

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

**Date: 12/6/21**

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 12/6/21 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.**

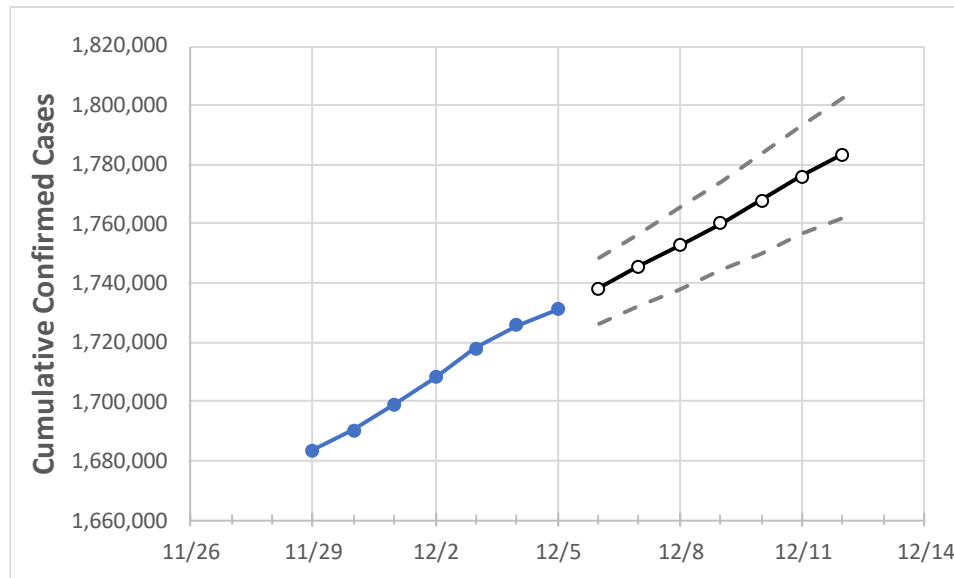
### **IEM's Modeling Lead**

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:						
	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12
Ohio	1,708,292	1,717,876	1,725,669	1,731,003	1,738,170	1,745,480	1,752,714	1,760,263	1,768,061	1,775,971	1,783,612

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:						
	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12
Athens	8,353	8,381	8,401	8,418	8,438	8,458	8,479	8,501	8,522	8,545	8,567
Cuyahoga	166,949	168,159	169,146	169,866	170,758	171,675	172,618	173,577	174,548	175,537	176,566
Franklin	178,565	179,329	179,909	180,371	180,950	181,547	182,150	182,777	183,395	184,037	184,707
Hamilton	113,285	113,772	114,154	114,437	114,764	115,084	115,420	115,766	116,112	116,470	116,822
Lake	32,124	32,314	32,510	32,696	32,885	33,081	33,276	33,478	33,677	33,887	34,096
Lorain	41,895	42,330	42,555	42,754	43,018	43,281	43,563	43,836	44,119	44,407	44,706
Lucas	62,708	63,029	63,370	63,614	63,875	64,144	64,417	64,695	64,985	65,278	65,576
Mahoning	35,635	35,798	35,952	36,035	36,186	36,336	36,486	36,636	36,786	36,943	37,094
Medina	25,825	26,042	26,179	26,290	26,439	26,588	26,742	26,897	27,054	27,221	27,383
Miami	17,196	17,338	17,412	17,456	17,509	17,567	17,621	17,675	17,731	17,796	17,851
Summit	71,540	71,953	72,346	72,623	72,980	73,358	73,721	74,099	74,484	74,882	75,276

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:											
	12/2	12/3	12/4	12/5	12/7				12/9				12/11			
Athens	8,353	8,381	8,401	8,418	8,458	(1,692)	[406]	{203}	8,501	(1,700)	[408]	{204}	8,545	(1,709)	[410]	{205}
Cuyahoga	166,949	168,159	169,146	169,866	171,675	(34,335)	[8,240]	{4,120}	173,577	(34,715)	[8,332]	{4,166}	175,537	(35,107)	[8,426]	{4,213}
Franklin	178,565	179,329	179,909	180,371	181,547	(36,309)	[8,714]	{4,357}	182,777	(36,555)	[8,773]	{4,387}	184,037	(36,807)	[8,834]	{4,417}
Hamilton	113,285	113,772	114,154	114,437	115,084	(23,017)	[5,524]	{2,762}	115,766	(23,153)	[5,557]	{2,778}	116,470	(23,294)	[5,591]	{2,795}
Lake	32,124	32,314	32,510	32,696	33,081	(6,616)	[1,588]	{794}	33,478	(6,696)	[1,607]	{803}	33,887	(6,777)	[1,627]	{813}
Lorain	41,895	42,330	42,555	42,754	43,281	(8,656)	[2,077]	{1,039}	43,836	(8,767)	[2,104]	{1,052}	44,407	(8,881)	[2,132]	{1,066}
Lucas	62,708	63,029	63,370	63,614	64,144	(12,829)	[3,079]	{1,539}	64,695	(12,939)	[3,105]	{1,553}	65,278	(13,056)	[3,133]	{1,567}
Mahoning	35,635	35,798	35,952	36,035	36,336	(7,267)	[1,744]	{872}	36,636	(7,327)	[1,759]	{879}	36,943	(7,389)	[1,773]	{887}
Medina	25,825	26,042	26,179	26,290	26,588	(5,318)	[1,276]	{638}	26,897	(5,379)	[1,291]	{646}	27,221	(5,444)	[1,307]	{653}
Miami	17,196	17,338	17,412	17,456	17,567	(3,513)	[843]	{422}	17,675	(3,535)	[848]	{424}	17,796	(3,559)	[854]	{427}
Summit	71,540	71,953	72,346	72,623	73,358	(14,672)	[3,521]	{1,761}	74,099	(14,820)	[3,557]	{1,778}	74,882	(14,976)	[3,594]	{1,797}

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.