IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/8/21

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 <u>not</u> 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 10/8/21 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.

Illinois State Projections
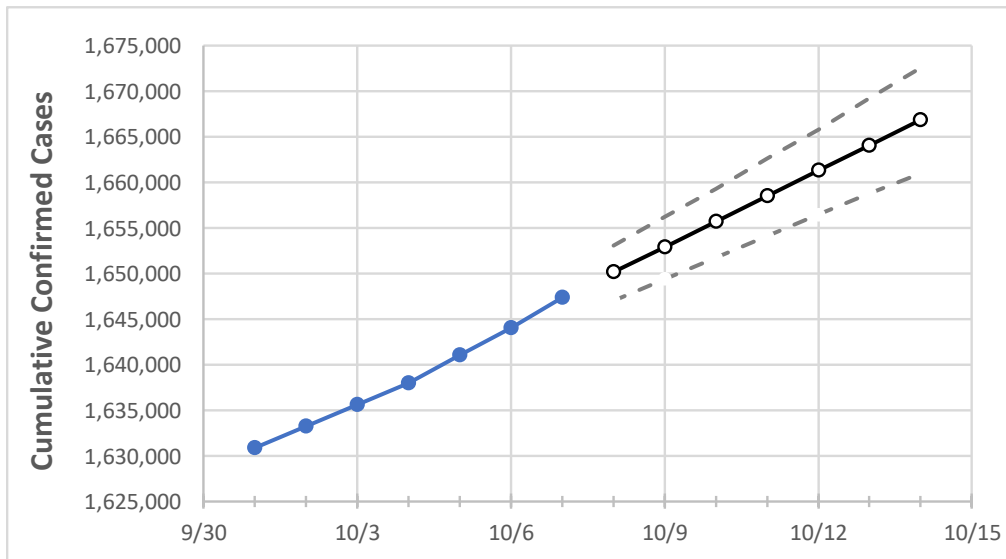
	Actual Confirmed Cases On:				Projected Cases For:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Illinois	1,638,003	1,641,057	1,643,993	1,647,364	1,650,147	1,652,899	1,655,742	1,658,497	1,661,327	1,664,061	1,666,878

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.

Illinois Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Cook	622,884	623,750	624,557	625,647	626,488	627,330	628,171	629,021	629,882	630,754	631,592
DuPage	105,694	105,921	106,076	106,259	106,419	106,582	106,742	106,903	107,068	107,234	107,395
Kane	66,983	67,097	67,190	67,288	67,381	67,473	67,569	67,665	67,755	67,850	67,946
Lake	78,468	78,542	78,631	78,768	78,870	78,971	79,072	79,170	79,270	79,368	79,464
McHenry	33,781	33,845	33,929	34,000	34,069	34,137	34,205	34,275	34,347	34,419	34,490
Will	89,027	89,198	89,392	89,583	89,743	89,905	90,066	90,229	90,393	90,556	90,728

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.*

Illinois Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	10/4	10/5	10/6	10/7	10/9	10/11	10/13
Cook	622,884	623,750	624,557	625,647	627,330 (125,466) [30,112] {15,056}	629,021 (125,804) [30,193] {15,097}	630,754 (126,151) [30,276] {15,138}
DuPage	105,694	105,921	106,076	106,259	106,582 (21,316) [5,116] {2,558}	106,903 (21,381) [5,131] {2,566}	107,234 (21,447) [5,147] {2,574}
Kane	66,983	67,097	67,190	67,288	67,473 (13,495) [3,239] {1,619}	67,665 (13,533) [3,248] {1,624}	67,850 (13,570) [3,257] {1,628}
Lake	78,468	78,542	78,631	78,768	78,971 (15,794) [3,791] {1,895}	79,170 (15,834) [3,800] {1,900}	79,368 (15,874) [3,810] {1,905}
McHenry	33,781	33,845	33,929	34,000	34,137 (6,827) [1,639] {819}	34,275 (6,855) [1,645] {823}	34,419 (6,884) [1,652] {826}
Will	89,027	89,198	89,392	89,583	89,905 (17,981) [4,315] {2,158}	90,229 (18,046) [4,331] {2,165}	90,556 (18,111) [4,347] {2,173}

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.