

## 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.**

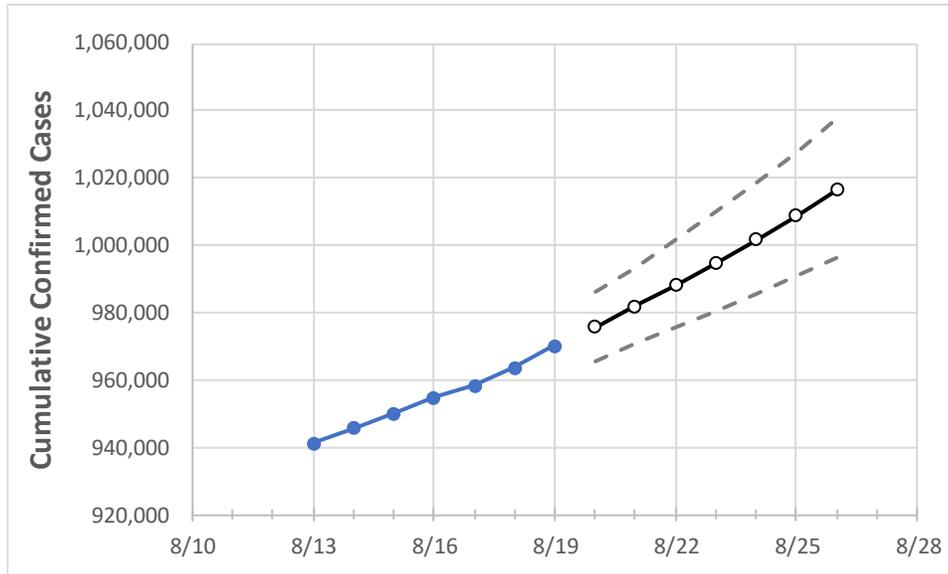
### IEM's Modeling Lead

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.

### Tennessee 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
Tennessee	954,610	958,169	963,647	969,998	975,750	981,910	988,167	994,775	1,001,631	1,008,880	1,016,416

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:						
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26
Blount	17,395	17,490	17,601	17,690	17,793	17,900	18,013	18,131	18,254	18,383	18,518
Davidson	97,881	98,095	98,590	99,078	99,514	99,975	100,438	100,920	101,419	101,926	102,461
Hamilton	50,145	50,309	50,527	50,785	51,045	51,314	51,596	51,888	52,183	52,492	52,803
Knox	56,302	56,503	56,764	57,013	57,288	57,579	57,882	58,195	58,525	58,864	59,220
Rutherford	47,405	47,538	47,755	47,996	48,228	48,467	48,716	48,975	49,246	49,524	49,816
Shelby	114,005	114,380	115,270	116,088	116,876	117,674	118,487	119,338	120,205	121,090	122,023
Sumner	27,032	27,137	27,283	27,498	27,669	27,850	28,041	28,243	28,454	28,677	28,909
Williamson	31,550	31,673	31,794	31,945	32,091	32,240	32,392	32,549	32,709	32,873	33,041

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:											
	8/16	8/17	8/18	8/19	8/21			8/23			8/25					
Blount	17,395	17,490	17,601	17,690	17,900	(3,580)	[859]	{430}	18,131	(3,626)	[870]	{435}	18,383	(3,677)	[882]	{441}
Davidson	97,881	98,095	98,590	99,078	99,975	(19,995)	[4,799]	{2,399}	100,920	(20,184)	[4,844]	{2,422}	101,926	(20,385)	[4,892]	{2,446}
Hamilton	50,145	50,309	50,527	50,785	51,314	(10,263)	[2,463]	{1,232}	51,888	(10,378)	[2,491]	{1,245}	52,492	(10,498)	[2,520]	{1,260}
Knox	56,302	56,503	56,764	57,013	57,579	(11,516)	[2,764]	{1,382}	58,195	(11,639)	[2,793]	{1,397}	58,864	(11,773)	[2,825]	{1,413}
Rutherford	47,405	47,538	47,755	47,996	48,467	(9,693)	[2,326]	{1,163}	48,975	(9,795)	[2,351]	{1,175}	49,524	(9,905)	[2,377]	{1,189}
Shelby	114,005	114,380	115,270	116,088	117,674	(23,535)	[5,648]	{2,824}	119,338	(23,868)	[5,728]	{2,864}	121,090	(24,218)	[5,812]	{2,906}
Sumner	27,032	27,137	27,283	27,498	27,850	(5,570)	[1,337]	{668}	28,243	(5,649)	[1,356]	{678}	28,677	(5,735)	[1,376]	{688}
Williamson	31,550	31,673	31,794	31,945	32,240	(6,448)	[1,548]	{774}	32,549	(6,510)	[1,562]	{781}	32,873	(6,575)	[1,578]	{789}

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.