

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

Date: 8/18/21

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 8/18/21 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.**

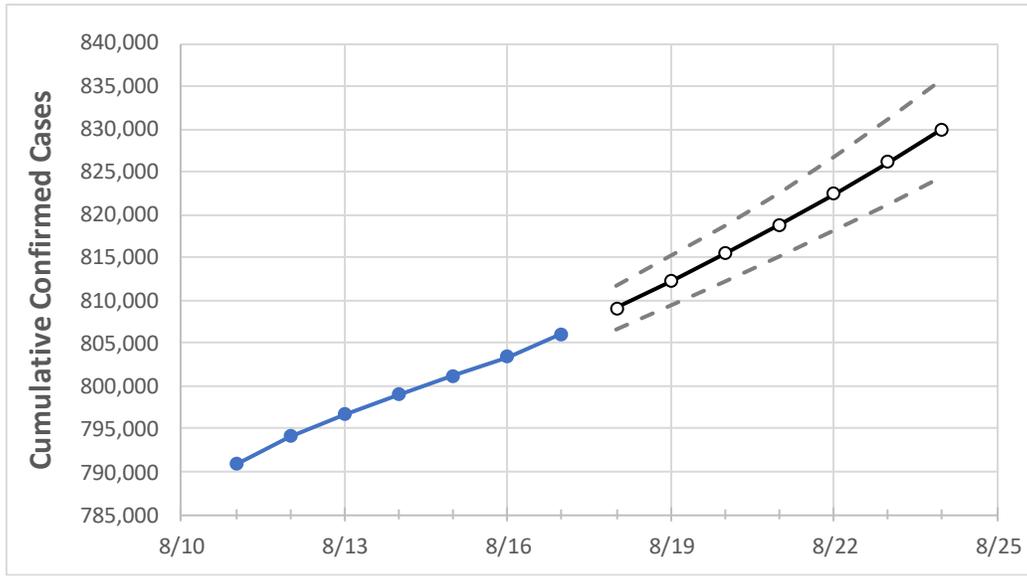
### IEM's Modeling Lead

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Indiana	798,956	801,180	803,403	806,094	809,083	812,210	815,460	818,879	822,430	826,136	830,039	

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Decatur	3,048	3,060	3,073	3,091	3,110	3,130	3,153	3,179	3,208	3,240	3,275	
Hamilton	38,540	38,647	38,753	38,848	38,967	39,093	39,223	39,360	39,504	39,655	39,812	
Hendricks	18,833	18,884	18,934	19,010	19,085	19,162	19,245	19,332	19,422	19,519	19,620	
Johnson	19,698	19,772	19,846	19,918	20,010	20,108	20,212	20,322	20,438	20,561	20,693	
Lake	58,023	58,090	58,157	58,287	58,391	58,500	58,615	58,735	58,861	58,997	59,136	
Madison	14,288	14,336	14,384	14,437	14,503	14,572	14,643	14,718	14,796	14,876	14,960	
Marion	109,858	110,186	110,514	110,865	111,276	111,706	112,156	112,623	113,112	113,622	114,157	
St. Joseph	37,996	38,045	38,095	38,143	38,201	38,262	38,326	38,391	38,460	38,531	38,602	

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:											
	8/14	8/15	8/16	8/17	8/19				8/21				8/23			
Decatur	3,048	3,060	3,073	3,091	3,130 (626) [150] {75}				3,179 (636) [153] {76}				3,240 (648) [156] {78}			
Hamilton	38,540	38,647	38,753	38,848	39,093 (7,819) [1,876] {938}				39,360 (7,872) [1,889] {945}				39,655 (7,931) [1,903] {952}			
Hendricks	18,833	18,884	18,934	19,010	19,162 (3,832) [920] {460}				19,332 (3,866) [928] {464}				19,519 (3,904) [937] {468}			
Johnson	19,698	19,772	19,846	19,918	20,108 (4,022) [965] {483}				20,322 (4,064) [975] {488}				20,561 (4,112) [987] {493}			
Lake	58,023	58,090	58,157	58,287	58,500 (11,700) [2,808] {1,404}				58,735 (11,747) [2,819] {1,410}				58,997 (11,799) [2,832] {1,416}			
Madison	14,288	14,336	14,384	14,437	14,572 (2,914) [699] {350}				14,718 (2,944) [706] {353}				14,876 (2,975) [714] {357}			
Marion	109,858	110,186	110,514	110,865	111,706 (22,341) [5,362] {2,681}				112,623 (22,525) [5,406] {2,703}				113,622 (22,724) [5,454] {2,727}			
St. Joseph	37,996	38,045	38,095	38,143	38,262 (7,652) [1,837] {918}				38,391 (7,678) [1,843] {921}				38,531 (7,706) [1,849] {925}			

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.