

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

Date: 8/16/21

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 8/16/21 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.

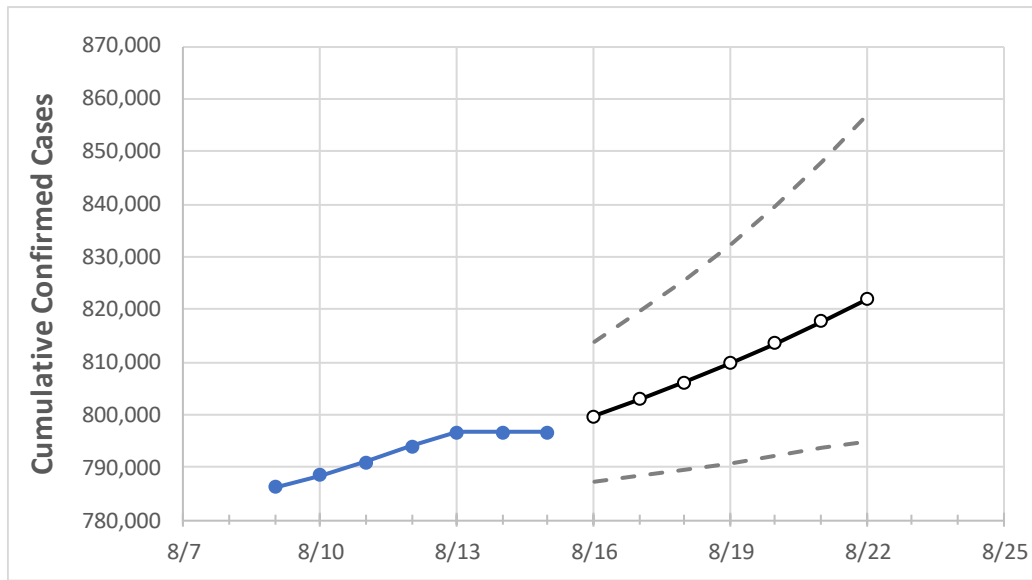
IEM's Modeling Lead

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:							
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	
Indiana	794,077	796,733	796,733	796,733	799,748	802,896	806,231	809,808	813,575	817,719	821,974	

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:							
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	
Decatur	3,032	3,035	3,035	3,035	3,053	3,073	3,096	3,121	3,149	3,182	3,220	
Hamilton	38,332	38,434	38,434	38,434	38,543	38,654	38,772	38,895	39,023	39,157	39,293	
Hendricks	18,710	18,783	18,783	18,783	18,868	18,958	19,058	19,164	19,279	19,404	19,535	
Johnson	19,543	19,624	19,624	19,624	19,718	19,818	19,926	20,044	20,167	20,294	20,436	
Lake	57,873	57,956	57,956	57,956	58,057	58,165	58,282	58,400	58,521	58,654	58,793	
Madison	14,162	14,240	14,240	14,240	14,325	14,417	14,514	14,620	14,729	14,847	14,973	
Marion	109,152	109,530	109,530	109,530	109,925	110,351	110,800	111,266	111,748	112,276	112,827	
St. Joseph	37,887	37,946	37,946	37,946	38,004	38,066	38,132	38,198	38,268	38,344	38,424	

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:											
	8/12	8/13	8/14	8/15	8/17				8/19				8/21			
Decatur	3,032	3,035	3,035	3,035	3,073	(615)	[148]	{74}	3,121	(624)	[150]	{75}	3,182	(636)	[153]	{76}
Hamilton	38,332	38,434	38,434	38,434	38,654	(7,731)	[1,855]	{928}	38,895	(7,779)	[1,867]	{933}	39,157	(7,831)	[1,880]	{940}
Hendricks	18,710	18,783	18,783	18,783	18,958	(3,792)	[910]	{455}	19,164	(3,833)	[920]	{460}	19,404	(3,881)	[931]	{466}
Johnson	19,543	19,624	19,624	19,624	19,818	(3,964)	[951]	{476}	20,044	(4,009)	[962]	{481}	20,294	(4,059)	[974]	{487}
Lake	57,873	57,956	57,956	57,956	58,165	(11,633)	[2,792]	{1,396}	58,400	(11,680)	[2,803]	{1,402}	58,654	(11,731)	[2,815]	{1,408}
Madison	14,162	14,240	14,240	14,240	14,417	(2,883)	[692]	{346}	14,620	(2,924)	[702]	{351}	14,847	(2,969)	[713]	{356}
Marion	109,152	109,530	109,530	109,530	110,351	(22,070)	[5,297]	{2,648}	111,266	(22,253)	[5,341]	{2,670}	112,276	(22,455)	[5,389]	{2,695}
St. Joseph	37,887	37,946	37,946	37,946	38,066	(7,613)	[1,827]	{914}	38,198	(7,640)	[1,833]	{917}	38,344	(7,669)	[1,841]	{920}

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.