

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

Date: 8/2/21

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 8/2/21 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.**

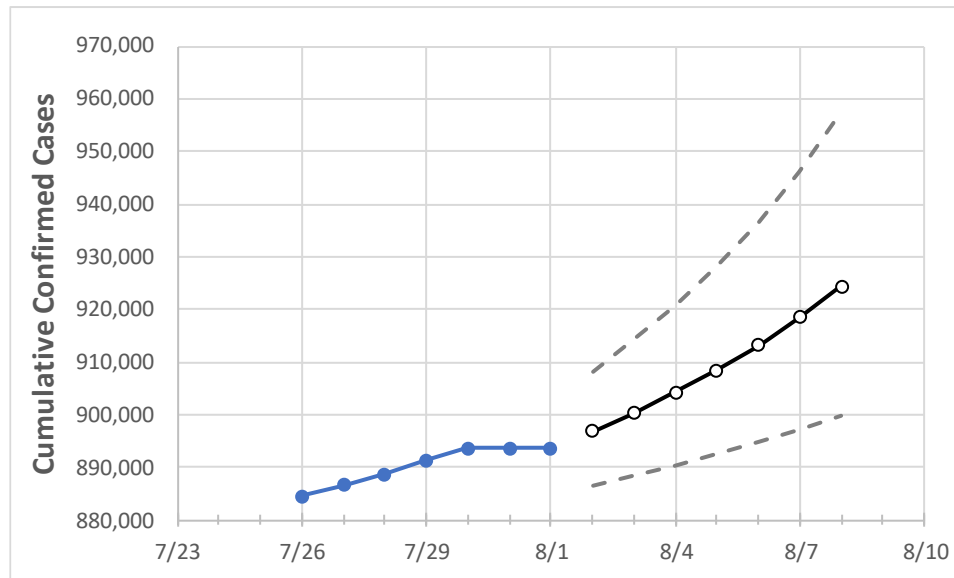
### IEM's Modeling Lead

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:						
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8
Tennessee	891,331	893,554	893,554	893,554	896,749	900,265	904,199	908,473	913,240	918,516	924,312

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:						
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8
Blount	16,309	16,334	16,334	16,334	16,379	16,428	16,481	16,539	16,603	16,672	16,747
Davidson	92,522	92,708	92,708	92,708	92,982	93,286	93,607	93,953	94,339	94,759	95,221
Hamilton	46,863	46,997	46,997	46,997	47,162	47,341	47,539	47,757	47,992	48,243	48,525
Knox	53,231	53,338	53,338	53,338	53,494	53,666	53,852	54,059	54,286	54,533	54,807
Rutherford	44,775	44,884	44,884	44,884	45,045	45,223	45,423	45,640	45,891	46,160	46,466
Shelby	103,735	104,185	104,185	104,185	104,700	105,255	105,848	106,487	107,195	107,949	108,783
Sumner	25,348	25,399	25,399	25,399	25,463	25,531	25,602	25,676	25,756	25,838	25,926
Williamson	29,563	29,614	29,614	29,614	29,738	29,873	30,025	30,189	30,368	30,568	30,794

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:											
	7/29	7/30	7/31	8/1	8/3				8/5				8/7			
Blount	16,309	16,334	16,334	16,334	16,428	(3,286)	[789]	{394}	16,539	(3,308)	[794]	{397}	16,672	(3,334)	[800]	{400}
Davidson	92,522	92,708	92,708	92,708	93,286	(18,657)	[4,478]	{2,239}	93,953	(18,791)	[4,510]	{2,255}	94,759	(18,952)	[4,548]	{2,274}
Hamilton	46,863	46,997	46,997	46,997	47,341	(9,468)	[2,272]	{1,136}	47,757	(9,551)	[2,292]	{1,146}	48,243	(9,649)	[2,316]	{1,158}
Knox	53,231	53,338	53,338	53,338	53,666	(10,733)	[2,576]	{1,288}	54,059	(10,812)	[2,595]	{1,297}	54,533	(10,907)	[2,618]	{1,309}
Rutherford	44,775	44,884	44,884	44,884	45,223	(9,045)	[2,171]	{1,085}	45,640	(9,128)	[2,191]	{1,095}	46,160	(9,232)	[2,216]	{1,108}
Shelby	103,735	104,185	104,185	104,185	105,255	(21,051)	[5,052]	{2,526}	106,487	(21,297)	[5,111]	{2,556}	107,949	(21,590)	[5,182]	{2,591}
Sumner	25,348	25,399	25,399	25,399	25,531	(5,106)	[1,226]	{613}	25,676	(5,135)	[1,232]	{616}	25,838	(5,168)	[1,240]	{620}
Williamson	29,563	29,614	29,614	29,614	29,873	(5,975)	[1,434]	{717}	30,189	(6,038)	[1,449]	{725}	30,568	(6,114)	[1,467]	{734}

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.