

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

**Date: 6/21/21**

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 6/21/21 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.**

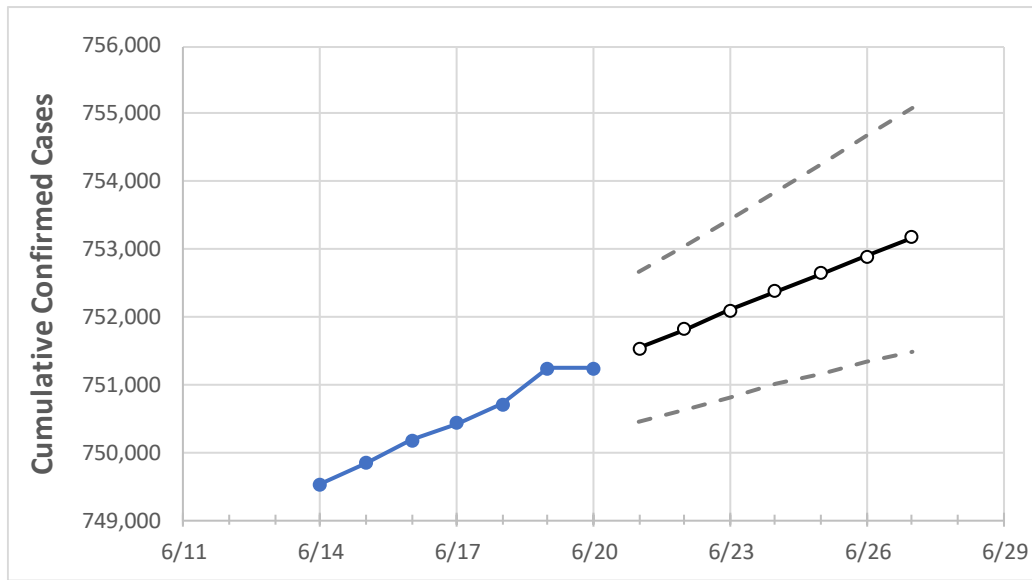
### **IEM's Modeling Lead**

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:						
	6/17	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Indiana	750,432	750,702	751,242	751,242	751,533	751,811	752,096	752,372	752,643	752,902	753,172

*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:						
	6/17	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Decatur	2,899	2,899	2,899	2,899	2,900	2,900	2,901	2,901	2,902	2,902	2,903
Hamilton	36,561	36,570	36,588	36,588	36,600	36,613	36,624	36,635	36,647	36,658	36,668
Hendricks	17,608	17,615	17,682	17,682	17,695	17,709	17,723	17,738	17,753	17,769	17,785
Johnson	18,432	18,452	18,471	18,471	18,482	18,493	18,505	18,516	18,528	18,540	18,552
Lake	55,641	55,680	55,691	55,691	55,732	55,774	55,813	55,855	55,896	55,938	55,980
Madison	13,139	13,141	13,149	13,149	13,153	13,156	13,160	13,164	13,167	13,170	13,173
Marion	103,199	103,237	103,293	103,293	103,331	103,368	103,404	103,439	103,472	103,506	103,538
St. Joseph	36,974	36,983	36,990	36,990	36,996	37,003	37,009	37,014	37,020	37,025	37,029

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:											
	6/17	6/18	6/19	6/20	6/22				6/24				6/26			
Decatur	2,899	2,899	2,899	2,899	2,900	(580)	[139]	{70}	2,901	(580)	[139]	{70}	2,902	(580)	[139]	{70}
Hamilton	36,561	36,570	36,588	36,588	36,613	(7,323)	[1,757]	{879}	36,635	(7,327)	[1,759]	{879}	36,658	(7,332)	[1,760]	{880}
Hendricks	17,608	17,615	17,682	17,682	17,709	(3,542)	[850]	{425}	17,738	(3,548)	[851]	{426}	17,769	(3,554)	[853]	{426}
Johnson	18,432	18,452	18,471	18,471	18,493	(3,699)	[888]	{444}	18,516	(3,703)	[889]	{444}	18,540	(3,708)	[890]	{445}
Lake	55,641	55,680	55,691	55,691	55,774	(11,155)	[2,677]	{1,339}	55,855	(11,171)	[2,681]	{1,341}	55,938	(11,188)	[2,685]	{1,343}
Madison	13,139	13,141	13,149	13,149	13,156	(2,631)	[632]	{316}	13,164	(2,633)	[632]	{316}	13,170	(2,634)	[632]	{316}
Marion	103,199	103,237	103,293	103,293	103,368	(20,674)	[4,962]	{2,481}	103,439	(20,688)	[4,965]	{2,483}	103,506	(20,701)	[4,968]	{2,484}
St. Joseph	36,974	36,983	36,990	36,990	37,003	(7,401)	[1,776]	{888}	37,014	(7,403)	[1,777]	{888}	37,025	(7,405)	[1,777]	{889}

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.