

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

Date: 8/18/21

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 8/18/21 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.

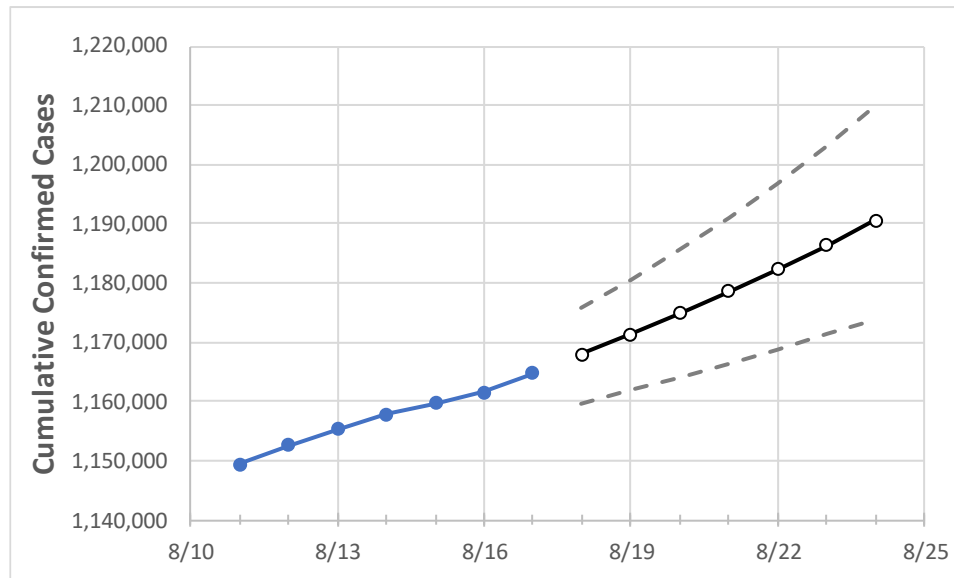
IEM's Modeling Lead

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Ohio	1,157,782	1,159,759	1,161,573	1,164,808	1,167,968	1,171,296	1,174,801	1,178,537	1,182,379	1,186,349	1,190,635

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Athens	5,356	5,366	5,371	5,379	5,389	5,399	5,411	5,423	5,436	5,450	5,465
Cuyahoga	120,021	120,167	120,320	120,525	120,746	120,980	121,220	121,469	121,729	121,998	122,270
Franklin	133,970	134,177	134,342	134,700	135,029	135,373	135,738	136,122	136,525	136,953	137,396
Hamilton	85,081	85,220	85,406	85,607	85,852	86,111	86,379	86,662	86,961	87,276	87,609
Lake	22,023	22,052	22,072	22,122	22,173	22,225	22,281	22,339	22,401	22,465	22,534
Lorain	26,825	26,872	26,922	26,990	27,058	27,127	27,199	27,275	27,354	27,433	27,517
Lucas	44,675	44,716	44,774	44,863	44,952	45,047	45,148	45,254	45,366	45,483	45,610
Mahoning	23,269	23,296	23,322	23,392	23,445	23,501	23,561	23,625	23,693	23,763	23,837
Medina	16,425	16,451	16,466	16,522	16,565	16,609	16,654	16,700	16,749	16,799	16,850
Miami	11,436	11,466	11,477	11,491	11,522	11,552	11,584	11,617	11,652	11,687	11,723
Summit	50,110	50,171	50,232	50,326	50,440	50,559	50,683	50,811	50,949	51,096	51,249

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:											
	8/14	8/15	8/16	8/17	8/19				8/21				8/23			
Athens	5,356	5,366	5,371	5,379	5,399	(1,080)	[259]	{130}	5,423	(1,085)	[260]	{130}	5,450	(1,090)	[262]	{131}
Cuyahoga	120,021	120,167	120,320	120,525	120,980	(24,196)	[5,807]	{2,904}	121,469	(24,294)	[5,831]	{2,915}	121,998	(24,400)	[5,856]	{2,928}
Franklin	133,970	134,177	134,342	134,700	135,373	(27,075)	[6,498]	{3,249}	136,122	(27,224)	[6,534]	{3,267}	136,953	(27,391)	[6,574]	{3,287}
Hamilton	85,081	85,220	85,406	85,607	86,111	(17,222)	[4,133]	{2,067}	86,662	(17,332)	[4,160]	{2,080}	87,276	(17,455)	[4,189]	{2,095}
Lake	22,023	22,052	22,072	22,122	22,225	(4,445)	[1,067]	{533}	22,339	(4,468)	[1,072]	{536}	22,465	(4,493)	[1,078]	{539}
Lorain	26,825	26,872	26,922	26,990	27,127	(5,425)	[1,302]	{651}	27,275	(5,455)	[1,309]	{655}	27,433	(5,487)	[1,317]	{658}
Lucas	44,675	44,716	44,774	44,863	45,047	(9,009)	[2,162]	{1,081}	45,254	(9,051)	[2,172]	{1,086}	45,483	(9,097)	[2,183]	{1,092}
Mahoning	23,269	23,296	23,322	23,392	23,501	(4,700)	[1,128]	{564}	23,625	(4,725)	[1,134]	{567}	23,763	(4,753)	[1,141]	{570}
Medina	16,425	16,451	16,466	16,522	16,609	(3,322)	[797]	{399}	16,700	(3,340)	[802]	{401}	16,799	(3,360)	[806]	{403}
Miami	11,436	11,466	11,477	11,491	11,552	(2,310)	[555]	{277}	11,617	(2,323)	[558]	{279}	11,687	(2,337)	[561]	{280}
Summit	50,110	50,171	50,232	50,326	50,559	(10,112)	[2,427]	{1,213}	50,811	(10,162)	[2,439]	{1,219}	51,096	(10,219)	[2,453]	{1,226}

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.