

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/11/22**

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 3/11/22 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.

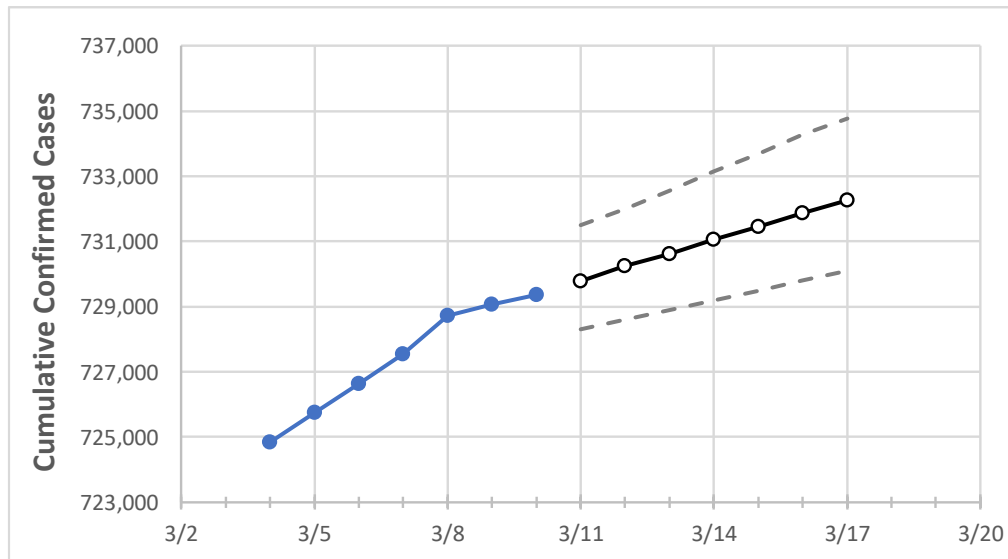
IEM's Modeling Lead

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.

Connecticut State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16	3/17
Connecticut	727,542	728,733	729,063	729,354	729,782	730,246	730,605	731,062	731,459	731,877	732,266

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.

Connecticut Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16	3/17
Fairfield	199,323	199,642	199,692	199,775	199,889	199,998	200,107	200,217	200,329	200,440	200,558
Hartford	175,033	175,119	175,186	175,229	175,280	175,331	175,380	175,427	175,472	175,516	175,559
Litchfield	31,306	31,313	31,324	31,333	31,340	31,347	31,353	31,360	31,366	31,372	31,377
Middlesex	27,515	27,528	27,582	27,610	27,630	27,650	27,669	27,689	27,706	27,726	27,744
New Haven	192,053	192,702	192,804	192,884	193,086	193,282	193,483	193,682	193,886	194,100	194,301
Tolland	20,175	20,189	20,196	20,203	20,210	20,216	20,221	20,227	20,233	20,238	20,243

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.

Connecticut Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	3/7	3/8	3/9	3/10	3/12				3/14				3/16			
Fairfield	199,323	199,642	199,692	199,775	199,998	(40,000)	[9,600]	{4,800}	200,217	(40,043)	[9,610]	{4,805}	200,440	(40,088)	[9,621]	{4,811}
Hartford	175,033	175,119	175,186	175,229	175,331	(35,066)	[8,416]	{4,208}	175,427	(35,085)	[8,420]	{4,210}	175,516	(35,103)	[8,425]	{4,212}
Litchfield	31,306	31,313	31,324	31,333	31,347	(6,269)	[1,505]	{752}	31,360	(6,272)	[1,505]	{753}	31,372	(6,274)	[1,506]	{753}
Middlesex	27,515	27,528	27,582	27,610	27,650	(5,530)	[1,327]	{664}	27,689	(5,538)	[1,329]	{665}	27,726	(5,545)	[1,331]	{665}
New Haven	192,053	192,702	192,804	192,884	193,282	(38,656)	[9,278]	{4,639}	193,682	(38,736)	[9,297]	{4,648}	194,100	(38,820)	[9,317]	{4,658}
Tolland	20,175	20,189	20,196	20,203	20,216	(4,043)	[970]	{485}	20,227	(4,045)	[971]	{485}	20,238	(4,048)	[971]	{486}

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.