

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

**Date: 6/8/21**

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 6/8/21 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.**

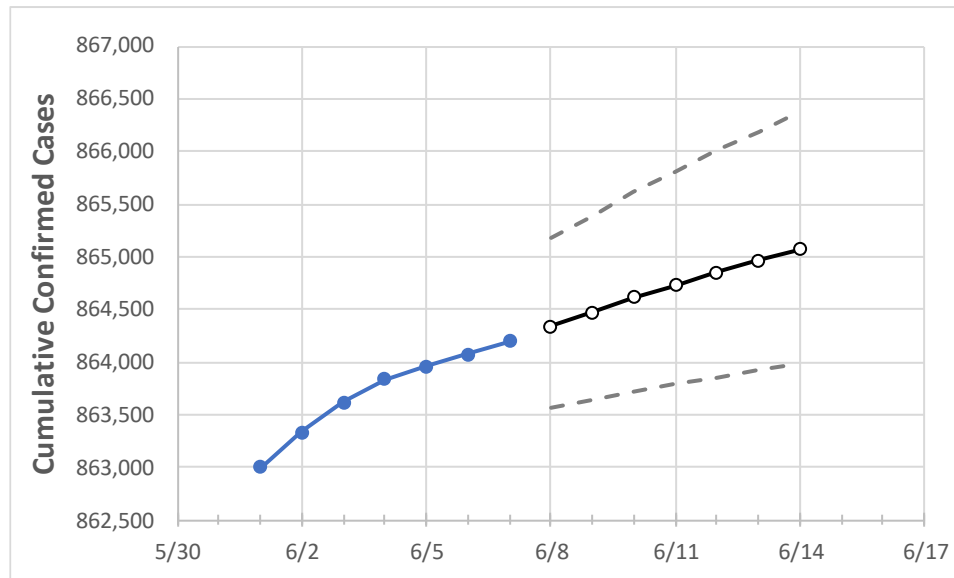
### **IEM's Modeling Lead**

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:						
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14
Tennessee	863,840	863,958	864,077	864,195	864,338	864,475	864,610	864,732	864,853	864,967	865,073

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:						
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14
Blount	15,633	15,636	15,640	15,643	15,646	15,650	15,653	15,656	15,659	15,661	15,664
Davidson	90,244	90,256	90,269	90,281	90,294	90,307	90,320	90,332	90,344	90,355	90,366
Hamilton	45,081	45,089	45,098	45,106	45,117	45,128	45,139	45,148	45,157	45,166	45,174
Knox	51,753	51,735	51,717	51,699	51,767	51,836	51,915	51,987	52,064	52,149	52,227
Rutherford	43,519	43,521	43,523	43,525	43,531	43,536	43,541	43,545	43,550	43,554	43,558
Shelby	97,826	97,863	97,900	97,937	97,965	97,993	98,019	98,044	98,068	98,089	98,110
Sumner	24,324	24,329	24,333	24,338	24,341	24,343	24,346	24,348	24,350	24,352	24,354
Williamson	28,305	28,315	28,324	28,334	28,340	28,346	28,352	28,358	28,363	28,368	28,374

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:											
	6/4	6/5	6/6	6/7	6/9				6/11				6/13			
Blount	15,633	15,636	15,640	15,643	15,650	(3,130)	[751]	{376}	15,656	(3,131)	[751]	{376}	15,661	(3,132)	[752]	{376}
Davidson	90,244	90,256	90,269	90,281	90,307	(18,061)	[4,335]	{2,167}	90,332	(18,066)	[4,336]	{2,168}	90,355	(18,071)	[4,337]	{2,169}
Hamilton	45,081	45,089	45,098	45,106	45,128	(9,026)	[2,166]	{1,083}	45,148	(9,030)	[2,167]	{1,084}	45,166	(9,033)	[2,168]	{1,084}
Knox	51,753	51,735	51,717	51,699	51,836	(10,367)	[2,488]	{1,244}	51,987	(10,397)	[2,495]	{1,248}	52,149	(10,430)	[2,503]	{1,252}
Rutherford	43,519	43,521	43,523	43,525	43,536	(8,707)	[2,090]	{1,045}	43,545	(8,709)	[2,090]	{1,045}	43,554	(8,711)	[2,091]	{1,045}
Shelby	97,826	97,863	97,900	97,937	97,993	(19,599)	[4,704]	{2,352}	98,044	(19,609)	[4,706]	{2,353}	98,089	(19,618)	[4,708]	{2,354}
Sumner	24,324	24,329	24,333	24,338	24,343	(4,869)	[1,168]	{584}	24,348	(4,870)	[1,169]	{584}	24,352	(4,870)	[1,169]	{584}
Williamson	28,305	28,315	28,324	28,334	28,346	(5,669)	[1,361]	{680}	28,358	(5,672)	[1,361]	{681}	28,368	(5,674)	[1,362]	{681}

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.