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

Date: 10/6/21

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 10/6/21 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.

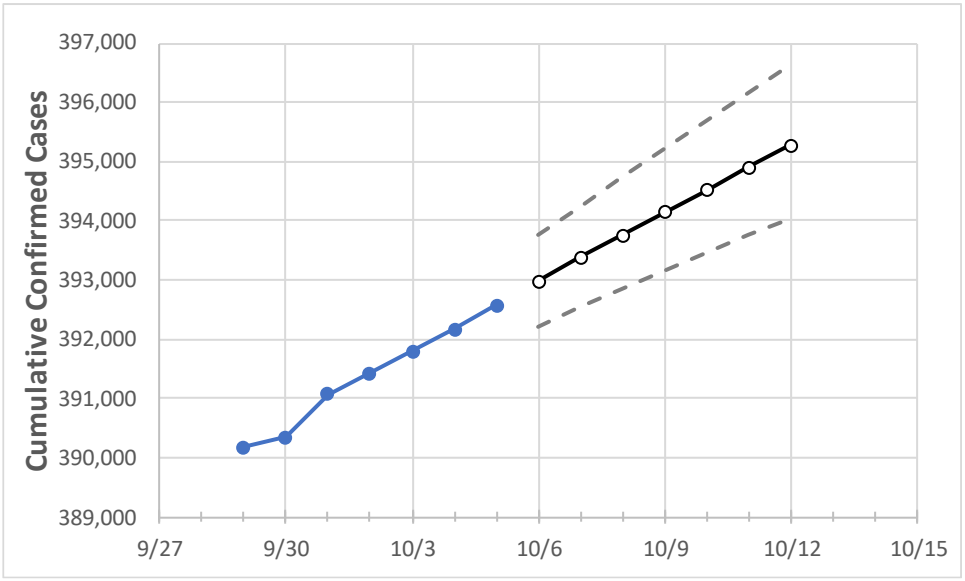
IEM's Modeling Lead

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Connecticut	391,432	391,797	392,163	392,574	392,980	393,378	393,755	394,140	394,521	394,901	395,278

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Fairfield	110,520	110,581	110,643	110,735	110,827	110,919	111,008	111,097	111,184	111,271	111,361
Hartford	95,708	95,791	95,875	95,980	96,080	96,177	96,270	96,370	96,458	96,550	96,638
Litchfield	16,531	16,547	16,563	16,590	16,609	16,627	16,645	16,663	16,681	16,699	16,717
Middlesex	14,482	14,499	14,516	14,540	14,558	14,576	14,594	14,611	14,628	14,646	14,664
New Haven	102,832	102,924	103,016	103,110	103,204	103,296	103,389	103,476	103,567	103,658	103,744
Tolland	10,980	10,992	11,005	11,017	11,030	11,042	11,054	11,067	11,078	11,090	11,101

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:		
	10/2	10/3	10/4	10/5	10/7	10/9	10/11
Fairfield	110,520	110,581	110,643	110,735	110,919 (22,184) [5,324] {2,662}	111,097 (22,219) [5,333] {2,666}	111,271 (22,254) [5,341] {2,671}
Hartford	95,708	95,791	95,875	95,980	96,177 (19,235) [4,616] {2,308}	96,370 (19,274) [4,626] {2,313}	96,550 (19,310) [4,634] {2,317}
Litchfield	16,531	16,547	16,563	16,590	16,627 (3,325) [798] {399}	16,663 (3,333) [800] {400}	16,699 (3,340) [802] {401}
Middlesex	14,482	14,499	14,516	14,540	14,576 (2,915) [700] {350}	14,611 (2,922) [701] {351}	14,646 (2,929) [703] {352}
New Haven	102,832	102,924	103,016	103,110	103,296 (20,659) [4,958] {2,479}	103,476 (20,695) [4,967] {2,483}	103,658 (20,732) [4,976] {2,488}
Tolland	10,980	10,992	11,005	11,017	11,042 (2,208) [530] {265}	11,067 (2,213) [531] {266}	11,090 (2,218) [532] {266}

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.