

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

Date: 11/17/20

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 11/17/20 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.

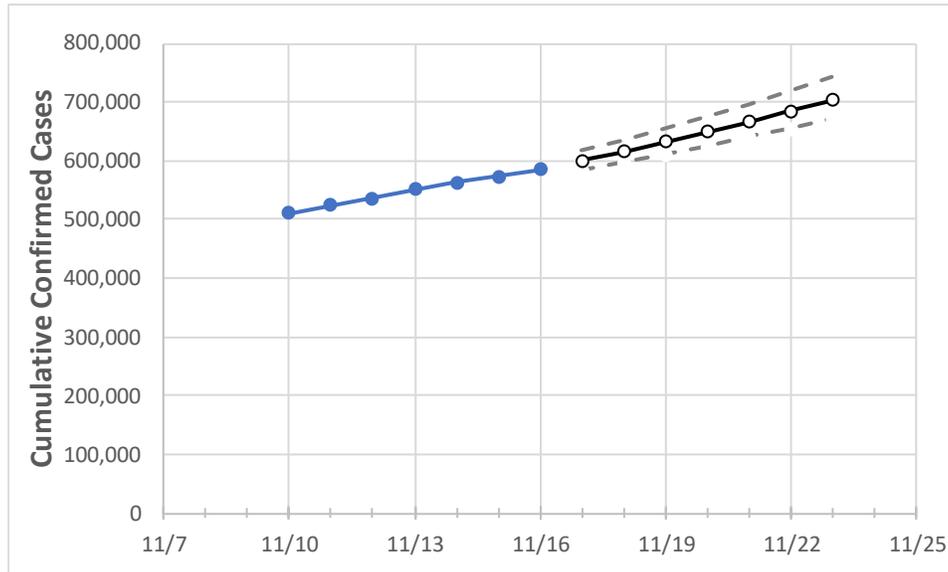
IEM's Modeling Lead

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Illinois	551,957	562,985	573,616	585,248	600,125	615,631	631,791	648,627	666,163	684,427	703,442

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Cook	242,662	246,392	251,101	255,608	261,334	267,305	273,530	280,018	286,778	293,821	301,155
DuPage	33,851	34,607	35,284	35,878	36,730	37,607	38,510	39,439	40,397	41,382	42,397
Kane	24,890	25,278	25,712	26,105	26,739	27,394	28,072	28,773	29,498	30,246	31,020
Lake	29,497	30,031	30,532	31,079	31,920	32,809	33,751	34,747	35,800	36,915	38,093
McHenry	10,834	11,069	11,237	11,494	11,866	12,253	12,658	13,080	13,520	13,979	14,458
Will	28,304	29,092	29,725	30,384	31,319	32,301	33,332	34,415	35,552	36,745	37,997

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:											
	11/13	11/14	11/15	11/16	11/18				11/20				11/22			
Cook	242,662	246,392	251,101	255,608	267,305	(53,461)	[12,831]	{6,415}	280,018	(56,004)	[13,441]	{6,720}	293,821	(58,764)	[14,103]	{7,052}
DuPage	33,851	34,607	35,284	35,878	37,607	(7,521)	[1,805]	{903}	39,439	(7,888)	[1,893]	{947}	41,382	(8,276)	[1,986]	{993}
Kane	24,890	25,278	25,712	26,105	27,394	(5,479)	[1,315]	{657}	28,773	(5,755)	[1,381]	{691}	30,246	(6,049)	[1,452]	{726}
Lake	29,497	30,031	30,532	31,079	32,809	(6,562)	[1,575]	{787}	34,747	(6,949)	[1,668]	{834}	36,915	(7,383)	[1,772]	{886}
McHenry	10,834	11,069	11,237	11,494	12,253	(2,451)	[588]	{294}	13,080	(2,616)	[628]	{314}	13,979	(2,796)	[671]	{335}
Will	28,304	29,092	29,725	30,384	32,301	(6,460)	[1,550]	{775}	34,415	(6,883)	[1,652]	{826}	36,745	(7,349)	[1,764]	{882}

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.