

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 11/15/21**

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 11/15/21 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.**

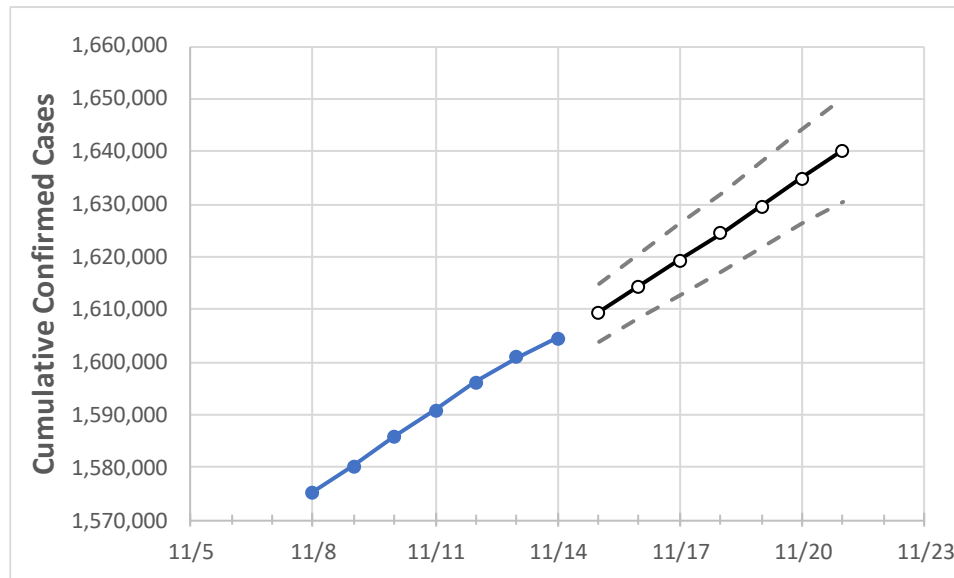
**IEM's Modeling Lead**

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:						
	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21
Ohio	1,590,792	1,596,171	1,600,860	1,604,488	1,609,356	1,614,313	1,619,355	1,624,415	1,629,627	1,634,863	1,640,183

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:						
	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21
Athens	8,040	8,055	8,061	8,073	8,085	8,098	8,109	8,121	8,134	8,146	8,158
Cuyahoga	153,372	154,006	154,623	155,077	155,654	156,243	156,851	157,483	158,135	158,801	159,476
Franklin	169,534	169,949	170,249	170,486	170,825	171,153	171,493	171,833	172,186	172,528	172,886
Hamilton	108,456	108,716	108,892	109,052	109,253	109,461	109,667	109,880	110,097	110,315	110,536
Lake	28,713	28,857	28,985	29,089	29,216	29,345	29,476	29,611	29,753	29,897	30,044
Lorain	37,842	38,066	38,215	38,320	38,491	38,658	38,834	39,014	39,200	39,390	39,587
Lucas	58,812	58,984	59,140	59,266	59,420	59,578	59,738	59,902	60,065	60,235	60,403
Mahoning	32,575	32,733	32,863	32,977	33,116	33,258	33,404	33,553	33,705	33,862	34,024
Medina	23,413	23,502	23,613	23,697	23,802	23,909	24,018	24,131	24,246	24,368	24,490
Miami	16,330	16,387	16,418	16,454	16,497	16,540	16,582	16,626	16,668	16,714	16,758
Summit	64,983	65,269	65,581	65,811	66,077	66,352	66,639	66,924	67,226	67,540	67,855

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:											
	11/11	11/12	11/13	11/14	11/16				11/18				11/20			
Athens	8,040	8,055	8,061	8,073	8,098	(1,620)	[389]	{194}	8,121	(1,624)	[390]	{195}	8,146	(1,629)	[391]	{196}
Cuyahoga	153,372	154,006	154,623	155,077	156,243	(31,249)	[7,500]	{3,750}	157,483	(31,497)	[7,559]	{3,780}	158,801	(31,760)	[7,622]	{3,811}
Franklin	169,534	169,949	170,249	170,486	171,153	(34,231)	[8,215]	{4,108}	171,833	(34,367)	[8,248]	{4,124}	172,528	(34,506)	[8,281]	{4,141}
Hamilton	108,456	108,716	108,892	109,052	109,461	(21,892)	[5,254]	{2,627}	109,880	(21,976)	[5,274]	{2,637}	110,315	(22,063)	[5,295]	{2,648}
Lake	28,713	28,857	28,985	29,089	29,345	(5,869)	[1,409]	{704}	29,611	(5,922)	[1,421]	{711}	29,897	(5,979)	[1,435]	{718}
Lorain	37,842	38,066	38,215	38,320	38,658	(7,732)	[1,856]	{928}	39,014	(7,803)	[1,873]	{936}	39,390	(7,878)	[1,891]	{945}
Lucas	58,812	58,984	59,140	59,266	59,578	(11,916)	[2,860]	{1,430}	59,902	(11,980)	[2,875]	{1,438}	60,235	(12,047)	[2,891]	{1,446}
Mahoning	32,575	32,733	32,863	32,977	33,258	(6,652)	[1,596]	{798}	33,553	(6,711)	[1,611]	{805}	33,862	(6,772)	[1,625]	{813}
Medina	23,413	23,502	23,613	23,697	23,909	(4,782)	[1,148]	{574}	24,131	(4,826)	[1,158]	{579}	24,368	(4,874)	[1,170]	{585}
Miami	16,330	16,387	16,418	16,454	16,540	(3,308)	[794]	{397}	16,626	(3,325)	[798]	{399}	16,714	(3,343)	[802]	{401}
Summit	64,983	65,269	65,581	65,811	66,352	(13,270)	[3,185]	{1,592}	66,924	(13,385)	[3,212]	{1,606}	67,540	(13,508)	[3,242]	{1,621}

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.