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

Date: 4/8/21

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 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 4/8/21 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.

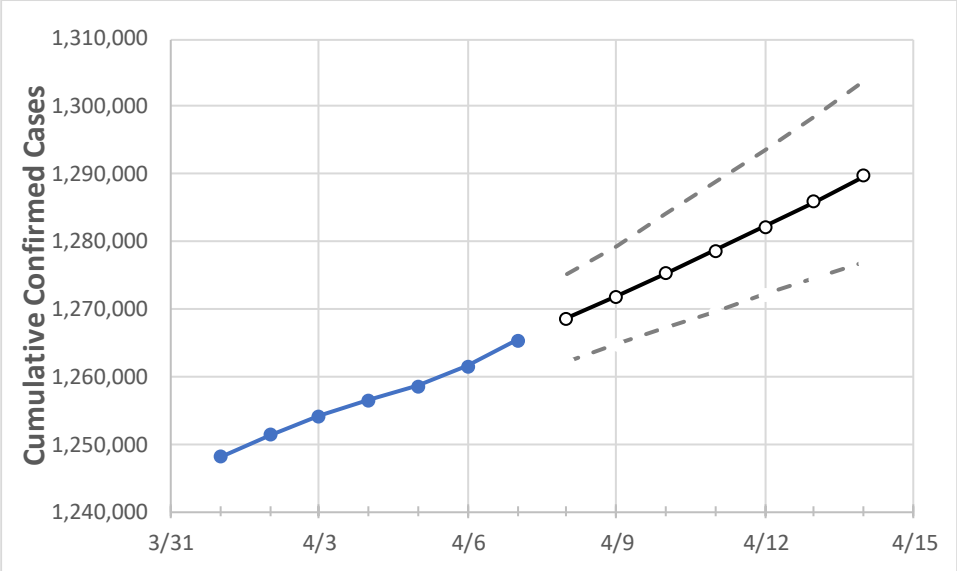
IEM's Modeling Lead

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Illinois	1,256,533	1,258,630	1,261,577	1,265,351	1,268,576	1,271,885	1,275,258	1,278,700	1,282,243	1,285,931	1,289,665

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Cook	503,169	504,203	505,380	506,828	508,183	509,579	511,016	512,509	514,035	515,600	517,178
DuPage	82,864	83,031	83,350	83,637	83,907	84,184	84,466	84,759	85,065	85,372	85,684
Kane	53,361	53,467	53,632	53,792	53,942	54,100	54,261	54,432	54,613	54,803	54,999
Lake	62,746	62,863	62,986	63,146	63,289	63,437	63,589	63,744	63,907	64,071	64,240
McHenry	25,782	25,812	25,920	25,998	26,058	26,121	26,184	26,246	26,316	26,384	26,456
Will	69,148	69,270	69,467	69,666	69,848	70,035	70,228	70,425	70,629	70,840	71,051

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:		
	4/4	4/5	4/6	4/7	4/9	4/11	4/13
Cook	503,169	504,203	505,380	506,828	509,579 (101,916) [24,460] {12,230}	512,509 (102,502) [24,600] {12,300}	515,600 (103,120) [24,749] {12,374}
DuPage	82,864	83,031	83,350	83,637	84,184 (16,837) [4,041] {2,020}	84,759 (16,952) [4,068] {2,034}	85,372 (17,074) [4,098] {2,049}
Kane	53,361	53,467	53,632	53,792	54,100 (10,820) [2,597] {1,298}	54,432 (10,886) [2,613] {1,306}	54,803 (10,961) [2,631] {1,315}
Lake	62,746	62,863	62,986	63,146	63,437 (12,687) [3,045] {1,522}	63,744 (12,749) [3,060] {1,530}	64,071 (12,814) [3,075] {1,538}
McHenry	25,782	25,812	25,920	25,998	26,121 (5,224) [1,254] {627}	26,246 (5,249) [1,260] {630}	26,384 (5,277) [1,266] {633}
Will	69,148	69,270	69,467	69,666	70,035 (14,007) [3,362] {1,681}	70,425 (14,085) [3,380] {1,690}	70,840 (14,168) [3,400] {1,700}

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.