

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 7/28/21**

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 7/28/21 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.**

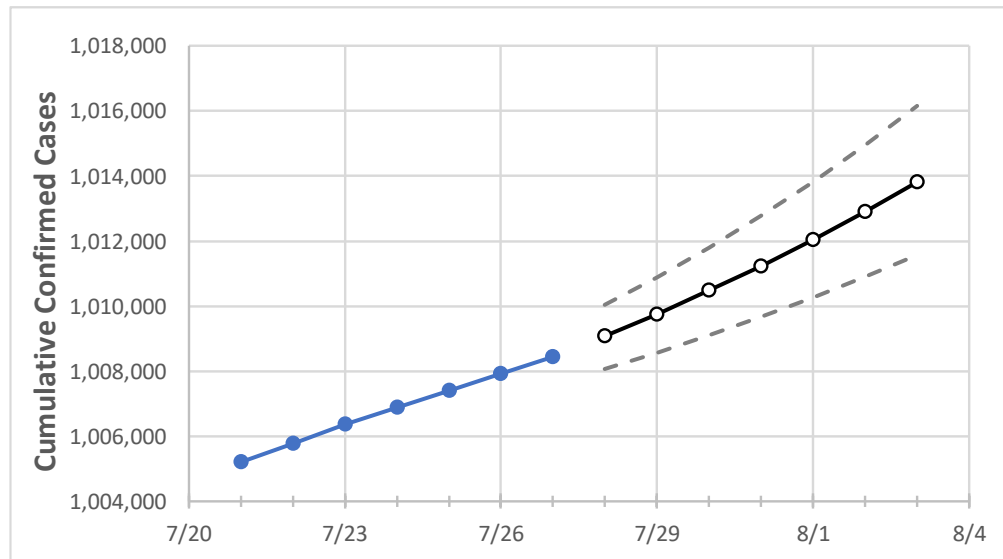
**IEM's Modeling Lead**

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.

## Michigan State Projections



	Actual Confirmed Cases On:					Projected Cases For:					
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Michigan	1,006,877	1,007,395	1,007,912	1,008,429	1,009,066	1,009,751	1,010,474	1,011,232	1,012,040	1,012,898	1,013,808

*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.*

## Michigan Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Genesee	41,967	41,987	42,006	42,026	42,050	42,076	42,104	42,133	42,165	42,199	42,235
Ingham	25,075	25,092	25,110	25,127	25,148	25,171	25,196	25,224	25,254	25,286	25,322
Kent	74,225	74,247	74,270	74,292	74,319	74,347	74,374	74,402	74,432	74,461	74,492
Livingston	16,884	16,897	16,909	16,922	16,937	16,954	16,972	16,991	17,012	17,035	17,059
Macomb	100,806	100,862	100,917	100,973	101,046	101,124	101,209	101,300	101,400	101,509	101,628
Monroe	15,539	15,548	15,557	15,566	15,576	15,587	15,598	15,610	15,623	15,636	15,650
Oakland	119,745	119,823	119,900	119,978	120,075	120,178	120,291	120,411	120,538	120,673	120,819
Washtenaw	26,705	26,724	26,742	26,761	26,783	26,806	26,831	26,857	26,886	26,916	26,949
Wayne	167,336	167,422	167,508	167,594	167,698	167,807	167,918	168,038	168,161	168,290	168,420

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.

### Michigan Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	7/24	7/25	7/26	7/27	7/29			7/31			8/2					
Genesee	41,967	41,987	42,006	42,026	42,076	(8,415)	[2,020]	{1,010}	42,133	(8,427)	[2,022]	{1,011}	42,199	(8,440)	[2,026]	{1,013}
Ingham	25,075	25,092	25,110	25,127	25,171	(5,034)	[1,208]	{604}	25,224	(5,045)	[1,211]	{605}	25,286	(5,057)	[1,214]	{607}
Kent	74,225	74,247	74,270	74,292	74,347	(14,869)	[3,569]	{1,784}	74,402	(14,880)	[3,571]	{1,786}	74,461	(14,892)	[3,574]	{1,787}
Livingston	16,884	16,897	16,909	16,922	16,954	(3,391)	[814]	{407}	16,991	(3,398)	[816]	{408}	17,035	(3,407)	[818]	{409}
Macomb	100,806	100,862	100,917	100,973	101,124	(20,225)	[4,854]	{2,427}	101,300	(20,260)	[4,862]	{2,431}	101,509	(20,302)	[4,872]	{2,436}
Monroe	15,539	15,548	15,557	15,566	15,587	(3,117)	[748]	{374}	15,610	(3,122)	[749]	{375}	15,636	(3,127)	[751]	{375}
Oakland	119,745	119,823	119,900	119,978	120,178	(24,036)	[5,769]	{2,884}	120,411	(24,082)	[5,780]	{2,890}	120,673	(24,135)	[5,792]	{2,896}
Washtenaw	26,705	26,724	26,742	26,761	26,806	(5,361)	[1,287]	{643}	26,857	(5,371)	[1,289]	{645}	26,916	(5,383)	[1,292]	{646}
Wayne	167,336	167,422	167,508	167,594	167,807	(33,561)	[8,055]	{4,027}	168,038	(33,608)	[8,066]	{4,033}	168,290	(33,658)	[8,078]	{4,039}

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.