

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 10/15/21**

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 10/15/21 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.**

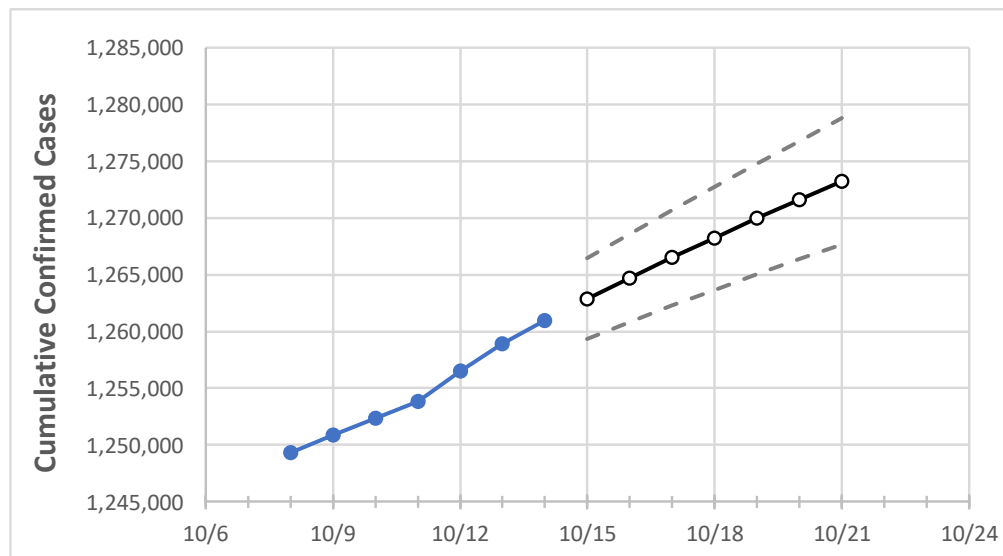
**IEM's Modeling Lead**

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Tennessee	1,253,863	1,256,502	1,258,933	1,260,980	1,262,851	1,264,676	1,266,495	1,268,188	1,269,946	1,271,573	1,273,209

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Blount	23,243	23,293	23,338	23,368	23,399	23,430	23,459	23,487	23,515	23,542	23,568
Davidson	119,195	119,308	119,534	119,700	119,857	120,018	120,166	120,325	120,477	120,620	120,758
Hamilton	62,260	62,376	62,525	62,642	62,741	62,839	62,934	63,031	63,124	63,219	63,312
Knox	76,787	76,953	77,105	77,226	77,375	77,515	77,654	77,790	77,925	78,062	78,187
Rutherford	60,734	60,802	60,909	60,995	61,068	61,131	61,199	61,266	61,330	61,395	61,454
Shelby	142,431	142,539	142,668	142,844	142,989	143,131	143,271	143,412	143,538	143,678	143,800
Sumner	33,636	33,669	33,735	33,802	33,844	33,887	33,929	33,972	34,012	34,054	34,093
Williamson	38,996	39,049	39,106	39,152	39,202	39,253	39,300	39,350	39,396	39,442	39,486

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:											
	10/11	10/12	10/13	10/14	10/16				10/18				10/20			
Blount	23,243	23,293	23,338	23,368	23,430	(4,686)	[1,125]	{562}	23,487	(4,697)	[1,127]	{564}	23,542	(4,708)	[1,130]	{565}
Davidson	119,195	119,308	119,534	119,700	120,018	(24,004)	[5,761]	{2,880}	120,325	(24,065)	[5,776]	{2,888}	120,620	(24,124)	[5,790]	{2,895}
Hamilton	62,260	62,376	62,525	62,642	62,839	(12,568)	[3,016]	{1,508}	63,031	(12,606)	[3,025]	{1,513}	63,219	(12,644)	[3,035]	{1,517}
Knox	76,787	76,953	77,105	77,226	77,515	(15,503)	[3,721]	{1,860}	77,790	(15,558)	[3,734]	{1,867}	78,062	(15,612)	[3,747]	{1,873}
Rutherford	60,734	60,802	60,909	60,995	61,131	(12,226)	[2,934]	{1,467}	61,266	(12,253)	[2,941]	{1,470}	61,395	(12,279)	[2,947]	{1,473}
Shelby	142,431	142,539	142,668	142,844	143,131	(28,626)	[6,870]	{3,435}	143,412	(28,682)	[6,884]	{3,442}	143,678	(28,736)	[6,897]	{3,448}
Sumner	33,636	33,669	33,735	33,802	33,887	(6,777)	[1,627]	{813}	33,972	(6,794)	[1,631]	{815}	34,054	(6,811)	[1,635]	{817}
Williamson	38,996	39,049	39,106	39,152	39,253	(7,851)	[1,884]	{942}	39,350	(7,870)	[1,889]	{944}	39,442	(7,888)	[1,893]	{947}

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.