

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

**Date: 8/18/21**

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 8/18/21 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.**

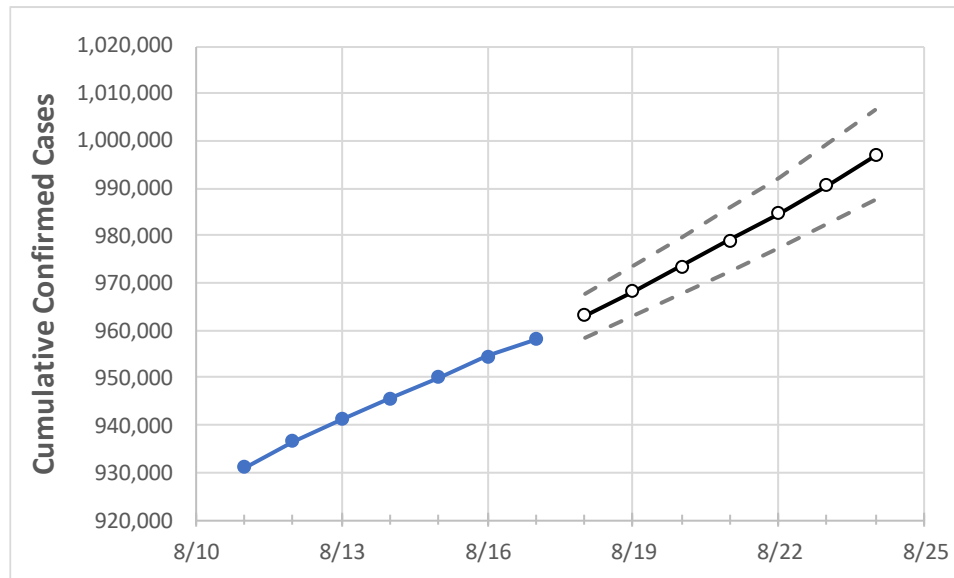
### **IEM's Modeling Lead**

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Tennessee	945,711	950,160	954,610	958,169	963,161	968,314	973,578	979,100	984,800	990,671	996,850	

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Blount	17,279	17,337	17,395	17,490	17,586	17,687	17,792	17,901	18,016	18,136	18,262	
Davidson	97,178	97,530	97,881	98,095	98,466	98,847	99,241	99,645	100,066	100,499	100,927	
Hamilton	49,739	49,942	50,145	50,309	50,556	50,813	51,074	51,357	51,638	51,926	52,231	
Knox	55,845	56,074	56,302	56,503	56,771	57,052	57,347	57,654	57,976	58,311	58,668	
Rutherford	47,020	47,213	47,405	47,538	47,748	47,967	48,194	48,428	48,672	48,928	49,191	
Shelby	112,618	113,312	114,005	114,380	115,072	115,775	116,493	117,242	118,027	118,818	119,626	
Sumner	26,803	26,917	27,032	27,137	27,284	27,436	27,597	27,764	27,940	28,123	28,311	
Williamson	31,298	31,424	31,550	31,673	31,816	31,964	32,115	32,270	32,429	32,593	32,760	

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:											
	8/14	8/15	8/16	8/17	8/19				8/21				8/23			
Blount	17,279	17,337	17,395	17,490	17,687	(3,537)	[849]	{424}	17,901	(3,580)	[859]	{430}	18,136	(3,627)	[871]	{435}
Davidson	97,178	97,530	97,881	98,095	98,847	(19,769)	[4,745]	{2,372}	99,645	(19,929)	[4,783]	{2,391}	100,499	(20,100)	[4,824]	{2,412}
Hamilton	49,739	49,942	50,145	50,309	50,813	(10,163)	[2,439]	{1,220}	51,357	(10,271)	[2,465]	{1,233}	51,926	(10,385)	[2,492]	{1,246}
Knox	55,845	56,074	56,302	56,503	57,052	(11,410)	[2,738]	{1,369}	57,654	(11,531)	[2,767]	{1,384}	58,311	(11,662)	[2,799]	{1,399}
Rutherford	47,020	47,213	47,405	47,538	47,967	(9,593)	[2,302]	{1,151}	48,428	(9,686)	[2,325]	{1,162}	48,928	(9,786)	[2,349]	{1,174}
Shelby	112,618	113,312	114,005	114,380	115,775	(23,155)	[5,557]	{2,779}	117,242	(23,448)	[5,628]	{2,814}	118,818	(23,764)	[5,703]	{2,852}
Sumner	26,803	26,917	27,032	27,137	27,436	(5,487)	[1,317]	{658}	27,764	(5,553)	[1,333]	{666}	28,123	(5,625)	[1,350]	{675}
Williamson	31,298	31,424	31,550	31,673	31,964	(6,393)	[1,534]	{767}	32,270	(6,454)	[1,549]	{774}	32,593	(6,519)	[1,564]	{782}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.