

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/22/21**

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 12/22/21 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.

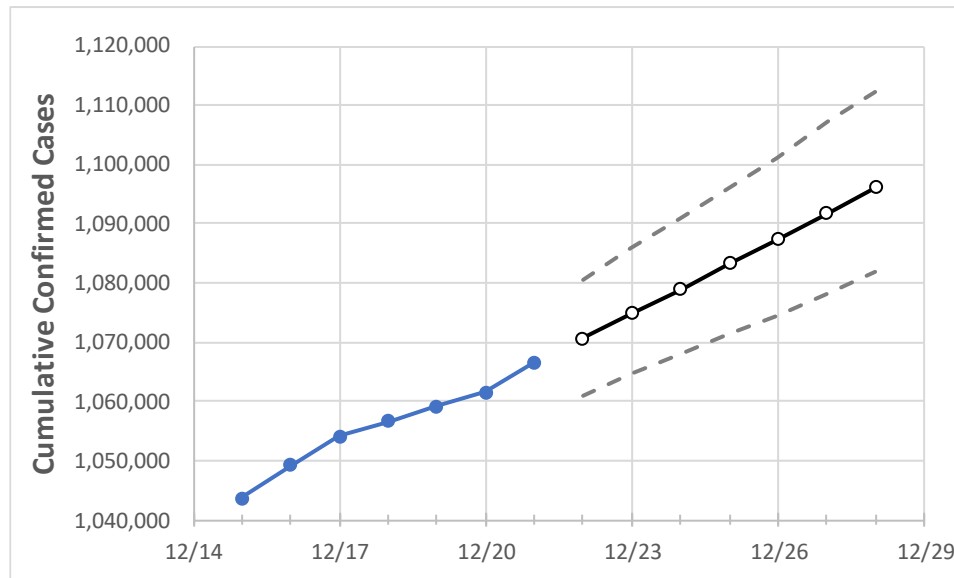
IEM's Modeling Lead

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.

Wisconsin State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Wisconsin	1,056,667	1,059,142	1,061,618	1,066,544	1,070,737	1,074,867	1,078,870	1,083,249	1,087,420	1,091,744	1,096,098

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.

Wisconsin Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
Dane	67,569	67,815	68,061	68,574	68,955	69,345	69,732	70,157	70,576	71,018	71,472
Milwaukee	171,268	171,598	171,927	172,995	173,659	174,318	174,991	175,675	176,384	177,072	177,801
Ozaukee	14,664	14,721	14,779	14,830	14,893	14,957	15,021	15,088	15,154	15,221	15,289
Washington	27,211	27,280	27,348	27,458	27,550	27,642	27,733	27,825	27,918	28,008	28,099
Waukesha	74,490	74,612	74,733	75,064	75,319	75,572	75,830	76,076	76,330	76,584	76,845

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.

Wisconsin Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	12/18	12/19	12/20	12/21	12/23				12/25				12/27			
Dane	67,569	67,815	68,061	68,574	69,345	(13,869)	[3,329]	{1,664}	70,157	(14,031)	[3,368]	{1,684}	71,018	(14,204)	[3,409]	{1,704}
Milwaukee	171,268	171,598	171,927	172,995	174,318	(34,864)	[8,367]	{4,184}	175,675	(35,135)	[8,432]	{4,216}	177,072	(35,414)	[8,499]	{4,250}
Ozaukee	14,664	14,721	14,779	14,830	14,957	(2,991)	[718]	{359}	15,088	(3,018)	[724]	{362}	15,221	(3,044)	[731]	{365}
Washington	27,211	27,280	27,348	27,458	27,642	(5,528)	[1,327]	{663}	27,825	(5,565)	[1,336]	{668}	28,008	(5,602)	[1,344]	{672}
Waukesha	74,490	74,612	74,733	75,064	75,572	(15,114)	[3,627]	{1,814}	76,076	(15,215)	[3,652]	{1,826}	76,584	(15,317)	[3,676]	{1,838}

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.