

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/30/20**

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 11/30/20 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.

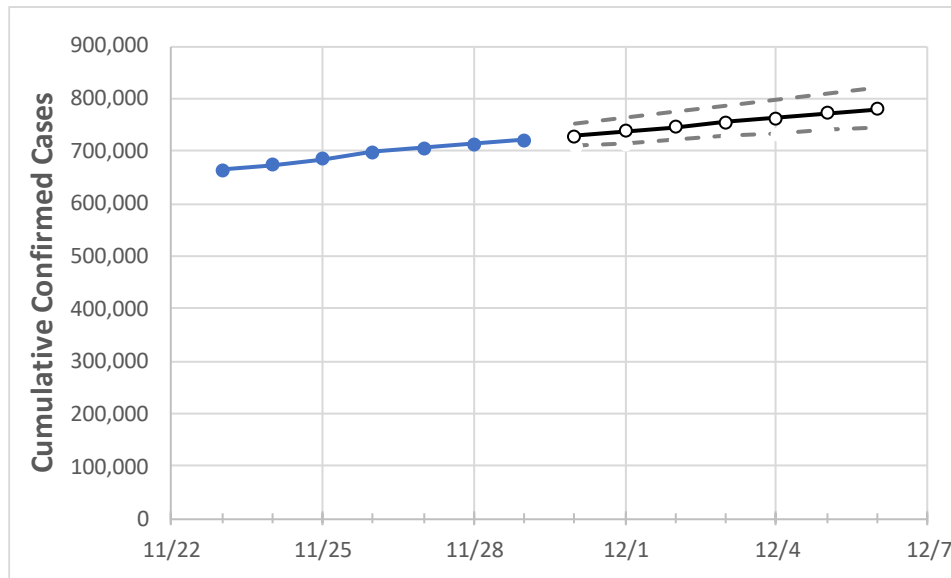
IEM's Modeling Lead

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:					
	11/26	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6
Illinois	697,489	705,063	712,936	720,114	729,026	737,783	746,389	754,848	763,162	771,334	779,367

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:					
	11/26	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6
Cook	296,129	298,870	301,582	304,220	307,384	310,492	313,546	316,547	319,494	322,390	325,235
DuPage	43,513	44,035	44,656	45,087	45,677	46,257	46,827	47,387	47,938	48,479	49,011
Kane	30,756	31,136	31,493	31,767	32,143	32,512	32,877	33,236	33,589	33,938	34,281
Lake	36,001	36,375	36,845	37,299	37,717	38,132	38,541	38,946	39,347	39,743	40,135
McHenry	13,788	13,979	14,182	14,269	14,430	14,586	14,737	14,885	15,028	15,167	15,302
Will	37,368	37,864	38,291	38,684	39,185	39,672	40,145	40,606	41,055	41,491	41,915

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:											
	11/26	11/27	11/28	11/29	12/1			12/3			12/5					
Cook	296,129	298,870	301,582	304,220	310,492	(62,098)	[14,904]	{7,452}	316,547	(63,309)	[15,194]	{7,597}	322,390	(64,478)	[15,475]	{7,737}
DuPage	43,513	44,035	44,656	45,087	46,257	(9,251)	[2,220]	{1,110}	47,387	(9,477)	[2,275]	{1,137}	48,479	(9,696)	[2,327]	{1,163}
Kane	30,756	31,136	31,493	31,767	32,512	(6,502)	[1,561]	{780}	33,236	(6,647)	[1,595]	{798}	33,938	(6,788)	[1,629]	{815}
Lake	36,001	36,375	36,845	37,299	38,132	(7,626)	[1,830]	{915}	38,946	(7,789)	[1,869]	{935}	39,743	(7,949)	[1,908]	{954}
McHenry	13,788	13,979	14,182	14,269	14,586	(2,917)	[700]	{350}	14,885	(2,977)	[714]	{357}	15,167	(3,033)	[728]	{364}
Will	37,368	37,864	38,291	38,684	39,672	(7,934)	[1,904]	{952}	40,606	(8,121)	[1,949]	{975}	41,491	(8,298)	[1,992]	{996}

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.