

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

Date: 10/22/21

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 10/22/21 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.

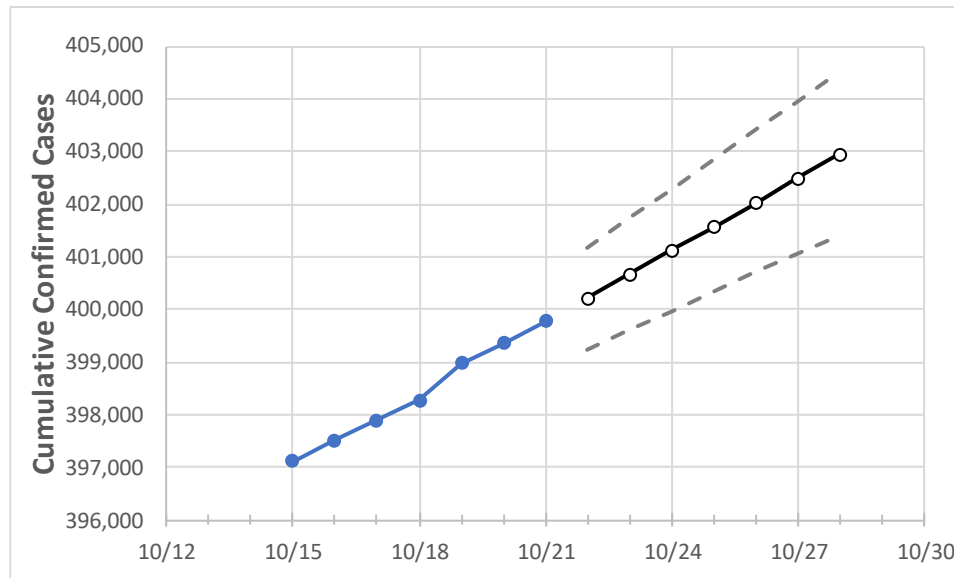
IEM's Modeling Lead

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:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
Connecticut	398,270	398,979	399,363	399,773	400,201	400,674	401,124	401,563	402,013	402,485	402,942

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:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
Fairfield	111,812	111,942	111,988	112,061	112,139	112,216	112,292	112,369	112,447	112,525	112,601
Hartford	97,405	97,694	97,828	97,941	98,065	98,192	98,312	98,441	98,570	98,699	98,834
Litchfield	16,926	16,960	16,979	17,005	17,033	17,061	17,088	17,118	17,146	17,177	17,206
Middlesex	14,768	14,782	14,807	14,821	14,838	14,855	14,872	14,889	14,907	14,924	14,941
New Haven	104,575	104,705	104,773	104,865	104,974	105,085	105,194	105,304	105,416	105,527	105,638
Tolland	11,198	11,266	11,279	11,297	11,315	11,334	11,353	11,370	11,391	11,412	11,431

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:											
	10/18	10/19	10/20	10/21	10/23				10/25				10/27			
Fairfield	111,812	111,942	111,988	112,061	112,216	(22,443)	[5,386]	{2,693}	112,369	(22,474)	[5,394]	{2,697}	112,525	(22,505)	[5,401]	{2,701}
Hartford	97,405	97,694	97,828	97,941	98,192	(19,638)	[4,713]	{2,357}	98,441	(19,688)	[4,725]	{2,363}	98,699	(19,740)	[4,738]	{2,369}
Litchfield	16,926	16,960	16,979	17,005	17,061	(3,412)	[819]	{409}	17,118	(3,424)	[822]	{411}	17,177	(3,435)	[824]	{412}
Middlesex	14,768	14,782	14,807	14,821	14,855	(2,971)	[713]	{357}	14,889	(2,978)	[715]	{357}	14,924	(2,985)	[716]	{358}
New Haven	104,575	104,705	104,773	104,865	105,085	(21,017)	[5,044]	{2,522}	105,304	(21,061)	[5,055]	{2,527}	105,527	(21,105)	[5,065]	{2,533}
Tolland	11,198	11,266	11,279	11,297	11,334	(2,267)	[544]	{272}	11,370	(2,274)	[546]	{273}	11,412	(2,282)	[548]	{274}

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.