

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

Date: 8/23/21

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 8/23/21 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.

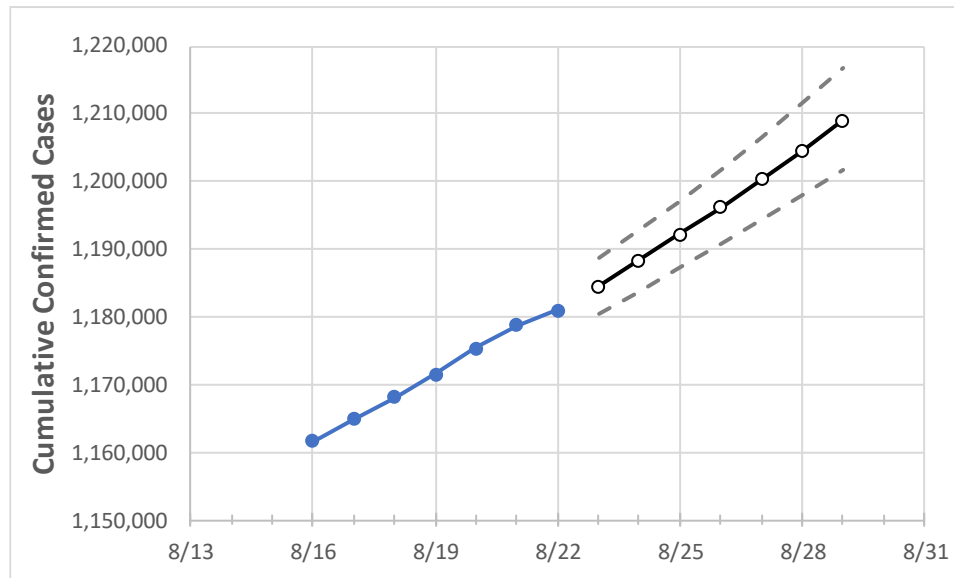
IEM's Modeling Lead

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:						
	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29
Ohio	1,171,557	1,175,340	1,178,792	1,180,986	1,184,543	1,188,290	1,192,151	1,196,150	1,200,288	1,204,516	1,209,023

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:						
	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29
Athens	5,415	5,429	5,449	5,460	5,477	5,494	5,513	5,533	5,554	5,577	5,600
Cuyahoga	121,054	121,330	121,626	121,875	122,153	122,435	122,733	123,039	123,354	123,686	124,021
Franklin	135,287	135,666	135,974	136,182	136,535	136,903	137,281	137,662	138,059	138,482	138,919
Hamilton	86,051	86,308	86,478	86,606	86,853	87,114	87,372	87,640	87,920	88,211	88,501
Lake	22,205	22,260	22,325	22,358	22,413	22,471	22,531	22,591	22,657	22,721	22,791
Lorain	27,149	27,221	27,300	27,350	27,427	27,506	27,588	27,671	27,759	27,848	27,943
Lucas	45,057	45,194	45,302	45,359	45,470	45,583	45,706	45,827	45,957	46,094	46,237
Mahoning	23,501	23,547	23,641	23,674	23,739	23,802	23,869	23,941	24,017	24,093	24,171
Medina	16,621	16,677	16,750	16,777	16,829	16,882	16,935	16,991	17,050	17,110	17,171
Miami	11,597	11,657	11,723	11,751	11,796	11,844	11,891	11,942	11,994	12,049	12,105
Summit	50,535	50,631	50,736	50,822	50,944	51,070	51,201	51,336	51,477	51,623	51,774

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:											
	8/19	8/20	8/21	8/22	8/24				8/26				8/28			
Athens	5,415	5,429	5,449	5,460	5,494	(1,099)	[264]	{132}	5,533	(1,107)	[266]	{133}	5,577	(1,115)	[268]	{134}
Cuyahoga	121,054	121,330	121,626	121,875	122,435	(24,487)	[5,877]	{2,938}	123,039	(24,608)	[5,906]	{2,953}	123,686	(24,737)	[5,937]	{2,968}
Franklin	135,287	135,666	135,974	136,182	136,903	(27,381)	[6,571]	{3,286}	137,662	(27,532)	[6,608]	{3,304}	138,482	(27,696)	[6,647]	{3,324}
Hamilton	86,051	86,308	86,478	86,606	87,114	(17,423)	[4,181]	{2,091}	87,640	(17,528)	[4,207]	{2,103}	88,211	(17,642)	[4,234]	{2,117}
Lake	22,205	22,260	22,325	22,358	22,471	(4,494)	[1,079]	{539}	22,591	(4,518)	[1,084]	{542}	22,721	(4,544)	[1,091]	{545}
Lorain	27,149	27,221	27,300	27,350	27,506	(5,501)	[1,320]	{660}	27,671	(5,534)	[1,328]	{664}	27,848	(5,570)	[1,337]	{668}
Lucas	45,057	45,194	45,302	45,359	45,583	(9,117)	[2,188]	{1,094}	45,827	(9,165)	[2,200]	{1,100}	46,094	(9,219)	[2,212]	{1,106}
Mahoning	23,501	23,547	23,641	23,674	23,802	(4,760)	[1,143]	{571}	23,941	(4,788)	[1,149]	{575}	24,093	(4,819)	[1,156]	{578}
Medina	16,621	16,677	16,750	16,777	16,882	(3,376)	[810]	{405}	16,991	(3,398)	[816]	{408}	17,110	(3,422)	[821]	{411}
Miami	11,597	11,657	11,723	11,751	11,844	(2,369)	[568]	{284}	11,942	(2,388)	[573]	{287}	12,049	(2,410)	[578]	{289}
Summit	50,535	50,631	50,736	50,822	51,070	(10,214)	[2,451]	{1,226}	51,336	(10,267)	[2,464]	{1,232}	51,623	(10,325)	[2,478]	{1,239}

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.