

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

Date: 5/28/21

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 5/28/21 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.**

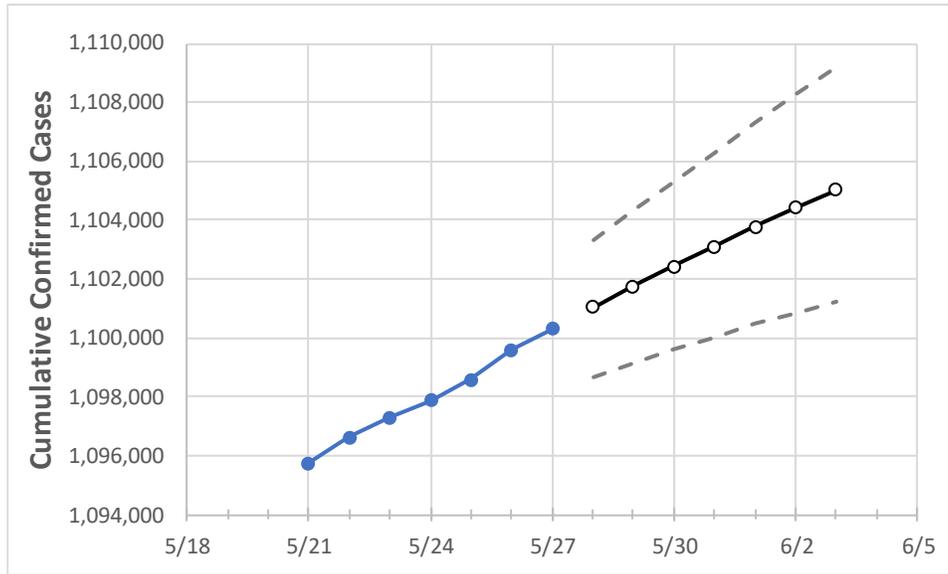
### IEM's Modeling Lead

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Ohio	1,097,867	1,098,594	1,099,580	1,100,312	1,101,029	1,101,748	1,102,422	1,103,089	1,103,769	1,104,405	1,105,026

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Athens	5,212	5,213	5,214	5,215	5,216	5,216	5,217	5,217	5,218	5,218	5,219
Cuyahoga	114,272	114,378	114,512	114,615	114,725	114,832	114,937	115,040	115,140	115,239	115,336
Franklin	127,421	127,494	127,615	127,698	127,770	127,839	127,908	127,974	128,036	128,098	128,158
Hamilton	80,741	80,780	80,825	80,850	80,884	80,916	80,947	80,977	81,007	81,037	81,064
Lake	20,981	20,991	21,009	21,023	21,038	21,052	21,066	21,080	21,093	21,106	21,119
Lorain	25,380	25,406	25,441	25,462	25,486	25,509	25,533	25,556	25,579	25,601	25,624
Lucas	42,907	42,945	42,982	43,018	43,048	43,076	43,104	43,131	43,156	43,180	43,203
Mahoning	22,027	22,045	22,090	22,112	22,142	22,172	22,203	22,233	22,263	22,292	22,323
Medina	15,472	15,486	15,493	15,508	15,520	15,531	15,543	15,555	15,566	15,578	15,589
Miami	10,752	10,762	10,771	10,779	10,786	10,794	10,802	10,810	10,819	10,828	10,838
Summit	47,932	47,953	48,000	48,037	48,072	48,105	48,137	48,168	48,198	48,228	48,256

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:											
	5/24	5/25	5/26	5/27	5/29			5/31			6/2					
Athens	5,212	5,213	5,214	5,215	5,216	(1,043)	[250]	{125}	5,217	(1,043)	[250]	{125}	5,218	(1,044)	[250]	{125}
Cuyahoga	114,272	114,378	114,512	114,615	114,832	(22,966)	[5,512]	{2,756}	115,040	(23,008)	[5,522]	{2,761}	115,239	(23,048)	[5,531]	{2,766}
Franklin	127,421	127,494	127,615	127,698	127,839	(25,568)	[6,136]	{3,068}	127,974	(25,595)	[6,143]	{3,071}	128,098	(25,620)	[6,149]	{3,074}
Hamilton	80,741	80,780	80,825	80,850	80,916	(16,183)	[3,884]	{1,942}	80,977	(16,195)	[3,887]	{1,943}	81,037	(16,207)	[3,890]	{1,945}
Lake	20,981	20,991	21,009	21,023	21,052	(4,210)	[1,010]	{505}	21,080	(4,216)	[1,012]	{506}	21,106	(4,221)	[1,013]	{507}
Lorain	25,380	25,406	25,441	25,462	25,509	(5,102)	[1,224]	{612}	25,556	(5,111)	[1,227]	{613}	25,601	(5,120)	[1,229]	{614}
Lucas	42,907	42,945	42,982	43,018	43,076	(8,615)	[2,068]	{1,034}	43,131	(8,626)	[2,070]	{1,035}	43,180	(8,636)	[2,073]	{1,036}
Mahoning	22,027	22,045	22,090	22,112	22,172	(4,434)	[1,064]	{532}	22,233	(4,447)	[1,067]	{534}	22,292	(4,458)	[1,070]	{535}
Medina	15,472	15,486	15,493	15,508	15,531	(3,106)	[746]	{373}	15,555	(3,111)	[747]	{373}	15,578	(3,116)	[748]	{374}
Miami	10,752	10,762	10,771	10,779	10,794	(2,159)	[518]	{259}	10,810	(2,162)	[519]	{259}	10,828	(2,166)	[520]	{260}
Summit	47,932	47,953	48,000	48,037	48,105	(9,621)	[2,309]	{1,155}	48,168	(9,634)	[2,312]	{1,156}	48,228	(9,646)	[2,315]	{1,157}

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.