

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 3/17/21**

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 3/17/21 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.**

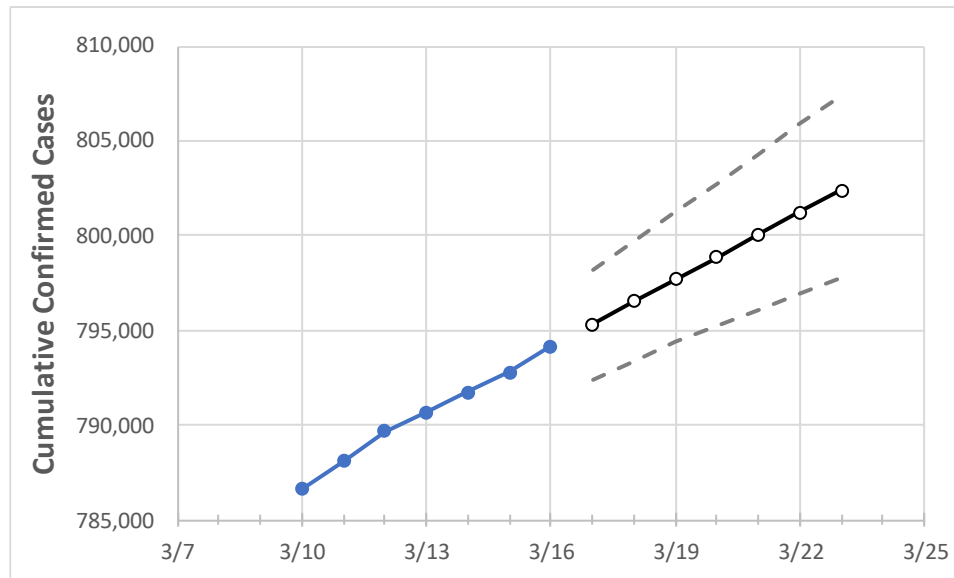
**IEM's Modeling Lead**

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:						
	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23
Tennessee	790,700	791,747	792,795	794,137	795,325	796,521	797,712	798,868	800,054	801,208	802,364

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:						
	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23
Blount	14,351	14,367	14,384	14,412	14,433	14,453	14,472	14,492	14,511	14,530	14,549
Davidson	83,062	83,191	83,321	83,462	83,591	83,717	83,844	83,969	84,097	84,223	84,347
Hamilton	41,186	41,244	41,301	41,379	41,438	41,497	41,555	41,611	41,668	41,724	41,780
Knox	46,999	47,057	47,116	47,187	47,251	47,315	47,376	47,435	47,494	47,549	47,603
Rutherford	39,359	39,444	39,529	39,622	39,710	39,798	39,887	39,975	40,063	40,152	40,241
Shelby	88,605	88,704	88,804	88,897	88,989	89,079	89,166	89,251	89,337	89,421	89,500
Sumner	21,819	21,851	21,884	21,933	21,971	22,007	22,044	22,080	22,119	22,155	22,192
Williamson	25,779	25,823	25,867	25,908	25,944	25,981	26,016	26,051	26,085	26,119	26,152

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:											
	3/13	3/14	3/15	3/16	3/18				3/20				3/22			
Blount	14,351	14,367	14,384	14,412	14,453	(2,891)	[694]	{347}	14,492	(2,898)	[696]	{348}	14,530	(2,906)	[697]	{349}
Davidson	83,062	83,191	83,321	83,462	83,717	(16,743)	[4,018]	{2,009}	83,969	(16,794)	[4,031]	{2,015}	84,223	(16,845)	[4,043]	{2,021}
Hamilton	41,186	41,244	41,301	41,379	41,497	(8,299)	[1,992]	{996}	41,611	(8,322)	[1,997]	{999}	41,724	(8,345)	[2,003]	{1,001}
Knox	46,999	47,057	47,116	47,187	47,315	(9,463)	[2,271]	{1,136}	47,435	(9,487)	[2,277]	{1,138}	47,549	(9,510)	[2,282]	{1,141}
Rutherford	39,359	39,444	39,529	39,622	39,798	(7,960)	[1,910]	{955}	39,975	(7,995)	[1,919]	{959}	40,152	(8,030)	[1,927]	{964}
Shelby	88,605	88,704	88,804	88,897	89,079	(17,816)	[4,276]	{2,138}	89,251	(17,850)	[4,284]	{2,142}	89,421	(17,884)	[4,292]	{2,146}
Sumner	21,819	21,851	21,884	21,933	22,007	(4,401)	[1,056]	{528}	22,080	(4,416)	[1,060]	{530}	22,155	(4,431)	[1,063]	{532}
Williamson	25,779	25,823	25,867	25,908	25,981	(5,196)	[1,247]	{624}	26,051	(5,210)	[1,250]	{625}	26,119	(5,224)	[1,254]	{627}

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.