

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/18/22**

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 2/18/22 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.

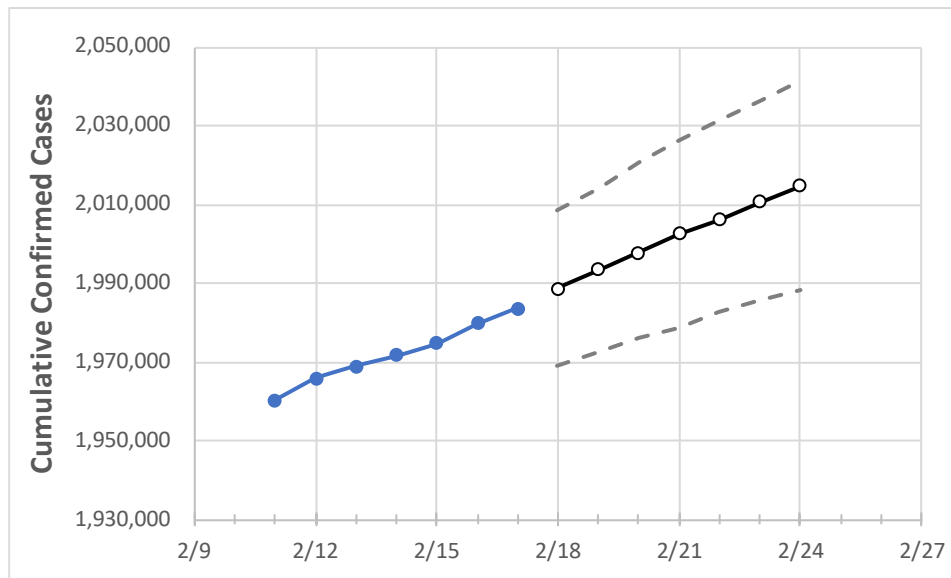
IEM's Modeling Lead

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Tennessee	1,971,779	1,974,677	1,979,762	1,983,621	1,988,603	1,993,547	1,997,697	2,002,526	2,006,117	2,010,669	2,014,817

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Blount	38,123	38,233	38,344	38,344	38,500	38,660	38,811	38,957	39,096	39,235	39,374
Davidson	186,205	186,572	186,939	186,939	187,331	187,721	188,079	188,438	188,780	189,110	189,419
Hamilton	95,719	95,937	96,154	96,154	96,405	96,644	96,878	97,099	97,313	97,529	97,730
Knox	123,442	123,824	124,205	124,205	124,703	125,200	125,656	126,118	126,556	126,990	127,413
Rutherford	93,626	93,808	93,990	93,990	94,204	94,420	94,615	94,810	94,996	95,173	95,346
Shelby	230,855	231,196	231,538	231,538	231,878	232,199	232,513	232,819	233,101	233,384	233,649
Sumner	51,948	52,058	52,168	52,168	52,325	52,469	52,605	52,742	52,878	53,005	53,131
Williamson	60,592	60,734	60,877	60,877	61,048	61,213	61,371	61,522	61,675	61,819	61,958

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:											
	2/14	2/15	2/16	2/17	2/19				2/21				2/23			
Blount	38,123	38,233	38,344	38,344	38,660	(7,732)	[1,856]	{928}	38,957	(7,791)	[1,870]	{935}	39,235	(7,847)	[1,883]	{942}
Davidson	186,205	186,572	186,939	186,939	187,721	(37,544)	[9,011]	{4,505}	188,438	(37,688)	[9,045]	{4,523}	189,110	(37,822)	[9,077]	{4,539}
Hamilton	95,719	95,937	96,154	96,154	96,644	(19,329)	[4,639]	{2,319}	97,099	(19,420)	[4,661]	{2,330}	97,529	(19,506)	[4,681]	{2,341}
Knox	123,442	123,824	124,205	124,205	125,200	(25,040)	[6,010]	{3,005}	126,118	(25,224)	[6,054]	{3,027}	126,990	(25,398)	[6,096]	{3,048}
Rutherford	93,626	93,808	93,990	93,990	94,420	(18,884)	[4,532]	{2,266}	94,810	(18,962)	[4,551]	{2,275}	95,173	(19,035)	[4,568]	{2,284}
Shelby	230,855	231,196	231,538	231,538	232,199	(46,440)	[11,146]	{5,573}	232,819	(46,564)	[11,175]	{5,588}	233,384	(46,677)	[11,202]	{5,601}
Sumner	51,948	52,058	52,168	52,168	52,469	(10,494)	[2,519]	{1,259}	52,742	(10,548)	[2,532]	{1,266}	53,005	(10,601)	[2,544]	{1,272}
Williamson	60,592	60,734	60,877	60,877	61,213	(12,243)	[2,938]	{1,469}	61,522	(12,304)	[2,953]	{1,477}	61,819	(12,364)	[2,967]	{1,484}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.