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

Date: 11/10/21

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 11/10/21 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.

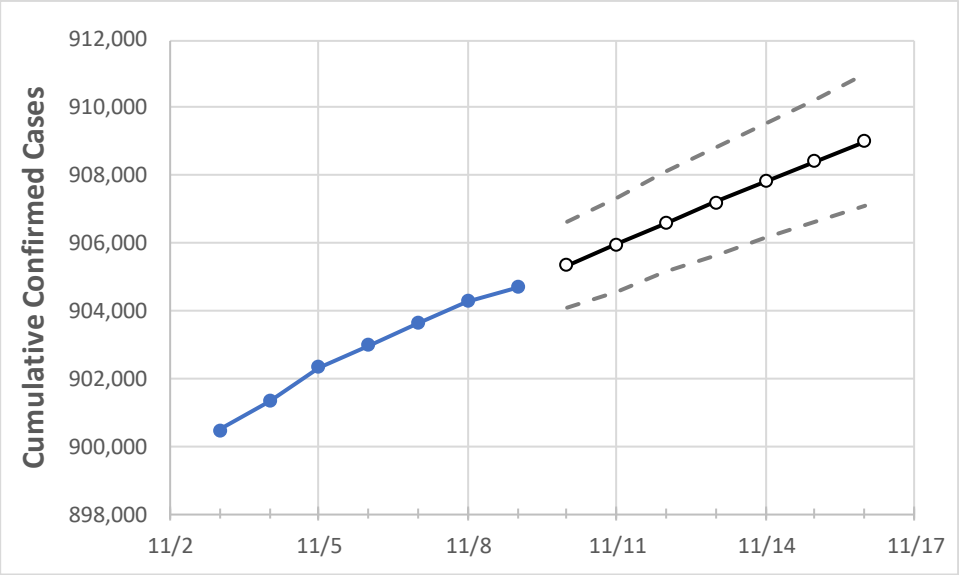
IEM's Modeling Lead

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
South Carolina	902,984	903,638	904,293	904,689	905,339	905,959	906,601	907,205	907,815	908,414	909,002

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Beaufort	27,364	27,382	27,400	27,403	27,420	27,436	27,451	27,467	27,483	27,499	27,516
Charleston	65,599	65,655	65,710	65,731	65,774	65,819	65,864	65,907	65,951	65,994	66,038
Greenville	105,763	105,843	105,922	105,996	106,078	106,160	106,238	106,315	106,395	106,472	106,546
Kershaw	12,057	12,066	12,076	12,078	12,087	12,095	12,103	12,111	12,119	12,126	12,134
Lexington	54,607	54,645	54,683	54,700	54,737	54,772	54,808	54,845	54,879	54,914	54,947
Richland	69,338	69,372	69,407	69,426	69,467	69,506	69,542	69,580	69,618	69,656	69,693
Spartanburg	62,170	62,207	62,243	62,270	62,315	62,357	62,399	62,441	62,481	62,522	62,561
York	47,098	47,135	47,172	47,200	47,236	47,269	47,302	47,335	47,367	47,400	47,432

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:											
	11/6	11/7	11/8	11/9	11/11				11/13				11/15			
Beaufort	27,364	27,382	27,400	27,403	27,436	(5,487)	[1,317]	{658}	27,467	(5,493)	[1,318]	{659}	27,499	(5,500)	[1,320]	{660}
Charleston	65,599	65,655	65,710	65,731	65,819	(13,164)	[3,159]	{1,580}	65,907	(13,181)	[3,164]	{1,582}	65,994	(13,199)	[3,168]	{1,584}
Greenville	105,763	105,843	105,922	105,996	106,160	(21,232)	[5,096]	{2,548}	106,315	(21,263)	[5,103]	{2,552}	106,472	(21,294)	[5,111]	{2,555}
Kershaw	12,057	12,066	12,076	12,078	12,095	(2,419)	[581]	{290}	12,111	(2,422)	[581]	{291}	12,126	(2,425)	[582]	{291}
Lexington	54,607	54,645	54,683	54,700	54,772	(10,954)	[2,629]	{1,315}	54,845	(10,969)	[2,633]	{1,316}	54,914	(10,983)	[2,636]	{1,318}
Richland	69,338	69,372	69,407	69,426	69,506	(13,901)	[3,336]	{1,668}	69,580	(13,916)	[3,340]	{1,670}	69,656	(13,931)	[3,343]	{1,672}
Spartanburg	62,170	62,207	62,243	62,270	62,357	(12,471)	[2,993]	{1,497}	62,441	(12,488)	[2,997]	{1,499}	62,522	(12,504)	[3,001]	{1,501}
York	47,098	47,135	47,172	47,200	47,269	(9,454)	[2,269]	{1,134}	47,335	(9,467)	[2,272]	{1,136}	47,400	(9,480)	[2,275]	{1,138}

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.