

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 11/8/21**

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 11/8/21 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.**

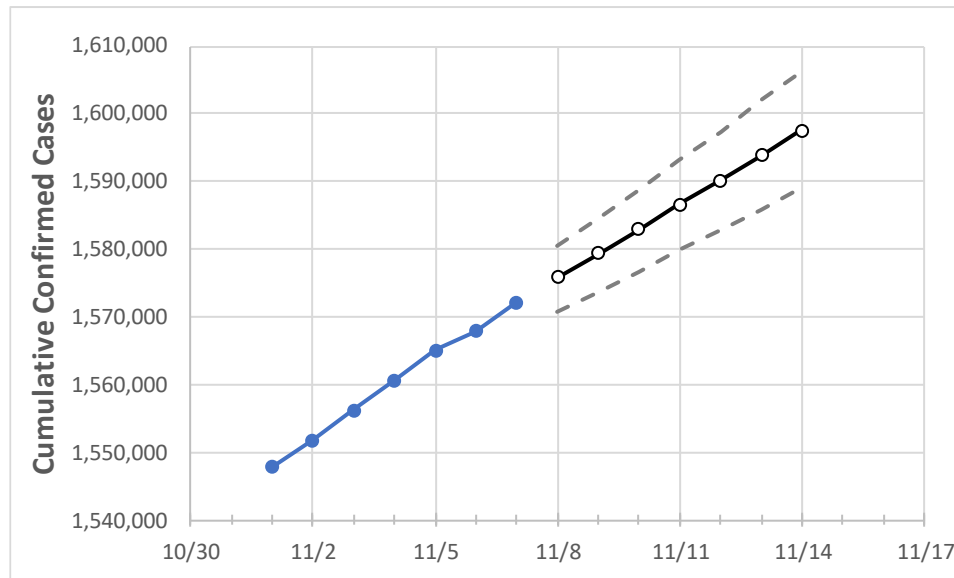
**IEM's Modeling Lead**

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:						
	11/4	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14
Ohio	1,560,695	1,565,043	1,567,834	1,572,197	1,575,782	1,579,374	1,582,951	1,586,652	1,590,238	1,593,905	1,597,574

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:						
	11/4	11/5	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14
Athens	7,928	7,955	8,006	8,014	8,029	8,044	8,057	8,073	8,086	8,101	8,115
Cuyahoga	150,149	150,614	150,937	151,442	151,851	152,275	152,704	153,144	153,595	154,043	154,511
Franklin	167,410	167,693	167,859	168,168	168,419	168,674	168,918	169,170	169,415	169,663	169,912
Hamilton	107,158	107,367	107,514	107,738	107,911	108,088	108,266	108,445	108,628	108,807	108,988
Lake	27,992	28,087	28,155	28,289	28,380	28,473	28,567	28,662	28,759	28,858	28,954
Lorain	36,841	37,023	37,107	37,280	37,402	37,523	37,646	37,775	37,899	38,025	38,154
Lucas	57,801	57,956	58,047	58,206	58,330	58,453	58,577	58,701	58,823	58,948	59,069
Mahoning	31,772	31,889	31,964	32,062	32,150	32,236	32,322	32,410	32,497	32,589	32,676
Medina	22,802	22,888	22,935	23,038	23,112	23,186	23,263	23,337	23,418	23,494	23,574
Miami	16,061	16,096	16,122	16,155	16,193	16,231	16,268	16,305	16,342	16,381	16,419
Summit	63,578	63,757	63,835	64,072	64,232	64,393	64,547	64,709	64,876	65,038	65,202

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:											
	11/4	11/5	11/6	11/7	11/9			11/11			11/13					
Athens	7,928	7,955	8,006	8,014	8,044	(1,609)	[386]	{193}	8,073	(1,615)	[387]	{194}	8,101	(1,620)	[389]	{194}
Cuyahoga	150,149	150,614	150,937	151,442	152,275	(30,455)	[7,309]	{3,655}	153,144	(30,629)	[7,351]	{3,675}	154,043	(30,809)	[7,394]	{3,697}
Franklin	167,410	167,693	167,859	168,168	168,674	(33,735)	[8,096]	{4,048}	169,170	(33,834)	[8,120]	{4,060}	169,663	(33,933)	[8,144]	{4,072}
Hamilton	107,158	107,367	107,514	107,738	108,088	(21,618)	[5,188]	{2,594}	108,445	(21,689)	[5,205]	{2,603}	108,807	(21,761)	[5,223]	{2,611}
Lake	27,992	28,087	28,155	28,289	28,473	(5,695)	[1,367]	{683}	28,662	(5,732)	[1,376]	{688}	28,858	(5,772)	[1,385]	{693}
Lorain	36,841	37,023	37,107	37,280	37,523	(7,505)	[1,801]	{901}	37,775	(7,555)	[1,813]	{907}	38,025	(7,605)	[1,825]	{913}
Lucas	57,801	57,956	58,047	58,206	58,453	(11,691)	[2,806]	{1,403}	58,701	(11,740)	[2,818]	{1,409}	58,948	(11,790)	[2,830]	{1,415}
Mahoning	31,772	31,889	31,964	32,062	32,236	(6,447)	[1,547]	{774}	32,410	(6,482)	[1,556]	{778}	32,589	(6,518)	[1,564]	{782}
Medina	22,802	22,888	22,935	23,038	23,186	(4,637)	[1,113]	{556}	23,337	(4,667)	[1,120]	{560}	23,494	(4,699)	[1,128]	{564}
Miami	16,061	16,096	16,122	16,155	16,231	(3,246)	[779]	{390}	16,305	(3,261)	[783]	{391}	16,381	(3,276)	[786]	{393}
Summit	63,578	63,757	63,835	64,072	64,393	(12,879)	[3,091]	{1,545}	64,709	(12,942)	[3,106]	{1,553}	65,038	(13,008)	[3,122]	{1,561}

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.