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

Date: 10/13/21

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 10/13/21 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.

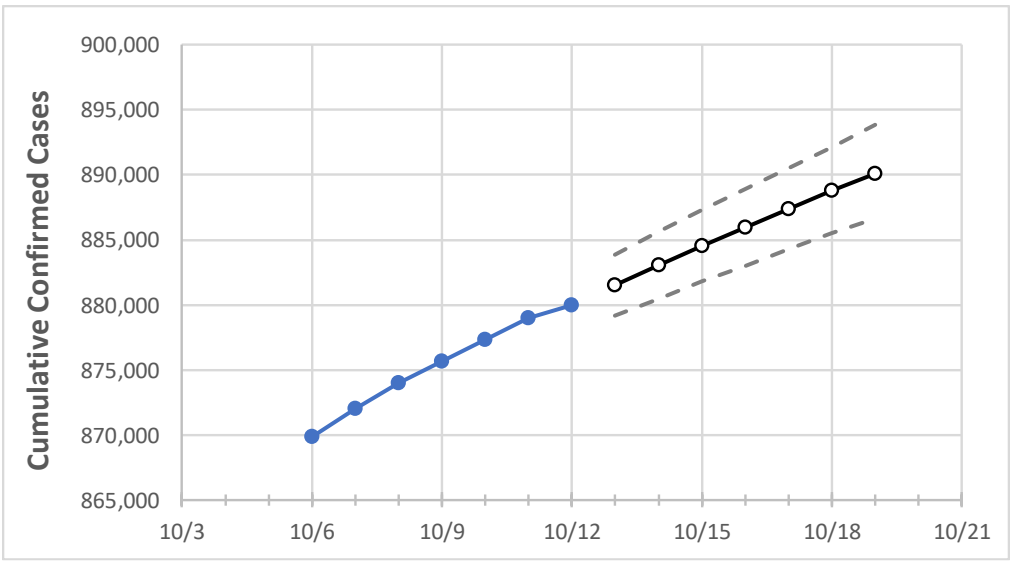
IEM's Modeling Lead

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
South Carolina	875,679	877,346	879,012	879,985	881,546	883,054	884,527	885,978	887,376	888,808	890,086

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Beaufort	26,738	26,774	26,809	26,841	26,876	26,910	26,943	26,974	27,005	27,038	27,067
Charleston	63,957	64,040	64,124	64,191	64,274	64,355	64,434	64,510	64,586	64,661	64,729
Greenville	102,225	102,447	102,669	102,806	103,005	103,193	103,383	103,561	103,746	103,919	104,092
Kershaw	11,677	11,701	11,724	11,745	11,771	11,796	11,821	11,845	11,868	11,892	11,915
Lexington	53,197	53,289	53,381	53,432	53,512	53,592	53,666	53,740	53,815	53,885	53,953
Richland	67,539	67,643	67,747	67,848	67,948	68,042	68,136	68,227	68,317	68,405	68,487
Spartanburg	60,264	60,389	60,514	60,578	60,719	60,849	60,977	61,098	61,242	61,363	61,477
York	45,651	45,738	45,825	45,864	45,940	46,017	46,089	46,163	46,233	46,300	46,367

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:		
	10/9	10/10	10/11	10/12	10/14	10/16	10/18
Beaufort	26,738	26,774	26,809	26,841	26,910 (5,382) [1,292] {646}	26,974 (5,395) [1,295] {647}	27,038 (5,408) [1,298] {649}
Charleston	63,957	64,040	64,124	64,191	64,355 (12,871) [3,089] {1,545}	64,510 (12,902) [3,096] {1,548}	64,661 (12,932) [3,104] {1,552}
Greenville	102,225	102,447	102,669	102,806	103,193 (20,639) [4,953] {2,477}	103,561 (20,712) [4,971] {2,485}	103,919 (20,784) [4,988] {2,494}
Kershaw	11,677	11,701	11,724	11,745	11,796 (2,359) [566] {283}	11,845 (2,369) [569] {284}	11,892 (2,378) [571] {285}
Lexington	53,197	53,289	53,381	53,432	53,592 (10,718) [2,572] {1,286}	53,740 (10,748) [2,580] {1,290}	53,885 (10,777) [2,586] {1,293}
Richland	67,539	67,643	67,747	67,848	68,042 (13,608) [3,266] {1,633}	68,227 (13,645) [3,275] {1,637}	68,405 (13,681) [3,283] {1,642}
Spartanburg	60,264	60,389	60,514	60,578	60,849 (12,170) [2,921] {1,460}	61,098 (12,220) [2,933] {1,466}	61,363 (12,273) [2,945] {1,473}
York	45,651	45,738	45,825	45,864	46,017 (9,203) [2,209] {1,104}	46,163 (9,233) [2,216] {1,108}	46,300 (9,260) [2,222] {1,111}

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.