

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 2/12/21**

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 2/12/21 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.**

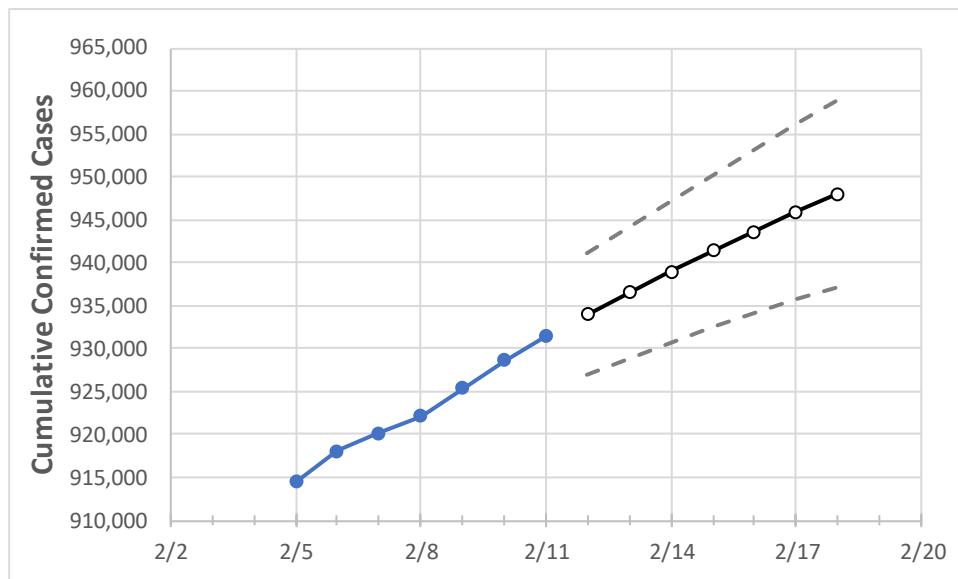
**IEM's Modeling Lead**

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:							
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18	
Ohio	922,143	925,350	928,631	931,437	934,027	936,592	939,023	941,393	943,647	945,895	948,015	

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:							
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18	
Athens	4,230	4,263	4,290	4,308	4,331	4,355	4,378	4,401	4,423	4,445	4,468	
Cuyahoga	91,318	91,474	91,739	91,924	92,122	92,306	92,485	92,656	92,825	92,993	93,140	
Franklin	107,282	107,627	107,954	108,226	108,463	108,696	108,923	109,141	109,352	109,554	109,749	
Hamilton	69,562	69,858	70,101	70,320	70,559	70,788	71,016	71,232	71,439	71,640	71,849	
Lake	17,371	17,454	17,516	17,601	17,660	17,717	17,771	17,826	17,880	17,932	17,984	
Lorain	20,717	20,801	20,915	20,987	21,058	21,128	21,194	21,257	21,319	21,379	21,441	
Lucas	33,471	33,564	33,665	33,762	33,846	33,928	34,004	34,078	34,148	34,217	34,282	
Mahoning	18,530	18,579	18,658	18,713	18,769	18,824	18,877	18,929	18,979	19,029	19,080	
Medina	12,592	12,641	12,689	12,728	12,772	12,815	12,856	12,897	12,937	12,975	13,014	
Miami	9,684	9,719	9,741	9,766	9,788	9,808	9,829	9,848	9,867	9,886	9,903	
Summit	37,749	37,898	38,074	38,210	38,350	38,487	38,623	38,754	38,880	39,008	39,130	

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:											
	2/8	2/9	2/10	2/11	2/13		2/15		2/17							
Athens	4,230	4,263	4,290	4,308	4,355	(871)	[209]	{105}	4,401	(880)	[211]	{106}	4,445	(889)	[213]	{107}
Cuyahoga	91,318	91,474	91,739	91,924	92,306	(18,461)	[4,431]	{2,215}	92,656	(18,531)	[4,447]	{2,224}	92,993	(18,599)	[4,464]	{2,232}
Franklin	107,282	107,627	107,954	108,226	108,696	(21,739)	[5,217]	{2,609}	109,141	(21,828)	[5,239]	{2,619}	109,554	(21,911)	[5,259]	{2,629}
Hamilton	69,562	69,858	70,101	70,320	70,788	(14,158)	[3,398]	{1,699}	71,232	(14,246)	[3,419]	{1,710}	71,640	(14,328)	[3,439]	{1,719}
Lake	17,371	17,454	17,516	17,601	17,717	(3,543)	[850]	{425}	17,826	(3,565)	[856]	{428}	17,932	(3,586)	[861]	{430}
Lorain	20,717	20,801	20,915	20,987	21,128	(4,226)	[1,014]	{507}	21,257	(4,251)	[1,020]	{510}	21,379	(4,276)	[1,026]	{513}
Lucas	33,471	33,564	33,665	33,762	33,928	(6,786)	[1,629]	{814}	34,078	(6,816)	[1,636]	{818}	34,217	(6,843)	[1,642]	{821}
Mahoning	18,530	18,579	18,658	18,713	18,824	(3,765)	[904]	{452}	18,929	(3,786)	[909]	{454}	19,029	(3,806)	[913]	{457}
Medina	12,592	12,641	12,689	12,728	12,815	(2,563)	[615]	{308}	12,897	(2,579)	[619]	{310}	12,975	(2,595)	[623]	{311}
Miami	9,684	9,719	9,741	9,766	9,808	(1,962)	[471]	{235}	9,848	(1,970)	[473]	{236}	9,886	(1,977)	[475]	{237}
Summit	37,749	37,898	38,074	38,210	38,487	(7,697)	[1,847]	{924}	38,754	(7,751)	[1,860]	{930}	39,008	(7,802)	[1,872]	{936}

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.