

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

**Date: 5/28/21**

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 5/28/21 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.**

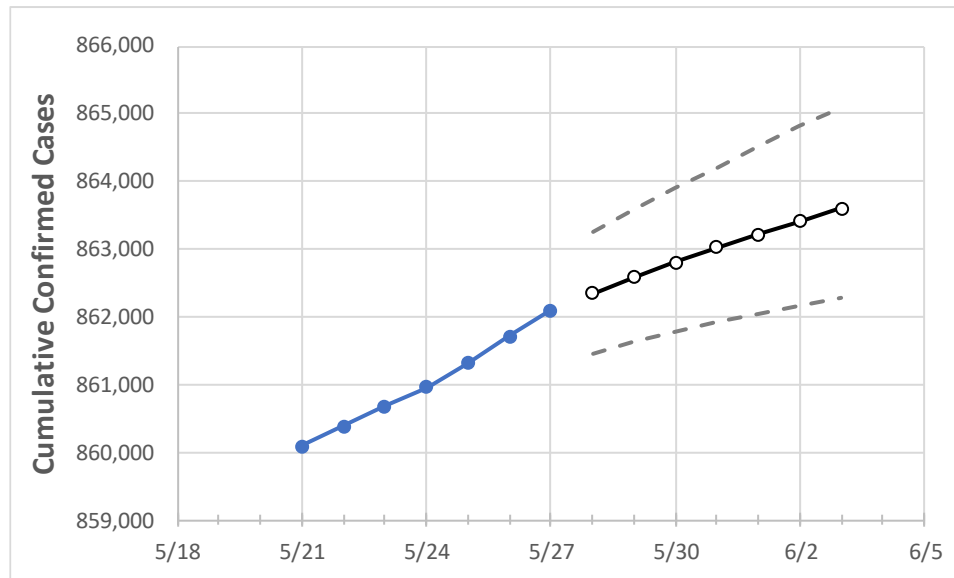
### **IEM's Modeling Lead**

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Tennessee	860,966	861,313	861,706	862,098	862,344	862,582	862,809	863,024	863,226	863,419	863,603

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Blount	15,609	15,608	15,617	15,620	15,623	15,625	15,627	15,629	15,631	15,633	15,634
Davidson	90,012	90,039	90,066	90,080	90,103	90,125	90,145	90,165	90,183	90,201	90,218
Hamilton	44,843	44,870	44,900	44,959	44,985	45,012	45,037	45,064	45,089	45,113	45,138
Knox	51,386	51,465	51,564	51,585	51,615	51,645	51,675	51,704	51,734	51,766	51,795
Rutherford	43,401	43,406	43,422	43,441	43,455	43,468	43,481	43,493	43,504	43,515	43,526
Shelby	97,295	97,354	97,429	97,502	97,567	97,627	97,686	97,744	97,797	97,850	97,901
Sumner	24,257	24,271	24,290	24,305	24,316	24,326	24,336	24,346	24,355	24,364	24,374
Williamson	28,225	28,228	28,240	28,253	28,261	28,269	28,277	28,284	28,292	28,299	28,305

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:											
	5/24	5/25	5/26	5/27	5/29				5/31				6/2			
Blount	15,609	15,608	15,617	15,620	15,625	(3,125)	[750]	{375}	15,629	(3,126)	[750]	{375}	15,633	(3,127)	[750]	{375}
Davidson	90,012	90,039	90,066	90,080	90,125	(18,025)	[4,326]	{2,163}	90,165	(18,033)	[4,328]	{2,164}	90,201	(18,040)	[4,330]	{2,165}
Hamilton	44,843	44,870	44,900	44,959	45,012	(9,002)	[2,161]	{1,080}	45,064	(9,013)	[2,163]	{1,082}	45,113	(9,023)	[2,165]	{1,083}
Knox	51,386	51,465	51,564	51,585	51,645	(10,329)	[2,479]	{1,239}	51,704	(10,341)	[2,482]	{1,241}	51,766	(10,353)	[2,485]	{1,242}
Rutherford	43,401	43,406	43,422	43,441	43,468	(8,694)	[2,086]	{1,043}	43,493	(8,699)	[2,088]	{1,044}	43,515	(8,703)	[2,089]	{1,044}
Shelby	97,295	97,354	97,429	97,502	97,627	(19,525)	[4,686]	{2,343}	97,744	(19,549)	[4,692]	{2,346}	97,850	(19,570)	[4,697]	{2,348}
Sumner	24,257	24,271	24,290	24,305	24,326	(4,865)	[1,168]	{584}	24,346	(4,869)	[1,169]	{584}	24,364	(4,873)	[1,169]	{585}
Williamson	28,225	28,228	28,240	28,253	28,269	(5,654)	[1,357]	{678}	28,284	(5,657)	[1,358]	{679}	28,299	(5,660)	[1,358]	{679}

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.