

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

Date: 2/16/22

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 2/16/22 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.

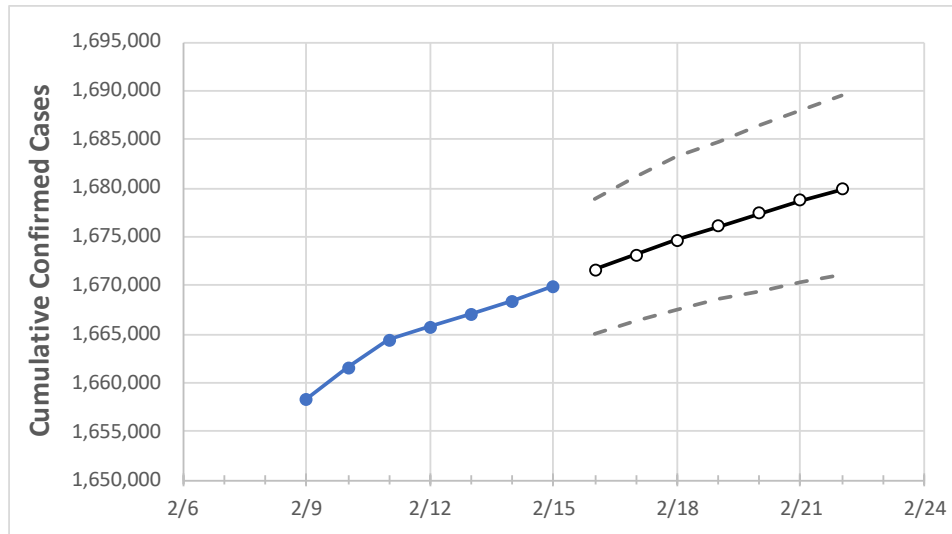
IEM's Modeling Lead

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:						
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22
Indiana	1,665,703	1,667,054	1,668,404	1,669,872	1,671,590	1,673,160	1,674,617	1,676,043	1,677,436	1,678,749	1,679,918

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:						
	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22
Decatur	6,890	6,897	6,904	6,920	6,931	6,940	6,950	6,959	6,968	6,976	6,983
Hamilton	80,291	80,349	80,406	80,457	80,525	80,596	80,656	80,710	80,771	80,818	80,870
Hendricks	40,182	40,210	40,237	40,260	40,297	40,329	40,360	40,388	40,415	40,442	40,464
Johnson	41,765	41,795	41,826	41,861	41,894	41,926	41,952	41,981	42,004	42,033	42,054
Lake	104,814	104,857	104,900	104,932	104,984	105,032	105,078	105,122	105,166	105,206	105,246
Madison	32,153	32,184	32,214	32,231	32,259	32,285	32,310	32,335	32,356	32,378	32,398
Marion	221,772	221,907	222,043	222,158	222,305	222,446	222,578	222,692	222,816	222,923	223,022
St. Joseph	69,644	69,686	69,729	69,781	69,832	69,877	69,921	69,960	70,001	70,037	70,069

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:											
	2/12	2/13	2/14	2/15	2/17			2/19			2/21					
Decatur	6,890	6,897	6,904	6,920	6,940	(1,388)	[333]	{167}	6,959	(1,392)	[334]	{167}	6,976	(1,395)	[335]	{167}
Hamilton	80,291	80,349	80,406	80,457	80,596	(16,119)	[3,869]	{1,934}	80,710	(16,142)	[3,874]	{1,937}	80,818	(16,164)	[3,879]	{1,940}
Hendricks	40,182	40,210	40,237	40,260	40,329	(8,066)	[1,936]	{968}	40,388	(8,078)	[1,939]	{969}	40,442	(8,088)	[1,941]	{971}
Johnson	41,765	41,795	41,826	41,861	41,926	(8,385)	[2,012]	{1,006}	41,981	(8,396)	[2,015]	{1,008}	42,033	(8,407)	[2,018]	{1,009}
Lake	104,814	104,857	104,900	104,932	105,032	(21,006)	[5,042]	{2,521}	105,122	(21,024)	[5,046]	{2,523}	105,206	(21,041)	[5,050]	{2,525}
Madison	32,153	32,184	32,214	32,231	32,285	(6,457)	[1,550]	{775}	32,335	(6,467)	[1,552]	{776}	32,378	(6,476)	[1,554]	{777}
Marion	221,772	221,907	222,043	222,158	222,446	(44,489)	[10,677]	{5,339}	222,692	(44,538)	[10,689]	{5,345}	222,923	(44,585)	[10,700]	{5,350}
St. Joseph	69,644	69,686	69,729	69,781	69,877	(13,975)	[3,354]	{1,677}	69,960	(13,992)	[3,358]	{1,679}	70,037	(14,007)	[3,362]	{1,681}

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.