

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/14/20**

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 12/14/20 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.**

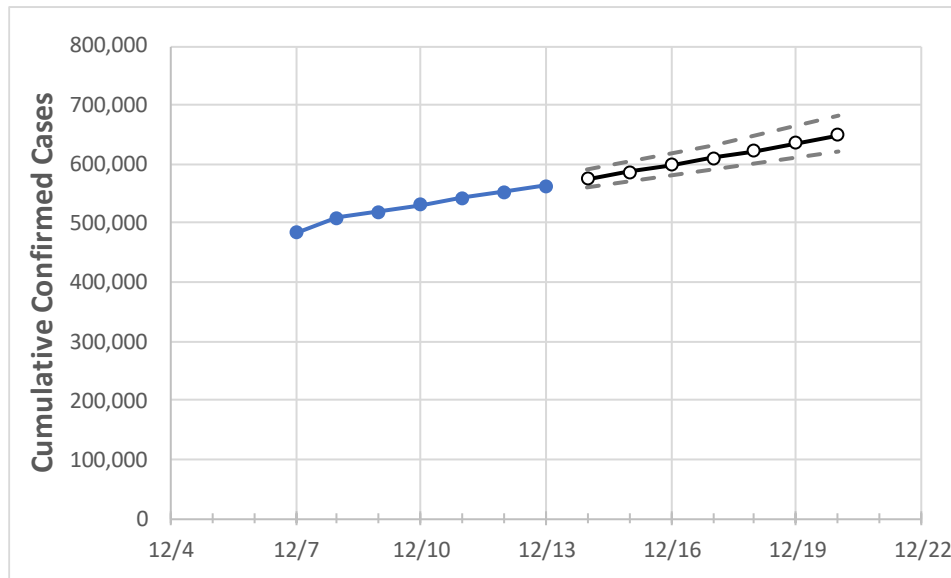
**IEM's Modeling Lead**

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:						
	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20
Ohio	531,850	542,209	553,461	562,727	574,304	586,113	598,158	610,442	622,967	635,737	648,756

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 20%, and are often within 10%, of actual confirmed cases.

## Ohio Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20
Athens	2,502	2,565	2,598	2,629	2,676	2,724	2,773	2,823	2,874	2,926	2,979
Cuyahoga	52,712	53,832	55,093	56,505	57,774	59,079	60,420	61,799	63,216	64,672	66,168
Franklin	66,184	67,043	68,157	69,074	70,229	71,409	72,613	73,843	75,098	76,379	77,687
Hamilton	40,751	41,545	42,448	43,008	43,834	44,678	45,541	46,422	47,322	48,242	49,180
Lake	9,734	9,860	10,032	10,207	10,347	10,485	10,622	10,757	10,892	11,024	11,156
Lorain	10,684	10,874	11,143	11,410	11,701	12,000	12,308	12,623	12,947	13,279	13,621
Lucas	20,006	20,510	20,916	21,239	21,642	22,054	22,474	22,902	23,340	23,786	24,242
Mahoning	11,096	11,297	11,508	11,716	11,959	12,206	12,456	12,710	12,967	13,228	13,493
Medina	6,872	6,983	7,122	7,297	7,454	7,613	7,775	7,940	8,106	8,276	8,447
Miami	5,915	6,032	6,122	6,203	6,306	6,409	6,513	6,617	6,722	6,827	6,932
Summit	20,545	20,931	21,501	21,898	22,434	22,986	23,553	24,136	24,735	25,352	25,985

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:											
	12/10	12/11	12/12	12/13	12/15				12/17				12/19			
Athens	2,502	2,565	2,598	2,629	2,724	(545)	[131]	{65}	2,823	(565)	[135]	{68}	2,926	(585)	[140]	{70}
Cuyahoga	52,712	53,832	55,093	56,505	59,079	(11,816)	[2,836]	{1,418}	61,799	(12,360)	[2,966]	{1,483}	64,672	(12,934)	[3,104]	{1,552}
Franklin	66,184	67,043	68,157	69,074	71,409	(14,282)	[3,428]	{1,714}	73,843	(14,769)	[3,544]	{1,772}	76,379	(15,276)	[3,666]	{1,833}
Hamilton	40,751	41,545	42,448	43,008	44,678	(8,936)	[2,145]	{1,072}	46,422	(9,284)	[2,228]	{1,114}	48,242	(9,648)	[2,316]	{1,158}
Lake	9,734	9,860	10,032	10,207	10,485	(2,097)	[503]	{252}	10,757	(2,151)	[516]	{258}	11,024	(2,205)	[529]	{265}
Lorain	10,684	10,874	11,143	11,410	12,000	(2,400)	[576]	{288}	12,623	(2,525)	[606]	{303}	13,279	(2,656)	[637]	{319}
Lucas	20,006	20,510	20,916	21,239	22,054	(4,411)	[1,059]	{529}	22,902	(4,580)	[1,099]	{550}	23,786	(4,757)	[1,142]	{571}
Mahoning	11,096	11,297	11,508	11,716	12,206	(2,441)	[586]	{293}	12,710	(2,542)	[610]	{305}	13,228	(2,646)	[635]	{317}
Medina	6,872	6,983	7,122	7,297	7,613	(1,523)	[365]	{183}	7,940	(1,588)	[381]	{191}	8,276	(1,655)	[397]	{199}
Miami	5,915	6,032	6,122	6,203	6,409	(1,282)	[308]	{154}	6,617	(1,323)	[318]	{159}	6,827	(1,365)	[328]	{164}
Summit	20,545	20,931	21,501	21,898	22,986	(4,597)	[1,103]	{552}	24,136	(4,827)	[1,159]	{579}	25,352	(5,070)	[1,217]	{608}

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.