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

Date: 10/21/20

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 10/21/20 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.

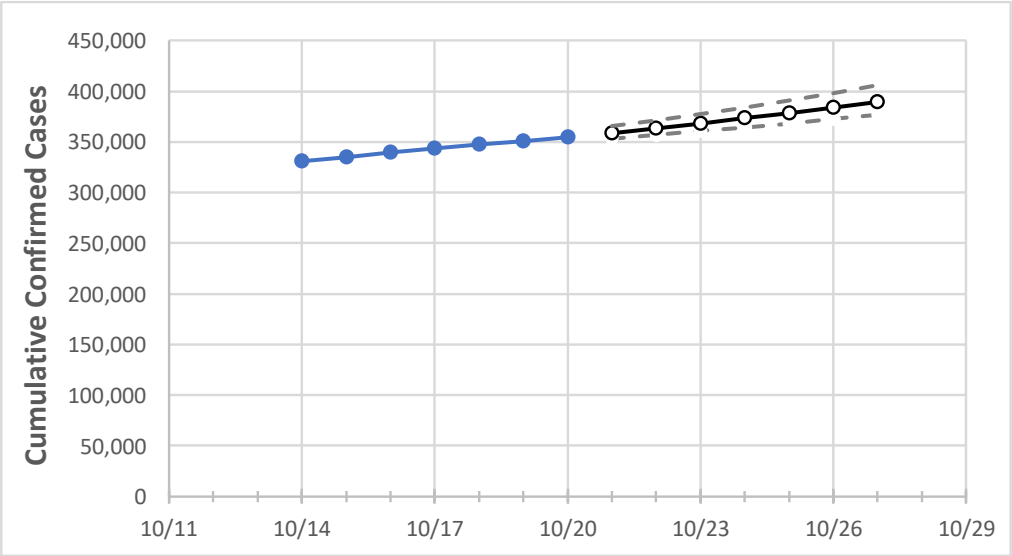
IEM's Modeling Lead

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:						
	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27
Illinois	343,386	347,631	350,744	354,457	358,866	363,458	368,241	373,220	378,406	383,805	389,426

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:						
	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27
Cook	162,220	163,912	165,198	166,457	168,131	169,889	171,735	173,673	175,709	177,845	180,089
DuPage	20,477	20,724	20,947	21,231	21,500	21,781	22,076	22,384	22,707	23,045	23,399
Kane	15,091	15,234	15,422	15,616	15,831	16,061	16,307	16,569	16,849	17,147	17,466
Lake	19,252	19,438	19,546	19,714	19,910	20,115	20,330	20,555	20,791	21,038	21,297
McHenry	5,485	5,583	5,642	5,726	5,817	5,914	6,016	6,124	6,239	6,360	6,489
Will	16,481	16,748	16,898	17,106	17,323	17,550	17,788	18,036	18,295	18,566	18,849

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:		
	10/17	10/18	10/19	10/20	10/22	10/24	10/26
Cook	162,220	163,912	165,198	166,457	169,889 (33,978) [8,155] {4,077}	173,673 (34,735) [8,336] {4,168}	177,845 (35,569) [8,537] {4,268}
DuPage	20,477	20,724	20,947	21,231	21,781 (4,356) [1,045] {523}	22,384 (4,477) [1,074] {537}	23,045 (4,609) [1,106] {553}
Kane	15,091	15,234	15,422	15,616	16,061 (3,212) [771] {385}	16,569 (3,314) [795] {398}	17,147 (3,429) [823] {412}
Lake	19,252	19,438	19,546	19,714	20,115 (4,023) [966] {483}	20,555 (4,111) [987] {493}	21,038 (4,208) [1,010] {505}
McHenry	5,485	5,583	5,642	5,726	5,914 (1,183) [284] {142}	6,124 (1,225) [294] {147}	6,360 (1,272) [305] {153}
Will	16,481	16,748	16,898	17,106	17,550 (3,510) [842] {421}	18,036 (3,607) [866] {433}	18,566 (3,713) [891] {446}

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.