

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/18/22**

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 2/18/22 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.

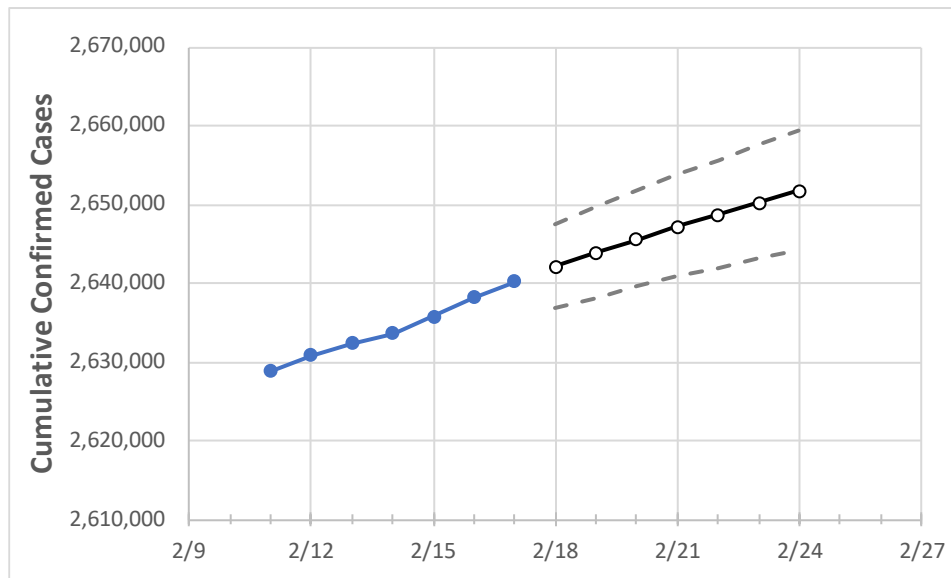
IEM's Modeling Lead

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Ohio	2,633,648	2,635,769	2,638,202	2,640,201	2,642,092	2,643,908	2,645,575	2,647,209	2,648,722	2,650,259	2,651,711

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Athens	14,027	14,053	14,091	14,129	14,156	14,181	14,206	14,230	14,253	14,274	14,299
Cuyahoga	265,127	265,209	265,361	265,509	265,605	265,689	265,778	265,862	265,942	266,023	266,093
Franklin	284,109	284,294	284,584	284,777	284,963	285,150	285,324	285,489	285,653	285,807	285,952
Hamilton	184,514	184,652	184,793	184,925	185,046	185,162	185,271	185,375	185,469	185,568	185,657
Lake	48,361	48,373	48,391	48,408	48,425	48,441	48,457	48,471	48,486	48,500	48,513
Lorain	65,835	65,856	65,884	65,907	65,950	65,988	66,023	66,061	66,094	66,139	66,167
Lucas	97,751	97,914	98,077	98,169	98,255	98,337	98,411	98,481	98,554	98,624	98,687
Mahoning	52,778	52,811	52,846	52,880	52,910	52,939	52,967	52,993	53,019	53,044	53,069
Medina	39,577	39,598	39,619	39,628	39,642	39,655	39,667	39,678	39,689	39,700	39,709
Miami	25,461	25,483	25,514	25,524	25,540	25,554	25,569	25,581	25,594	25,607	25,618
Summit	111,144	111,187	111,233	111,294	111,338	111,381	111,422	111,461	111,499	111,533	111,569

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:											
	2/14	2/15	2/16	2/17	2/19				2/21				2/23			
Athens	14,027	14,053	14,091	14,129	14,181	(2,836)	[681]	{340}	14,230	(2,846)	[683]	{342}	14,274	(2,855)	[685]	{343}
Cuyahoga	265,127	265,209	265,361	265,509	265,689	(53,138)	[12,753]	{6,377}	265,862	(53,172)	[12,761]	{6,381}	266,023	(53,205)	[12,769]	{6,385}
Franklin	284,109	284,294	284,584	284,777	285,150	(57,030)	[13,687]	{6,844}	285,489	(57,098)	[13,703]	{6,852}	285,807	(57,161)	[13,719]	{6,859}
Hamilton	184,514	184,652	184,793	184,925	185,162	(37,032)	[8,888]	{4,444}	185,375	(37,075)	[8,898]	{4,449}	185,568	(37,114)	[8,907]	{4,454}
Lake	48,361	48,373	48,391	48,408	48,441	(9,688)	[2,325]	{1,163}	48,471	(9,694)	[2,327]	{1,163}	48,500	(9,700)	[2,328]	{1,164}
Lorain	65,835	65,856	65,884	65,907	65,988	(13,198)	[3,167]	{1,584}	66,061	(13,212)	[3,171]	{1,585}	66,139	(13,228)	[3,175]	{1,587}
Lucas	97,751	97,914	98,077	98,169	98,337	(19,667)	[4,720]	{2,360}	98,481	(19,696)	[4,727]	{2,364}	98,624	(19,725)	[4,734]	{2,367}
Mahoning	52,778	52,811	52,846	52,880	52,939	(10,588)	[2,541]	{1,271}	52,993	(10,599)	[2,544]	{1,272}	53,044	(10,609)	[2,546]	{1,273}
Medina	39,577	39,598	39,619	39,628	39,655	(7,931)	[1,903]	{952}	39,678	(7,936)	[1,905]	{952}	39,700	(7,940)	[1,906]	{953}
Miami	25,461	25,483	25,514	25,524	25,554	(5,111)	[1,227]	{613}	25,581	(5,116)	[1,228]	{614}	25,607	(5,121)	[1,229]	{615}
Summit	111,144	111,187	111,233	111,294	111,381	(22,276)	[5,346]	{2,673}	111,461	(22,292)	[5,350]	{2,675}	111,533	(22,307)	[5,354]	{2,677}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.