

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/13/21**

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 10/13/21 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.

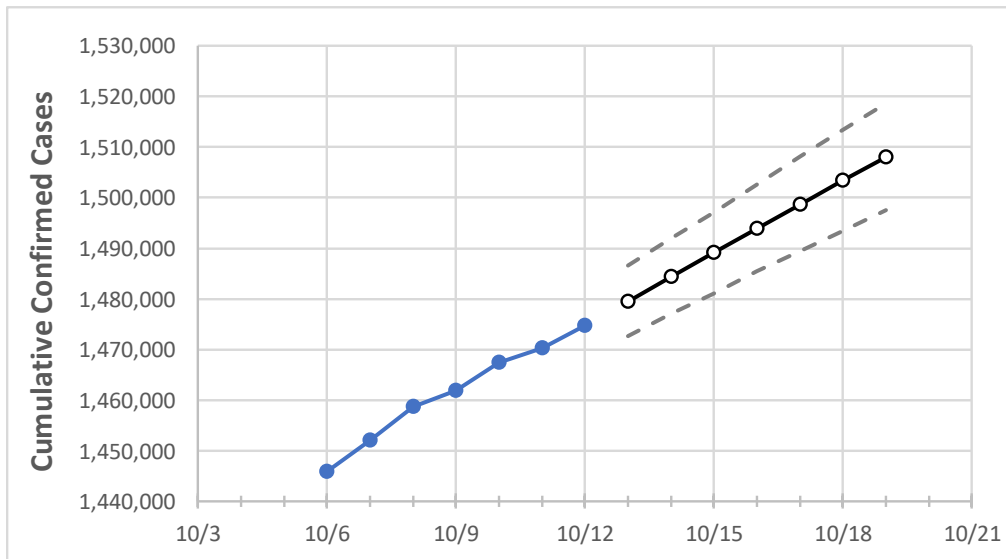
IEM's Modeling Lead

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Ohio	1,461,932	1,467,331	1,470,267	1,474,723	1,479,489	1,484,376	1,489,168	1,493,885	1,498,634	1,503,415	1,507,968

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Athens	7,505	7,531	7,543	7,569	7,595	7,619	7,643	7,666	7,690	7,713	7,736
Cuyahoga	141,484	142,029	142,302	142,685	143,084	143,476	143,873	144,261	144,664	145,056	145,452
Franklin	159,913	160,316	160,553	160,901	161,272	161,630	162,004	162,365	162,715	163,086	163,433
Hamilton	102,702	102,982	103,118	103,275	103,510	103,747	103,982	104,212	104,441	104,676	104,887
Lake	25,941	26,029	26,093	26,163	26,248	26,333	26,418	26,506	26,591	26,679	26,765
Lorain	34,093	34,252	34,336	34,466	34,600	34,738	34,874	35,012	35,145	35,282	35,417
Lucas	54,199	54,427	54,551	54,701	54,882	55,059	55,239	55,420	55,598	55,777	55,955
Mahoning	29,316	29,465	29,532	29,612	29,738	29,865	29,990	30,118	30,241	30,363	30,489
Medina	21,194	21,258	21,321	21,380	21,447	21,515	21,581	21,648	21,712	21,779	21,844
Miami	14,923	14,995	15,024	15,079	15,137	15,194	15,251	15,306	15,363	15,418	15,472
Summit	59,515	59,760	59,900	60,084	60,278	60,473	60,665	60,866	61,056	61,254	61,458

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:											
	10/9	10/10	10/11	10/12	10/14				10/16				10/18			
Athens	7,505	7,531	7,543	7,569	7,619	(1,524)	[366]	{183}	7,666	(1,533)	[368]	{184}	7,713	(1,543)	[370]	{185}
Cuyahoga	141,484	142,029	142,302	142,685	143,476	(28,695)	[6,887]	{3,443}	144,261	(28,852)	[6,925]	{3,462}	145,056	(29,011)	[6,963]	{3,481}
Franklin	159,913	160,316	160,553	160,901	161,630	(32,326)	[7,758]	{3,879}	162,365	(32,473)	[7,793]	{3,897}	163,086	(32,617)	[7,828]	{3,914}
Hamilton	102,702	102,982	103,118	103,275	103,747	(20,749)	[4,980]	{2,490}	104,212	(20,842)	[5,002]	{2,501}	104,676	(20,935)	[5,024]	{2,512}
Lake	25,941	26,029	26,093	26,163	26,333	(5,267)	[1,264]	{632}	26,506	(5,301)	[1,272]	{636}	26,679	(5,336)	[1,281]	{640}
Lorain	34,093	34,252	34,336	34,466	34,738	(6,948)	[1,667]	{834}	35,012	(7,002)	[1,681]	{840}	35,282	(7,056)	[1,694]	{847}
Lucas	54,199	54,427	54,551	54,701	55,059	(11,012)	[2,643]	{1,321}	55,420	(11,084)	[2,660]	{1,330}	55,777	(11,155)	[2,677]	{1,339}
Mahoning	29,316	29,465	29,532	29,612	29,865	(5,973)	[1,434]	{717}	30,118	(6,024)	[1,446]	{723}	30,363	(6,073)	[1,457]	{729}
Medina	21,194	21,258	21,321	21,380	21,515	(4,303)	[1,033]	{516}	21,648	(4,330)	[1,039]	{520}	21,779	(4,356)	[1,045]	{523}
Miami	14,923	14,995	15,024	15,079	15,194	(3,039)	[729]	{365}	15,306	(3,061)	[735]	{367}	15,418	(3,084)	[740]	{370}
Summit	59,515	59,760	59,900	60,084	60,473	(12,095)	[2,903]	{1,451}	60,866	(12,173)	[2,922]	{1,461}	61,254	(12,251)	[2,940]	{1,470}

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.