

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

Date: 8/18/20

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 8/18/20 1 p.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.

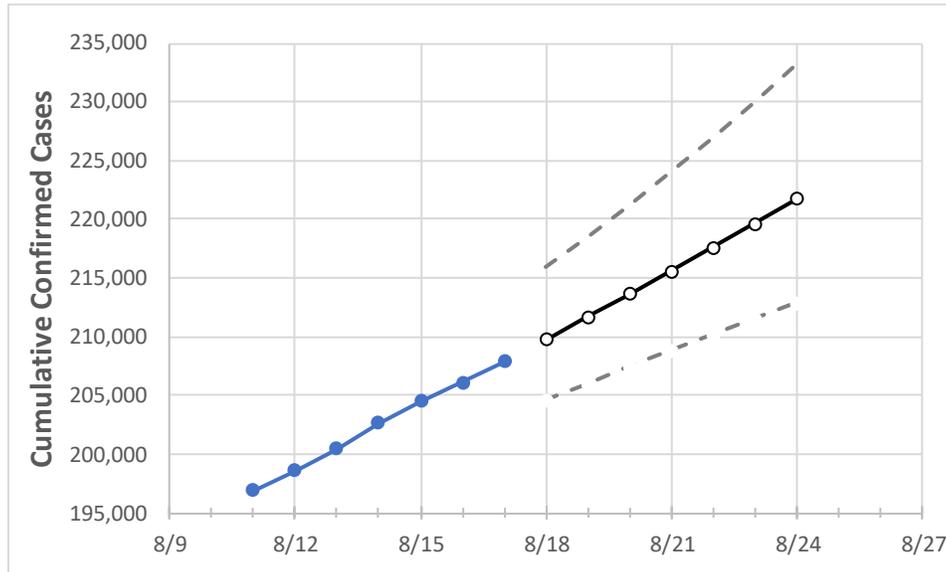
IEM's Modeling Lead

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Illinois	202,683	204,516	206,078	207,853	209,735	211,648	213,593	215,570	217,580	219,623	221,700	

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Cook	114,724	115,344	115,960	116,620	117,334	118,059	118,795	119,542	120,300	121,070	121,851	
DuPage	12,693	12,815	12,892	13,032	13,136	13,241	13,349	13,459	13,572	13,686	13,803	
Kane	10,100	10,157	10,184	10,314	10,388	10,463	10,540	10,618	10,697	10,777	10,859	
Lake	13,144	13,231	13,282	13,375	13,460	13,546	13,634	13,723	13,813	13,904	13,996	
McHenry	3,335	3,364	3,389	3,417	3,447	3,478	3,509	3,540	3,571	3,602	3,633	
Will	9,692	9,804	9,874	10,013	10,115	10,220	10,328	10,440	10,555	10,673	10,794	

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:											
	8/14	8/15	8/16	8/17	8/19				8/21				8/23			
Cook	114,724	115,344	115,960	116,620	118,059	(23,612)	[5,667]	{2,833}	119,542	(23,908)	[5,738]	{2,869}	121,070	(24,214)	[5,811]	{2,906}
DuPage	12,693	12,815	12,892	13,032	13,241	(2,648)	[636]	{318}	13,459	(2,692)	[646]	{323}	13,686	(2,737)	[657]	{328}
Kane	10,100	10,157	10,184	10,314	10,463	(2,093)	[502]	{251}	10,618	(2,124)	[510]	{255}	10,777	(2,155)	[517]	{259}
Lake	13,144	13,231	13,282	13,375	13,546	(2,709)	[650]	{325}	13,723	(2,745)	[659]	{329}	13,904	(2,781)	[667]	{334}
McHenry	3,335	3,364	3,389	3,417	3,478	(696)	[167]	{83}	3,540	(708)	[170]	{85}	3,602	(720)	[173]	{86}
Will	9,692	9,804	9,874	10,013	10,220	(2,044)	[491]	{245}	10,440	(2,088)	[501]	{251}	10,673	(2,135)	[512]	{256}

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.