

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

Date: 9/9/20

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 9/9/20 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.

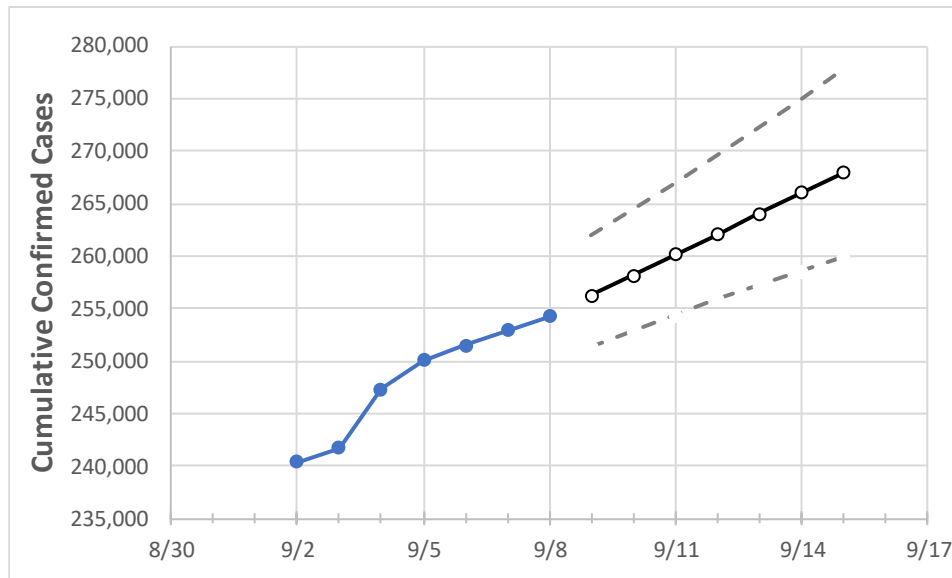
IEM's Modeling Lead

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:						
	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15
Illinois	250,102	251,515	252,884	254,276	256,223	258,171	260,120	262,070	264,022	265,974	267,928

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:						
	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15
Cook	130,616	131,078	131,622	132,072	132,682	133,290	133,897	134,501	135,103	135,704	136,302
DuPage	15,247	15,322	15,385	15,499	15,597	15,696	15,794	15,892	15,989	16,087	16,184
Kane	11,660	11,689	11,735	11,761	11,813	11,866	11,918	11,969	12,020	12,071	12,122
Lake	15,151	15,192	15,250	15,349	15,427	15,506	15,585	15,664	15,743	15,823	15,903
McHenry	4,060	4,085	4,109	4,139	4,170	4,201	4,232	4,263	4,294	4,325	4,357
Will	12,189	12,260	12,337	12,415	12,506	12,597	12,687	12,777	12,867	12,956	13,045

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:											
	9/5	9/6	9/7	9/8	9/10				9/12				9/14			
Cook	130,616	131,078	131,622	132,072	133,290	(26,658)	[6,398]	{3,199}	134,501	(26,900)	[6,456]	{3,228}	135,704	(27,141)	[6,514]	{3,257}
DuPage	15,247	15,322	15,385	15,499	15,696	(3,139)	[753]	{377}	15,892	(3,178)	[763]	{381}	16,087	(3,217)	[772]	{386}
Kane	11,660	11,689	11,735	11,761	11,866	(2,373)	[570]	{285}	11,969	(2,394)	[575]	{287}	12,071	(2,414)	[579]	{290}
Lake	15,151	15,192	15,250	15,349	15,506	(3,101)	[744]	{372}	15,664	(3,133)	[752]	{376}	15,823	(3,165)	[760]	{380}
McHenry	4,060	4,085	4,109	4,139	4,201	(840)	[202]	{101}	4,263	(853)	[205]	{102}	4,325	(865)	[208]	{104}
Will	12,189	12,260	12,337	12,415	12,597	(2,519)	[605]	{302}	12,777	(2,555)	[613]	{307}	12,956	(2,591)	[622]	{311}

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.