IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/20/21

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 8/20/21 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
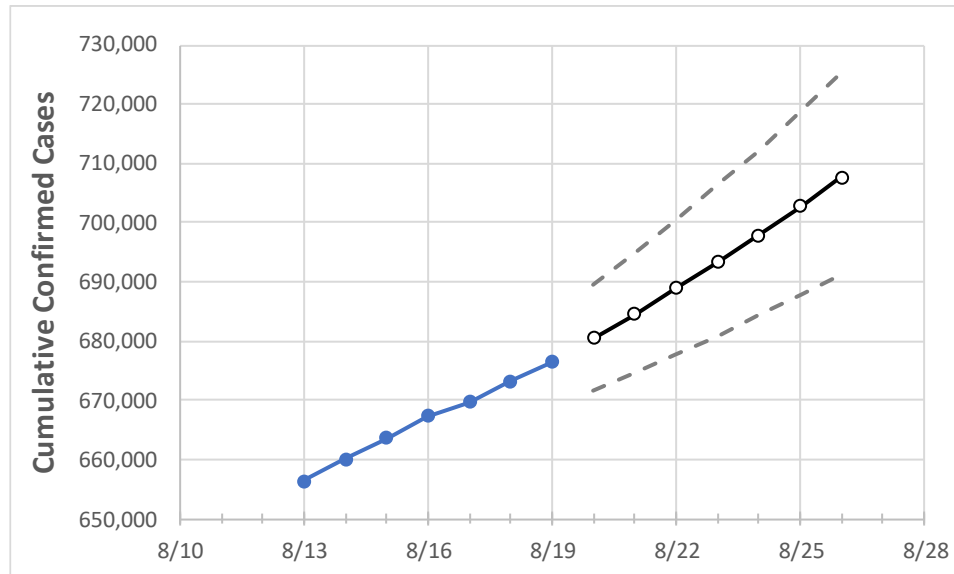
	Actual Confirmed Cases On:				Projected Cases For:						
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26
South Carolina	667,352	669,638	673,172	676,431	680,456	684,582	688,931	693,390	697,958	702,738	707,623

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:						
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26
Beaufort	20,428	20,544	20,770	20,900	21,106	21,319	21,539	21,768	22,010	22,255	22,509
Charleston	50,104	50,276	50,529	50,878	51,246	51,621	52,022	52,429	52,859	53,305	53,757
Greenville	81,098	81,348	81,591	81,851	82,178	82,517	82,869	83,232	83,615	83,994	84,389
Kershaw	8,873	8,913	8,996	9,054	9,133	9,214	9,299	9,385	9,476	9,571	9,670
Lexington	39,432	39,648	39,892	40,171	40,492	40,819	41,156	41,508	41,869	42,240	42,622
Richland	53,846	53,999	54,332	54,531	54,828	55,129	55,436	55,750	56,072	56,405	56,742
Spartanburg	45,587	45,713	45,895	46,049	46,268	46,491	46,720	46,963	47,210	47,461	47,722
York	35,562	35,648	35,791	35,928	36,085	36,249	36,416	36,586	36,759	36,936	37,119

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:		
	8/16	8/17	8/18	8/19	8/21	8/23	8/25
Beaufort	20,428	20,544	20,770	20,900	21,319 (4,264) [1,023] {512}	21,768 (4,354) [1,045] {522}	22,255 (4,451) [1,068] {534}
Charleston	50,104	50,276	50,529	50,878	51,621 (10,324) [2,478] {1,239}	52,429 (10,486) [2,517] {1,258}	53,305 (10,661) [2,559] {1,279}
Greenville	81,098	81,348	81,591	81,851	82,517 (16,503) [3,961] {1,980}	83,232 (16,646) [3,995] {1,998}	83,994 (16,799) [4,032] {2,016}
Kershaw	8,873	8,913	8,996	9,054	9,214 (1,843) [442] {221}	9,385 (1,877) [450] {225}	9,571 (1,914) [459] {230}
Lexington	39,432	39,648	39,892	40,171	40,819 (8,164) [1,959] {980}	41,508 (8,302) [1,992] {996}	42,240 (8,448) [2,028] {1,014}
Richland	53,846	53,999	54,332	54,531	55,129 (11,026) [2,646] {1,323}	55,750 (11,150) [2,676] {1,338}	56,405 (11,281) [2,707] {1,354}
Spartanburg	45,587	45,713	45,895	46,049	46,491 (9,298) [2,232] {1,116}	46,963 (9,393) [2,254] {1,127}	47,461 (9,492) [2,278] {1,139}
York	35,562	35,648	35,791	35,928	36,249 (7,250) [1,740] {870}	36,586 (7,317) [1,756] {878}	36,936 (7,387) [1,773] {886}

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.