

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 9/24/21**

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 9/24/21 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.**

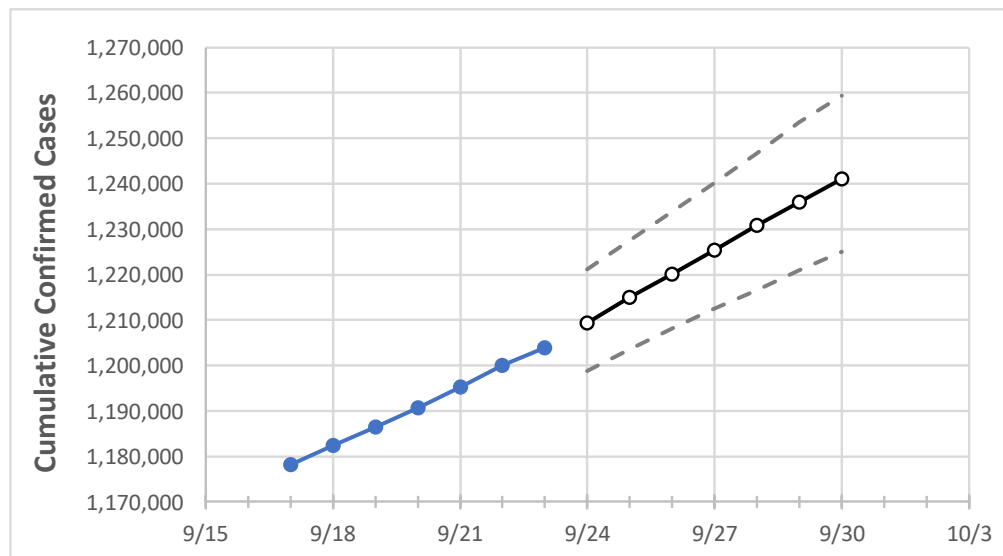
**IEM's Modeling Lead**

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Tennessee	1,190,689	1,195,323	1,199,956	1,203,930	1,209,435	1,215,019	1,220,106	1,225,465	1,230,806	1,235,934	1,240,996

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Blount	21,762	21,880	21,998	22,104	22,244	22,381	22,520	22,656	22,793	22,932	23,062
Davidson	113,876	114,194	114,511	114,864	115,274	115,686	116,100	116,496	116,897	117,318	117,707
Hamilton	59,524	59,760	59,996	60,180	60,416	60,641	60,864	61,086	61,315	61,528	61,747
Knox	71,997	72,387	72,777	73,018	73,472	73,954	74,417	74,873	75,333	75,798	76,246
Rutherford	58,372	58,547	58,721	58,882	59,152	59,402	59,663	59,914	60,162	60,400	60,655
Shelby	137,018	137,374	137,729	138,071	138,575	139,038	139,497	139,965	140,398	140,881	141,317
Sumner	32,399	32,472	32,544	32,636	32,733	32,833	32,928	33,020	33,113	33,207	33,295
Williamson	37,372	37,463	37,554	37,656	37,788	37,919	38,038	38,162	38,284	38,404	38,521

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:											
	9/20	9/21	9/22	9/23	9/25				9/27				9/29			
Blount	21,762	21,880	21,998	22,104	22,381	(4,476)	[1,074]	{537}	22,656	(4,531)	[1,088]	{544}	22,932	(4,586)	[1,101]	{550}
Davidson	113,876	114,194	114,511	114,864	115,686	(23,137)	[5,553]	{2,776}	116,496	(23,299)	[5,592]	{2,796}	117,318	(23,464)	[5,631]	{2,816}
Hamilton	59,524	59,760	59,996	60,180	60,641	(12,128)	[2,911]	{1,455}	61,086	(12,217)	[2,932]	{1,466}	61,528	(12,306)	[2,953]	{1,477}
Knox	71,997	72,387	72,777	73,018	73,954	(14,791)	[3,550]	{1,775}	74,873	(14,975)	[3,594]	{1,797}	75,798	(15,160)	[3,638]	{1,819}
Rutherford	58,372	58,547	58,721	58,882	59,402	(11,880)	[2,851]	{1,426}	59,914	(11,983)	[2,876]	{1,438}	60,400	(12,080)	[2,899]	{1,450}
Shelby	137,018	137,374	137,729	138,071	139,038	(27,808)	[6,674]	{3,337}	139,965	(27,993)	[6,718]	{3,359}	140,881	(28,176)	[6,762]	{3,381}
Sumner	32,399	32,472	32,544	32,636	32,833	(6,567)	[1,576]	{788}	33,020	(6,604)	[1,585]	{792}	33,207	(6,641)	[1,594]	{797}
Williamson	37,372	37,463	37,554	37,656	37,919	(7,584)	[1,820]	{910}	38,162	(7,632)	[1,832]	{916}	38,404	(7,681)	[1,843]	{922}

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.