

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/29/20**

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 12/29/20 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.

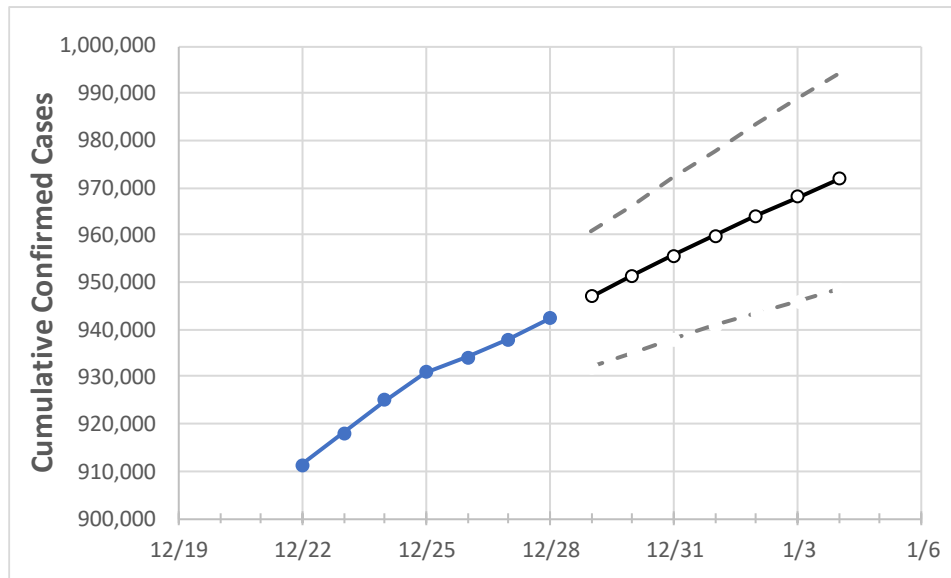
IEM's Modeling Lead

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
Illinois	930,849	934,142	937,909	942,362	947,002	951,448	955,707	959,946	964,094	968,079	971,795

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:						
	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3	1/4
Cook	382,213	383,480	384,931	386,469	388,166	389,806	391,392	392,931	394,399	395,796	397,126
DuPage	59,577	59,758	60,077	60,473	60,746	61,002	61,243	61,479	61,712	61,927	62,144
Kane	40,196	40,356	40,532	40,678	40,871	41,057	41,231	41,399	41,565	41,722	41,871
Lake	46,833	46,940	47,101	47,325	47,534	47,723	47,913	48,085	48,257	48,425	48,589
McHenry	18,402	18,474	18,589	18,692	18,806	18,918	19,033	19,138	19,246	19,353	19,456
Will	50,528	50,712	50,920	51,137	51,385	51,620	51,848	52,071	52,292	52,498	52,701

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:											
	12/25	12/26	12/27	12/28	12/30				1/1				1/3			
Cook	382,213	383,480	384,931	386,469	389,806	(77,961)	[18,711]	{9,355}	392,931	(78,586)	[18,861]	{9,430}	395,796	(79,159)	[18,998]	{9,499}
DuPage	59,577	59,758	60,077	60,473	61,002	(12,200)	[2,928]	{1,464}	61,479	(12,296)	[2,951]	{1,475}	61,927	(12,385)	[2,972]	{1,486}
Kane	40,196	40,356	40,532	40,678	41,057	(8,211)	[1,971]	{985}	41,399	(8,280)	[1,987]	{994}	41,722	(8,344)	[2,003]	{1,001}
Lake	46,833	46,940	47,101	47,325	47,723	(9,545)	[2,291]	{1,145}	48,085	(9,617)	[2,308]	{1,154}	48,425	(9,685)	[2,324]	{1,162}
McHenry	18,402	18,474	18,589	18,692	18,918	(3,784)	[908]	{454}	19,138	(3,828)	[919]	{459}	19,353	(3,871)	[929]	{464}
Will	50,528	50,712	50,920	51,137	51,620	(10,324)	[2,478]	{1,239}	52,071	(10,414)	[2,499]	{1,250}	52,498	(10,500)	[2,520]	{1,260}

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.