

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/8/21**

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 12/8/21 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.**

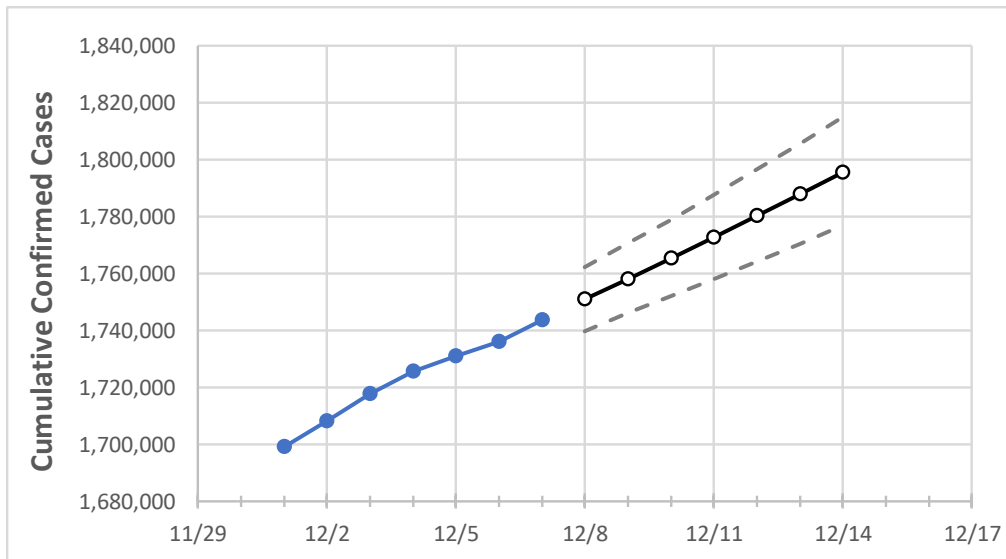
**IEM's Modeling Lead**

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.

## Ohio State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14
Ohio	1,725,669	1,731,003	1,735,925	1,743,801	1,750,994	1,758,049	1,765,430	1,772,779	1,780,348	1,787,848	1,795,648

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:						
	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14
Athens	8,401	8,418	8,428	8,449	8,469	8,489	8,509	8,530	8,551	8,573	8,595
Cuyahoga	169,146	169,866	170,504	171,282	172,158	173,039	173,947	174,862	175,796	176,736	177,738
Franklin	179,909	180,371	180,794	181,509	182,098	182,689	183,312	183,908	184,566	185,204	185,866
Hamilton	114,154	114,437	114,644	114,988	115,308	115,629	115,962	116,300	116,648	116,999	117,359
Lake	32,510	32,696	32,818	33,008	33,198	33,387	33,573	33,767	33,967	34,164	34,360
Lorain	42,555	42,754	42,941	43,171	43,429	43,690	43,952	44,216	44,493	44,776	45,054
Lucas	63,370	63,614	63,786	64,042	64,301	64,573	64,836	65,113	65,391	65,682	65,965
Mahoning	35,952	36,035	36,168	36,360	36,515	36,669	36,827	36,981	37,138	37,297	37,455
Medina	26,179	26,290	26,408	26,529	26,678	26,820	26,967	27,122	27,276	27,428	27,590
Miami	17,412	17,456	17,486	17,571	17,629	17,689	17,748	17,807	17,866	17,932	17,994
Summit	72,346	72,623	72,889	73,287	73,654	74,017	74,389	74,769	75,141	75,535	75,917

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:											
	12/4	12/5	12/6	12/7	12/9				12/11				12/13			
Athens	8,401	8,418	8,428	8,449	8,489	(1,698)	[407]	{204}	8,530	(1,706)	[409]	{205}	8,573	(1,715)	[411]	{206}
Cuyahoga	169,146	169,866	170,504	171,282	173,039	(34,608)	[8,306]	{4,153}	174,862	(34,972)	[8,393]	{4,197}	176,736	(35,347)	[8,483]	{4,242}
Franklin	179,909	180,371	180,794	181,509	182,689	(36,538)	[8,769]	{4,385}	183,908	(36,782)	[8,828]	{4,414}	185,204	(37,041)	[8,890]	{4,445}
Hamilton	114,154	114,437	114,644	114,988	115,629	(23,126)	[5,550]	{2,775}	116,300	(23,260)	[5,582]	{2,791}	116,999	(23,400)	[5,616]	{2,808}
Lake	32,510	32,696	32,818	33,008	33,387	(6,677)	[1,603]	{801}	33,767	(6,753)	[1,621]	{810}	34,164	(6,833)	[1,640]	{820}
Lorain	42,555	42,754	42,941	43,171	43,690	(8,738)	[2,097]	{1,049}	44,216	(8,843)	[2,122]	{1,061}	44,776	(8,955)	[2,149]	{1,075}
Lucas	63,370	63,614	63,786	64,042	64,573	(12,915)	[3,099]	{1,550}	65,113	(13,023)	[3,125]	{1,563}	65,682	(13,136)	[3,153]	{1,576}
Mahoning	35,952	36,035	36,168	36,360	36,669	(7,334)	[1,760]	{880}	36,981	(7,396)	[1,775]	{888}	37,297	(7,459)	[1,790]	{895}
Medina	26,179	26,290	26,408	26,529	26,820	(5,364)	[1,287]	{644}	27,122	(5,424)	[1,302]	{651}	27,428	(5,486)	[1,317]	{658}
Miami	17,412	17,456	17,486	17,571	17,689	(3,538)	[849]	{425}	17,807	(3,561)	[855]	{427}	17,932	(3,586)	[861]	{430}
Summit	72,346	72,623	72,889	73,287	74,017	(14,803)	[3,553]	{1,776}	74,769	(14,954)	[3,589]	{1,794}	75,535	(15,107)	[3,626]	{1,813}

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.