

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/23/21**

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 2/23/21 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.

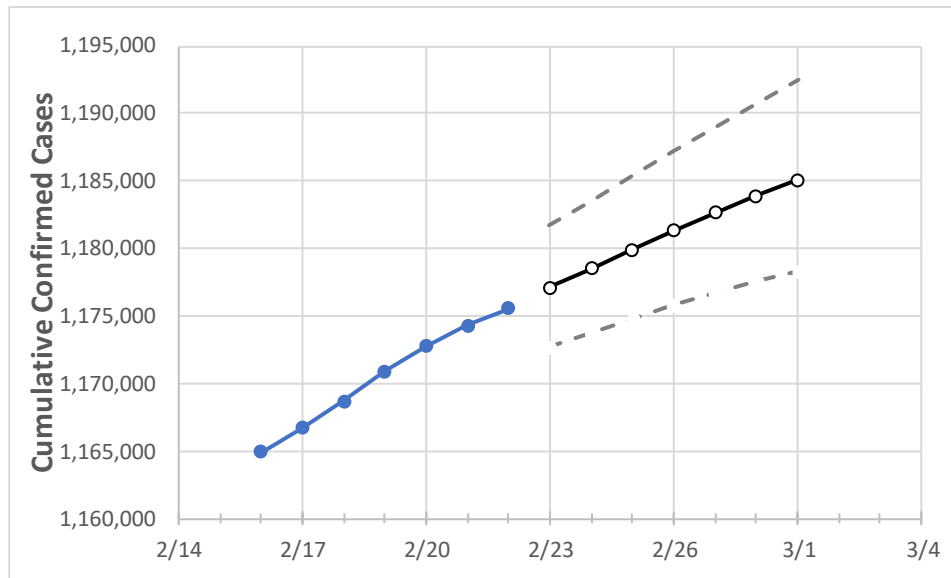
IEM's Modeling Lead

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:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Illinois	1,170,902	1,172,736	1,174,330	1,175,568	1,177,087	1,178,523	1,179,916	1,181,297	1,182,626	1,183,881	1,185,106

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:						
	2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1
Cook	468,690	469,379	469,935	470,391	470,902	471,396	471,862	472,332	472,789	473,229	473,653
DuPage	75,587	75,701	75,826	76,009	76,145	76,278	76,407	76,534	76,660	76,786	76,906
Kane	49,986	50,069	50,134	50,182	50,243	50,303	50,359	50,413	50,468	50,519	50,571
Lake	58,508	58,618	58,711	58,770	58,857	58,939	59,019	59,096	59,170	59,240	59,310
McHenry	23,914	23,967	24,003	24,021	24,062	24,102	24,141	24,179	24,217	24,255	24,292
Will	63,994	64,131	64,251	64,320	64,420	64,522	64,619	64,712	64,803	64,891	64,975

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:											
	2/19	2/20	2/21	2/22	2/24				2/26				2/28			
Cook	468,690	469,379	469,935	470,391	471,396	(94,279)	[22,627]	{11,314}	472,332	(94,466)	[22,672]	{11,336}	473,229	(94,646)	[22,715]	{11,357}
DuPage	75,587	75,701	75,826	76,009	76,278	(15,256)	[3,661]	{1,831}	76,534	(15,307)	[3,674]	{1,837}	76,786	(15,357)	[3,686]	{1,843}
Kane	49,986	50,069	50,134	50,182	50,303	(10,061)	[2,415]	{1,207}	50,413	(10,083)	[2,420]	{1,210}	50,519	(10,104)	[2,425]	{1,212}
Lake	58,508	58,618	58,711	58,770	58,939	(11,788)	[2,829]	{1,415}	59,096	(11,819)	[2,837]	{1,418}	59,240	(11,848)	[2,844]	{1,422}
McHenry	23,914	23,967	24,003	24,021	24,102	(4,820)	[1,157]	{578}	24,179	(4,836)	[1,161]	{580}	24,255	(4,851)	[1,164]	{582}
Will	63,994	64,131	64,251	64,320	64,522	(12,904)	[3,097]	{1,549}	64,712	(12,942)	[3,106]	{1,553}	64,891	(12,978)	[3,115]	{1,557}

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.