

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

Date: 10/25/21

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 10/25/21 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.**

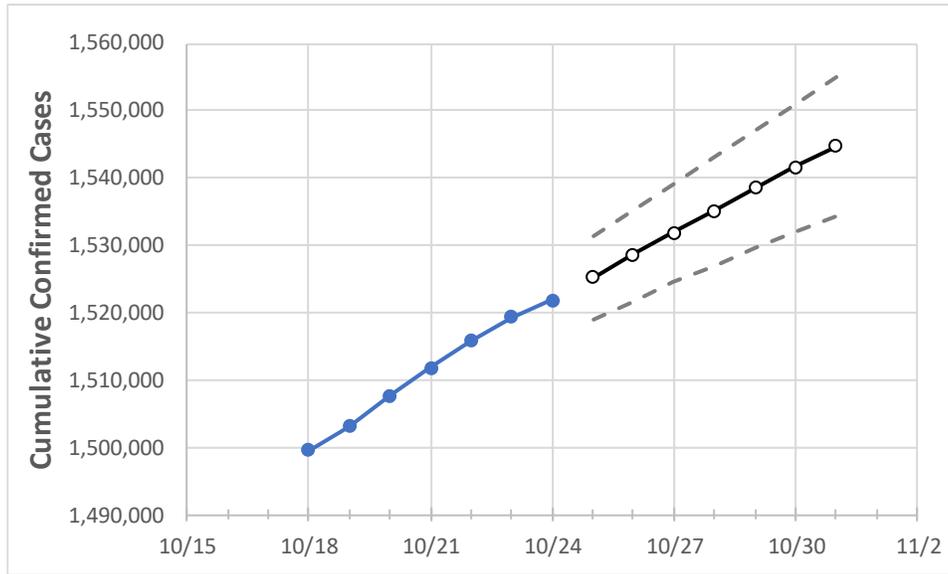
### IEM's Modeling Lead

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:							
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	
Ohio	1,511,760	1,515,838	1,519,304	1,521,844	1,525,293	1,528,617	1,531,903	1,535,151	1,538,510	1,541,655	1,544,766	

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:							
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	
Athens	7,736	7,761	7,777	7,792	7,807	7,823	7,837	7,853	7,868	7,881	7,895	
Cuyahoga	145,725	146,053	146,407	146,656	146,953	147,241	147,523	147,807	148,080	148,360	148,622	
Franklin	163,686	164,013	164,265	164,479	164,738	165,001	165,256	165,510	165,759	166,011	166,254	
Hamilton	105,042	105,206	105,366	105,489	105,642	105,795	105,937	106,084	106,231	106,375	106,513	
Lake	26,907	26,979	27,063	27,122	27,197	27,271	27,343	27,418	27,492	27,566	27,639	
Lorain	35,443	35,525	35,628	35,688	35,773	35,859	35,939	36,021	36,100	36,177	36,253	
Lucas	56,058	56,212	56,338	56,476	56,606	56,735	56,859	56,983	57,109	57,230	57,350	
Mahoning	30,598	30,719	30,787	30,856	30,941	31,031	31,114	31,199	31,282	31,367	31,444	
Medina	21,941	22,002	22,047	22,092	22,144	22,197	22,248	22,300	22,348	22,400	22,448	
Miami	15,487	15,524	15,582	15,601	15,638	15,675	15,709	15,743	15,779	15,812	15,845	
Summit	61,497	61,649	61,784	61,920	62,054	62,188	62,317	62,448	62,576	62,702	62,827	

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:											
	10/21	10/22	10/23	10/24	10/26			10/28			10/30					
Athens	7,736	7,761	7,777	7,792	7,823	(1,565)	[376]	{188}	7,853	(1,571)	[377]	{188}	7,881	(1,576)	[378]	{189}
Cuyahoga	145,725	146,053	146,407	146,656	147,241	(29,448)	[7,068]	{3,534}	147,807	(29,561)	[7,095]	{3,547}	148,360	(29,672)	[7,121]	{3,561}
Franklin	163,686	164,013	164,265	164,479	165,001	(33,000)	[7,920]	{3,960}	165,510	(33,102)	[7,944]	{3,972}	166,011	(33,202)	[7,969]	{3,984}
Hamilton	105,042	105,206	105,366	105,489	105,795	(21,159)	[5,078]	{2,539}	106,084	(21,217)	[5,092]	{2,546}	106,375	(21,275)	[5,106]	{2,553}
Lake	26,907	26,979	27,063	27,122	27,271	(5,454)	[1,309]	{654}	27,418	(5,484)	[1,316]	{658}	27,566	(5,513)	[1,323]	{662}
Lorain	35,443	35,525	35,628	35,688	35,859	(7,172)	[1,721]	{861}	36,021	(7,204)	[1,729]	{865}	36,177	(7,235)	[1,737]	{868}
Lucas	56,058	56,212	56,338	56,476	56,735	(11,347)	[2,723]	{1,362}	56,983	(11,397)	[2,735]	{1,368}	57,230	(11,446)	[2,747]	{1,374}
Mahoning	30,598	30,719	30,787	30,856	31,031	(6,206)	[1,489]	{745}	31,199	(6,240)	[1,498]	{749}	31,367	(6,273)	[1,506]	{753}
Medina	21,941	22,002	22,047	22,092	22,197	(4,439)	[1,065]	{533}	22,300	(4,460)	[1,070]	{535}	22,400	(4,480)	[1,075]	{538}
Miami	15,487	15,524	15,582	15,601	15,675	(3,135)	[752]	{376}	15,743	(3,149)	[756]	{378}	15,812	(3,162)	[759]	{379}
Summit	61,497	61,649	61,784	61,920	62,188	(12,438)	[2,985]	{1,493}	62,448	(12,490)	[2,998]	{1,499}	62,702	(12,540)	[3,010]	{1,505}

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.