

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/13/21**

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 9/13/21 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.

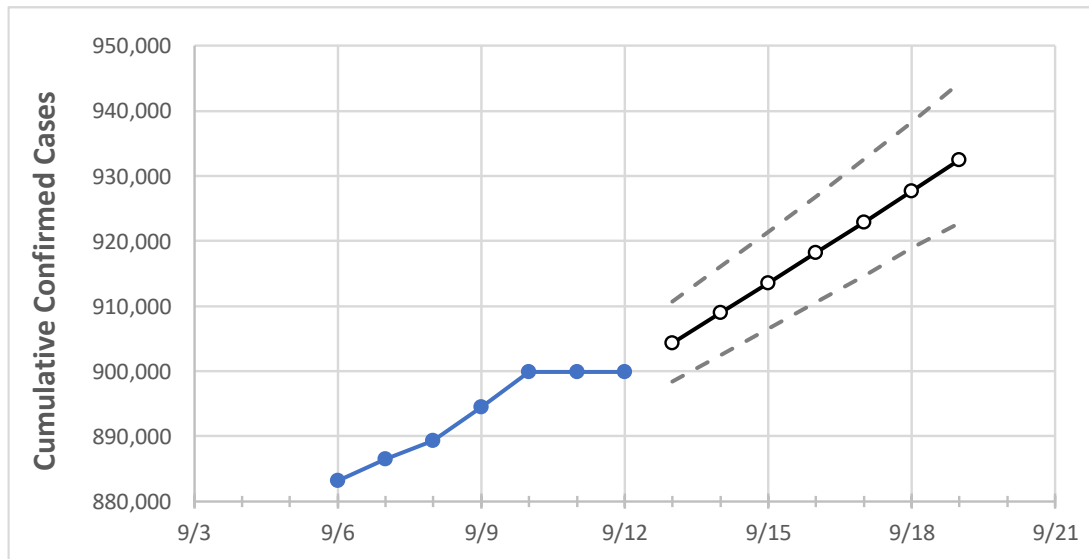
IEM's Modeling Lead

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Indiana	894,516	899,844	899,844	899,844	904,318	908,928	913,553	918,151	922,870	927,664	932,492

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Decatur	3,610	3,657	3,657	3,657	3,683	3,707	3,734	3,761	3,787	3,814	3,841
Hamilton	42,070	42,261	42,261	42,261	42,418	42,578	42,736	42,896	43,055	43,222	43,385
Hendricks	21,082	21,225	21,225	21,225	21,338	21,450	21,563	21,679	21,796	21,918	22,040
Johnson	22,553	22,694	22,694	22,694	22,814	22,933	23,050	23,170	23,290	23,412	23,532
Lake	61,393	61,604	61,604	61,604	61,793	61,984	62,178	62,375	62,577	62,785	62,997
Madison	16,389	16,493	16,493	16,493	16,581	16,670	16,760	16,847	16,939	17,027	17,119
Marion	122,136	122,873	122,873	122,873	123,470	124,057	124,659	125,265	125,879	126,506	127,134
St. Joseph	40,448	40,597	40,597	40,597	40,737	40,882	41,028	41,176	41,330	41,480	41,640

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:											
	9/9	9/10	9/11	9/12	9/14				9/16				9/18			
Decatur	3,610	3,657	3,657	3,657	3,707 (741) [178] {89}				3,761 (752) [181] {90}				3,814 (763) [183] {92}			
Hamilton	42,070	42,261	42,261	42,261	42,578 (8,516) [2,044] {1,022}				42,896 (8,579) [2,059] {1,030}				43,222 (8,644) [2,075] {1,037}			
Hendricks	21,082	21,225	21,225	21,225	21,450 (4,290) [1,030] {515}				21,679 (4,336) [1,041] {520}				21,918 (4,384) [1,052] {526}			
Johnson	22,553	22,694	22,694	22,694	22,933 (4,587) [1,101] {550}				23,170 (4,634) [1,112] {556}				23,412 (4,682) [1,124] {562}			
Lake	61,393	61,604	61,604	61,604	61,984 (12,397) [2,975] {1,488}				62,375 (12,475) [2,994] {1,497}				62,785 (12,557) [3,014] {1,507}			
Madison	16,389	16,493	16,493	16,493	16,670 (3,334) [800] {400}				16,847 (3,369) [809] {404}				17,027 (3,405) [817] {409}			
Marion	122,136	122,873	122,873	122,873	124,057 (24,811) [5,955] {2,977}				125,265 (25,053) [6,013] {3,006}				126,506 (25,301) [6,072] {3,036}			
St. Joseph	40,448	40,597	40,597	40,597	40,882 (8,176) [1,962] {981}				41,176 (8,235) [1,976] {988}				41,480 (8,296) [1,991] {996}			

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.