

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

Date: 6/4/21

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 6/4/21 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.**

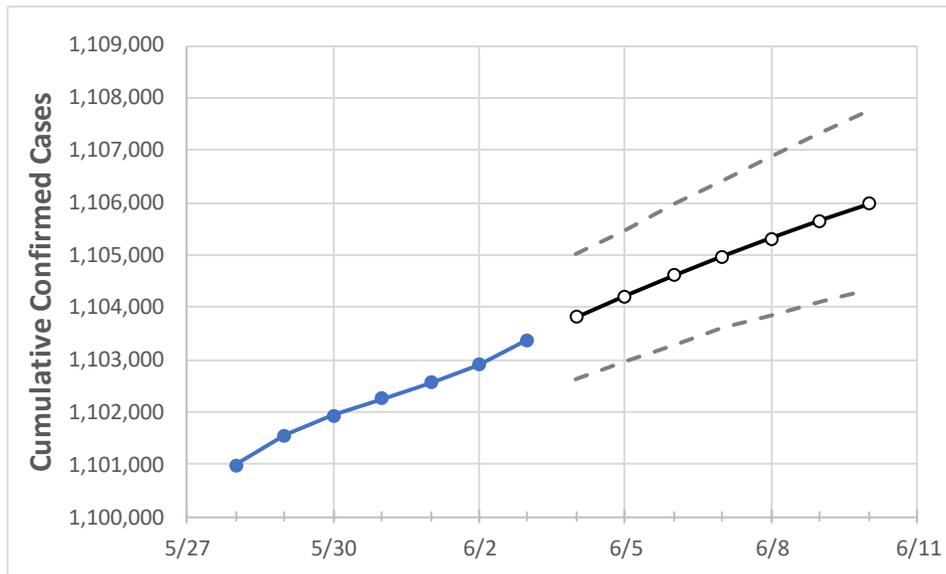
### IEM's Modeling Lead

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:							
	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	
Ohio	1,102,245	1,102,556	1,102,890	1,103,380	1,103,807	1,104,212	1,104,600	1,104,960	1,105,310	1,105,644	1,105,969	

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:							
	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	
Athens	5,221	5,221	5,225	5,226	5,227	5,228	5,229	5,230	5,231	5,232	5,232	
Cuyahoga	114,962	115,009	115,055	115,137	115,205	115,272	115,335	115,396	115,453	115,509	115,562	
Franklin	127,903	127,936	127,965	128,033	128,079	128,124	128,168	128,210	128,249	128,287	128,323	
Hamilton	80,943	80,955	80,972	81,015	81,037	81,058	81,078	81,097	81,116	81,135	81,152	
Lake	21,067	21,072	21,077	21,085	21,094	21,102	21,110	21,117	21,124	21,131	21,138	
Lorain	25,507	25,509	25,516	25,522	25,534	25,546	25,558	25,568	25,579	25,589	25,599	
Lucas	43,109	43,120	43,137	43,149	43,167	43,183	43,199	43,213	43,228	43,241	43,252	
Mahoning	22,185	22,195	22,211	22,219	22,237	22,255	22,272	22,289	22,305	22,322	22,337	
Medina	15,532	15,533	15,534	15,536	15,542	15,547	15,552	15,557	15,561	15,566	15,570	
Miami	10,797	10,799	10,804	10,807	10,812	10,817	10,822	10,828	10,833	10,838	10,843	
Summit	48,137	48,160	48,169	48,187	48,208	48,228	48,247	48,265	48,282	48,298	48,314	

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:											
	5/31	6/1	6/2	6/3	6/5			6/7			6/9					
Athens	5,221	5,221	5,225	5,226	5,228	(1,046)	[251]	{125}	5,230	(1,046)	[251]	{126}	5,232	(1,046)	[251]	{126}
Cuyahoga	114,962	115,009	115,055	115,137	115,272	(23,054)	[5,533]	{2,767}	115,396	(23,079)	[5,539]	{2,770}	115,509	(23,102)	[5,544]	{2,772}
Franklin	127,903	127,936	127,965	128,033	128,124	(25,625)	[6,150]	{3,075}	128,210	(25,642)	[6,154]	{3,077}	128,287	(25,657)	[6,158]	{3,079}
Hamilton	80,943	80,955	80,972	81,015	81,058	(16,212)	[3,891]	{1,945}	81,097	(16,219)	[3,893]	{1,946}	81,135	(16,227)	[3,894]	{1,947}
Lake	21,067	21,072	21,077	21,085	21,102	(4,220)	[1,013]	{506}	21,117	(4,223)	[1,014]	{507}	21,131	(4,226)	[1,014]	{507}
Lorain	25,507	25,509	25,516	25,522	25,546	(5,109)	[1,226]	{613}	25,568	(5,114)	[1,227]	{614}	25,589	(5,118)	[1,228]	{614}
Lucas	43,109	43,120	43,137	43,149	43,183	(8,637)	[2,073]	{1,036}	43,213	(8,643)	[2,074]	{1,037}	43,241	(8,648)	[2,076]	{1,038}
Mahoning	22,185	22,195	22,211	22,219	22,255	(4,451)	[1,068]	{534}	22,289	(4,458)	[1,070]	{535}	22,322	(4,464)	[1,071]	{536}
Medina	15,532	15,533	15,534	15,536	15,547	(3,109)	[746]	{373}	15,557	(3,111)	[747]	{373}	15,566	(3,113)	[747]	{374}
Miami	10,797	10,799	10,804	10,807	10,817	(2,163)	[519]	{260}	10,828	(2,166)	[520]	{260}	10,838	(2,168)	[520]	{260}
Summit	48,137	48,160	48,169	48,187	48,228	(9,646)	[2,315]	{1,157}	48,265	(9,653)	[2,317]	{1,158}	48,298	(9,660)	[2,318]	{1,159}

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.