

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 2/19/21**

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 2/19/21 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.**

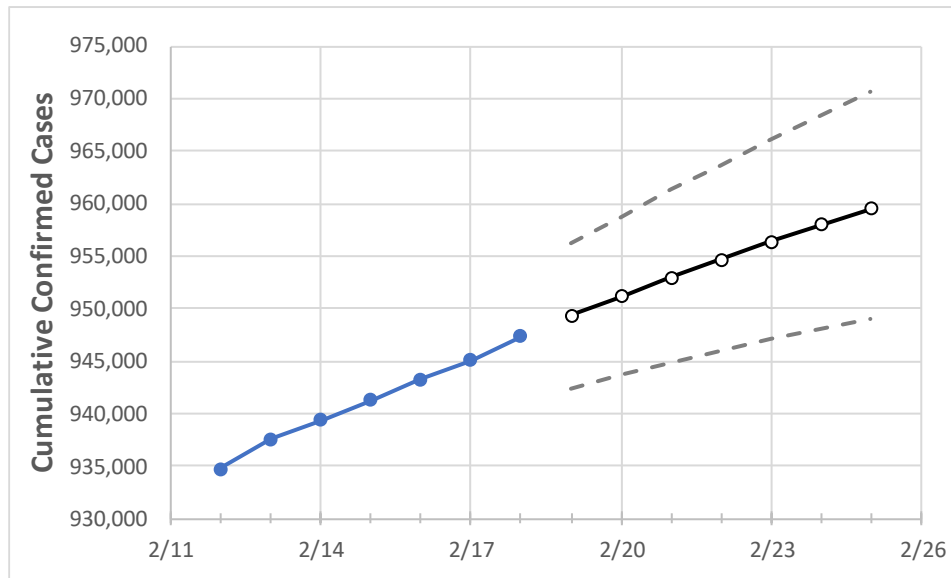
**IEM's Modeling Lead**

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:						
	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25
Ohio	941,265	943,291	945,107	947,389	949,334	951,151	952,990	954,695	956,329	957,952	959,478

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:						
	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25
Athens	4,438	4,452	4,467	4,480	4,500	4,518	4,535	4,553	4,571	4,590	4,607
Cuyahoga	92,902	93,069	93,157	93,399	93,562	93,717	93,869	94,013	94,149	94,283	94,413
Franklin	109,190	109,415	109,605	109,830	110,025	110,213	110,394	110,569	110,736	110,898	111,062
Hamilton	71,123	71,245	71,388	71,567	71,711	71,850	71,983	72,108	72,220	72,335	72,439
Lake	17,810	17,854	17,907	17,949	17,993	18,037	18,081	18,122	18,161	18,200	18,237
Lorain	21,291	21,343	21,377	21,438	21,494	21,547	21,599	21,650	21,700	21,749	21,794
Lucas	34,075	34,122	34,174	34,243	34,299	34,354	34,404	34,453	34,501	34,547	34,589
Mahoning	18,896	18,947	18,987	19,034	19,074	19,111	19,148	19,184	19,219	19,251	19,283
Medina	12,905	12,954	12,987	13,025	13,059	13,091	13,123	13,153	13,184	13,213	13,241
Miami	9,834	9,851	9,853	9,877	9,891	9,905	9,918	9,930	9,942	9,953	9,964
Summit	38,688	38,838	38,965	39,100	39,214	39,326	39,434	39,539	39,640	39,739	39,839

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:											
	2/15	2/16	2/17	2/18	2/20				2/22				2/24			
Athens	4,438	4,452	4,467	4,480	4,518	(904)	[217]	{108}	4,553	(911)	[219]	{109}	4,590	(918)	[220]	{110}
Cuyahoga	92,902	93,069	93,157	93,399	93,717	(18,743)	[4,498]	{2,249}	94,013	(18,803)	[4,513]	{2,256}	94,283	(18,857)	[4,526]	{2,263}
Franklin	109,190	109,415	109,605	109,830	110,213	(22,043)	[5,290]	{2,645}	110,569	(22,114)	[5,307]	{2,654}	110,898	(22,180)	[5,323]	{2,662}
Hamilton	71,123	71,245	71,388	71,567	71,850	(14,370)	[3,449]	{1,724}	72,108	(14,422)	[3,461]	{1,731}	72,335	(14,467)	[3,472]	{1,736}
Lake	17,810	17,854	17,907	17,949	18,037	(3,607)	[866]	{433}	18,122	(3,624)	[870]	{435}	18,200	(3,640)	[874]	{437}
Lorain	21,291	21,343	21,377	21,438	21,547	(4,309)	[1,034]	{517}	21,650	(4,330)	[1,039]	{520}	21,749	(4,350)	[1,044]	{522}
Lucas	34,075	34,122	34,174	34,243	34,354	(6,871)	[1,649]	{824}	34,453	(6,891)	[1,654]	{827}	34,547	(6,909)	[1,658]	{829}
Mahoning	18,896	18,947	18,987	19,034	19,111	(3,822)	[917]	{459}	19,184	(3,837)	[921]	{460}	19,251	(3,850)	[924]	{462}
Medina	12,905	12,954	12,987	13,025	13,091	(2,618)	[628]	{314}	13,153	(2,631)	[631]	{316}	13,213	(2,643)	[634]	{317}
Miami	9,834	9,851	9,853	9,877	9,905	(1,981)	[475]	{238}	9,930	(1,986)	[477]	{238}	9,953	(1,991)	[478]	{239}
Summit	38,688	38,838	38,965	39,100	39,326	(7,865)	[1,888]	{944}	39,539	(7,908)	[1,898]	{949}	39,739	(7,948)	[1,907]	{954}

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.