

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

Date: 7/14/21

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 7/14/21 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.**

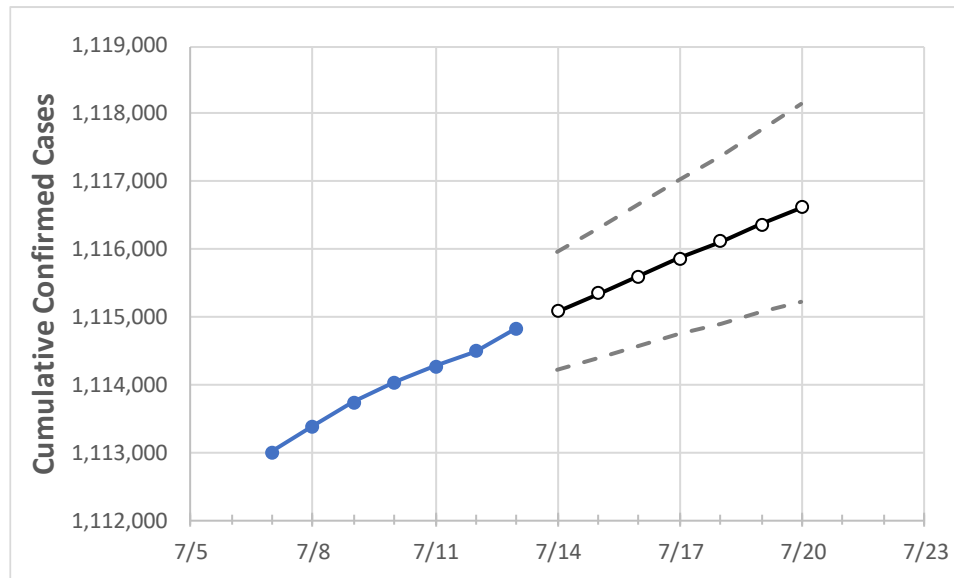
### IEM's Modeling Lead

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Ohio	1,114,036	1,114,267	1,114,491	1,114,835	1,115,088	1,115,346	1,115,600	1,115,859	1,116,115	1,116,368	1,116,623

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Athens	5,250	5,251	5,252	5,251	5,252	5,253	5,254	5,254	5,255	5,256	5,257
Cuyahoga	116,294	116,308	116,330	116,366	116,388	116,409	116,431	116,452	116,474	116,495	116,516
Franklin	129,420	129,439	129,463	129,489	129,510	129,531	129,551	129,570	129,590	129,608	129,627
Hamilton	81,709	81,730	81,743	81,768	81,788	81,809	81,831	81,853	81,875	81,898	81,920
Lake	21,292	21,300	21,314	21,323	21,331	21,339	21,347	21,356	21,365	21,374	21,384
Lorain	25,763	25,768	25,773	25,773	25,777	25,780	25,784	25,788	25,792	25,795	25,798
Lucas	43,485	43,492	43,498	43,509	43,514	43,518	43,523	43,527	43,532	43,536	43,540
Mahoning	22,461	22,466	22,469	22,470	22,473	22,477	22,480	22,483	22,486	22,489	22,492
Medina	15,692	15,698	15,700	15,702	15,707	15,712	15,717	15,723	15,728	15,734	15,739
Miami	10,888	10,892	10,895	10,902	10,905	10,908	10,911	10,914	10,917	10,921	10,924
Summit	48,592	48,596	48,603	48,620	48,627	48,635	48,642	48,649	48,657	48,664	48,671

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:											
	7/10	7/11	7/12	7/13	7/15				7/17				7/19			
Athens	5,250	5,251	5,252	5,251	5,253	(1,051)	[252]	{126}	5,254	(1,051)	[252]	{126}	5,256	(1,051)	[252]	{126}
Cuyahoga	116,294	116,308	116,330	116,366	116,409	(23,282)	[5,588]	{2,794}	116,452	(23,290)	[5,590]	{2,795}	116,495	(23,299)	[5,592]	{2,796}
Franklin	129,420	129,439	129,463	129,489	129,531	(25,906)	[6,217]	{3,109}	129,570	(25,914)	[6,219]	{3,110}	129,608	(25,922)	[6,221]	{3,111}
Hamilton	81,709	81,730	81,743	81,768	81,809	(16,362)	[3,927]	{1,963}	81,853	(16,371)	[3,929]	{1,964}	81,898	(16,380)	[3,931]	{1,966}
Lake	21,292	21,300	21,314	21,323	21,339	(4,268)	[1,024]	{512}	21,356	(4,271)	[1,025]	{513}	21,374	(4,275)	[1,026]	{513}
Lorain	25,763	25,768	25,773	25,773	25,780	(5,156)	[1,237]	{619}	25,788	(5,158)	[1,238]	{619}	25,795	(5,159)	[1,238]	{619}
Lucas	43,485	43,492	43,498	43,509	43,518	(8,704)	[2,089]	{1,044}	43,527	(8,705)	[2,089]	{1,045}	43,536	(8,707)	[2,090]	{1,045}
Mahoning	22,461	22,466	22,469	22,470	22,477	(4,495)	[1,079]	{539}	22,483	(4,497)	[1,079]	{540}	22,489	(4,498)	[1,079]	{540}
Medina	15,692	15,698	15,700	15,702	15,712	(3,142)	[754]	{377}	15,723	(3,145)	[755]	{377}	15,734	(3,147)	[755]	{378}
Miami	10,888	10,892	10,895	10,902	10,908	(2,182)	[524]	{262}	10,914	(2,183)	[524]	{262}	10,921	(2,184)	[524]	{262}
Summit	48,592	48,596	48,603	48,620	48,635	(9,727)	[2,334]	{1,167}	48,649	(9,730)	[2,335]	{1,168}	48,664	(9,733)	[2,336]	{1,168}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.