

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

Date: 12/22/20

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 12/22/20 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.

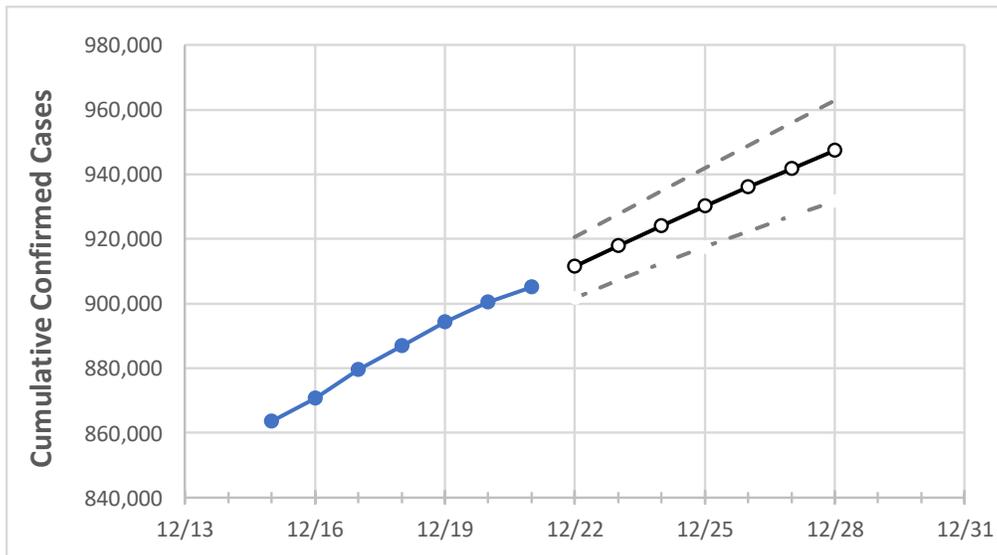
IEM's Modeling Lead

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:					
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Illinois	886,805	894,367	900,370	905,069	911,574	917,924	924,123	930,173	936,080	941,845	947,472

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:					
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Cook	366,020	368,824	371,088	373,008	375,484	377,908	380,280	382,601	384,873	387,097	389,273
DuPage	56,881	57,421	57,784	58,048	58,439	58,818	59,185	59,542	59,887	60,223	60,548
Kane	38,407	38,694	38,997	39,186	39,457	39,723	39,984	40,241	40,492	40,739	40,981
Lake	44,858	45,168	45,431	45,653	45,943	46,227	46,504	46,776	47,041	47,301	47,555
McHenry	17,380	17,568	17,713	17,802	17,951	18,099	18,246	18,392	18,538	18,683	18,827
Will	48,272	48,657	49,025	49,253	49,606	49,952	50,291	50,621	50,945	51,262	51,571

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:											
	12/18	12/19	12/20	12/21	12/23				12/25				12/27			
Cook	366,020	368,824	371,088	373,008	377,908	(75,582)	[18,140]	{9,070}	382,601	(76,520)	[18,365]	{9,182}	387,097	(77,419)	[18,581]	{9,290}
DuPage	56,881	57,421	57,784	58,048	58,818	(11,764)	[2,823]	{1,412}	59,542	(11,908)	[2,858]	{1,429}	60,223	(12,045)	[2,891]	{1,445}
Kane	38,407	38,694	38,997	39,186	39,723	(7,945)	[1,907]	{953}	40,241	(8,048)	[1,932]	{966}	40,739	(8,148)	[1,955]	{978}
Lake	44,858	45,168	45,431	45,653	46,227	(9,245)	[2,219]	{1,109}	46,776	(9,355)	[2,245]	{1,123}	47,301	(9,460)	[2,270]	{1,135}
McHenry	17,380	17,568	17,713	17,802	18,099	(3,620)	[869]	{434}	18,392	(3,678)	[883]	{441}	18,683	(3,737)	[897]	{448}
Will	48,272	48,657	49,025	49,253	49,952	(9,990)	[2,398]	{1,199}	50,621	(10,124)	[2,430]	{1,215}	51,262	(10,252)	[2,461]	{1,230}

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.