

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

Date: 1/21/22

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 1/21/22 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.**

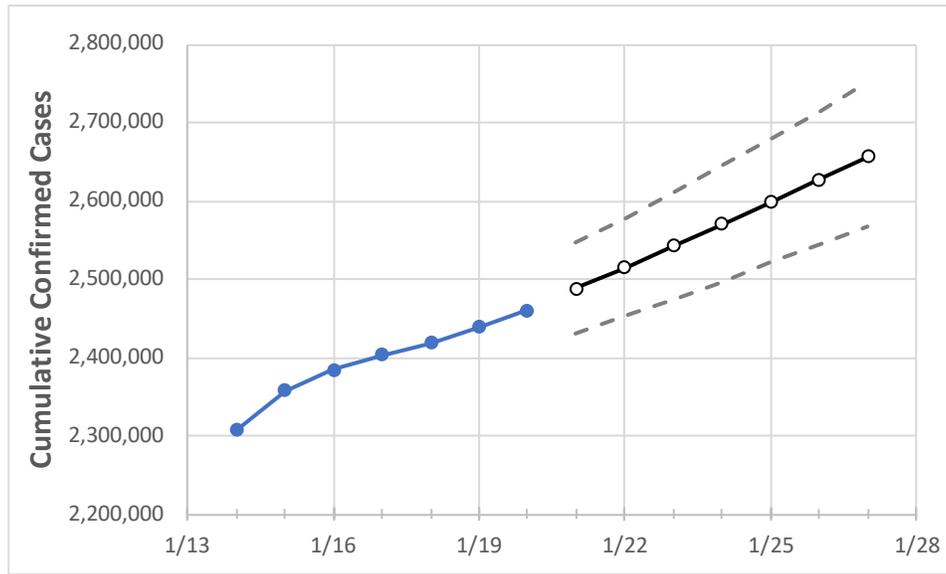
### IEM's Modeling Lead

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.

Ohio State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	
Ohio	2,403,645	2,418,722	2,439,205	2,460,869	2,488,427	2,515,298	2,542,311	2,570,717	2,597,943	2,627,925	2,656,294	

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.

Ohio Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	
Athens	11,949	11,991	12,126	12,272	12,612	12,957	13,305	13,700	14,089	14,512	14,944	
Cuyahoga	257,267	257,695	258,274	258,984	259,991	260,976	261,944	262,838	263,728	264,592	265,427	
Franklin	259,693	261,393	263,721	266,068	269,524	273,085	276,661	280,211	283,928	287,729	291,415	
Hamilton	166,671	167,931	169,609	171,129	173,835	176,454	179,209	182,023	184,823	187,881	190,760	
Lake	46,850	46,923	47,051	47,212	47,433	47,648	47,849	48,059	48,252	48,449	48,638	
Lorain	62,885	63,061	63,313	63,561	63,937	64,315	64,686	65,051	65,402	65,773	66,115	
Lucas	89,517	89,997	90,937	91,746	93,085	94,442	95,850	97,271	98,704	100,226	101,711	
Mahoning	49,735	49,909	50,162	50,412	50,918	51,419	51,945	52,424	52,961	53,471	53,998	
Medina	37,611	37,708	37,850	38,036	38,321	38,587	38,852	39,115	39,372	39,639	39,890	
Miami	22,806	23,075	23,274	23,567	23,885	24,214	24,549	24,897	25,264	25,639	26,024	
Summit	106,686	107,031	107,427	107,780	108,474	109,112	109,795	110,434	111,076	111,747	112,329	

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.

### Ohio Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	1/17	1/18	1/19	1/20	1/22			1/24			1/26					
Athens	11,949	11,991	12,126	12,272	12,957	(2,591)	[622]	{311}	13,700	(2,740)	[658]	{329}	14,512	(2,902)	[697]	{348}
Cuyahoga	257,267	257,695	258,274	258,984	260,976	(52,195)	[12,527]	{6,263}	262,838	(52,568)	[12,616]	{6,308}	264,592	(52,918)	[12,700]	{6,350}
Franklin	259,693	261,393	263,721	266,068	273,085	(54,617)	[13,108]	{6,554}	280,211	(56,042)	[13,450]	{6,725}	287,729	(57,546)	[13,811]	{6,905}
Hamilton	166,671	167,931	169,609	171,129	176,454	(35,291)	[8,470]	{4,235}	182,023	(36,405)	[8,737]	{4,369}	187,881	(37,576)	[9,018]	{4,509}
Lake	46,850	46,923	47,051	47,212	47,648	(9,530)	[2,287]	{1,144}	48,059	(9,612)	[2,307]	{1,153}	48,449	(9,690)	[2,326]	{1,163}
Lorain	62,885	63,061	63,313	63,561	64,315	(12,863)	[3,087]	{1,544}	65,051	(13,010)	[3,122]	{1,561}	65,773	(13,155)	[3,157]	{1,579}
Lucas	89,517	89,997	90,937	91,746	94,442	(18,888)	[4,533]	{2,267}	97,271	(19,454)	[4,669]	{2,335}	100,226	(20,045)	[4,811]	{2,405}
Mahoning	49,735	49,909	50,162	50,412	51,419	(10,284)	[2,468]	{1,234}	52,424	(10,485)	[2,516]	{1,258}	53,471	(10,694)	[2,567]	{1,283}
Medina	37,611	37,708	37,850	38,036	38,587	(7,717)	[1,852]	{926}	39,115	(7,823)	[1,878]	{939}	39,639	(7,928)	[1,903]	{951}
Miami	22,806	23,075	23,274	23,567	24,214	(4,843)	[1,162]	{581}	24,897	(4,979)	[1,195]	{598}	25,639	(5,128)	[1,231]	{615}
Summit	106,686	107,031	107,427	107,780	109,112	(21,822)	[5,237]	{2,619}	110,434	(22,087)	[5,301]	{2,650}	111,747	(22,349)	[5,364]	{2,682}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.