

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

Date: 10/1/21

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 10/1/21 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.**

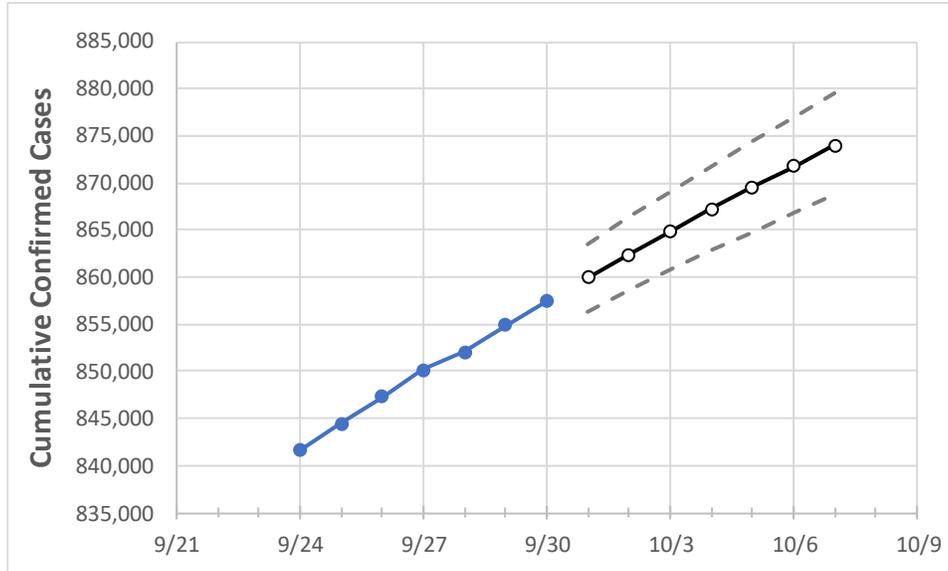
### IEM's Modeling Lead

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:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7

South Carolina 850,188 852,006 854,874 857,386 859,922 862,373 864,841 867,215 869,588 871,805 874,027

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:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7
Beaufort	26,177	26,212	26,285	26,352	26,408	26,464	26,516	26,569	26,619	26,668	26,717
Charleston	62,583	62,669	62,799	62,941	63,073	63,205	63,330	63,450	63,571	63,685	63,800
Greenville	99,354	99,565	99,762	100,029	100,330	100,627	100,909	101,189	101,465	101,736	102,003
Kershaw	11,278	11,300	11,347	11,384	11,420	11,456	11,490	11,525	11,558	11,590	11,622
Lexington	51,881	51,987	52,099	52,217	52,343	52,467	52,586	52,702	52,810	52,922	53,025
Richland	66,028	66,134	66,283	66,419	66,561	66,699	66,832	66,960	67,088	67,208	67,328
Spartanburg	57,976	58,152	58,765	58,946	59,196	59,428	59,670	59,920	60,148	60,371	60,611
York	44,392	44,515	44,637	44,721	44,846	44,970	45,090	45,207	45,324	45,435	45,545

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:											
	9/27	9/28	9/29	9/30	10/2			10/4			10/6					
Beaufort	26,177	26,212	26,285	26,352	26,464	(5,293)	[1,270]	{635}	26,569	(5,314)	[1,275]	{638}	26,668	(5,334)	[1,280]	{640}
Charleston	62,583	62,669	62,799	62,941	63,205	(12,641)	[3,034]	{1,517}	63,450	(12,690)	[3,046]	{1,523}	63,685	(12,737)	[3,057]	{1,528}
Greenville	99,354	99,565	99,762	100,029	100,627	(20,125)	[4,830]	{2,415}	101,189	(20,238)	[4,857]	{2,429}	101,736	(20,347)	[4,883]	{2,442}
Kershaw	11,278	11,300	11,347	11,384	11,456	(2,291)	[550]	{275}	11,525	(2,305)	[553]	{277}	11,590	(2,318)	[556]	{278}
Lexington	51,881	51,987	52,099	52,217	52,467	(10,493)	[2,518]	{1,259}	52,702	(10,540)	[2,530]	{1,265}	52,922	(10,584)	[2,540]	{1,270}
Richland	66,028	66,134	66,283	66,419	66,699	(13,340)	[3,202]	{1,601}	66,960	(13,392)	[3,214]	{1,607}	67,208	(13,442)	[3,226]	{1,613}
Spartanburg	57,976	58,152	58,765	58,946	59,428	(11,886)	[2,853]	{1,426}	59,920	(11,984)	[2,876]	{1,438}	60,371	(12,074)	[2,898]	{1,449}
York	44,392	44,515	44,637	44,721	44,970	(8,994)	[2,159]	{1,079}	45,207	(9,041)	[2,170]	{1,085}	45,435	(9,087)	[2,181]	{1,090}

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.