

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

Date: 8/11/21

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 8/11/21 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.

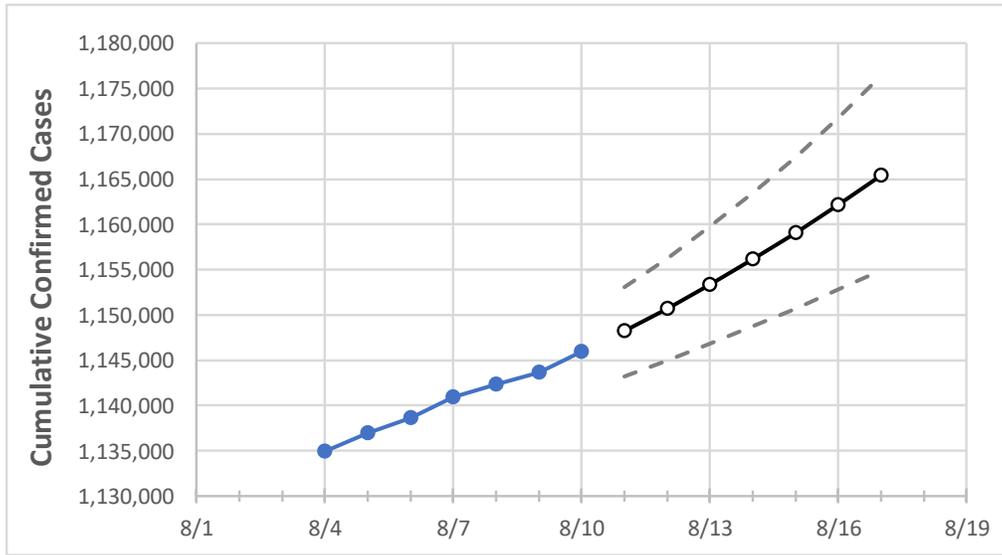
IEM's Modeling Lead

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Ohio	1,140,917	1,142,330	1,143,599	1,145,925	1,148,231	1,150,719	1,153,323	1,156,132	1,159,029	1,162,139	1,165,437

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Athens	5,305	5,316	5,321	5,325	5,331	5,337	5,344	5,352	5,360	5,369	5,379
Cuyahoga	118,725	118,825	118,945	119,108	119,285	119,475	119,672	119,879	120,095	120,322	120,559
Franklin	132,188	132,355	132,478	132,759	133,020	133,292	133,585	133,894	134,235	134,591	134,980
Hamilton	83,745	83,873	83,974	84,148	84,342	84,546	84,765	84,999	85,244	85,501	85,789
Lake	21,741	21,758	21,780	21,814	21,849	21,887	21,927	21,969	22,015	22,064	22,115
Lorain	26,443	26,474	26,516	26,581	26,637	26,695	26,757	26,822	26,892	26,963	27,040
Lucas	44,173	44,217	44,261	44,314	44,372	44,433	44,498	44,567	44,639	44,716	44,796
Mahoning	22,991	23,008	23,016	23,057	23,093	23,129	23,169	23,210	23,254	23,299	23,348
Medina	16,176	16,200	16,217	16,261	16,304	16,349	16,397	16,449	16,504	16,562	16,623
Miami	11,241	11,268	11,278	11,312	11,342	11,375	11,409	11,444	11,483	11,524	11,567
Summit	49,458	49,505	49,566	49,663	49,750	49,843	49,942	50,051	50,167	50,289	50,422

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:											
	8/7	8/8	8/9	8/10	8/12			8/14			8/16					
Athens	5,305	5,316	5,321	5,325	5,337	(1,067)	[256]	{128}	5,352	(1,070)	[257]	{128}	5,369	(1,074)	[258]	{129}
Cuyahoga	118,725	118,825	118,945	119,108	119,475	(23,895)	[5,735]	{2,867}	119,879	(23,976)	[5,754]	{2,877}	120,322	(24,064)	[5,775]	{2,888}
Franklin	132,188	132,355	132,478	132,759	133,292	(26,658)	[6,398]	{3,199}	133,894	(26,779)	[6,427]	{3,213}	134,591	(26,918)	[6,460]	{3,230}
Hamilton	83,745	83,873	83,974	84,148	84,546	(16,909)	[4,058]	{2,029}	84,999	(17,000)	[4,080]	{2,040}	85,501	(17,100)	[4,104]	{2,052}
Lake	21,741	21,758	21,780	21,814	21,887	(4,377)	[1,051]	{525}	21,969	(4,394)	[1,055]	{527}	22,064	(4,413)	[1,059]	{530}
Lorain	26,443	26,474	26,516	26,581	26,695	(5,339)	[1,281]	{641}	26,822	(5,364)	[1,287]	{644}	26,963	(5,393)	[1,294]	{647}
Lucas	44,173	44,217	44,261	44,314	44,433	(8,887)	[2,133]	{1,066}	44,567	(8,913)	[2,139]	{1,070}	44,716	(8,943)	[2,146]	{1,073}
Mahoning	22,991	23,008	23,016	23,057	23,129	(4,626)	[1,110]	{555}	23,210	(4,642)	[1,114]	{557}	23,299	(4,660)	[1,118]	{559}
Medina	16,176	16,200	16,217	16,261	16,349	(3,270)	[785]	{392}	16,449	(3,290)	[790]	{395}	16,562	(3,312)	[795]	{397}
Miami	11,241	11,268	11,278	11,312	11,375	(2,275)	[546]	{273}	11,444	(2,289)	[549]	{275}	11,524	(2,305)	[553]	{277}
Summit	49,458	49,505	49,566	49,663	49,843	(9,969)	[2,392]	{1,196}	50,051	(10,010)	[2,402]	{1,201}	50,289	(10,058)	[2,414]	{1,207}

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.