

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/10/21**

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 11/10/21 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.

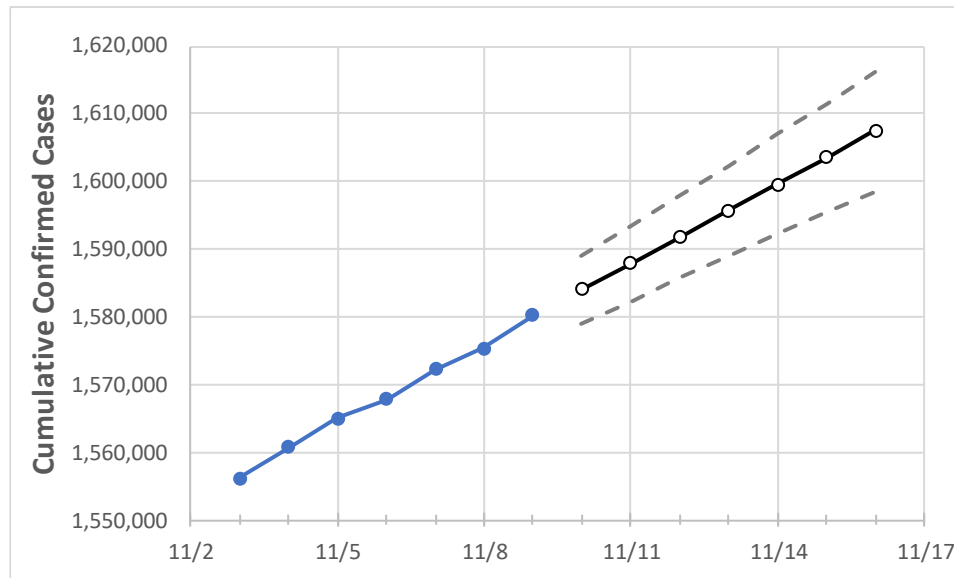
IEM's Modeling Lead

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Ohio	1,567,834	1,572,197	1,575,319	1,580,271	1,584,111	1,587,972	1,591,807	1,595,721	1,599,650	1,603,537	1,607,514

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Athens	8,006	8,014	8,018	8,022	8,035	8,049	8,063	8,077	8,090	8,104	8,118
Cuyahoga	150,937	151,442	151,850	152,302	152,733	153,169	153,621	154,072	154,530	155,008	155,482
Franklin	167,859	168,168	168,363	168,728	168,993	169,253	169,510	169,768	170,031	170,294	170,549
Hamilton	107,514	107,738	107,870	108,024	108,184	108,343	108,503	108,665	108,828	108,990	109,153
Lake	28,155	28,289	28,348	28,468	28,560	28,653	28,745	28,839	28,937	29,032	29,129
Lorain	37,107	37,280	37,425	37,537	37,665	37,795	37,924	38,055	38,186	38,324	38,459
Lucas	58,047	58,206	58,289	58,436	58,558	58,681	58,797	58,922	59,043	59,162	59,284
Mahoning	31,964	32,062	32,140	32,295	32,389	32,483	32,577	32,674	32,769	32,866	32,965
Medina	22,935	23,038	23,108	23,193	23,271	23,348	23,427	23,505	23,587	23,670	23,753
Miami	16,122	16,155	16,178	16,228	16,267	16,303	16,339	16,377	16,412	16,450	16,486
Summit	63,835	64,072	64,247	64,536	64,721	64,899	65,084	65,267	65,454	65,645	65,834

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:											
	11/6	11/7	11/8	11/9	11/11				11/13				11/15			
Athens	8,006	8,014	8,018	8,022	8,049	(1,610)	[386]	{193}	8,077	(1,615)	[388]	{194}	8,104	(1,621)	[389]	{195}
Cuyahoga	150,937	151,442	151,850	152,302	153,169	(30,634)	[7,352]	{3,676}	154,072	(30,814)	[7,395]	{3,698}	155,008	(31,002)	[7,440]	{3,720}
Franklin	167,859	168,168	168,363	168,728	169,253	(33,851)	[8,124]	{4,062}	169,768	(33,954)	[8,149]	{4,074}	170,294	(34,059)	[8,174]	{4,087}
Hamilton	107,514	107,738	107,870	108,024	108,343	(21,669)	[5,200]	{2,600}	108,665	(21,733)	[5,216]	{2,608}	108,990	(21,798)	[5,232]	{2,616}
Lake	28,155	28,289	28,348	28,468	28,653	(5,731)	[1,375]	{688}	28,839	(5,768)	[1,384]	{692}	29,032	(5,806)	[1,394]	{697}
Lorain	37,107	37,280	37,425	37,537	37,795	(7,559)	[1,814]	{907}	38,055	(7,611)	[1,827]	{913}	38,324	(7,665)	[1,840]	{920}
Lucas	58,047	58,206	58,289	58,436	58,681	(11,736)	[2,817]	{1,408}	58,922	(11,784)	[2,828]	{1,414}	59,162	(11,832)	[2,840]	{1,420}
Mahoning	31,964	32,062	32,140	32,295	32,483	(6,497)	[1,559]	{780}	32,674	(6,535)	[1,568]	{784}	32,866	(6,573)	[1,578]	{789}
Medina	22,935	23,038	23,108	23,193	23,348	(4,670)	[1,121]	{560}	23,505	(4,701)	[1,128]	{564}	23,670	(4,734)	[1,136]	{568}
Miami	16,122	16,155	16,178	16,228	16,303	(3,261)	[783]	{391}	16,377	(3,275)	[786]	{393}	16,450	(3,290)	[790]	{395}
Summit	63,835	64,072	64,247	64,536	64,899	(12,980)	[3,115]	{1,558}	65,267	(13,053)	[3,133]	{1,566}	65,645	(13,129)	[3,151]	{1,575}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.