

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 6/30/21**

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 6/30/21 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.

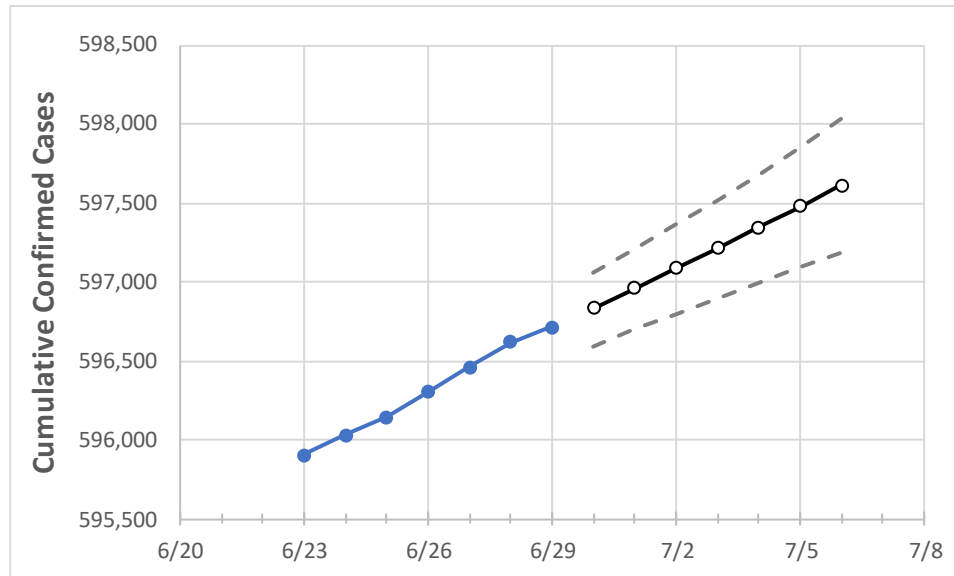
IEM's Modeling Lead

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:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6
South Carolina	596,301	596,459	596,616	596,712	596,835	596,961	597,086	597,212	597,343	597,476	597,609

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:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6
Beaufort	17,117	17,124	17,130	17,135	17,139	17,143	17,147	17,152	17,156	17,160	17,164
Charleston	43,925	43,931	43,938	43,947	43,951	43,956	43,960	43,964	43,968	43,973	43,976
Greenville	75,620	75,636	75,651	75,661	75,674	75,685	75,698	75,709	75,721	75,733	75,744
Kershaw	7,546	7,546	7,546	7,546	7,547	7,548	7,549	7,549	7,550	7,551	7,551
Lexington	33,722	33,725	33,729	33,736	33,738	33,740	33,741	33,743	33,745	33,746	33,748
Richland	47,563	47,596	47,628	47,637	47,666	47,695	47,725	47,757	47,788	47,823	47,858
Spartanburg	42,027	42,036	42,044	42,045	42,051	42,057	42,064	42,069	42,075	42,081	42,087
York	31,982	31,993	32,004	32,013	32,019	32,026	32,032	32,038	32,044	32,050	32,056

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:											
	6/26	6/27	6/28	6/29	7/1				7/3				7/5			
Beaufort	17,117	17,124	17,130	17,135	17,143	(3,429)	[823]	{411}	17,152	(3,430)	[823]	{412}	17,160	(3,432)	[824]	{412}
Charleston	43,925	43,931	43,938	43,947	43,956	(8,791)	[2,110]	{1,055}	43,964	(8,793)	[2,110]	{1,055}	43,973	(8,795)	[2,111]	{1,055}
Greenville	75,620	75,636	75,651	75,661	75,685	(15,137)	[3,633]	{1,816}	75,709	(15,142)	[3,634]	{1,817}	75,733	(15,147)	[3,635]	{1,818}
Kershaw	7,546	7,546	7,546	7,546	7,548	(1,510)	[362]	{181}	7,549	(1,510)	[362]	{181}	7,551	(1,510)	[362]	{181}
Lexington	33,722	33,725	33,729	33,736	33,740	(6,748)	[1,620]	{810}	33,743	(6,749)	[1,620]	{810}	33,746	(6,749)	[1,620]	{810}
Richland	47,563	47,596	47,628	47,637	47,695	(9,539)	[2,289]	{1,145}	47,757	(9,551)	[2,292]	{1,146}	47,823	(9,565)	[2,295]	{1,148}
Spartanburg	42,027	42,036	42,044	42,045	42,057	(8,411)	[2,019]	{1,009}	42,069	(8,414)	[2,019]	{1,010}	42,081	(8,416)	[2,020]	{1,010}
York	31,982	31,993	32,004	32,013	32,026	(6,405)	[1,537]	{769}	32,038	(6,408)	[1,538]	{769}	32,050	(6,410)	[1,538]	{769}

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.