

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

Date: 6/25/21

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 6/25/21 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.**

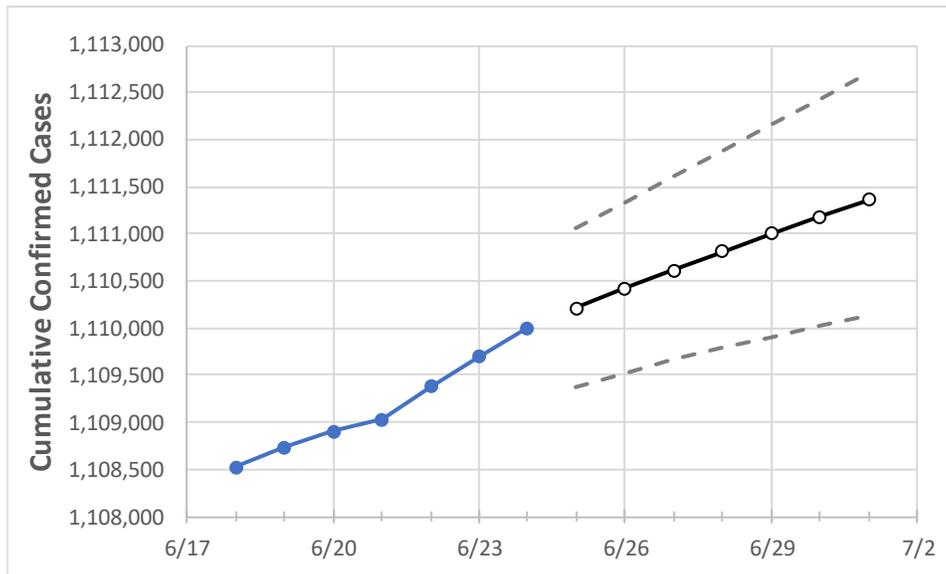
### IEM's Modeling Lead

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:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Ohio	1,109,025	1,109,374	1,109,697	1,110,000	1,110,213	1,110,422	1,110,617	1,110,815	1,111,003	1,111,188	1,111,365

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:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Athens	5,243	5,244	5,244	5,245	5,246	5,247	5,248	5,249	5,249	5,250	5,251
Cuyahoga	115,829	115,849	115,880	115,903	115,922	115,940	115,958	115,975	115,991	116,007	116,021
Franklin	128,765	128,856	128,952	129,009	129,053	129,098	129,142	129,186	129,230	129,275	129,319
Hamilton	81,413	81,416	81,420	81,440	81,454	81,466	81,479	81,491	81,503	81,514	81,525
Lake	21,213	21,216	21,219	21,223	21,229	21,235	21,241	21,246	21,252	21,257	21,263
Lorain	25,679	25,690	25,689	25,693	25,697	25,702	25,706	25,709	25,713	25,717	25,720
Lucas	43,364	43,380	43,384	43,387	43,393	43,398	43,403	43,408	43,413	43,418	43,422
Mahoning	22,378	22,383	22,388	22,392	22,395	22,399	22,402	22,405	22,408	22,411	22,413
Medina	15,613	15,615	15,618	15,620	15,622	15,624	15,625	15,627	15,629	15,630	15,632
Miami	10,850	10,857	10,858	10,859	10,861	10,863	10,864	10,866	10,868	10,869	10,871
Summit	48,440	48,443	48,455	48,463	48,471	48,479	48,487	48,494	48,501	48,508	48,515

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:											
	6/21	6/22	6/23	6/24	6/26			6/28			6/30					
Athens	5,243	5,244	5,244	5,245	5,247	(1,049)	[252]	{126}	5,249	(1,050)	[252]	{126}	5,250	(1,050)	[252]	{126}
Cuyahoga	115,829	115,849	115,880	115,903	115,940	(23,188)	[5,565]	{2,783}	115,975	(23,195)	[5,567]	{2,783}	116,007	(23,201)	[5,568]	{2,784}
Franklin	128,765	128,856	128,952	129,009	129,098	(25,820)	[6,197]	{3,098}	129,186	(25,837)	[6,201]	{3,100}	129,275	(25,855)	[6,205]	{3,103}
Hamilton	81,413	81,416	81,420	81,440	81,466	(16,293)	[3,910]	{1,955}	81,491	(16,298)	[3,912]	{1,956}	81,514	(16,303)	[3,913]	{1,956}
Lake	21,213	21,216	21,219	21,223	21,235	(4,247)	[1,019]	{510}	21,246	(4,249)	[1,020]	{510}	21,257	(4,251)	[1,020]	{510}
Lorain	25,679	25,690	25,689	25,693	25,702	(5,140)	[1,234]	{617}	25,709	(5,142)	[1,234]	{617}	25,717	(5,143)	[1,234]	{617}
Lucas	43,364	43,380	43,384	43,387	43,398	(8,680)	[2,083]	{1,042}	43,408	(8,682)	[2,084]	{1,042}	43,418	(8,684)	[2,084]	{1,042}
Mahoning	22,378	22,383	22,388	22,392	22,399	(4,480)	[1,075]	{538}	22,405	(4,481)	[1,075]	{538}	22,411	(4,482)	[1,076]	{538}
Medina	15,613	15,615	15,618	15,620	15,624	(3,125)	[750]	{375}	15,627	(3,125)	[750]	{375}	15,630	(3,126)	[750]	{375}
Miami	10,850	10,857	10,858	10,859	10,863	(2,173)	[521]	{261}	10,866	(2,173)	[522]	{261}	10,869	(2,174)	[522]	{261}
Summit	48,440	48,443	48,455	48,463	48,479	(9,696)	[2,327]	{1,163}	48,494	(9,699)	[2,328]	{1,164}	48,508	(9,702)	[2,328]	{1,164}

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.