

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

Date: 6/17/21

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 6/17/21 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.

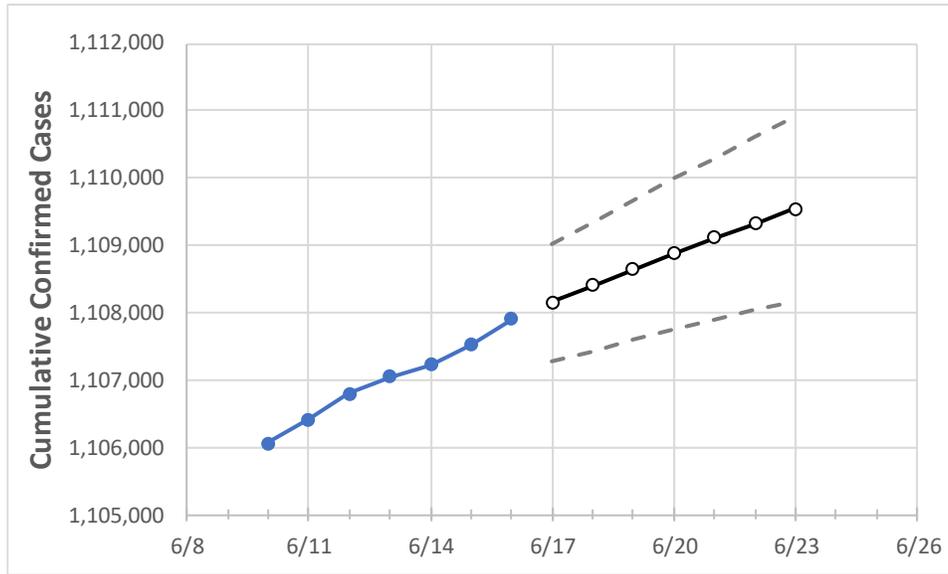
IEM's Modeling Lead

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
Ohio	1,107,047	1,107,225	1,107,521	1,107,902	1,108,158	1,108,406	1,108,648	1,108,885	1,109,109	1,109,326	1,109,542

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:						
	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22	6/23
Athens	5,234	5,234	5,234	5,234	5,235	5,235	5,236	5,236	5,237	5,237	5,238
Cuyahoga	115,597	115,632	115,671	115,713	115,739	115,765	115,791	115,813	115,834	115,855	115,874
Franklin	128,492	128,506	128,549	128,632	128,669	128,704	128,739	128,771	128,803	128,833	128,866
Hamilton	81,299	81,310	81,321	81,343	81,367	81,390	81,414	81,438	81,461	81,484	81,507
Lake	21,135	21,139	21,145	21,147	21,150	21,153	21,156	21,158	21,161	21,163	21,165
Lorain	25,641	25,642	25,642	25,653	25,660	25,667	25,674	25,681	25,687	25,693	25,699
Lucas	43,303	43,309	43,320	43,336	43,348	43,359	43,369	43,380	43,390	43,400	43,409
Mahoning	22,330	22,332	22,340	22,346	22,352	22,357	22,362	22,366	22,371	22,375	22,379
Medina	15,593	15,597	15,599	15,600	15,603	15,606	15,608	15,611	15,613	15,616	15,618
Miami	10,835	10,837	10,840	10,842	10,844	10,846	10,848	10,850	10,852	10,853	10,855
Summit	48,339	48,356	48,370	48,381	48,391	48,399	48,407	48,415	48,423	48,430	48,437

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:											
	6/13	6/14	6/15	6/16	6/18			6/20			6/22					
Athens	5,234	5,234	5,234	5,234	5,235	(1,047)	[251]	{126}	5,236	(1,047)	[251]	{126}	5,237	(1,047)	[251]	{126}
Cuyahoga	115,597	115,632	115,671	115,713	115,765	(23,153)	[5,557]	{2,778}	115,813	(23,163)	[5,559]	{2,780}	115,855	(23,171)	[5,561]	{2,781}
Franklin	128,492	128,506	128,549	128,632	128,704	(25,741)	[6,178]	{3,089}	128,771	(25,754)	[6,181]	{3,091}	128,833	(25,767)	[6,184]	{3,092}
Hamilton	81,299	81,310	81,321	81,343	81,390	(16,278)	[3,907]	{1,953}	81,438	(16,288)	[3,909]	{1,955}	81,484	(16,297)	[3,911]	{1,956}
Lake	21,135	21,139	21,145	21,147	21,153	(4,231)	[1,015]	{508}	21,158	(4,232)	[1,016]	{508}	21,163	(4,233)	[1,016]	{508}
Lorain	25,641	25,642	25,642	25,653	25,667	(5,133)	[1,232]	{616}	25,681	(5,136)	[1,233]	{616}	25,693	(5,139)	[1,233]	{617}
Lucas	43,303	43,309	43,320	43,336	43,359	(8,672)	[2,081]	{1,041}	43,380	(8,676)	[2,082]	{1,041}	43,400	(8,680)	[2,083]	{1,042}
Mahoning	22,330	22,332	22,340	22,346	22,357	(4,471)	[1,073]	{537}	22,366	(4,473)	[1,074]	{537}	22,375	(4,475)	[1,074]	{537}
Medina	15,593	15,597	15,599	15,600	15,606	(3,121)	[749]	{375}	15,611	(3,122)	[749]	{375}	15,616	(3,123)	[750]	{375}
Miami	10,835	10,837	10,840	10,842	10,846	(2,169)	[521]	{260}	10,850	(2,170)	[521]	{260}	10,853	(2,171)	[521]	{260}
Summit	48,339	48,356	48,370	48,381	48,399	(9,680)	[2,323]	{1,162}	48,415	(9,683)	[2,324]	{1,162}	48,430	(9,686)	[2,325]	{1,162}

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.