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

Date: 11/24/21

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 11/24/21 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.

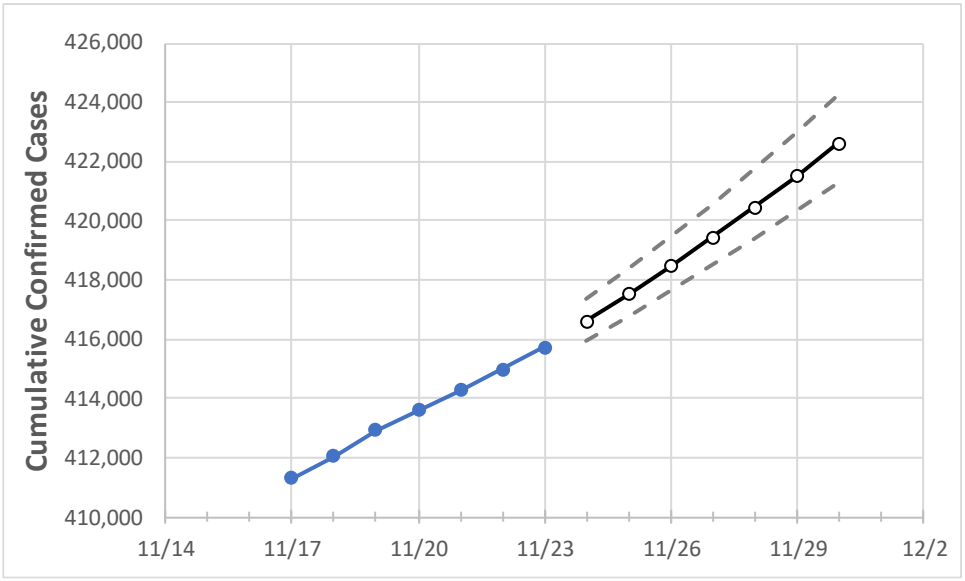
IEM's Modeling Lead

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Connecticut	413,605	414,291	414,978	415,732	416,618	417,514	418,453	419,429	420,449	421,506	422,619

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Fairfield	114,594	114,715	114,835	114,991	115,171	115,355	115,549	115,751	115,963	116,187	116,425
Hartford	101,313	101,452	101,591	101,728	101,897	102,072	102,252	102,436	102,625	102,816	103,016
Litchfield	17,945	17,988	18,032	18,067	18,124	18,182	18,241	18,303	18,366	18,434	18,501
Middlesex	15,388	15,424	15,460	15,491	15,529	15,569	15,611	15,654	15,699	15,747	15,796
New Haven	108,145	108,326	108,507	108,762	108,997	109,240	109,492	109,758	110,033	110,329	110,633
Tolland	11,750	11,775	11,801	11,820	11,848	11,875	11,904	11,933	11,964	11,996	12,028

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:											
	11/20	11/21	11/22	11/23	11/25				11/27				11/29			
Fairfield	114,594	114,715	114,835	114,991	115,355	(23,071)	[5,537]	{2,769}	115,751	(23,150)	[5,556]	{2,778}	116,187	(23,237)	[5,577]	{2,788}
Hartford	101,313	101,452	101,591	101,728	102,072	(20,414)	[4,899]	{2,450}	102,436	(20,487)	[4,917]	{2,458}	102,816	(20,563)	[4,935]	{2,468}
Litchfield	17,945	17,988	18,032	18,067	18,182	(3,636)	[873]	{436}	18,303	(3,661)	[879]	{439}	18,434	(3,687)	[885]	{442}
Middlesex	15,388	15,424	15,460	15,491	15,569	(3,114)	[747]	{374}	15,654	(3,131)	[751]	{376}	15,747	(3,149)	[756]	{378}
New Haven	108,145	108,326	108,507	108,762	109,240	(21,848)	[5,244]	{2,622}	109,758	(21,952)	[5,268]	{2,634}	110,329	(22,066)	[5,296]	{2,648}
Tolland	11,750	11,775	11,801	11,820	11,875	(2,375)	[570]	{285}	11,933	(2,387)	[573]	{286}	11,996	(2,399)	[576]	{288}

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.