

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 6/23/21**

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 6/23/21 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.**

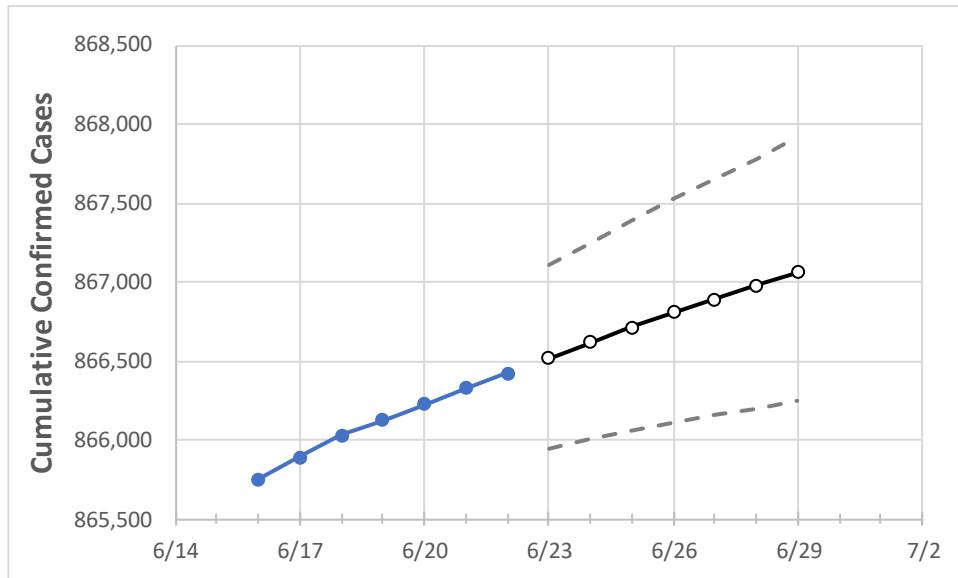
**IEM's Modeling Lead**

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:							
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	
Tennessee	866,126	866,225	866,324	866,419	866,519	866,617	866,714	866,805	866,891	866,981	867,062	

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:							
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	
Blount	15,890	15,891	15,893	15,898	15,905	15,911	15,917	15,924	15,930	15,937	15,944	
Davidson	90,483	90,482	90,480	90,480	90,489	90,498	90,507	90,516	90,524	90,531	90,539	
Hamilton	45,340	45,344	45,348	45,359	45,373	45,386	45,399	45,413	45,425	45,439	45,451	
Knox	52,014	52,051	52,088	52,098	52,116	52,134	52,152	52,169	52,185	52,200	52,217	
Rutherford	43,707	43,709	43,710	43,711	43,718	43,725	43,732	43,739	43,746	43,753	43,759	
Shelby	98,421	98,441	98,461	98,480	98,503	98,526	98,549	98,571	98,592	98,613	98,633	
Sumner	24,499	24,501	24,504	24,505	24,509	24,513	24,517	24,521	24,525	24,529	24,533	
Williamson	28,609	28,610	28,611	28,612	28,614	28,615	28,617	28,618	28,619	28,621	28,622	

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:			
	6/19	6/20	6/21	6/22	6/24	6/26	6/28	
Blount	15,890	15,891	15,893	15,898	15,911 (3,182) [764] {382}	15,924 (3,185) [764] {382}	15,937 (3,187) [765] {382}	
Davidson	90,483	90,482	90,480	90,480	90,498 (18,100) [4,344] {2,172}	90,516 (18,103) [4,345] {2,172}	90,531 (18,106) [4,346] {2,173}	
Hamilton	45,340	45,344	45,348	45,359	45,386 (9,077) [2,179] {1,089}	45,413 (9,083) [2,180] {1,090}	45,439 (9,088) [2,181] {1,091}	
Knox	52,014	52,051	52,088	52,098	52,134 (10,427) [2,502] {1,251}	52,169 (10,434) [2,504] {1,252}	52,200 (10,440) [2,506] {1,253}	
Rutherford	43,707	43,709	43,710	43,711	43,725 (8,745) [2,099] {1,049}	43,739 (8,748) [2,099] {1,050}	43,753 (8,751) [2,100] {1,050}	
Shelby	98,421	98,441	98,461	98,480	98,526 (19,705) [4,729] {2,365}	98,571 (19,714) [4,731] {2,366}	98,613 (19,723) [4,733] {2,367}	
Sumner	24,499	24,501	24,504	24,505	24,513 (4,903) [1,177] {588}	24,521 (4,904) [1,177] {589}	24,529 (4,906) [1,177] {589}	
Williamson	28,609	28,610	28,611	28,612	28,615 (5,723) [1,374] {687}	28,618 (5,724) [1,374] {687}	28,621 (5,724) [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.