

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/20/21**

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 5/20/21 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.

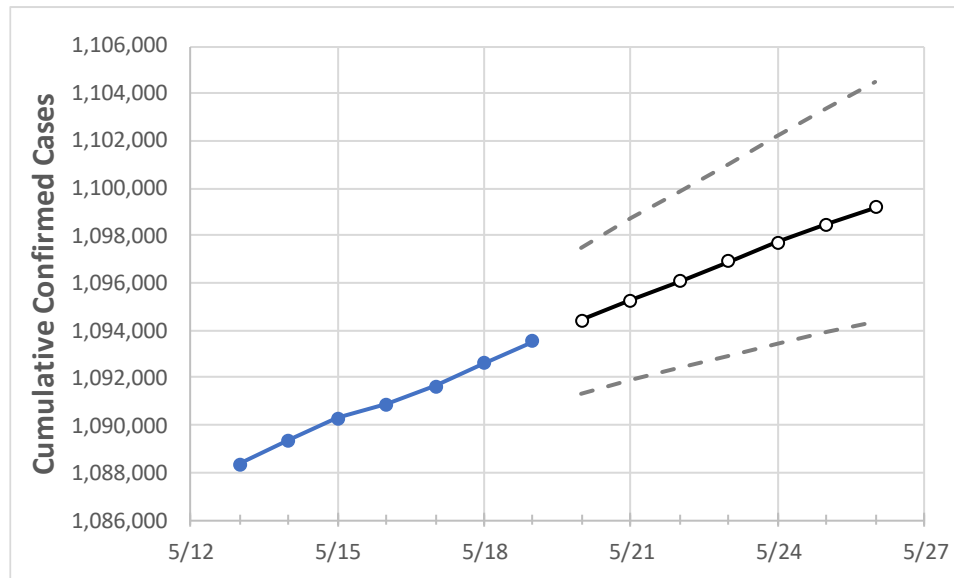
IEM's Modeling Lead

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:						
	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26
Ohio	1,090,894	1,091,623	1,092,616	1,093,534	1,094,416	1,095,260	1,096,090	1,096,907	1,097,712	1,098,466	1,099,201

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:						
	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26
Athens	5,207	5,208	5,208	5,208	5,209	5,210	5,211	5,212	5,213	5,214	5,215
Cuyahoga	113,199	113,298	113,441	113,585	113,712	113,840	113,962	114,075	114,188	114,297	114,405
Franklin	126,712	126,806	126,903	126,988	127,088	127,182	127,277	127,367	127,453	127,541	127,627
Hamilton	80,393	80,421	80,476	80,521	80,564	80,607	80,648	80,687	80,727	80,765	80,802
Lake	20,830	20,846	20,860	20,874	20,891	20,908	20,925	20,941	20,956	20,971	20,986
Lorain	25,187	25,199	25,226	25,247	25,268	25,288	25,307	25,325	25,343	25,360	25,377
Lucas	42,580	42,618	42,665	42,721	42,765	42,808	42,850	42,890	42,930	42,967	43,003
Mahoning	21,768	21,795	21,828	21,862	21,892	21,922	21,952	21,982	22,012	22,041	22,070
Medina	15,370	15,379	15,395	15,407	15,419	15,430	15,441	15,453	15,464	15,474	15,485
Miami	10,708	10,713	10,721	10,723	10,727	10,731	10,734	10,738	10,741	10,744	10,748
Summit	47,556	47,606	47,670	47,716	47,760	47,803	47,844	47,885	47,924	47,961	47,997

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:											
	5/16	5/17	5/18	5/19	5/21				5/23				5/25			
Athens	5,207	5,208	5,208	5,208	5,210	(1,042)	[250]	{125}	5,212	(1,042)	[250]	{125}	5,214	(1,043)	[250]	{125}
Cuyahoga	113,199	113,298	113,441	113,585	113,840	(22,768)	[5,464]	{2,732}	114,075	(22,815)	[5,476]	{2,738}	114,297	(22,859)	[5,486]	{2,743}
Franklin	126,712	126,806	126,903	126,988	127,182	(25,436)	[6,105]	{3,052}	127,367	(25,473)	[6,114]	{3,057}	127,541	(25,508)	[6,122]	{3,061}
Hamilton	80,393	80,421	80,476	80,521	80,607	(16,121)	[3,869]	{1,935}	80,687	(16,137)	[3,873]	{1,936}	80,765	(16,153)	[3,877]	{1,938}
Lake	20,830	20,846	20,860	20,874	20,908	(4,182)	[1,004]	{502}	20,941	(4,188)	[1,005]	{503}	20,971	(4,194)	[1,007]	{503}
Lorain	25,187	25,199	25,226	25,247	25,288	(5,058)	[1,214]	{607}	25,325	(5,065)	[1,216]	{608}	25,360	(5,072)	[1,217]	{609}
Lucas	42,580	42,618	42,665	42,721	42,808	(8,562)	[2,055]	{1,027}	42,890	(8,578)	[2,059]	{1,029}	42,967	(8,593)	[2,062]	{1,031}
Mahoning	21,768	21,795	21,828	21,862	21,922	(4,384)	[1,052]	{526}	21,982	(4,396)	[1,055]	{528}	22,041	(4,408)	[1,058]	{529}
Medina	15,370	15,379	15,395	15,407	15,430	(3,086)	[741]	{370}	15,453	(3,091)	[742]	{371}	15,474	(3,095)	[743]	{371}
Miami	10,708	10,713	10,721	10,723	10,731	(2,146)	[515]	{258}	10,738	(2,148)	[515]	{258}	10,744	(2,149)	[516]	{258}
Summit	47,556	47,606	47,670	47,716	47,803	(9,561)	[2,295]	{1,147}	47,885	(9,577)	[2,298]	{1,149}	47,961	(9,592)	[2,302]	{1,151}

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.