

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 9/15/21**

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 9/15/21 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.**

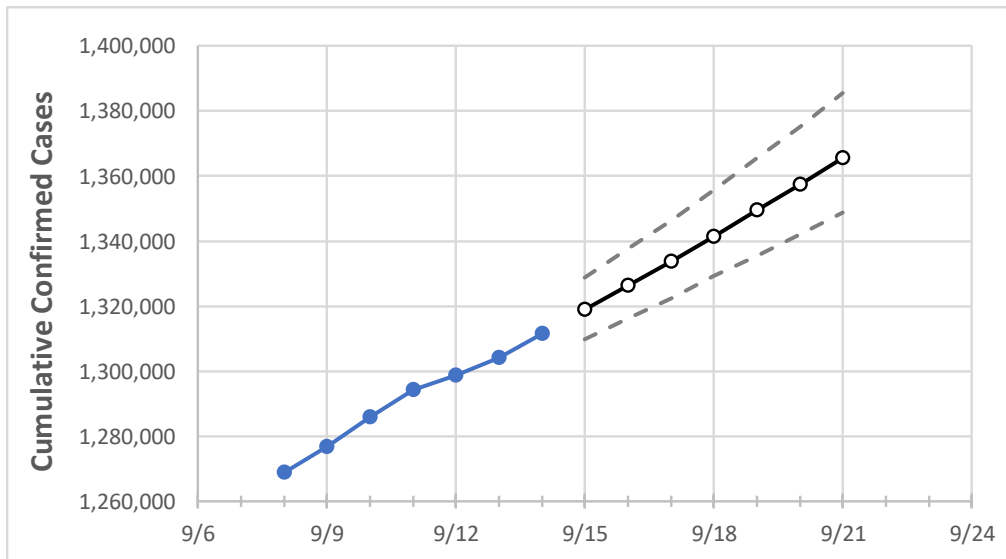
**IEM's Modeling Lead**

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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21
Ohio	1,294,162	1,298,625	1,304,193	1,311,518	1,318,853	1,326,306	1,333,801	1,341,269	1,349,428	1,357,470	1,365,554

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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21
Athens	6,509	6,536	6,571	6,616	6,672	6,729	6,784	6,843	6,900	6,958	7,018
Cuyahoga	129,444	129,835	130,195	130,656	131,136	131,620	132,113	132,608	133,112	133,645	134,180
Franklin	145,898	146,227	146,809	147,419	148,023	148,635	149,259	149,887	150,534	151,187	151,878
Hamilton	93,528	93,837	94,134	94,500	94,917	95,344	95,760	96,173	96,636	97,074	97,496
Lake	23,767	23,824	23,884	23,984	24,064	24,146	24,228	24,310	24,394	24,480	24,566
Lorain	29,804	29,907	30,075	30,240	30,428	30,620	30,817	31,026	31,234	31,454	31,681
Lucas	48,690	48,868	49,016	49,206	49,435	49,665	49,903	50,139	50,388	50,639	50,900
Mahoning	25,486	25,569	25,688	25,848	25,989	26,134	26,285	26,439	26,602	26,773	26,942
Medina	18,805	18,902	19,022	19,108	19,236	19,368	19,500	19,634	19,774	19,915	20,061
Miami	13,029	13,091	13,163	13,216	13,298	13,381	13,465	13,551	13,638	13,729	13,819
Summit	54,140	54,281	54,415	54,635	54,846	55,053	55,267	55,486	55,707	55,940	56,169

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:											
	9/11	9/12	9/13	9/14	9/16				9/18				9/20			
Athens	6,509	6,536	6,571	6,616	6,729	(1,346)	[323]	{161}	6,843	(1,369)	[328]	{164}	6,958	(1,392)	[334]	{167}
Cuyahoga	129,444	129,835	130,195	130,656	131,620	(26,324)	[6,318]	{3,159}	132,608	(26,522)	[6,365]	{3,183}	133,645	(26,729)	[6,415]	{3,207}
Franklin	145,898	146,227	146,809	147,419	148,635	(29,727)	[7,134]	{3,567}	149,887	(29,977)	[7,195]	{3,597}	151,187	(30,237)	[7,257]	{3,628}
Hamilton	93,528	93,837	94,134	94,500	95,344	(19,069)	[4,577]	{2,288}	96,173	(19,235)	[4,616]	{2,308}	97,074	(19,415)	[4,660]	{2,330}
Lake	23,767	23,824	23,884	23,984	24,146	(4,829)	[1,159]	{579}	24,310	(4,862)	[1,167]	{583}	24,480	(4,896)	[1,175]	{588}
Lorain	29,804	29,907	30,075	30,240	30,620	(6,124)	[1,470]	{735}	31,026	(6,205)	[1,489]	{745}	31,454	(6,291)	[1,510]	{755}
Lucas	48,690	48,868	49,016	49,206	49,665	(9,933)	[2,384]	{1,192}	50,139	(10,028)	[2,407]	{1,203}	50,639	(10,128)	[2,431]	{1,215}
Mahoning	25,486	25,569	25,688	25,848	26,134	(5,227)	[1,254]	{627}	26,439	(5,288)	[1,269]	{635}	26,773	(5,355)	[1,285]	{643}
Medina	18,805	18,902	19,022	19,108	19,368	(3,874)	[930]	{465}	19,634	(3,927)	[942]	{471}	19,915	(3,983)	[956]	{478}
Miami	13,029	13,091	13,163	13,216	13,381	(2,676)	[642]	{321}	13,551	(2,710)	[650]	{325}	13,729	(2,746)	[659]	{329}
Summit	54,140	54,281	54,415	54,635	55,053	(11,011)	[2,643]	{1,321}	55,486	(11,097)	[2,663]	{1,332}	55,940	(11,188)	[2,685]	{1,343}

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.