

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

**Date: 10/8/21**

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 10/8/21 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.**

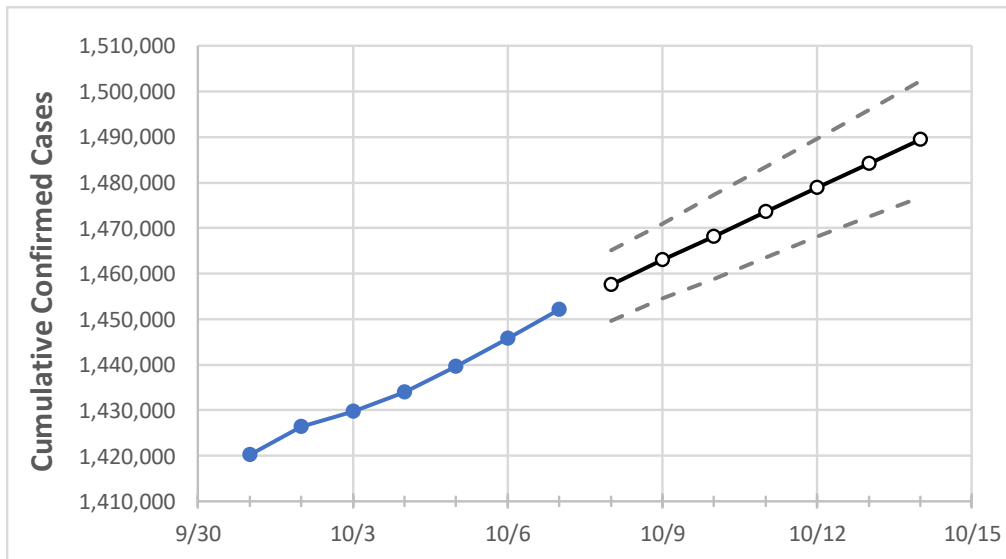
### **IEM's Modeling Lead**

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Ohio	1,433,957	1,439,490	1,445,785	1,452,096	1,457,479	1,462,916	1,468,140	1,473,625	1,478,908	1,484,187	1,489,483

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Athens	7,368	7,399	7,442	7,466	7,495	7,523	7,550	7,578	7,607	7,631	7,661
Cuyahoga	139,423	139,831	140,258	140,741	141,158	141,574	141,989	142,396	142,820	143,242	143,661
Franklin	157,634	158,084	158,547	159,040	159,455	159,853	160,260	160,653	161,057	161,442	161,836
Hamilton	101,339	101,567	101,908	102,238	102,522	102,803	103,084	103,363	103,647	103,922	104,199
Lake	25,468	25,543	25,664	25,776	25,865	25,956	26,049	26,143	26,238	26,333	26,434
Lorain	33,317	33,513	33,643	33,833	33,981	34,134	34,280	34,435	34,583	34,730	34,888
Lucas	53,223	53,355	53,603	53,746	53,924	54,102	54,276	54,455	54,625	54,803	54,974
Mahoning	28,565	28,722	28,861	29,061	29,204	29,345	29,491	29,632	29,778	29,924	30,072
Medina	20,812	20,920	20,986	21,079	21,160	21,243	21,325	21,406	21,488	21,570	21,652
Miami	14,632	14,684	14,742	14,816	14,881	14,945	15,012	15,077	15,141	15,208	15,271
Summit	58,506	58,699	58,914	59,139	59,337	59,537	59,735	59,937	60,139	60,345	60,550

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:											
	10/4	10/5	10/6	10/7	10/9				10/11				10/13			
Athens	7,368	7,399	7,442	7,466	7,523	(1,505)	[361]	{181}	7,578	(1,516)	[364]	{182}	7,631	(1,526)	[366]	{183}
Cuyahoga	139,423	139,831	140,258	140,741	141,574	(28,315)	[6,796]	{3,398}	142,396	(28,479)	[6,835]	{3,418}	143,242	(28,648)	[6,876]	{3,438}
Franklin	157,634	158,084	158,547	159,040	159,853	(31,971)	[7,673]	{3,836}	160,653	(32,131)	[7,711]	{3,856}	161,442	(32,288)	[7,749]	{3,875}
Hamilton	101,339	101,567	101,908	102,238	102,803	(20,561)	[4,935]	{2,467}	103,363	(20,673)	[4,961]	{2,481}	103,922	(20,784)	[4,988]	{2,494}
Lake	25,468	25,543	25,664	25,776	25,956	(5,191)	[1,246]	{623}	26,143	(5,229)	[1,255]	{627}	26,333	(5,267)	[1,264]	{632}
Lorain	33,317	33,513	33,643	33,833	34,134	(6,827)	[1,638]	{819}	34,435	(6,887)	[1,653]	{826}	34,730	(6,946)	[1,667]	{834}
Lucas	53,223	53,355	53,603	53,746	54,102	(10,820)	[2,597]	{1,298}	54,455	(10,891)	[2,614]	{1,307}	54,803	(10,961)	[2,631]	{1,315}
Mahoning	28,565	28,722	28,861	29,061	29,345	(5,869)	[1,409]	{704}	29,632	(5,926)	[1,422]	{711}	29,924	(5,985)	[1,436]	{718}
Medina	20,812	20,920	20,986	21,079	21,243	(4,249)	[1,020]	{510}	21,406	(4,281)	[1,027]	{514}	21,570	(4,314)	[1,035]	{518}
Miami	14,632	14,684	14,742	14,816	14,945	(2,989)	[717]	{359}	15,077	(3,015)	[724]	{362}	15,208	(3,042)	[730]	{365}
Summit	58,506	58,699	58,914	59,139	59,537	(11,907)	[2,858]	{1,429}	59,937	(11,987)	[2,877]	{1,438}	60,345	(12,069)	[2,897]	{1,448}

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.