

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

Date: 5/4/21

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 5/4/21 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.

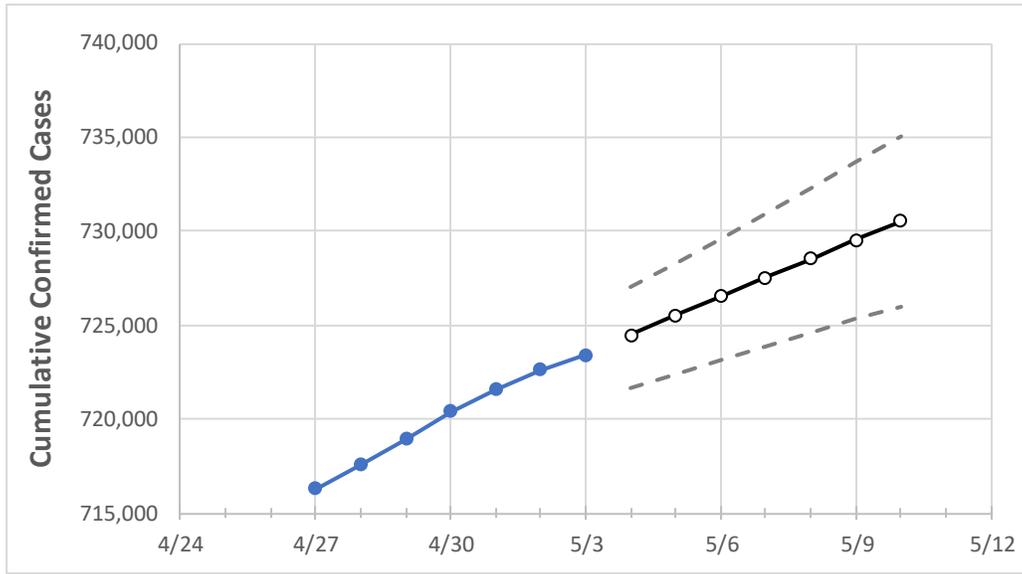
IEM's Modeling Lead

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.

Indiana State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Indiana	720,425	721,577	722,646	723,443	724,472	725,511	726,525	727,518	728,538	729,552	730,551

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.

Indiana Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Decatur	2,820	2,823	2,825	2,826	2,829	2,832	2,835	2,838	2,841	2,845	2,848
Hamilton	35,172	35,229	35,288	35,322	35,377	35,432	35,485	35,539	35,593	35,647	35,701
Hendricks	17,030	17,054	17,072	17,086	17,104	17,123	17,140	17,158	17,176	17,193	17,212
Johnson	17,757	17,787	17,808	17,821	17,840	17,858	17,877	17,896	17,914	17,932	17,950
Lake	52,833	52,935	53,031	53,113	53,213	53,314	53,416	53,518	53,621	53,724	53,825
Madison	12,480	12,485	12,501	12,510	12,520	12,531	12,541	12,551	12,561	12,571	12,582
Marion	98,285	98,455	98,637	98,753	98,903	99,054	99,208	99,361	99,514	99,670	99,821
St. Joseph	35,008	35,086	35,148	35,214	35,282	35,351	35,417	35,483	35,548	35,612	35,674

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.

Indiana Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	4/30	5/1	5/2	5/3	5/5				5/7				5/9			
Decatur	2,820	2,823	2,825	2,826	2,832	(566)	[136]	{68}	2,838	(568)	[136]	{68}	2,845	(569)	[137]	{68}
Hamilton	35,172	35,229	35,288	35,322	35,432	(7,086)	[1,701]	{850}	35,539	(7,108)	[1,706]	{853}	35,647	(7,129)	[1,711]	{856}
Hendricks	17,030	17,054	17,072	17,086	17,123	(3,425)	[822]	{411}	17,158	(3,432)	[824]	{412}	17,193	(3,439)	[825]	{413}
Johnson	17,757	17,787	17,808	17,821	17,858	(3,572)	[857]	{429}	17,896	(3,579)	[859]	{429}	17,932	(3,586)	[861]	{430}
Lake	52,833	52,935	53,031	53,113	53,314	(10,663)	[2,559]	{1,280}	53,518	(10,704)	[2,569]	{1,284}	53,724	(10,745)	[2,579]	{1,289}
Madison	12,480	12,485	12,501	12,510	12,531	(2,506)	[601]	{301}	12,551	(2,510)	[602]	{301}	12,571	(2,514)	[603]	{302}
Marion	98,285	98,455	98,637	98,753	99,054	(19,811)	[4,755]	{2,377}	99,361	(19,872)	[4,769]	{2,385}	99,670	(19,934)	[4,784]	{2,392}
St. Joseph	35,008	35,086	35,148	35,214	35,351	(7,070)	[1,697]	{848}	35,483	(7,097)	[1,703]	{852}	35,612	(7,122)	[1,709]	{855}

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.