

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

**Date: 8/6/21**

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 8/6/21 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.**

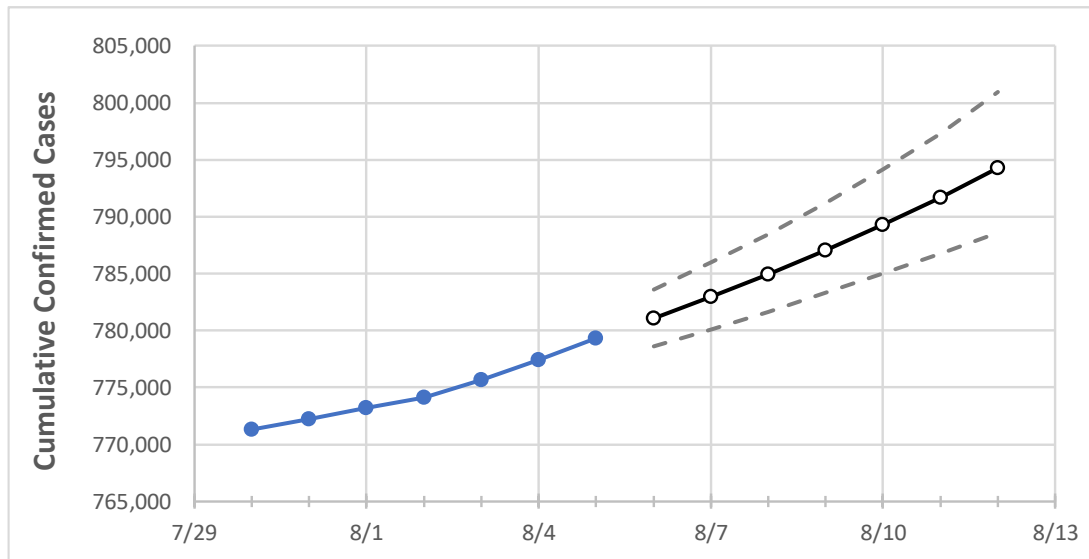
### **IEM's Modeling Lead**

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:					
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Indiana	774,097	775,686	777,417	779,317	781,089	782,966	784,937	787,031	789,269	791,689	794,266

*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:					
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Decatur	2,940	2,943	2,947	2,954	2,959	2,964	2,970	2,977	2,984	2,992	3,000
Hamilton	37,585	37,653	37,697	37,777	37,844	37,913	37,986	38,061	38,144	38,229	38,317
Hendricks	18,232	18,271	18,320	18,356	18,397	18,441	18,488	18,537	18,589	18,646	18,707
Johnson	18,990	19,020	19,067	19,136	19,185	19,238	19,295	19,357	19,423	19,494	19,570
Lake	57,180	57,268	57,307	57,369	57,432	57,499	57,571	57,645	57,723	57,806	57,894
Madison	13,675	13,719	13,751	13,809	13,851	13,898	13,948	14,000	14,056	14,118	14,184
Marion	106,406	106,687	106,867	107,114	107,362	107,621	107,901	108,197	108,508	108,840	109,190
St. Joseph	37,480	37,508	37,547	37,598	37,641	37,688	37,737	37,792	37,849	37,911	37,976

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:											
	8/2	8/3	8/4	8/5	8/7				8/9				8/11			
Decatur	2,940	2,943	2,947	2,954	2,964	(593)	[142]	{71}	2,977	(595)	[143]	{71}	2,992	(598)	[144]	{72}
Hamilton	37,585	37,653	37,697	37,777	37,913	(7,583)	[1,820]	{910}	38,061	(7,612)	[1,827]	{913}	38,229	(7,646)	[1,835]	{917}
Hendricks	18,232	18,271	18,320	18,356	18,441	(3,688)	[885]	{443}	18,537	(3,707)	[890]	{445}	18,646	(3,729)	[895]	{448}
Johnson	18,990	19,020	19,067	19,136	19,238	(3,848)	[923]	{462}	19,357	(3,871)	[929]	{465}	19,494	(3,899)	[936]	{468}
Lake	57,180	57,268	57,307	57,369	57,499	(11,500)	[2,760]	{1,380}	57,645	(11,529)	[2,767]	{1,383}	57,806	(11,561)	[2,775]	{1,387}
Madison	13,675	13,719	13,751	13,809	13,898	(2,780)	[667]	{334}	14,000	(2,800)	[672]	{336}	14,118	(2,824)	[678]	{339}
Marion	106,406	106,687	106,867	107,114	107,621	(21,524)	[5,166]	{2,583}	108,197	(21,639)	[5,193]	{2,597}	108,840	(21,768)	[5,224]	{2,612}
St. Joseph	37,480	37,508	37,547	37,598	37,688	(7,538)	[1,809]	{905}	37,792	(7,558)	[1,814]	{907}	37,911	(7,582)	[1,820]	{910}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.