

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

Date: 6/8/21

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 6/8/21 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.

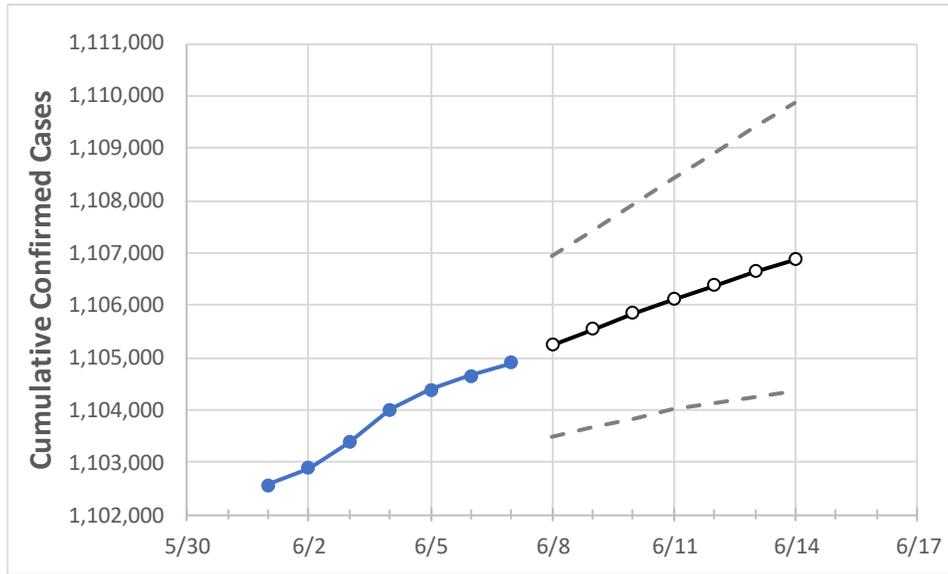
IEM's Modeling Lead

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:							
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	
Ohio	1,104,001	1,104,380	1,104,648	1,104,903	1,105,233	1,105,546	1,105,840	1,106,124	1,106,388	1,106,648	1,106,883	

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:							
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	
Athens	5,227	5,229	5,230	5,231	5,232	5,233	5,234	5,235	5,236	5,237	5,238	
Cuyahoga	115,236	115,283	115,328	115,365	115,413	115,462	115,506	115,548	115,587	115,626	115,664	
Franklin	128,116	128,156	128,192	128,222	128,260	128,298	128,334	128,368	128,400	128,431	128,461	
Hamilton	81,042	81,066	81,085	81,092	81,109	81,125	81,141	81,155	81,170	81,185	81,198	
Lake	21,091	21,100	21,104	21,105	21,109	21,114	21,118	21,121	21,125	21,128	21,131	
Lorain	25,535	25,556	25,563	25,571	25,579	25,585	25,592	25,598	25,604	25,609	25,615	
Lucas	43,166	43,178	43,187	43,203	43,215	43,225	43,235	43,244	43,253	43,261	43,268	
Mahoning	22,242	22,258	22,263	22,270	22,280	22,290	22,299	22,308	22,316	22,324	22,331	
Medina	15,546	15,555	15,558	15,570	15,574	15,578	15,581	15,585	15,588	15,591	15,594	
Miami	10,810	10,811	10,814	10,815	10,818	10,821	10,823	10,825	10,828	10,830	10,832	
Summit	48,233	48,256	48,260	48,265	48,280	48,294	48,308	48,321	48,333	48,345	48,356	

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:											
	6/4	6/5	6/6	6/7	6/9			6/11			6/13					
Athens	5,227	5,229	5,230	5,231	5,233	(1,047)	[251]	{126}	5,235	(1,047)	[251]	{126}	5,237	(1,047)	[251]	{126}
Cuyahoga	115,236	115,283	115,328	115,365	115,462	(23,092)	[5,542]	{2,771}	115,548	(23,110)	[5,546]	{2,773}	115,626	(23,125)	[5,550]	{2,775}
Franklin	128,116	128,156	128,192	128,222	128,298	(25,660)	[6,158]	{3,079}	128,368	(25,674)	[6,162]	{3,081}	128,431	(25,686)	[6,165]	{3,082}
Hamilton	81,042	81,066	81,085	81,092	81,125	(16,225)	[3,894]	{1,947}	81,155	(16,231)	[3,895]	{1,948}	81,185	(16,237)	[3,897]	{1,948}
Lake	21,091	21,100	21,104	21,105	21,114	(4,223)	[1,013]	{507}	21,121	(4,224)	[1,014]	{507}	21,128	(4,226)	[1,014]	{507}
Lorain	25,535	25,556	25,563	25,571	25,585	(5,117)	[1,228]	{614}	25,598	(5,120)	[1,229]	{614}	25,609	(5,122)	[1,229]	{615}
Lucas	43,166	43,178	43,187	43,203	43,225	(8,645)	[2,075]	{1,037}	43,244	(8,649)	[2,076]	{1,038}	43,261	(8,652)	[2,077]	{1,038}
Mahoning	22,242	22,258	22,263	22,270	22,290	(4,458)	[1,070]	{535}	22,308	(4,462)	[1,071]	{535}	22,324	(4,465)	[1,072]	{536}
Medina	15,546	15,555	15,558	15,570	15,578	(3,116)	[748]	{374}	15,585	(3,117)	[748]	{374}	15,591	(3,118)	[748]	{374}
Miami	10,810	10,811	10,814	10,815	10,821	(2,164)	[519]	{260}	10,825	(2,165)	[520]	{260}	10,830	(2,166)	[520]	{260}
Summit	48,233	48,256	48,260	48,265	48,294	(9,659)	[2,318]	{1,159}	48,321	(9,664)	[2,319]	{1,160}	48,345	(9,669)	[2,321]	{1,160}

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.