

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

Date: 10/13/21

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 10/13/21 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.

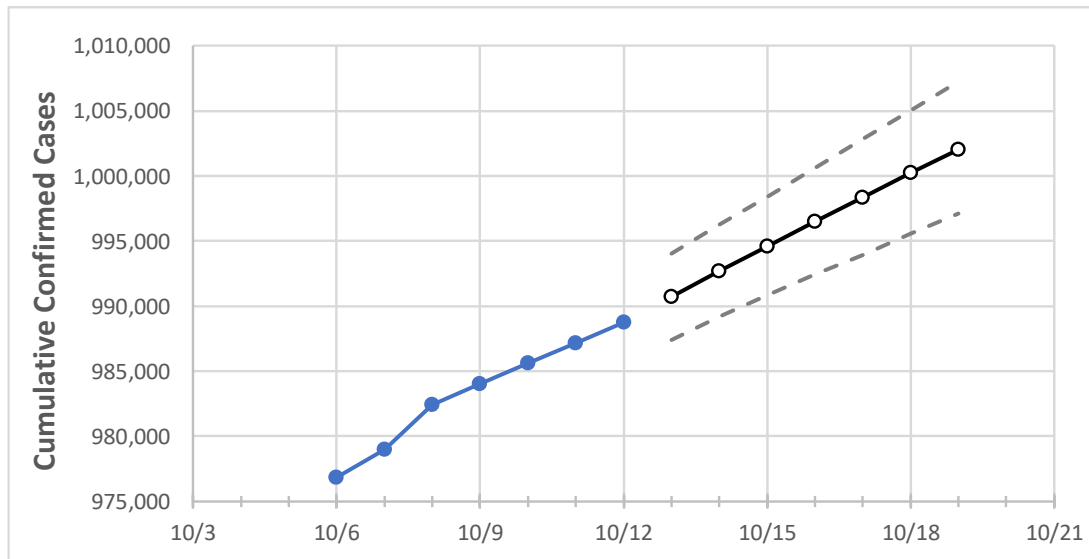
IEM's Modeling Lead

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Indiana	984,017	985,591	987,164	988,765	990,736	992,705	994,567	996,481	998,370	1,000,231	1,002,032

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Decatur	4,053	4,059	4,066	4,076	4,086	4,095	4,104	4,114	4,123	4,132	4,141
Hamilton	45,487	45,561	45,636	45,693	45,773	45,853	45,932	46,009	46,086	46,162	46,237
Hendricks	23,363	23,408	23,453	23,488	23,541	23,594	23,647	23,699	23,749	23,801	23,852
Johnson	24,562	24,593	24,625	24,657	24,702	24,746	24,789	24,831	24,872	24,914	24,956
Lake	65,225	65,304	65,384	65,464	65,555	65,645	65,733	65,819	65,906	65,991	66,073
Madison	18,240	18,275	18,309	18,348	18,390	18,433	18,473	18,512	18,552	18,592	18,630
Marion	133,084	133,272	133,459	133,643	133,845	134,041	134,228	134,418	134,606	134,789	134,964
St. Joseph	43,504	43,573	43,643	43,691	43,774	43,856	43,936	44,017	44,100	44,181	44,264

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:											
	10/9	10/10	10/11	10/12	10/14				10/16				10/18			
Decatur	4,053	4,059	4,066	4,076	4,095	(819)	[197]	{98}	4,114	(823)	[197]	{99}	4,132	(826)	[198]	{99}
Hamilton	45,487	45,561	45,636	45,693	45,853	(9,171)	[2,201]	{1,100}	46,009	(9,202)	[2,208]	{1,104}	46,162	(9,232)	[2,216]	{1,108}
Hendricks	23,363	23,408	23,453	23,488	23,594	(4,719)	[1,133]	{566}	23,699	(4,740)	[1,138]	{569}	23,801	(4,760)	[1,142]	{571}
Johnson	24,562	24,593	24,625	24,657	24,746	(4,949)	[1,188]	{594}	24,831	(4,966)	[1,192]	{596}	24,914	(4,983)	[1,196]	{598}
Lake	65,225	65,304	65,384	65,464	65,645	(13,129)	[3,151]	{1,575}	65,819	(13,164)	[3,159]	{1,580}	65,991	(13,198)	[3,168]	{1,584}
Madison	18,240	18,275	18,309	18,348	18,433	(3,687)	[885]	{442}	18,512	(3,702)	[889]	{444}	18,592	(3,718)	[892]	{446}
Marion	133,084	133,272	133,459	133,643	134,041	(26,808)	[6,434]	{3,217}	134,418	(26,884)	[6,452]	{3,226}	134,789	(26,958)	[6,470]	{3,235}
St. Joseph	43,504	43,573	43,643	43,691	43,856	(8,771)	[2,105]	{1,053}	44,017	(8,803)	[2,113]	{1,056}	44,181	(8,836)	[2,121]	{1,060}

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.