

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

Date: 8/18/21

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 8/18/21 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.**

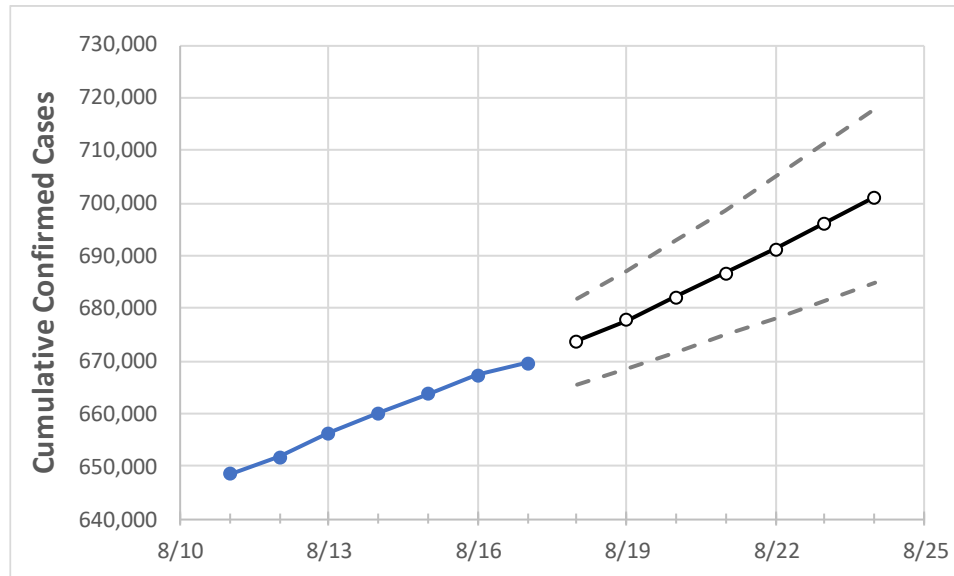
### IEM's Modeling Lead

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
South Carolina	659,993	663,672	667,352	669,638	673,677	677,807	682,120	686,599	691,251	696,114	701,089

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Beaufort	20,097	20,262	20,428	20,544	20,744	20,952	21,168	21,391	21,621	21,860	22,107
Charleston	49,464	49,784	50,104	50,276	50,648	51,027	51,420	51,834	52,253	52,694	53,145
Greenville	80,504	80,801	81,098	81,348	81,686	82,039	82,413	82,802	83,211	83,639	84,084
Kershaw	8,748	8,810	8,873	8,913	8,984	9,058	9,134	9,213	9,294	9,377	9,464
Lexington	38,862	39,147	39,432	39,648	39,962	40,284	40,615	40,960	41,316	41,680	42,053
Richland	53,314	53,580	53,846	53,999	54,291	54,589	54,893	55,212	55,532	55,860	56,196
Spartanburg	45,198	45,392	45,587	45,713	45,927	46,150	46,380	46,619	46,868	47,127	47,394
York	35,239	35,401	35,562	35,648	35,808	35,974	36,146	36,320	36,498	36,679	36,866

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:											
	8/14	8/15	8/16	8/17	8/19				8/21				8/23			
Beaufort	20,097	20,262	20,428	20,544	20,952	(4,190)	[1,006]	{503}	21,391	(4,278)	[1,027]	{513}	21,860	(4,372)	[1,049]	{525}
Charleston	49,464	49,784	50,104	50,276	51,027	(10,205)	[2,449]	{1,225}	51,834	(10,367)	[2,488]	{1,244}	52,694	(10,539)	[2,529]	{1,265}
Greenville	80,504	80,801	81,098	81,348	82,039	(16,408)	[3,938]	{1,969}	82,802	(16,560)	[3,974]	{1,987}	83,639	(16,728)	[4,015]	{2,007}
Kershaw	8,748	8,810	8,873	8,913	9,058	(1,812)	[435]	{217}	9,213	(1,843)	[442]	{221}	9,377	(1,875)	[450]	{225}
Lexington	38,862	39,147	39,432	39,648	40,284	(8,057)	[1,934]	{967}	40,960	(8,192)	[1,966]	{983}	41,680	(8,336)	[2,001]	{1,000}
Richland	53,314	53,580	53,846	53,999	54,589	(10,918)	[2,620]	{1,310}	55,212	(11,042)	[2,650]	{1,325}	55,860	(11,172)	[2,681]	{1,341}
Spartanburg	45,198	45,392	45,587	45,713	46,150	(9,230)	[2,215]	{1,108}	46,619	(9,324)	[2,238]	{1,119}	47,127	(9,425)	[2,262]	{1,131}
York	35,239	35,401	35,562	35,648	35,974	(7,195)	[1,727]	{863}	36,320	(7,264)	[1,743]	{872}	36,679	(7,336)	[1,761]	{880}

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.