

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

**Date: 5/18/21**

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 5/18/21 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.**

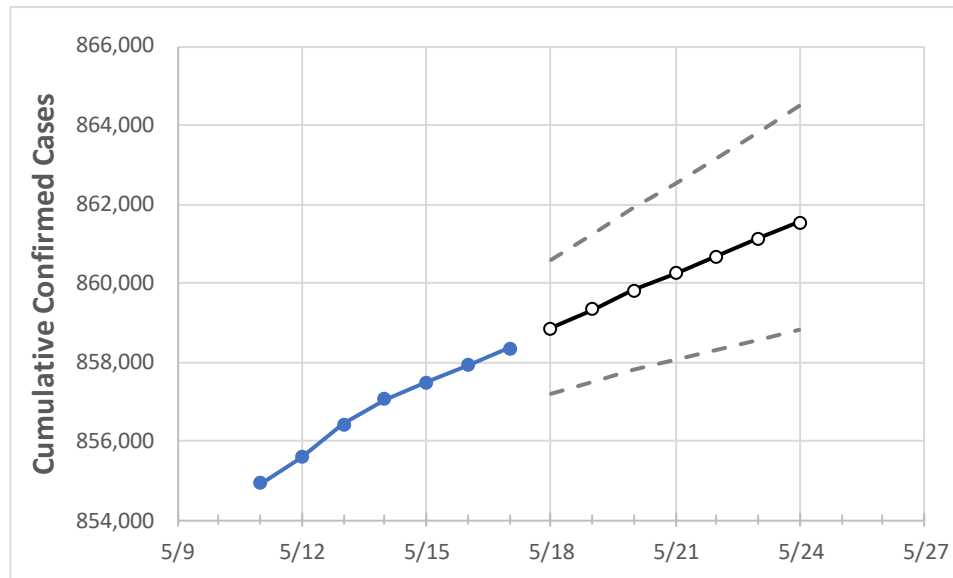
### **IEM's Modeling Lead**

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:						
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24
Tennessee	857,055	857,488	857,922	858,355	858,851	859,341	859,806	860,252	860,686	861,123	861,533

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:						
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24
Blount	15,559	15,567	15,574	15,582	15,589	15,595	15,601	15,607	15,613	15,619	15,623
Davidson	89,674	89,708	89,743	89,777	89,813	89,848	89,882	89,916	89,949	89,979	90,008
Hamilton	44,570	44,596	44,621	44,647	44,681	44,714	44,748	44,781	44,813	44,844	44,875
Knox	51,116	51,141	51,165	51,190	51,239	51,288	51,338	51,386	51,436	51,487	51,540
Rutherford	43,212	43,234	43,256	43,278	43,297	43,316	43,334	43,352	43,368	43,384	43,400
Shelby	96,452	96,544	96,636	96,728	96,828	96,928	97,025	97,118	97,210	97,301	97,393
Sumner	24,135	24,147	24,158	24,170	24,184	24,198	24,211	24,223	24,234	24,246	24,257
Williamson	28,116	28,127	28,137	28,148	28,159	28,169	28,179	28,189	28,198	28,207	28,215

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:											
	5/14	5/15	5/16	5/17	5/19				5/21				5/23			
Blount	15,559	15,567	15,574	15,582	15,595	(3,119)	[749]	{374}	15,607	(3,121)	[749]	{375}	15,619	(3,124)	[750]	{375}
Davidson	89,674	89,708	89,743	89,777	89,848	(17,970)	[4,313]	{2,156}	89,916	(17,983)	[4,316]	{2,158}	89,979	(17,996)	[4,319]	{2,159}
Hamilton	44,570	44,596	44,621	44,647	44,714	(8,943)	[2,146]	{1,073}	44,781	(8,956)	[2,149]	{1,075}	44,844	(8,969)	[2,152]	{1,076}
Knox	51,116	51,141	51,165	51,190	51,288	(10,258)	[2,462]	{1,231}	51,386	(10,277)	[2,467]	{1,233}	51,487	(10,297)	[2,471]	{1,236}
Rutherford	43,212	43,234	43,256	43,278	43,316	(8,663)	[2,079]	{1,040}	43,352	(8,670)	[2,081]	{1,040}	43,384	(8,677)	[2,082]	{1,041}
Shelby	96,452	96,544	96,636	96,728	96,928	(19,386)	[4,653]	{2,326}	97,118	(19,424)	[4,662]	{2,331}	97,301	(19,460)	[4,670]	{2,335}
Sumner	24,135	24,147	24,158	24,170	24,198	(4,840)	[1,162]	{581}	24,223	(4,845)	[1,163]	{581}	24,246	(4,849)	[1,164]	{582}
Williamson	28,116	28,127	28,137	28,148	28,169	(5,634)	[1,352]	{676}	28,189	(5,638)	[1,353]	{677}	28,207	(5,641)	[1,354]	{677}

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.