

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 10/6/21**

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 10/6/21 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.**

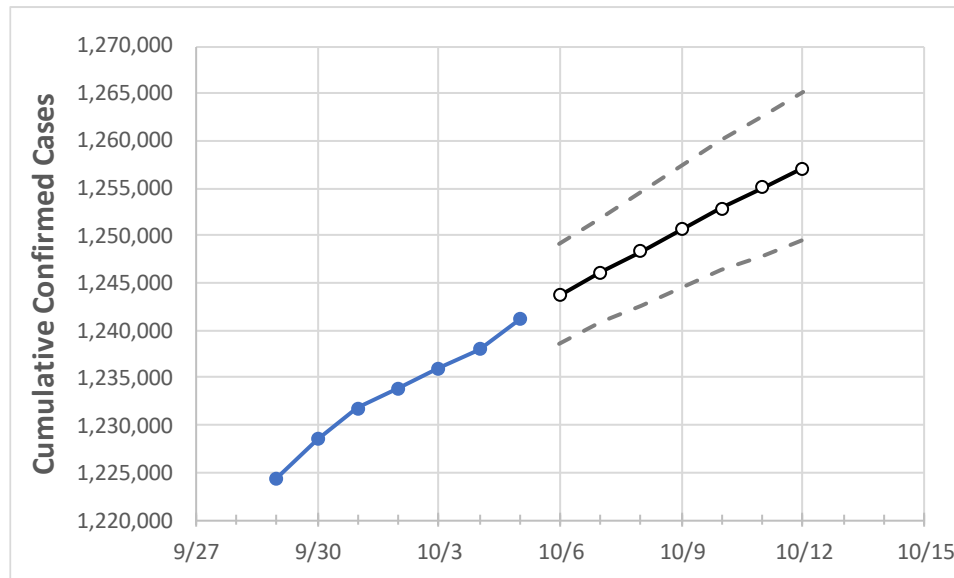
**IEM's Modeling Lead**

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Tennessee	1,233,888	1,235,955	1,238,023	1,241,204	1,243,726	1,246,084	1,248,395	1,250,681	1,252,866	1,255,100	1,257,068

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Blount	22,872	22,918	22,964	22,995	23,057	23,118	23,174	23,229	23,287	23,342	23,390
Davidson	117,437	117,629	117,822	117,957	118,177	118,391	118,589	118,786	118,989	119,185	119,366
Hamilton	61,348	61,435	61,522	61,642	61,736	61,829	61,917	62,002	62,088	62,171	62,249
Knox	75,190	75,323	75,455	75,613	75,784	75,943	76,097	76,254	76,406	76,551	76,688
Rutherford	60,004	60,084	60,163	60,203	60,284	60,359	60,435	60,506	60,576	60,643	60,702
Shelby	140,691	140,889	141,086	141,190	141,392	141,597	141,786	141,972	142,151	142,329	142,501
Sumner	33,221	33,269	33,318	33,342	33,389	33,437	33,480	33,526	33,569	33,611	33,651
Williamson	38,447	38,508	38,570	38,606	38,671	38,737	38,798	38,859	38,921	38,978	39,035

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:											
	10/2	10/3	10/4	10/5	10/7				10/9				10/11			
Blount	22,872	22,918	22,964	22,995	23,118	(4,624)	[1,110]	{555}	23,229	(4,646)	[1,115]	{557}	23,342	(4,668)	[1,120]	{560}
Davidson	117,437	117,629	117,822	117,957	118,391	(23,678)	[5,683]	{2,841}	118,786	(23,757)	[5,702]	{2,851}	119,185	(23,837)	[5,721]	{2,860}
Hamilton	61,348	61,435	61,522	61,642	61,829	(12,366)	[2,968]	{1,484}	62,002	(12,400)	[2,976]	{1,488}	62,171	(12,434)	[2,984]	{1,492}
Knox	75,190	75,323	75,455	75,613	75,943	(15,189)	[3,645]	{1,823}	76,254	(15,251)	[3,660]	{1,830}	76,551	(15,310)	[3,674]	{1,837}
Rutherford	60,004	60,084	60,163	60,203	60,359	(12,072)	[2,897]	{1,449}	60,506	(12,101)	[2,904]	{1,452}	60,643	(12,129)	[2,911]	{1,455}
Shelby	140,691	140,889	141,086	141,190	141,597	(28,319)	[6,797]	{3,398}	141,972	(28,394)	[6,815]	{3,407}	142,329	(28,466)	[6,832]	{3,416}
Sumner	33,221	33,269	33,318	33,342	33,437	(6,687)	[1,605]	{802}	33,526	(6,705)	[1,609]	{805}	33,611	(6,722)	[1,613]	{807}
Williamson	38,447	38,508	38,570	38,606	38,737	(7,747)	[1,859]	{930}	38,859	(7,772)	[1,865]	{933}	38,978	(7,796)	[1,871]	{935}

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.