

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

Date: 9/27/21

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 9/27/21 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.

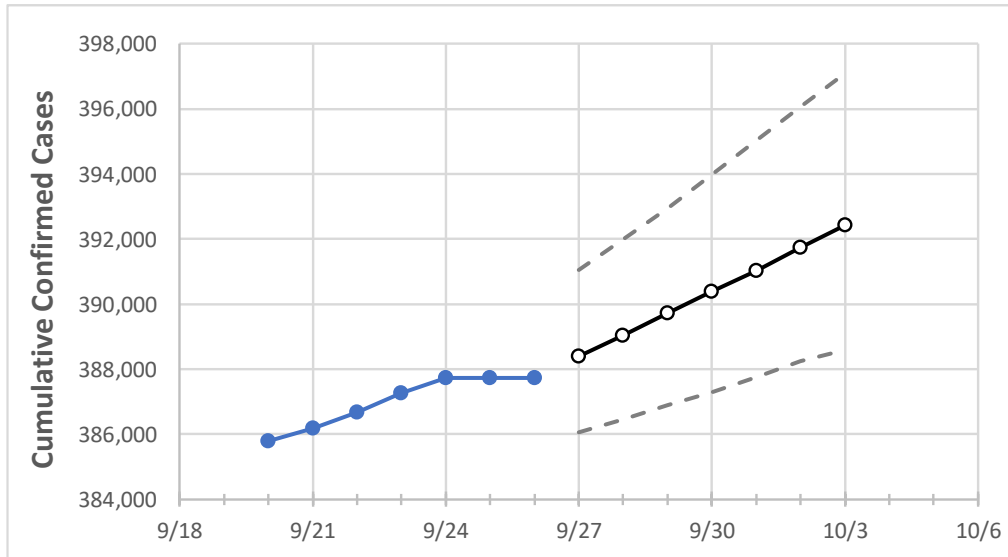
IEM's Modeling Lead

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Connecticut	387,263	387,733	387,733	387,733	388,385	389,034	389,726	390,392	391,033	391,745	392,421

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Fairfield	109,589	109,675	109,675	109,675	109,791	109,905	110,012	110,126	110,242	110,344	110,455
Hartford	94,621	94,764	94,764	94,764	94,949	95,132	95,303	95,474	95,674	95,857	96,044
Litchfield	16,342	16,366	16,366	16,366	16,395	16,425	16,453	16,482	16,512	16,541	16,573
Middlesex	14,326	14,342	14,342	14,342	14,364	14,387	14,407	14,432	14,453	14,476	14,498
New Haven	101,903	101,994	101,994	101,994	102,123	102,244	102,368	102,492	102,619	102,741	102,867
Tolland	10,844	10,870	10,870	10,870	10,893	10,917	10,940	10,964	10,989	11,013	11,037

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:											
	9/23	9/24	9/25	9/26	9/28				9/30				10/2			
Fairfield	109,589	109,675	109,675	109,675	109,905	(21,981)	[5,275]	{2,638}	110,126	(22,025)	[5,286]	{2,643}	110,344	(22,069)	[5,297]	{2,648}
Hartford	94,621	94,764	94,764	94,764	95,132	(19,026)	[4,566]	{2,283}	95,474	(19,095)	[4,583]	{2,291}	95,857	(19,171)	[4,601]	{2,301}
Litchfield	16,342	16,366	16,366	16,366	16,425	(3,285)	[788]	{394}	16,482	(3,296)	[791]	{396}	16,541	(3,308)	[794]	{397}
Middlesex	14,326	14,342	14,342	14,342	14,387	(2,877)	[691]	{345}	14,432	(2,886)	[693]	{346}	14,476	(2,895)	[695]	{347}
New Haven	101,903	101,994	101,994	101,994	102,244	(20,449)	[4,908]	{2,454}	102,492	(20,498)	[4,920]	{2,460}	102,741	(20,548)	[4,932]	{2,466}
Tolland	10,844	10,870	10,870	10,870	10,917	(2,183)	[524]	{262}	10,964	(2,193)	[526]	{263}	11,013	(2,203)	[529]	{264}

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.