

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/19/21**

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 11/19/21 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.

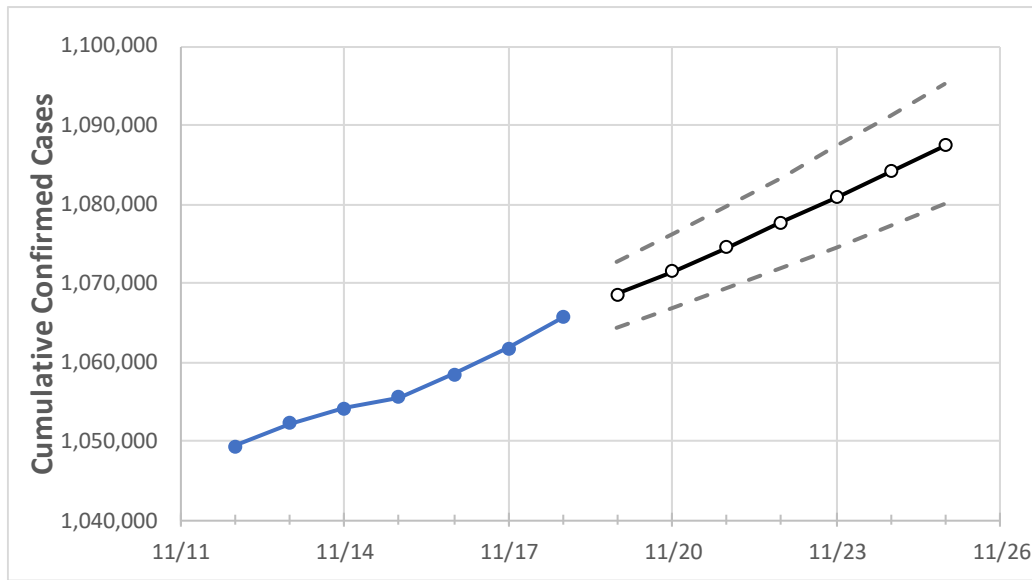
IEM's Modeling Lead

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Indiana	1,055,549	1,058,379	1,061,791	1,065,717	1,068,585	1,071,507	1,074,573	1,077,672	1,080,826	1,084,090	1,087,425

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Decatur	4,356	4,365	4,384	4,395	4,409	4,424	4,439	4,456	4,472	4,489	4,507
Hamilton	48,258	48,366	48,522	48,698	48,825	48,952	49,086	49,219	49,361	49,506	49,653
Hendricks	24,835	24,888	24,968	25,033	25,092	25,150	25,209	25,272	25,335	25,399	25,466
Johnson	26,126	26,227	26,324	26,421	26,488	26,558	26,626	26,698	26,772	26,849	26,928
Lake	68,988	69,152	69,297	69,489	69,635	69,782	69,933	70,086	70,243	70,402	70,568
Madison	19,776	19,845	19,927	20,016	20,083	20,150	20,220	20,291	20,364	20,439	20,517
Marion	139,879	140,209	140,495	140,858	141,114	141,371	141,643	141,912	142,192	142,475	142,760
St. Joseph	46,725	46,862	47,021	47,218	47,363	47,510	47,656	47,807	47,963	48,126	48,290

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:											
	11/15	11/16	11/17	11/18	11/20				11/22				11/24			
Decatur	4,356	4,365	4,384	4,395	4,424	(885)	[212]	{106}	4,456	(891)	[214]	{107}	4,489	(898)	[215]	{108}
Hamilton	48,258	48,366	48,522	48,698	48,952	(9,790)	[2,350]	{1,175}	49,219	(9,844)	[2,362]	{1,181}	49,506	(9,901)	[2,376]	{1,188}
Hendricks	24,835	24,888	24,968	25,033	25,150	(5,030)	[1,207]	{604}	25,272	(5,054)	[1,213]	{607}	25,399	(5,080)	[1,219]	{610}
Johnson	26,126	26,227	26,324	26,421	26,558	(5,312)	[1,275]	{637}	26,698	(5,340)	[1,282]	{641}	26,849	(5,370)	[1,289]	{644}
Lake	68,988	69,152	69,297	69,489	69,782	(13,956)	[3,350]	{1,675}	70,086	(14,017)	[3,364]	{1,682}	70,402	(14,080)	[3,379]	{1,690}
Madison	19,776	19,845	19,927	20,016	20,150	(4,030)	[967]	{484}	20,291	(4,058)	[974]	{487}	20,439	(4,088)	[981]	{491}
Marion	139,879	140,209	140,495	140,858	141,371	(28,274)	[6,786]	{3,393}	141,912	(28,382)	[6,812]	{3,406}	142,475	(28,495)	[6,839]	{3,419}
St. Joseph	46,725	46,862	47,021	47,218	47,510	(9,502)	[2,280]	{1,140}	47,807	(9,561)	[2,295]	{1,147}	48,126	(9,625)	[2,310]	{1,155}

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.