

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

Date: 6/17/21

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 6/17/21 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.**

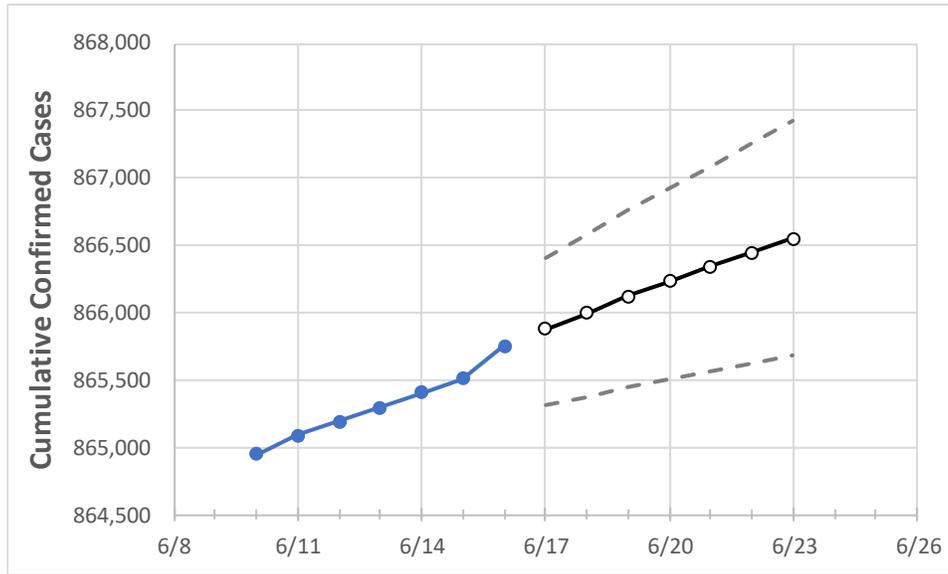
### IEM's Modeling Lead

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
Tennessee	865,298	865,405	865,511	865,750	865,877	865,998	866,120	866,232	866,343	866,445	866,548

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
Blount	15,847	15,863	15,880	15,884	15,898	15,914	15,930	15,948	15,966	15,987	16,008
Davidson	90,507	90,478	90,450	90,464	90,474	90,483	90,493	90,501	90,509	90,517	90,525
Hamilton	45,222	45,251	45,279	45,305	45,325	45,344	45,364	45,384	45,404	45,426	45,447
Knox	51,963	51,953	51,943	51,956	51,972	51,986	51,999	52,013	52,027	52,039	52,049
Rutherford	43,649	43,673	43,697	43,699	43,715	43,732	43,750	43,768	43,787	43,807	43,827
Shelby	98,189	98,215	98,241	98,304	98,328	98,353	98,376	98,398	98,420	98,442	98,461
Sumner	24,465	24,472	24,480	24,487	24,494	24,500	24,507	24,514	24,521	24,529	24,536
Williamson	28,599	28,601	28,603	28,601	28,605	28,609	28,613	28,616	28,619	28,623	28,626

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:											
	6/13	6/14	6/15	6/16	6/18			6/20			6/22					
Blount	15,847	15,863	15,880	15,884	15,914	(3,183)	[764]	{382}	15,948	(3,190)	[766]	{383}	15,987	(3,197)	[767]	{384}
Davidson	90,507	90,478	90,450	90,464	90,483	(18,097)	[4,343]	{2,172}	90,501	(18,100)	[4,344]	{2,172}	90,517	(18,103)	[4,345]	{2,172}
Hamilton	45,222	45,251	45,279	45,305	45,344	(9,069)	[2,177]	{1,088}	45,384	(9,077)	[2,178]	{1,089}	45,426	(9,085)	[2,180]	{1,090}
Knox	51,963	51,953	51,943	51,956	51,986	(10,397)	[2,495]	{1,248}	52,013	(10,403)	[2,497]	{1,248}	52,039	(10,408)	[2,498]	{1,249}
Rutherford	43,649	43,673	43,697	43,699	43,732	(8,746)	[2,099]	{1,050}	43,768	(8,754)	[2,101]	{1,050}	43,807	(8,761)	[2,103]	{1,051}
Shelby	98,189	98,215	98,241	98,304	98,353	(19,671)	[4,721]	{2,360}	98,398	(19,680)	[4,723]	{2,362}	98,442	(19,688)	[4,725]	{2,363}
Sumner	24,465	24,472	24,480	24,487	24,500	(4,900)	[1,176]	{588}	24,514	(4,903)	[1,177]	{588}	24,529	(4,906)	[1,177]	{589}
Williamson	28,599	28,601	28,603	28,601	28,609	(5,722)	[1,373]	{687}	28,616	(5,723)	[1,374]	{687}	28,623	(5,725)	[1,374]	{687}

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.