

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 11/19/21**

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 11/19/21 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.**

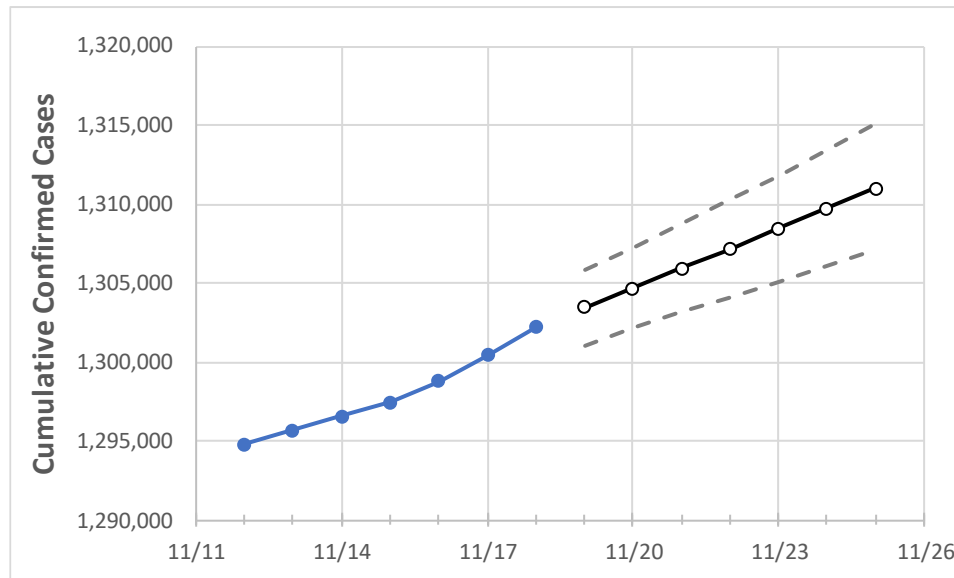
**IEM's Modeling Lead**

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Tennessee	1,297,472	1,298,767	1,300,452	1,302,201	1,303,443	1,304,683	1,305,900	1,307,153	1,308,432	1,309,717	1,311,009

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Blount	24,095	24,124	24,154	24,180	24,205	24,230	24,255	24,281	24,306	24,333	24,359
Davidson	122,791	122,860	123,001	123,155	123,256	123,362	123,467	123,575	123,683	123,791	123,901
Hamilton	64,441	64,481	64,555	64,615	64,667	64,723	64,776	64,834	64,888	64,946	65,002
Knox	79,748	79,838	79,912	80,009	80,076	80,145	80,211	80,281	80,349	80,418	80,486
Rutherford	62,788	62,828	62,920	63,025	63,083	63,143	63,202	63,263	63,324	63,383	63,446
Shelby	146,063	146,165	146,298	146,482	146,611	146,739	146,873	147,004	147,140	147,280	147,418
Sumner	34,747	34,776	34,828	34,885	34,920	34,956	34,991	35,028	35,066	35,104	35,141
Williamson	40,262	40,318	40,372	40,436	40,497	40,561	40,629	40,701	40,778	40,856	40,940

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:											
	11/15	11/16	11/17	11/18	11/20				11/22				11/24			
Blount	24,095	24,124	24,154	24,180	24,230	(4,846)	[1,163]	{582}	24,281	(4,856)	[1,165]	{583}	24,333	(4,867)	[1,168]	{584}
Davidson	122,791	122,860	123,001	123,155	123,362	(24,672)	[5,921]	{2,961}	123,575	(24,715)	[5,932]	{2,966}	123,791	(24,758)	[5,942]	{2,971}
Hamilton	64,441	64,481	64,555	64,615	64,723	(12,945)	[3,107]	{1,553}	64,834	(12,967)	[3,112]	{1,556}	64,946	(12,989)	[3,117]	{1,559}
Knox	79,748	79,838	79,912	80,009	80,145	(16,029)	[3,847]	{1,923}	80,281	(16,056)	[3,853]	{1,927}	80,418	(16,084)	[3,860]	{1,930}
Rutherford	62,788	62,828	62,920	63,025	63,143	(12,629)	[3,031]	{1,515}	63,263	(12,653)	[3,037]	{1,518}	63,383	(12,677)	[3,042]	{1,521}
Shelby	146,063	146,165	146,298	146,482	146,739	(29,348)	[7,043]	{3,522}	147,004	(29,401)	[7,056]	{3,528}	147,280	(29,456)	[7,069]	{3,535}
Sumner	34,747	34,776	34,828	34,885	34,956	(6,991)	[1,678]	{839}	35,028	(7,006)	[1,681]	{841}	35,104	(7,021)	[1,685]	{842}
Williamson	40,262	40,318	40,372	40,436	40,561	(8,112)	[1,947]	{973}	40,701	(8,140)	[1,954]	{977}	40,856	(8,171)	[1,961]	{981}

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.