

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

Date: 12/22/21

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 12/22/21 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.

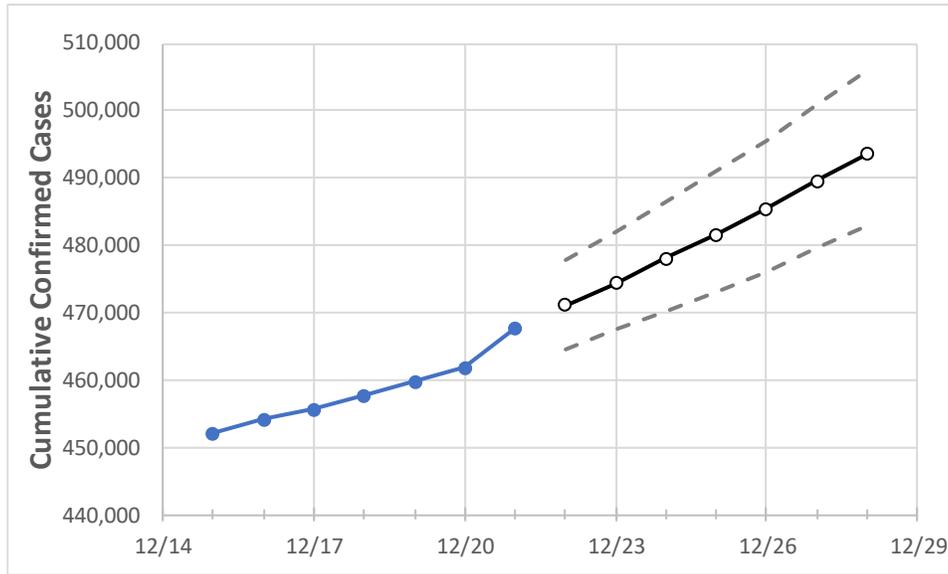
IEM's Modeling Lead

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.

Connecticut State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Connecticut	457,636	459,705	461,775	467,775	471,118	474,416	478,044	481,666	485,491	489,573	493,626

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:						
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Fairfield	123,819	124,416	125,013	126,561	127,345	128,202	129,045	129,960	130,880	131,911	132,975
Hartford	112,282	112,705	113,127	114,483	115,313	116,158	117,041	117,948	118,919	119,913	120,936
Litchfield	20,526	20,618	20,710	20,956	21,118	21,284	21,456	21,633	21,812	22,002	22,189
Middlesex	17,162	17,231	17,301	17,534	17,653	17,772	17,895	18,026	18,158	18,295	18,434
New Haven	119,245	119,824	120,403	122,290	123,181	124,081	125,052	126,070	127,129	128,217	129,344
Tolland	13,410	13,461	13,513	13,642	13,756	13,871	13,990	14,113	14,243	14,374	14,511

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:											
	12/18	12/19	12/20	12/21	12/23			12/25			12/27					
Fairfield	123,819	124,416	125,013	126,561	128,202	(25,640)	[6,154]	{3,077}	129,960	(25,992)	[6,238]	{3,119}	131,911	(26,382)	[6,332]	{3,166}
Hartford	112,282	112,705	113,127	114,483	116,158	(23,232)	[5,576]	{2,788}	117,948	(23,590)	[5,662]	{2,831}	119,913	(23,983)	[5,756]	{2,878}
Litchfield	20,526	20,618	20,710	20,956	21,284	(4,257)	[1,022]	{511}	21,633	(4,327)	[1,038]	{519}	22,002	(4,400)	[1,056]	{528}
Middlesex	17,162	17,231	17,301	17,534	17,772	(3,554)	[853]	{427}	18,026	(3,605)	[865]	{433}	18,295	(3,659)	[878]	{439}
New Haven	119,245	119,824	120,403	122,290	124,081	(24,816)	[5,956]	{2,978}	126,070	(25,214)	[6,051]	{3,026}	128,217	(25,643)	[6,154]	{3,077}
Tolland	13,410	13,461	13,513	13,642	13,871	(2,774)	[666]	{333}	14,113	(2,823)	[677]	{339}	14,374	(2,875)	[690]	{345}

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.