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

Date: 5/6/21

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 5/6/21 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.

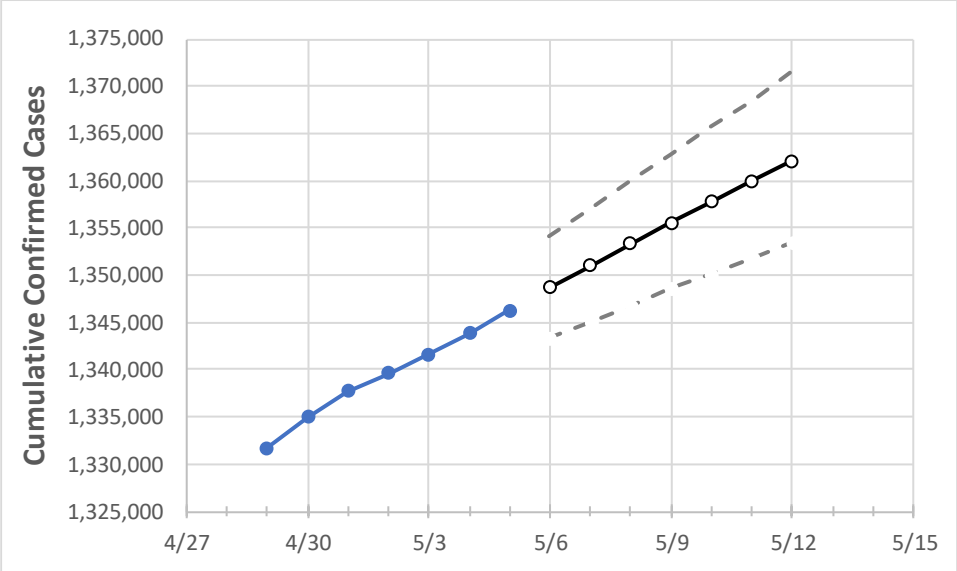
IEM's Modeling Lead

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:						
	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12
Illinois	1,339,621	1,341,671	1,343,875	1,346,294	1,348,654	1,351,036	1,353,301	1,355,587	1,357,824	1,359,958	1,362,151

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:						
	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12
Cook	536,384	537,224	538,095	539,005	539,898	540,777	541,650	542,499	543,354	544,167	544,969
DuPage	89,043	89,180	89,343	89,505	89,658	89,810	89,962	90,108	90,251	90,391	90,528
Kane	57,368	57,486	57,580	57,682	57,788	57,890	57,994	58,094	58,194	58,291	58,385
Lake	66,132	66,246	66,368	66,448	66,550	66,652	66,755	66,854	66,954	67,055	67,151
McHenry	28,064	28,113	28,156	28,210	28,266	28,320	28,372	28,423	28,471	28,519	28,564
Will	74,136	74,284	74,435	74,566	74,722	74,875	75,030	75,184	75,335	75,484	75,635

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:		
	5/2	5/3	5/4	5/5	5/7	5/9	5/11
Cook	536,384	537,224	538,095	539,005	540,777 (108,155) [25,957] {12,979}	542,499 (108,500) [26,040] {13,020}	544,167 (108,833) [26,120] {13,060}
DuPage	89,043	89,180	89,343	89,505	89,810 (17,962) [4,311] {2,155}	90,108 (18,022) [4,325] {2,163}	90,391 (18,078) [4,339] {2,169}
Kane	57,368	57,486	57,580	57,682	57,890 (11,578) [2,779] {1,389}	58,094 (11,619) [2,789] {1,394}	58,291 (11,658) [2,798] {1,399}
Lake	66,132	66,246	66,368	66,448	66,652 (13,330) [3,199] {1,600}	66,854 (13,371) [3,209] {1,604}	67,055 (13,411) [3,219] {1,609}
McHenry	28,064	28,113	28,156	28,210	28,320 (5,664) [1,359] {680}	28,423 (5,685) [1,364] {682}	28,519 (5,704) [1,369] {684}
Will	74,136	74,284	74,435	74,566	74,875 (14,975) [3,594] {1,797}	75,184 (15,037) [3,609] {1,804}	75,484 (15,097) [3,623] {1,812}

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.