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

Date: 10/15/21

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 10/15/21 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.

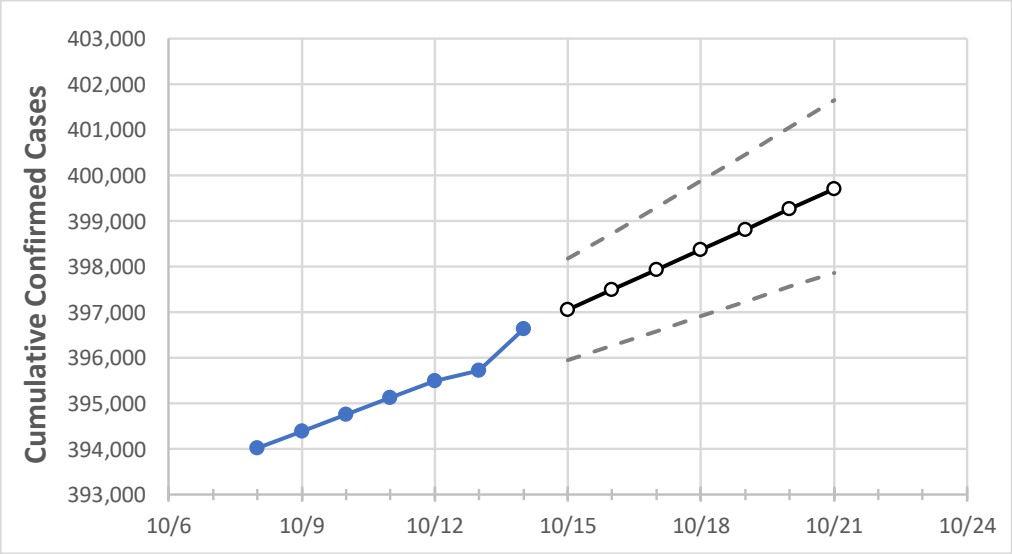
IEM's Modeling Lead

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Connecticut	395,113	395,481	395,721	396,629	397,053	397,496	397,923	398,366	398,809	399,269	399,701

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Fairfield	111,250	111,333	111,386	111,545	111,630	111,715	111,797	111,878	111,961	112,045	112,127
Hartford	96,558	96,624	96,666	96,958	97,057	97,162	97,263	97,358	97,456	97,562	97,658
Litchfield	16,742	16,762	16,767	16,824	16,851	16,877	16,904	16,932	16,961	16,989	17,019
Middlesex	14,652	14,670	14,684	14,719	14,740	14,761	14,783	14,804	14,827	14,848	14,870
New Haven	103,790	103,904	104,002	104,187	104,313	104,441	104,570	104,702	104,835	104,972	105,109
Tolland	11,083	11,091	11,094	11,118	11,129	11,139	11,149	11,160	11,169	11,179	11,189

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:		
	10/11	10/12	10/13	10/14	10/16	10/18	10/20
Fairfield	111,250	111,333	111,386	111,545	111,715 (22,343) [5,362] {2,681}	111,878 (22,376) [5,370] {2,685}	112,045 (22,409) [5,378] {2,689}
Hartford	96,558	96,624	96,666	96,958	97,162 (19,432) [4,664] {2,332}	97,358 (19,472) [4,673] {2,337}	97,562 (19,512) [4,683] {2,341}
Litchfield	16,742	16,762	16,767	16,824	16,877 (3,375) [810] {405}	16,932 (3,386) [813] {406}	16,989 (3,398) [815] {408}
Middlesex	14,652	14,670	14,684	14,719	14,761 (2,952) [709] {354}	14,804 (2,961) [711] {355}	14,848 (2,970) [713] {356}
New Haven	103,790	103,904	104,002	104,187	104,441 (20,888) [5,013] {2,507}	104,702 (20,940) [5,026] {2,513}	104,972 (20,994) [5,039] {2,519}
Tolland	11,083	11,091	11,094	11,118	11,139 (2,228) [535] {267}	11,160 (2,232) [536] {268}	11,179 (2,236) [537] {268}

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.