

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

Date: 6/8/21

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 6/8/21 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.

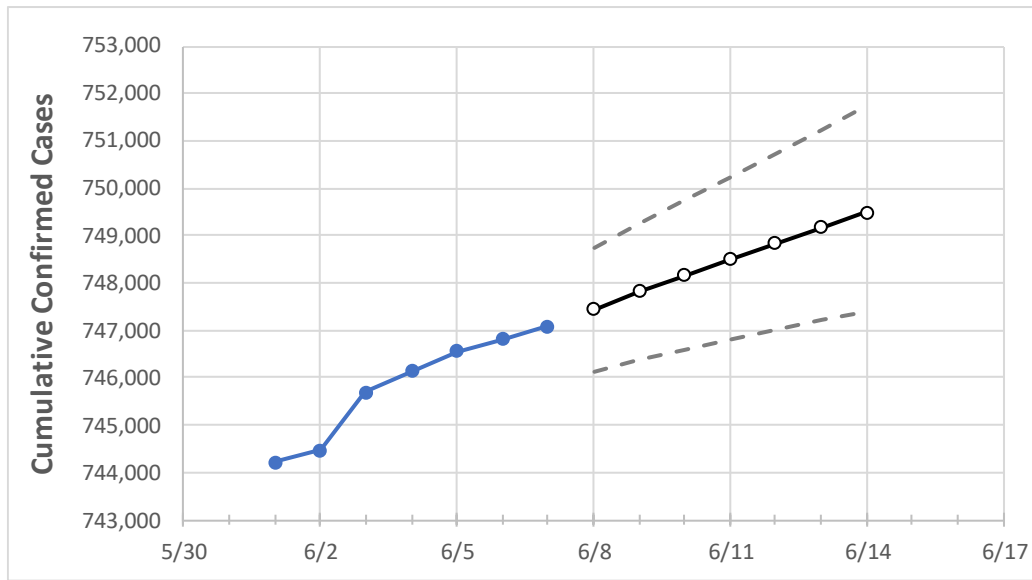
IEM's Modeling Lead

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:						
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14
Indiana	746,135	746,554	746,819	747,083	747,452	747,814	748,167	748,507	748,843	749,166	749,485

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:						
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14
Decatur	2,892	2,897	2,897	2,897	2,899	2,901	2,903	2,905	2,907	2,909	2,911
Hamilton	36,367	36,386	36,399	36,411	36,424	36,436	36,447	36,458	36,469	36,479	36,489
Hendricks	17,517	17,526	17,531	17,535	17,541	17,546	17,551	17,556	17,561	17,565	17,569
Johnson	18,328	18,335	18,339	18,342	18,348	18,354	18,360	18,366	18,372	18,377	18,382
Lake	55,086	55,116	55,139	55,161	55,181	55,199	55,217	55,233	55,248	55,262	55,275
Madison	13,062	13,073	13,081	13,089	13,098	13,107	13,115	13,124	13,133	13,141	13,150
Marion	102,562	102,638	102,677	102,715	102,756	102,796	102,833	102,869	102,901	102,934	102,966
St. Joseph	36,827	36,848	36,859	36,870	36,883	36,894	36,905	36,916	36,926	36,935	36,944

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:											
	6/4	6/5	6/6	6/7	6/9				6/11				6/13			
Decatur	2,892	2,897	2,897	2,897	2,901	(580)	[139]	{70}	2,905	(581)	[139]	{70}	2,909	(582)	[140]	{70}
Hamilton	36,367	36,386	36,399	36,411	36,436	(7,287)	[1,749]	{874}	36,458	(7,292)	[1,750]	{875}	36,479	(7,296)	[1,751]	{876}
Hendricks	17,517	17,526	17,531	17,535	17,546	(3,509)	[842]	{421}	17,556	(3,511)	[843]	{421}	17,565	(3,513)	[843]	{422}
Johnson	18,328	18,335	18,339	18,342	18,354	(3,671)	[881]	{441}	18,366	(3,673)	[882]	{441}	18,377	(3,675)	[882]	{441}
Lake	55,086	55,116	55,139	55,161	55,199	(11,040)	[2,650]	{1,325}	55,233	(11,047)	[2,651]	{1,326}	55,262	(11,052)	[2,653]	{1,326}
Madison	13,062	13,073	13,081	13,089	13,107	(2,621)	[629]	{315}	13,124	(2,625)	[630]	{315}	13,141	(2,628)	[631]	{315}
Marion	102,562	102,638	102,677	102,715	102,796	(20,559)	[4,934]	{2,467}	102,869	(20,574)	[4,938]	{2,469}	102,934	(20,587)	[4,941]	{2,470}
St. Joseph	36,827	36,848	36,859	36,870	36,894	(7,379)	[1,771]	{885}	36,916	(7,383)	[1,772]	{886}	36,935	(7,387)	[1,773]	{886}

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.