IEM's AI Modeling: Short-term COVID-19 Projections
Date: 12/30/20

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 12/30/20 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
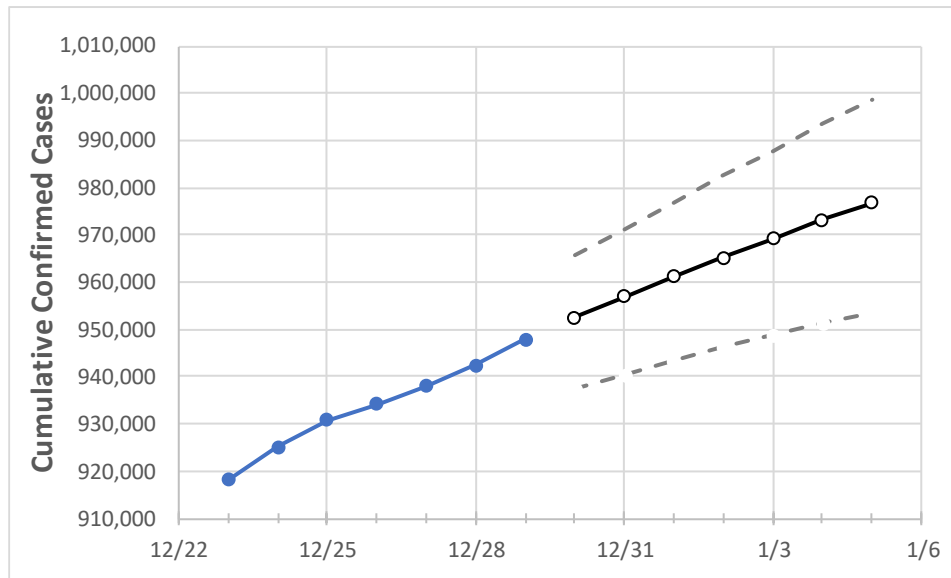
	Actual Confirmed Cases On:				Projected Cases For:						
	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	1/5
Illinois	934,142	937,909	942,362	948,006	952,498	956,943	961,132	965,311	969,274	973,181	976,765

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:						
	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4	1/5
Cook	383,480	384,931	386,469	388,386	389,998	391,589	393,138	394,632	396,047	397,381	398,694
DuPage	59,758	60,077	60,473	60,839	61,120	61,395	61,670	61,921	62,169	62,393	62,616
Kane	40,356	40,532	40,678	40,869	41,050	41,225	41,390	41,554	41,711	41,864	42,014
Lake	46,940	47,101	47,325	47,564	47,762	47,955	48,137	48,315	48,484	48,647	48,812
McHenry	18,474	18,589	18,692	18,794	18,907	19,016	19,124	19,228	19,332	19,437	19,538
Will	50,712	50,920	51,137	51,466	51,709	51,951	52,180	52,394	52,609	52,817	53,020

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:		
	12/26	12/27	12/28	12/29	12/31	1/2	1/4
Cook	383,480	384,931	386,469	388,386	391,589 (78,318) [18,796] {9,398}	394,632 (78,926) [18,942] {9,471}	397,381 (79,476) [19,074] {9,537}
DuPage	59,758	60,077	60,473	60,839	61,395 (12,279) [2,947] {1,473}	61,921 (12,384) [2,972] {1,486}	62,393 (12,479) [2,995] {1,497}
Kane	40,356	40,532	40,678	40,869	41,225 (8,245) [1,979] {989}	41,554 (8,311) [1,995] {997}	41,864 (8,373) [2,009] {1,005}
Lake	46,940	47,101	47,325	47,564	47,955 (9,591) [2,302] {1,151}	48,315 (9,663) [2,319] {1,160}	48,647 (9,729) [2,335] {1,168}
McHenry	18,474	18,589	18,692	18,794	19,016 (3,803) [913] {456}	19,228 (3,846) [923] {461}	19,437 (3,887) [933] {466}
Will	50,712	50,920	51,137	51,466	51,951 (10,390) [2,494] {1,247}	52,394 (10,479) [2,515] {1,257}	52,817 (10,563) [2,535] {1,268}

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.