

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

Date: 8/6/21

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 8/6/21 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.

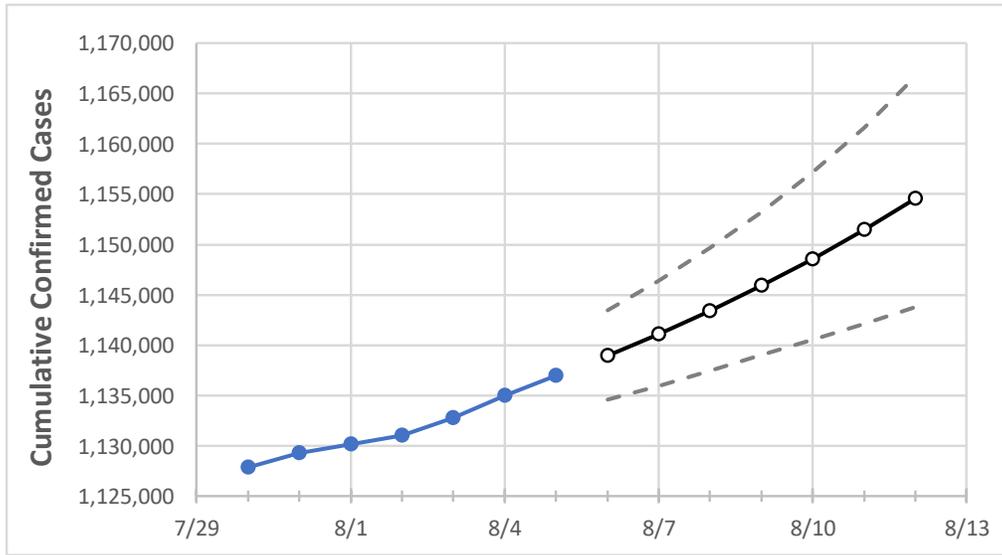
IEM's Modeling Lead

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:						
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Ohio	1,131,029	1,132,798	1,134,965	1,136,934	1,138,942	1,141,110	1,143,401	1,145,908	1,148,574	1,151,477	1,154,593

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:						
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Athens	5,286	5,289	5,291	5,293	5,296	5,299	5,302	5,306	5,309	5,313	5,317
Cuyahoga	117,903	118,059	118,236	118,390	118,562	118,748	118,946	119,160	119,393	119,643	119,905
Franklin	131,111	131,291	131,537	131,733	131,930	132,145	132,374	132,624	132,896	133,181	133,485
Hamilton	82,922	83,023	83,207	83,390	83,545	83,711	83,897	84,095	84,310	84,546	84,799
Lake	21,561	21,602	21,629	21,666	21,695	21,727	21,760	21,797	21,836	21,878	21,923
Lorain	26,204	26,232	26,317	26,364	26,415	26,469	26,527	26,589	26,656	26,727	26,803
Lucas	43,941	43,982	44,046	44,092	44,142	44,196	44,252	44,314	44,382	44,454	44,532
Mahoning	22,851	22,881	22,915	22,944	22,981	23,021	23,064	23,111	23,163	23,219	23,280
Medina	15,985	16,019	16,080	16,098	16,137	16,179	16,224	16,274	16,328	16,386	16,449
Miami	11,116	11,140	11,158	11,191	11,217	11,245	11,274	11,306	11,340	11,377	11,417
Summit	49,132	49,189	49,254	49,316	49,380	49,449	49,522	49,602	49,687	49,780	49,882

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:											
	8/2	8/3	8/4	8/5	8/7			8/9			8/11					
Athens	5,286	5,289	5,291	5,293	5,299	(1,060)	[254]	{127}	5,306	(1,061)	[255]	{127}	5,313	(1,063)	[255]	{128}
Cuyahoga	117,903	118,059	118,236	118,390	118,748	(23,750)	[5,700]	{2,850}	119,160	(23,832)	[5,720]	{2,860}	119,643	(23,929)	[5,743]	{2,871}
Franklin	131,111	131,291	131,537	131,733	132,145	(26,429)	[6,343]	{3,171}	132,624	(26,525)	[6,366]	{3,183}	133,181	(26,636)	[6,393]	{3,196}
Hamilton	82,922	83,023	83,207	83,390	83,711	(16,742)	[4,018]	{2,009}	84,095	(16,819)	[4,037]	{2,018}	84,546	(16,909)	[4,058]	{2,029}
Lake	21,561	21,602	21,629	21,666	21,727	(4,345)	[1,043]	{521}	21,797	(4,359)	[1,046]	{523}	21,878	(4,376)	[1,050]	{525}
Lorain	26,204	26,232	26,317	26,364	26,469	(5,294)	[1,271]	{635}	26,589	(5,318)	[1,276]	{638}	26,727	(5,345)	[1,283]	{641}
Lucas	43,941	43,982	44,046	44,092	44,196	(8,839)	[2,121]	{1,061}	44,314	(8,863)	[2,127]	{1,064}	44,454	(8,891)	[2,134]	{1,067}
Mahoning	22,851	22,881	22,915	22,944	23,021	(4,604)	[1,105]	{552}	23,111	(4,622)	[1,109]	{555}	23,219	(4,644)	[1,115]	{557}
Medina	15,985	16,019	16,080	16,098	16,179	(3,236)	[777]	{388}	16,274	(3,255)	[781]	{391}	16,386	(3,277)	[787]	{393}
Miami	11,116	11,140	11,158	11,191	11,245	(2,249)	[540]	{270}	11,306	(2,261)	[543]	{271}	11,377	(2,275)	[546]	{273}
Summit	49,132	49,189	49,254	49,316	49,449	(9,890)	[2,374]	{1,187}	49,602	(9,920)	[2,381]	{1,190}	49,780	(9,956)	[2,389]	{1,195}

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.