

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/25/21**

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 8/25/21 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.

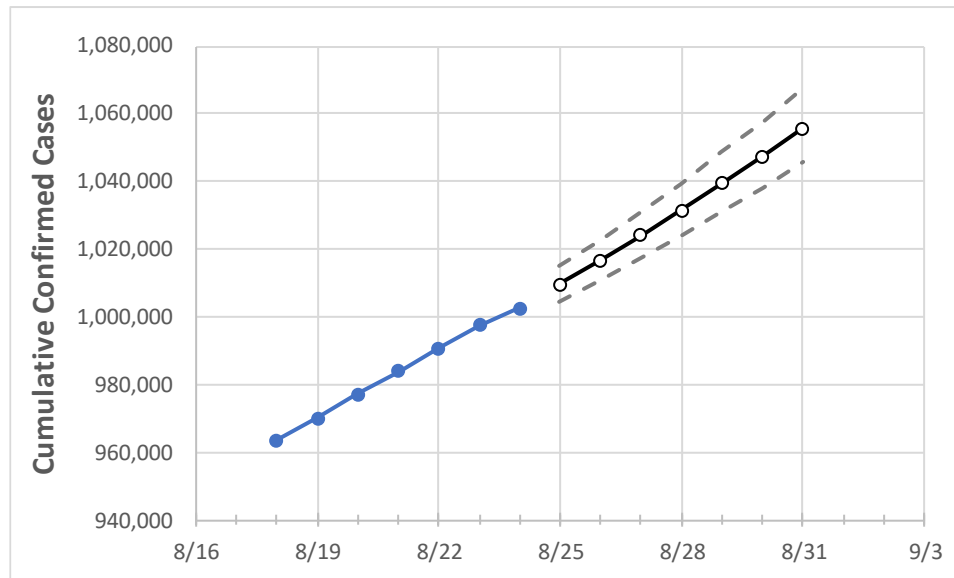
IEM's Modeling Lead

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
Tennessee	983,980	990,729	997,479	1,002,632	1,009,518	1,016,614	1,023,966	1,031,524	1,039,358	1,047,453	1,055,833

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
Blount	17,865	17,954	18,044	18,134	18,241	18,349	18,461	18,573	18,692	18,813	18,937
Davidson	99,826	100,277	100,728	100,965	101,408	101,852	102,312	102,784	103,263	103,757	104,253
Hamilton	51,306	51,570	51,834	52,048	52,322	52,592	52,882	53,171	53,468	53,777	54,085
Knox	57,768	58,149	58,529	58,797	59,167	59,546	59,945	60,352	60,776	61,220	61,676
Rutherford	48,580	48,884	49,187	49,384	49,671	49,956	50,256	50,570	50,889	51,224	51,567
Shelby	117,734	118,593	119,453	119,942	120,769	121,599	122,455	123,320	124,206	125,105	126,023
Sumner	27,849	28,033	28,216	28,357	28,550	28,747	28,957	29,170	29,389	29,621	29,863
Williamson	32,269	32,434	32,599	32,743	32,906	33,073	33,243	33,419	33,594	33,776	33,961

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:											
	8/21	8/22	8/23	8/24	8/26			8/28			8/30					
Blount	17,865	17,954	18,044	18,134	18,349	(3,670)	[881]	{440}	18,573	(3,715)	[892]	{446}	18,813	(3,763)	[903]	{452}
Davidson	99,826	100,277	100,728	100,965	101,852	(20,370)	[4,889]	{2,444}	102,784	(20,557)	[4,934]	{2,467}	103,757	(20,751)	[4,980]	{2,490}
Hamilton	51,306	51,570	51,834	52,048	52,592	(10,518)	[2,524]	{1,262}	53,171	(10,634)	[2,552]	{1,276}	53,777	(10,755)	[2,581]	{1,291}
Knox	57,768	58,149	58,529	58,797	59,546	(11,909)	[2,858]	{1,429}	60,352	(12,070)	[2,897]	{1,448}	61,220	(12,244)	[2,939]	{1,469}
Rutherford	48,580	48,884	49,187	49,384	49,956	(9,991)	[2,398]	{1,199}	50,570	(10,114)	[2,427]	{1,214}	51,224	(10,245)	[2,459]	{1,229}
Shelby	117,734	118,593	119,453	119,942	121,599	(24,320)	[5,837]	{2,918}	123,320	(24,664)	[5,919]	{2,960}	125,105	(25,021)	[6,005]	{3,003}
Sumner	27,849	28,033	28,216	28,357	28,747	(5,749)	[1,380]	{690}	29,170	(5,834)	[1,400]	{700}	29,621	(5,924)	[1,422]	{711}
Williamson	32,269	32,434	32,599	32,743	33,073	(6,615)	[1,587]	{794}	33,419	(6,684)	[1,604]	{802}	33,776	(6,755)	[1,621]	{811}

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.