

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 7/30/21**

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 7/30/21 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.

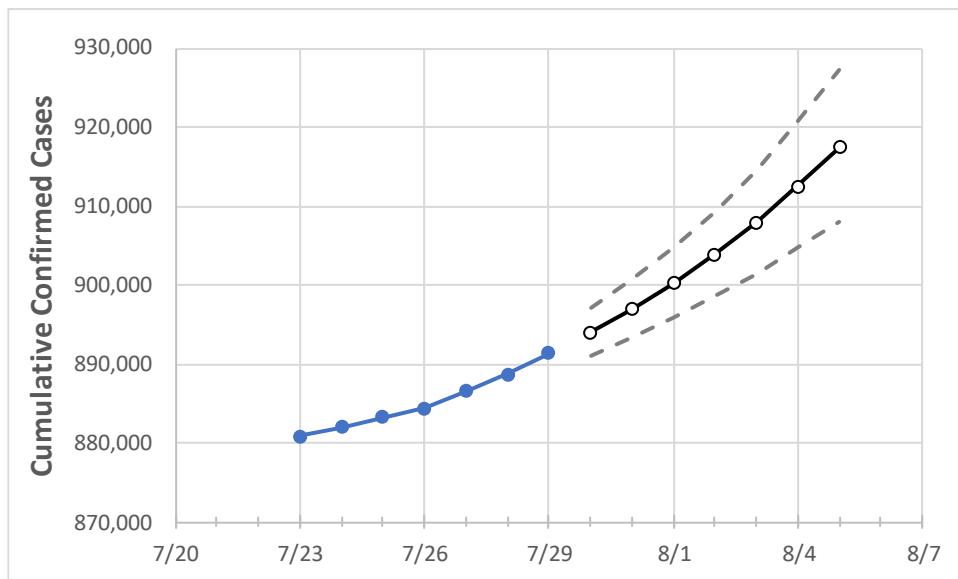
IEM's Modeling Lead

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.

Tennessee State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	
Tennessee	884,417	886,519	888,745	891,331	893,999	896,968	900,232	903,889	907,906	912,447	917,421	

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.

Tennessee Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	
Blount	16,190	16,233	16,275	16,309	16,348	16,391	16,438	16,489	16,545	16,606	16,673	
Davidson	91,959	92,152	92,321	92,522	92,740	92,974	93,236	93,525	93,851	94,202	94,586	
Hamilton	46,465	46,568	46,701	46,863	47,006	47,163	47,337	47,529	47,740	47,971	48,225	
Knox	52,905	52,993	53,103	53,231	53,359	53,499	53,650	53,818	54,005	54,215	54,445	
Rutherford	44,470	44,558	44,636	44,775	44,900	45,042	45,199	45,375	45,573	45,794	46,042	
Shelby	102,650	102,919	103,267	103,735	104,171	104,643	105,157	105,710	106,317	106,961	107,672	
Sumner	25,183	25,235	25,292	25,348	25,405	25,464	25,528	25,596	25,667	25,743	25,824	
Williamson	29,285	29,377	29,452	29,563	29,675	29,800	29,942	30,098	30,276	30,477	30,700	

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.

Tennessee Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases {Hospitalized} [ICU] {Ventilator} For:			
	7/26	7/27	7/28	7/29	7/31	8/2	8/4	
Blount	16,190	16,233	16,275	16,309	16,391 (3,278) [787] {393}	16,489 (3,298) [791] {396}	16,606 (3,321) [797] {399}	
Davidson	91,959	92,152	92,321	92,522	92,974 (18,595) [4,463] {2,231}	93,525 (18,705) [4,489] {2,245}	94,202 (18,840) [4,522] {2,261}	
Hamilton	46,465	46,568	46,701	46,863	47,163 (9,433) [2,264] {1,132}	47,529 (9,506) [2,281] {1,141}	47,971 (9,594) [2,303] {1,151}	
Knox	52,905	52,993	53,103	53,231	53,499 (10,700) [2,568] {1,284}	53,818 (10,764) [2,583] {1,292}	54,215 (10,843) [2,602] {1,301}	
Rutherford	44,470	44,558	44,636	44,775	45,042 (9,008) [2,162] {1,081}	45,375 (9,075) [2,178] {1,089}	45,794 (9,159) [2,198] {1,099}	
Shelby	102,650	102,919	103,267	103,735	104,643 (20,929) [5,023] {2,511}	105,710 (21,142) [5,074] {2,537}	106,961 (21,392) [5,134] {2,567}	
Sumner	25,183	25,235	25,292	25,348	25,464 (5,093) [1,222] {611}	25,596 (5,119) [1,229] {614}	25,743 (5,149) [1,236] {618}	
Williamson	29,285	29,377	29,452	29,563	29,800 (5,960) [1,430] {715}	30,098 (6,020) [1,445] {722}	30,477 (6,095) [1,463] {731}	

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.