	70,015	(14,003)	[3,361]	{1,680}	70,092	(14,018)	[3,364]	{1,682}
Spartanburg	62,667	62,731	62,731	62,731	62,810	(12,562)	[3,015]	{1,507}	62,888	(12,578)	[3,019]	{1,509}	62,965	(12,593)	[3,022]	{1,511}
York	47,652	47,721	47,721	47,721	47,826	(9,565)	[2,296]	{1,148}	47,931	(9,586)	[2,301]	{1,150}	48,041	(9,608)	[2,306]	{1,153}

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.