

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

Date: 6/14/21

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 6/14/21 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.

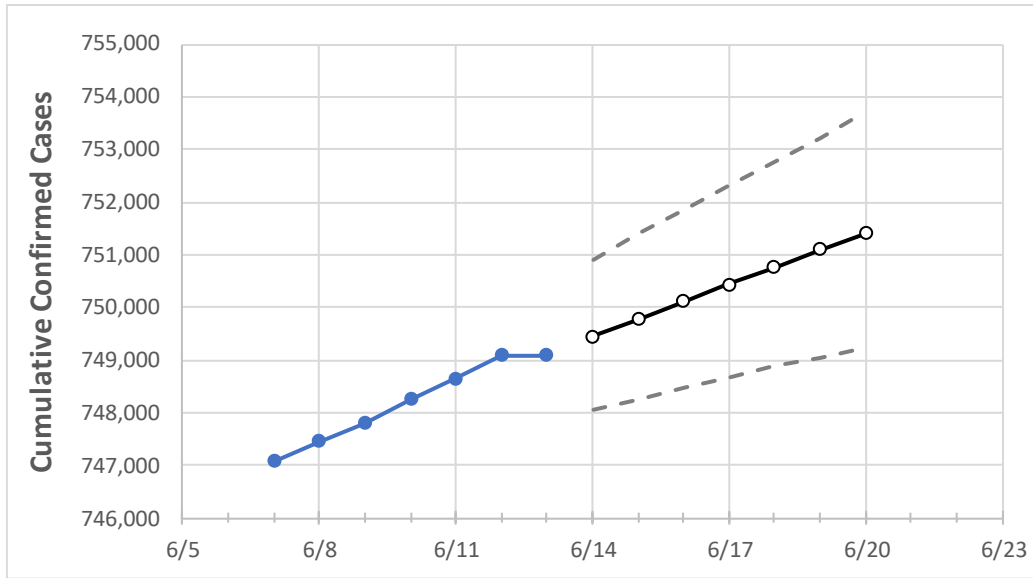
IEM's Modeling Lead

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20
Indiana	748,259	748,654	749,097	749,097	749,442	749,779	750,117	750,443	750,768	751,097	751,404

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20
Decatur	2,898	2,899	2,899	2,899	2,900	2,901	2,902	2,903	2,903	2,904	2,905
Hamilton	36,462	36,487	36,505	36,505	36,518	36,531	36,543	36,555	36,567	36,579	36,590
Hendricks	17,572	17,578	17,583	17,583	17,589	17,596	17,602	17,608	17,614	17,620	17,625
Johnson	18,369	18,377	18,386	18,386	18,392	18,399	18,404	18,410	18,416	18,422	18,427
Lake	55,275	55,330	55,421	55,421	55,450	55,477	55,504	55,530	55,557	55,583	55,607
Madison	13,101	13,105	13,111	13,111	13,117	13,123	13,128	13,134	13,139	13,144	13,149
Marion	102,920	102,980	103,027	103,027	103,069	103,111	103,150	103,189	103,227	103,265	103,300
St. Joseph	36,908	36,919	36,933	36,933	36,943	36,951	36,960	36,968	36,976	36,983	36,989

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:											
	6/10	6/11	6/12	6/13	6/15				6/17				6/19			
Decatur	2,898	2,899	2,899	2,899	2,901	(580)	[139]	{70}	2,903	(581)	[139]	{70}	2,904	(581)	[139]	{70}
Hamilton	36,462	36,487	36,505	36,505	36,531	(7,306)	[1,753]	{877}	36,555	(7,311)	[1,755]	{877}	36,579	(7,316)	[1,756]	{878}
Hendricks	17,572	17,578	17,583	17,583	17,596	(3,519)	[845]	{422}	17,608	(3,522)	[845]	{423}	17,620	(3,524)	[846]	{423}
Johnson	18,369	18,377	18,386	18,386	18,399	(3,680)	[883]	{442}	18,410	(3,682)	[884]	{442}	18,422	(3,684)	[884]	{442}
Lake	55,275	55,330	55,421	55,421	55,477	(11,095)	[2,663]	{1,331}	55,530	(11,106)	[2,665]	{1,333}	55,583	(11,117)	[2,668]	{1,334}
Madison	13,101	13,105	13,111	13,111	13,123	(2,625)	[630]	{315}	13,134	(2,627)	[630]	{315}	13,144	(2,629)	[631]	{315}
Marion	102,920	102,980	103,027	103,027	103,111	(20,622)	[4,949]	{2,475}	103,189	(20,638)	[4,953]	{2,477}	103,265	(20,653)	[4,957]	{2,478}
St. Joseph	36,908	36,919	36,933	36,933	36,951	(7,390)	[1,774]	{887}	36,968	(7,394)	[1,774]	{887}	36,983	(7,397)	[1,775]	{888}

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.