

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/12/21**

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 2/12/21 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.

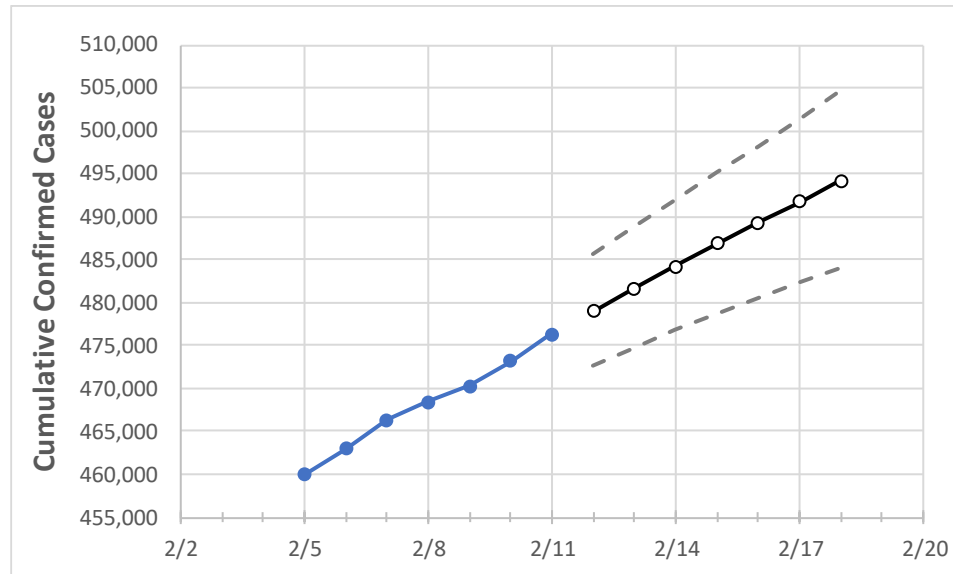
IEM's Modeling Lead

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:						
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18
South Carolina	468,403	470,311	473,140	476,287	478,978	481,708	484,248	486,864	489,310	491,732	494,170

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:						
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18
Beaufort	14,264	14,316	14,375	14,416	14,490	14,563	14,631	14,700	14,766	14,827	14,887
Charleston	34,748	34,892	35,153	35,374	35,593	35,808	36,022	36,232	36,438	36,643	36,841
Greenville	58,977	59,150	59,493	59,820	60,131	60,439	60,745	61,041	61,333	61,622	61,900
Kershaw	5,946	5,977	6,017	6,047	6,086	6,123	6,159	6,194	6,231	6,265	6,300
Lexington	26,156	26,258	26,402	26,621	26,784	26,948	27,107	27,263	27,416	27,569	27,722
Richland	37,482	37,631	37,804	38,012	38,193	38,367	38,535	38,693	38,856	39,008	39,159
Spartanburg	32,394	32,507	32,696	32,943	33,201	33,456	33,711	33,957	34,206	34,449	34,694
York	23,467	23,600	23,784	23,908	24,049	24,187	24,320	24,451	24,580	24,708	24,833

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:											
	2/8	2/9	2/10	2/11	2/13				2/15				2/17			
Beaufort	14,264	14,316	14,375	14,416	14,563	(2,913)	[699]	{350}	14,700	(2,940)	[706]	{353}	14,827	(2,965)	[712]	{356}
Charleston	34,748	34,892	35,153	35,374	35,808	(7,162)	[1,719]	{859}	36,232	(7,246)	[1,739]	{870}	36,643	(7,329)	[1,759]	{879}
Greenville	58,977	59,150	59,493	59,820	60,439	(12,088)	[2,901]	{1,451}	61,041	(12,208)	[2,930]	{1,465}	61,622	(12,324)	[2,958]	{1,479}
Kershaw	5,946	5,977	6,017	6,047	6,123	(1,225)	[294]	{147}	6,194	(1,239)	[297]	{149}	6,265	(1,253)	[301]	{150}
Lexington	26,156	26,258	26,402	26,621	26,948	(5,390)	[1,293]	{647}	27,263	(5,453)	[1,309]	{654}	27,569	(5,514)	[1,323]	{662}
Richland	37,482	37,631	37,804	38,012	38,367	(7,673)	[1,842]	{921}	38,693	(7,739)	[1,857]	{929}	39,008	(7,802)	[1,872]	{936}
Spartanburg	32,394	32,507	32,696	32,943	33,456	(6,691)	[1,606]	{803}	33,957	(6,791)	[1,630]	{815}	34,449	(6,890)	[1,654]	{827}
York	23,467	23,600	23,784	23,908	24,187	(4,837)	[1,161]	{580}	24,451	(4,890)	[1,174]	{587}	24,708	(4,942)	[1,186]	{593}

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.