IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/27/20

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 10/27/20 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
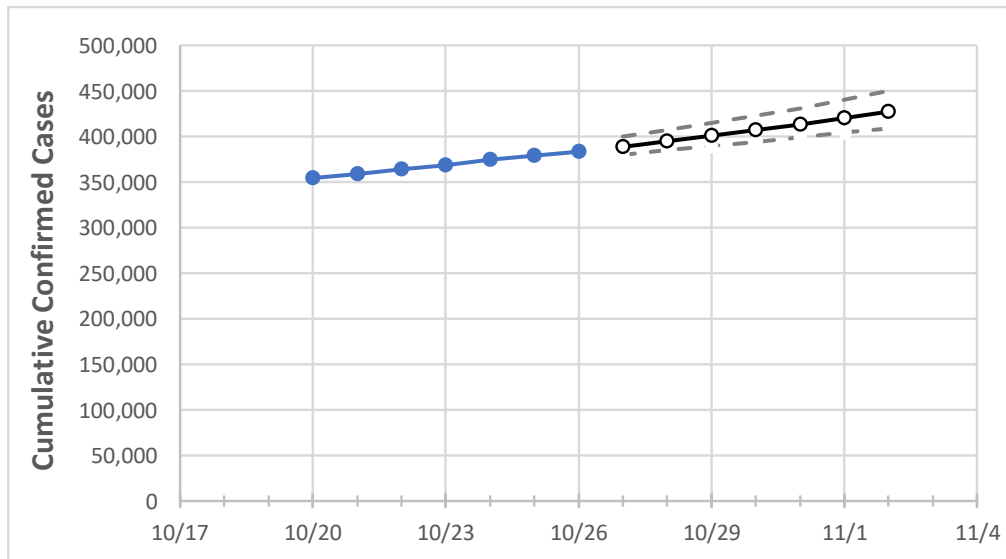
	Actual Confirmed Cases On:				Projected Cases For:						
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2
Illinois	368,740	374,901	378,958	383,687	389,205	394,949	400,928	407,151	413,627	420,368	427,383

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 20%, and are often within 10%, of actual confirmed cases.

Illinois Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2
Cook	171,437	173,817	175,586	177,465	179,599	181,836	184,180	186,635	189,208	191,903	194,727
DuPage	22,100	22,546	22,783	23,099	23,449	23,816	24,200	24,602	25,022	25,462	25,923
Kane	16,211	16,453	16,621	16,903	17,178	17,468	17,775	18,100	18,442	18,804	19,187
Lake	20,157	20,485	20,630	20,815	21,029	21,250	21,480	21,717	21,963	22,217	22,480
McHenry	6,049	6,225	6,310	6,452	6,589	6,736	6,891	7,057	7,233	7,420	7,619
Will	17,862	18,179	18,356	18,621	18,905	19,203	19,514	19,840	20,180	20,536	20,909

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:		
	10/23	10/24	10/25	10/26	10/28	10/30	11/1
Cook	171,437	173,817	175,586	177,465	181,836 (36,367) [8,728] {4,364}	186,635 (37,327) [8,958] {4,479}	191,903 (38,381) [9,211] {4,6...
DuPage	22,100	22,546	22,783	23,099	23,816 (4,763) [1,143] {572}	24,602 (4,920) [1,181] {590}	25,462 (5,092) [1,222] {61...
Kane	16,211	16,453	16,621	16,903	17,468 (3,494) [838] {419}	18,100 (3,620) [869] {434}	18,804 (3,761) [903] {451...
Lake	20,157	20,485	20,630	20,815	21,250 (4,250) [1,020] {510}	21,717 (4,343) [1,042] {521}	22,217 (4,443) [1,066] {53...
McHenry	6,049	6,225	6,310	6,452	6,736 (1,347) [323] {162}	7,057 (1,411) [339] {169}	7,420 (1,484) [356] {178...
Will	17,862	18,179	18,356	18,621	19,203 (3,841) [922] {461}	19,840 (3,968) [952] {476}	20,536 (4,107) [986] {493...

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.