

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

Date: 9/1/21

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 9/1/21 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.

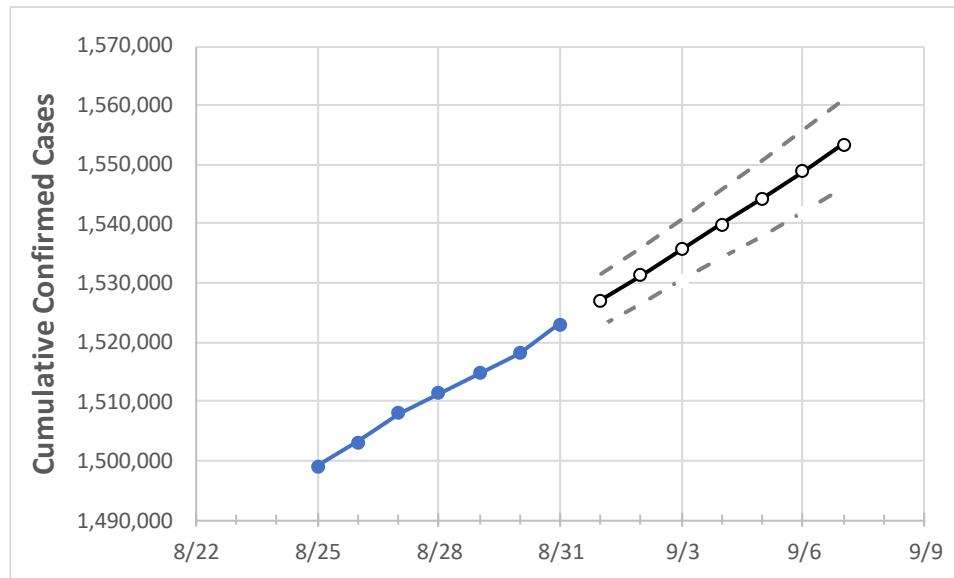
IEM's Modeling Lead

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:							
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	
Illinois	1,511,360	1,514,716	1,518,071	1,522,942	1,527,141	1,531,360	1,535,663	1,539,985	1,544,363	1,548,787	1,553,427	

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:							
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	
Cook	589,008	589,916	590,825	592,050	593,180	594,287	595,429	596,616	597,776	598,991	600,207	
DuPage	98,958	99,137	99,315	99,590	99,808	100,026	100,246	100,476	100,706	100,936	101,171	
Kane	63,034	63,135	63,236	63,399	63,532	63,664	63,800	63,937	64,078	64,222	64,367	
Lake	73,145	73,304	73,464	73,680	73,864	74,053	74,243	74,443	74,642	74,850	75,055	
McHenry	31,362	31,427	31,493	31,560	31,637	31,714	31,793	31,872	31,951	32,033	32,117	
Will	82,958	83,102	83,247	83,451	83,633	83,819	83,999	84,186	84,371	84,561	84,754	

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:											
	8/28	8/29	8/30	8/31	9/2				9/4				9/6			
Cook	589,008	589,916	590,825	592,050	594,287	(118,857)	[28,526]	{14,263}	596,616	(119,323)	[28,638]	{14,319}	598,991	(119,798)	[28,752]	{14,376}
DuPage	98,958	99,137	99,315	99,590	100,026	(20,005)	[4,801]	{2,401}	100,476	(20,095)	[4,823]	{2,411}	100,936	(20,187)	[4,845]	{2,422}
Kane	63,034	63,135	63,236	63,399	63,664	(12,733)	[3,056]	{1,528}	63,937	(12,787)	[3,069]	{1,534}	64,222	(12,844)	[3,083]	{1,541}
Lake	73,145	73,304	73,464	73,680	74,053	(14,811)	[3,555]	{1,777}	74,443	(14,889)	[3,573]	{1,787}	74,850	(14,970)	[3,593]	{1,796}
McHenry	31,362	31,427	31,493	31,560	31,714	(6,343)	[1,522]	{761}	31,872	(6,374)	[1,530]	{765}	32,033	(6,407)	[1,538]	{769}
Will	82,958	83,102	83,247	83,451	83,819	(16,764)	[4,023]	{2,012}	84,186	(16,837)	[4,041]	{2,020}	84,561	(16,912)	[4,059]	{2,029}

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.