

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

Date: 11/24/21

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 11/24/21 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.**

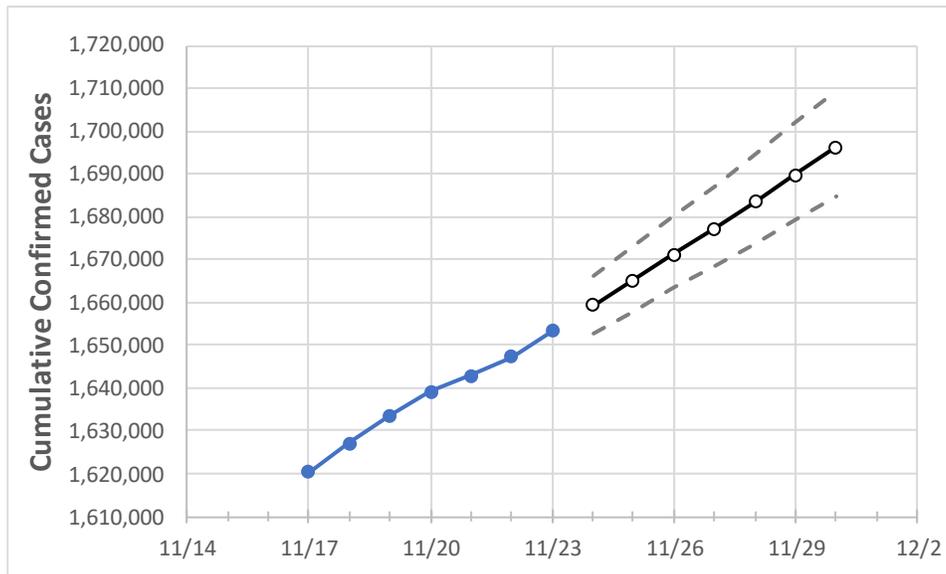
### IEM's Modeling Lead

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:							
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30	
Ohio	1,639,070	1,642,867	1,647,237	1,653,380	1,659,317	1,665,119	1,671,089	1,677,293	1,683,456	1,689,807	1,696,237	

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:							
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30	
Athens	8,171	8,178	8,194	8,208	8,224	8,241	8,258	8,275	8,292	8,310	8,329	
Cuyahoga	158,819	159,358	159,828	160,465	161,142	161,818	162,507	163,211	163,943	164,679	165,438	
Franklin	173,126	173,422	173,806	174,279	174,745	175,197	175,677	176,161	176,654	177,162	177,689	
Hamilton	110,497	110,637	110,791	111,034	111,270	111,509	111,751	112,001	112,246	112,503	112,759	
Lake	30,110	30,262	30,372	30,540	30,727	30,918	31,114	31,318	31,531	31,744	31,972	
Lorain	39,479	39,620	39,765	39,973	40,174	40,374	40,586	40,790	41,003	41,231	41,456	
Lucas	60,382	60,525	60,651	60,844	61,033	61,221	61,413	61,607	61,805	62,008	62,213	
Mahoning	33,855	33,954	34,114	34,264	34,421	34,579	34,739	34,906	35,071	35,241	35,415	
Medina	24,368	24,446	24,540	24,675	24,794	24,912	25,032	25,156	25,279	25,407	25,538	
Miami	16,729	16,748	16,787	16,832	16,874	16,916	16,958	17,000	17,042	17,084	17,125	
Summit	67,709	67,937	68,187	68,497	68,833	69,177	69,527	69,890	70,261	70,650	71,038	

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:											
	11/20	11/21	11/22	11/23	11/25			11/27			11/29					
Athens	8,171	8,178	8,194	8,208	8,241	(1,648)	[396]	{198}	8,275	(1,655)	[397]	{199}	8,310	(1,662)	[399]	{199}
Cuyahoga	158,819	159,358	159,828	160,465	161,818	(32,364)	[7,767]	{3,884}	163,211	(32,642)	[7,834]	{3,917}	164,679	(32,936)	[7,905]	{3,952}
Franklin	173,126	173,422	173,806	174,279	175,197	(35,039)	[8,409]	{4,205}	176,161	(35,232)	[8,456]	{4,228}	177,162	(35,432)	[8,504]	{4,252}
Hamilton	110,497	110,637	110,791	111,034	111,509	(22,302)	[5,352]	{2,676}	112,001	(22,400)	[5,376]	{2,688}	112,503	(22,501)	[5,400]	{2,700}
Lake	30,110	30,262	30,372	30,540	30,918	(6,184)	[1,484]	{742}	31,318	(6,264)	[1,503]	{752}	31,744	(6,349)	[1,524]	{762}
Lorain	39,479	39,620	39,765	39,973	40,374	(8,075)	[1,938]	{969}	40,790	(8,158)	[1,958]	{979}	41,231	(8,246)	[1,979]	{990}
Lucas	60,382	60,525	60,651	60,844	61,221	(12,244)	[2,939]	{1,469}	61,607	(12,321)	[2,957]	{1,479}	62,008	(12,402)	[2,976]	{1,488}
Mahoning	33,855	33,954	34,114	34,264	34,579	(6,916)	[1,660]	{830}	34,906	(6,981)	[1,675]	{838}	35,241	(7,048)	[1,692]	{846}
Medina	24,368	24,446	24,540	24,675	24,912	(4,982)	[1,196]	{598}	25,156	(5,031)	[1,207]	{604}	25,407	(5,081)	[1,220]	{610}
Miami	16,729	16,748	16,787	16,832	16,916	(3,383)	[812]	{406}	17,000	(3,400)	[816]	{408}	17,084	(3,417)	[820]	{410}
Summit	67,709	67,937	68,187	68,497	69,177	(13,835)	[3,320]	{1,660}	69,890	(13,978)	[3,355]	{1,677}	70,650	(14,130)	[3,391]	{1,696}

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.