

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/27/21**

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 8/27/21 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.

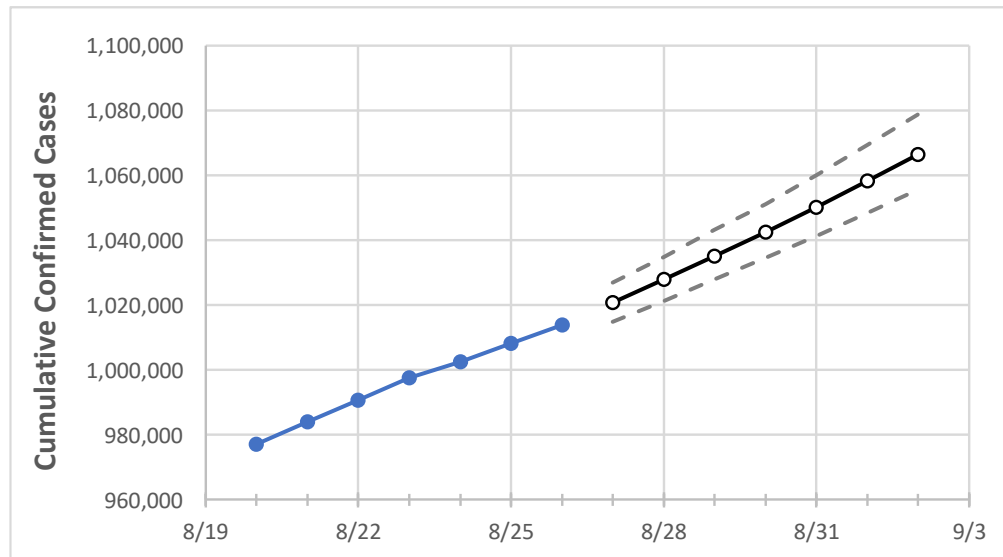
IEM's Modeling Lead

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Tennessee	997,479	1,002,632	1,008,288	1,013,943	1,020,823	1,027,813	1,034,971	1,042,510	1,050,158	1,058,130	1,066,332

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Blount	18,044	18,134	18,267	18,399	18,513	18,633	18,751	18,876	19,002	19,136	19,268
Davidson	100,728	100,965	101,359	101,752	102,159	102,588	103,019	103,444	103,891	104,332	104,788
Hamilton	51,834	52,048	52,278	52,507	52,759	53,013	53,273	53,532	53,799	54,069	54,343
Knox	58,529	58,797	59,162	59,527	59,928	60,338	60,761	61,207	61,671	62,151	62,645
Rutherford	49,187	49,384	49,615	49,845	50,130	50,423	50,726	51,035	51,355	51,687	52,026
Shelby	119,453	119,942	120,413	120,884	121,651	122,408	123,157	123,952	124,744	125,548	126,364
Sumner	28,216	28,357	28,505	28,653	28,837	29,025	29,216	29,414	29,615	29,825	30,039
Williamson	32,599	32,743	32,894	33,045	33,208	33,374	33,541	33,712	33,885	34,062	34,241

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Blount	18,044	18,134	18,267	18,399	18,633	(3,727)	[894]	{447}	18,876	(3,775)	[906]	{453}	19,136	(3,827)	[919]	{459}
Davidson	100,728	100,965	101,359	101,752	102,588	(20,518)	[4,924]	{2,462}	103,444	(20,689)	[4,965]	{2,483}	104,332	(20,866)	[5,008]	{2,504}
Hamilton	51,834	52,048	52,278	52,507	53,013	(10,603)	[2,545]	{1,272}	53,532	(10,706)	[2,570]	{1,285}	54,069	(10,814)	[2,595]	{1,298}
Knox	58,529	58,797	59,162	59,527	60,338	(12,068)	[2,896]	{1,448}	61,207	(12,241)	[2,938]	{1,469}	62,151	(12,430)	[2,983]	{1,492}
Rutherford	49,187	49,384	49,615	49,845	50,423	(10,085)	[2,420]	{1,210}	51,035	(10,207)	[2,450]	{1,225}	51,687	(10,337)	[2,481]	{1,240}
Shelby	119,453	119,942	120,413	120,884	122,408	(24,482)	[5,876]	{2,938}	123,952	(24,790)	[5,950]	{2,975}	125,548	(25,110)	[6,026]	{3,013}
Sumner	28,216	28,357	28,505	28,653	29,025	(5,805)	[1,393]	{697}	29,414	(5,883)	[1,412]	{706}	29,825	(5,965)	[1,432]	{716}
Williamson	32,599	32,743	32,894	33,045	33,374	(6,675)	[1,602]	{801}	33,712	(6,742)	[1,618]	{809}	34,062	(6,812)	[1,635]	{817}

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.