

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

Date: 1/7/21

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 1/7/21 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.**

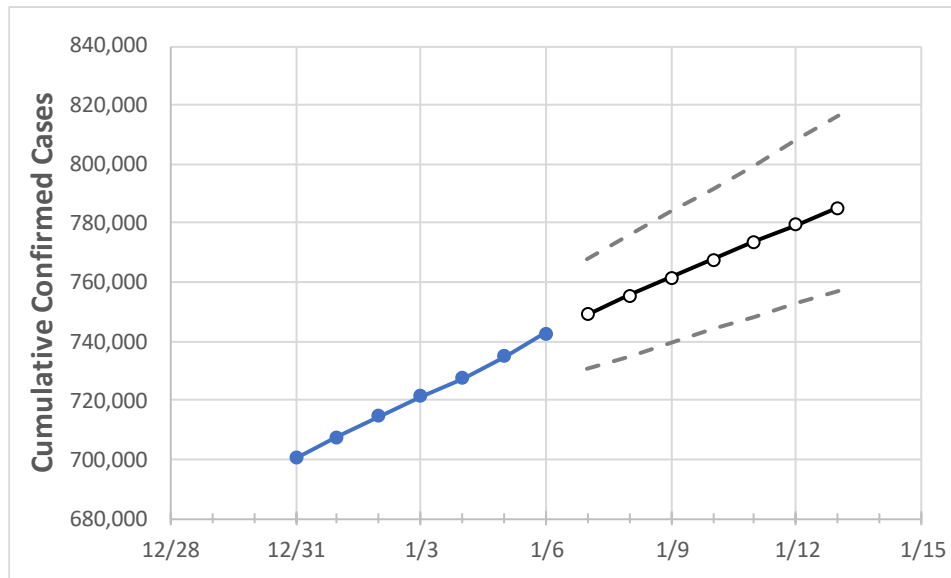
### IEM's Modeling Lead

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:						
	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13
Ohio	721,481	727,423	735,003	742,817	749,166	755,356	761,506	767,581	773,611	779,578	785,367

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:						
	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13
Athens	3,171	3,190	3,229	3,263	3,288	3,314	3,339	3,363	3,389	3,413	3,437
Cuyahoga	72,520	73,116	73,664	74,199	74,807	75,406	76,012	76,599	77,191	77,769	78,350
Franklin	86,446	87,106	87,784	88,447	89,122	89,776	90,417	91,068	91,697	92,317	92,943
Hamilton	53,404	53,797	54,379	54,992	55,455	55,908	56,367	56,826	57,272	57,740	58,206
Lake	13,156	13,317	13,478	13,670	13,813	13,955	14,100	14,245	14,390	14,533	14,677
Lorain	15,421	15,622	15,790	15,924	16,097	16,268	16,441	16,612	16,784	16,951	17,118
Lucas	26,509	26,742	26,934	27,228	27,440	27,644	27,846	28,044	28,240	28,432	28,624
Mahoning	15,131	15,269	15,399	15,529	15,635	15,742	15,844	15,948	16,047	16,141	16,233
Medina	9,601	9,700	9,830	9,930	10,024	10,117	10,211	10,301	10,394	10,486	10,577
Miami	7,841	7,872	7,960	8,016	8,076	8,137	8,200	8,261	8,320	8,378	8,437
Summit	28,782	29,030	29,361	29,645	29,895	30,146	30,386	30,625	30,857	31,090	31,323

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:											
	1/3	1/4	1/5	1/6	1/8				1/10				1/12			
Athens	3,171	3,190	3,229	3,263	3,314	(663)	[159]	{80}	3,363	(673)	[161]	{81}	3,413	(683)	[164]	{82}
Cuyahoga	72,520	73,116	73,664	74,199	75,406	(15,081)	[3,619]	{1,810}	76,599	(15,320)	[3,677]	{1,838}	77,769	(15,554)	[3,733]	{1,866}
Franklin	86,446	87,106	87,784	88,447	89,776	(17,955)	[4,309]	{2,155}	91,068	(18,214)	[4,371]	{2,186}	92,317	(18,463)	[4,431]	{2,216}
Hamilton	53,404	53,797	54,379	54,992	55,908	(11,182)	[2,684]	{1,342}	56,826	(11,365)	[2,728]	{1,364}	57,740	(11,548)	[2,772]	{1,386}
Lake	13,156	13,317	13,478	13,670	13,955	(2,791)	[670]	{335}	14,245	(2,849)	[684]	{342}	14,533	(2,907)	[698]	{349}
Lorain	15,421	15,622	15,790	15,924	16,268	(3,254)	[781]	{390}	16,612	(3,322)	[797]	{399}	16,951	(3,390)	[814]	{407}
Lucas	26,509	26,742	26,934	27,228	27,644	(5,529)	[1,327]	{663}	28,044	(5,609)	[1,346]	{673}	28,432	(5,686)	[1,365]	{682}
Mahoning	15,131	15,269	15,399	15,529	15,742	(3,148)	[756]	{378}	15,948	(3,190)	[766]	{383}	16,141	(3,228)	[775]	{387}
Medina	9,601	9,700	9,830	9,930	10,117	(2,023)	[486]	{243}	10,301	(2,060)	[494]	{247}	10,486	(2,097)	[503]	{252}
Miami	7,841	7,872	7,960	8,016	8,137	(1,627)	[391]	{195}	8,261	(1,652)	[397]	{198}	8,378	(1,676)	[402]	{201}
Summit	28,782	29,030	29,361	29,645	30,146	(6,029)	[1,447]	{724}	30,625	(6,125)	[1,470]	{735}	31,090	(6,218)	[1,492]	{746}

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.