

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

Date: 7/7/21

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 7/7/21 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.**

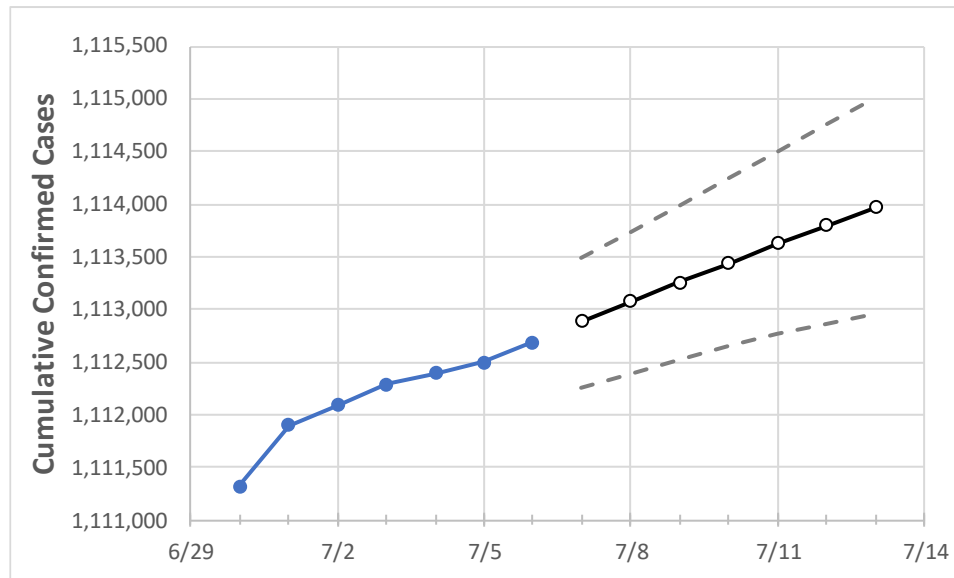
### IEM's Modeling Lead

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Ohio	1,112,289	1,112,394	1,112,499	1,112,689	1,112,885	1,113,076	1,113,261	1,113,441	1,113,624	1,113,796	1,113,966

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:							
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	
Athens	5,249	5,250	5,250	5,251	5,252	5,253	5,254	5,254	5,255	5,256	5,257	
Cuyahoga	116,131	116,139	116,147	116,156	116,172	116,188	116,203	116,218	116,233	116,246	116,259	
Franklin	129,236	129,250	129,263	129,289	129,307	129,324	129,339	129,355	129,369	129,383	129,395	
Hamilton	81,566	81,569	81,572	81,588	81,598	81,608	81,617	81,626	81,635	81,644	81,652	
Lake	21,252	21,256	21,259	21,262	21,264	21,267	21,269	21,271	21,273	21,275	21,277	
Lorain	25,734	25,734	25,735	25,739	25,742	25,744	25,746	25,749	25,751	25,753	25,755	
Lucas	43,457	43,460	43,462	43,463	43,467	43,471	43,475	43,478	43,482	43,485	43,488	
Mahoning	22,429	22,433	22,436	22,439	22,442	22,445	22,447	22,449	22,452	22,455	22,457	
Medina	15,658	15,659	15,660	15,666	15,670	15,673	15,677	15,681	15,684	15,688	15,692	
Miami	10,877	10,879	10,880	10,879	10,881	10,882	10,884	10,886	10,887	10,889	10,891	
Summit	48,533	48,537	48,541	48,546	48,551	48,556	48,560	48,565	48,569	48,573	48,576	

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:											
	7/3	7/4	7/5	7/6	7/8				7/10				7/12			
Athens	5,249	5,250	5,250	5,251	5,253	(1,051)	[252]	{126}	5,254	(1,051)	[252]	{126}	5,256	(1,051)	[252]	{126}
Cuyahoga	116,131	116,139	116,147	116,156	116,188	(23,238)	[5,577]	{2,789}	116,218	(23,244)	[5,578]	{2,789}	116,246	(23,249)	[5,580]	{2,790}
Franklin	129,236	129,250	129,263	129,289	129,324	(25,865)	[6,208]	{3,104}	129,355	(25,871)	[6,209]	{3,105}	129,383	(25,877)	[6,210]	{3,105}
Hamilton	81,566	81,569	81,572	81,588	81,608	(16,322)	[3,917]	{1,959}	81,626	(16,325)	[3,918]	{1,959}	81,644	(16,329)	[3,919]	{1,959}
Lake	21,252	21,256	21,259	21,262	21,267	(4,253)	[1,021]	{510}	21,271	(4,254)	[1,021]	{511}	21,275	(4,255)	[1,021]	{511}
Lorain	25,734	25,734	25,735	25,739	25,744	(5,149)	[1,236]	{618}	25,749	(5,150)	[1,236]	{618}	25,753	(5,151)	[1,236]	{618}
Lucas	43,457	43,460	43,462	43,463	43,471	(8,694)	[2,087]	{1,043}	43,478	(8,696)	[2,087]	{1,043}	43,485	(8,697)	[2,087]	{1,044}
Mahoning	22,429	22,433	22,436	22,439	22,445	(4,489)	[1,077]	{539}	22,449	(4,490)	[1,078]	{539}	22,455	(4,491)	[1,078]	{539}
Medina	15,658	15,659	15,660	15,666	15,673	(3,135)	[752]	{376}	15,681	(3,136)	[753]	{376}	15,688	(3,138)	[753]	{377}
Miami	10,877	10,879	10,880	10,879	10,882	(2,176)	[522]	{261}	10,886	(2,177)	[523]	{261}	10,889	(2,178)	[523]	{261}
Summit	48,533	48,537	48,541	48,546	48,556	(9,711)	[2,331]	{1,165}	48,565	(9,713)	[2,331]	{1,166}	48,573	(9,715)	[2,331]	{1,166}

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.