

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 3/29/21**

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 3/29/21 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.**

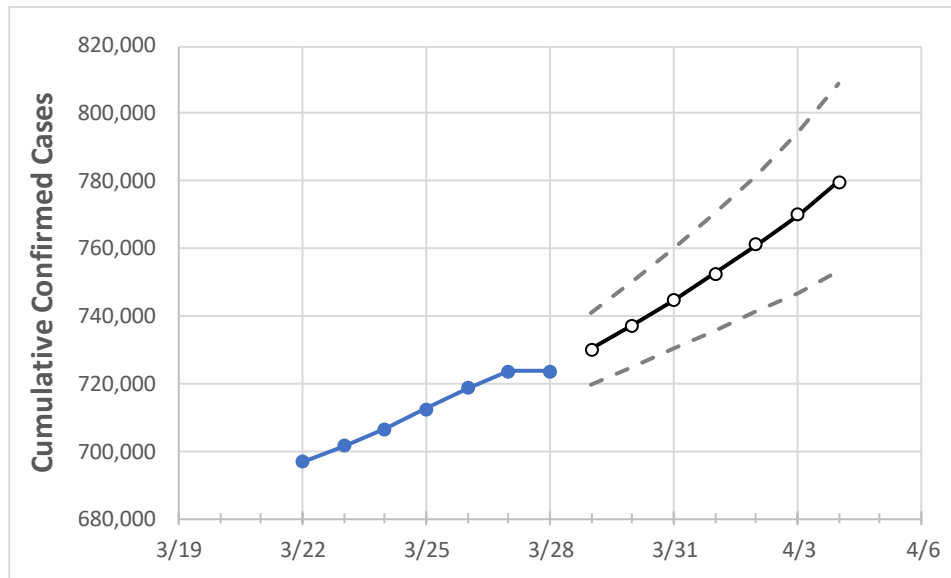
**IEM's Modeling Lead**

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Michigan	712,393	718,455	723,700	723,700	730,210	737,145	744,719	752,571	761,083	770,047	779,772

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Genesee	28,745	29,055	29,401	29,401	29,664	29,939	30,233	30,539	30,857	31,198	31,553
Ingham	18,445	18,644	18,753	18,753	18,940	19,136	19,343	19,563	19,793	20,036	20,294
Kent	54,835	55,160	55,430	55,430	55,756	56,111	56,486	56,895	57,344	57,818	58,328
Livingston	11,661	11,747	11,860	11,860	11,980	12,106	12,242	12,384	12,535	12,695	12,867
Macomb	67,441	68,315	69,100	69,100	70,077	71,129	72,279	73,506	74,846	76,282	77,803
Monroe	10,977	11,144	11,197	11,197	11,281	11,370	11,458	11,552	11,649	11,754	11,860
Oakland	83,444	84,210	84,984	84,984	85,925	86,923	87,993	89,150	90,405	91,735	93,142
Washtenaw	20,126	20,295	20,434	20,434	20,542	20,658	20,782	20,911	21,042	21,182	21,328
Wayne	112,946	113,931	114,811	114,811	115,925	117,120	118,408	119,815	121,317	122,912	124,588

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:											
	3/25	3/26	3/27	3/28	3/30				4/1				4/3			
Genesee	28,745	29,055	29,401	29,401	29,939	(5,988)	[1,437]	{719}	30,539	(6,108)	[1,466]	{733}	31,198	(6,240)	[1,498]	{749}
Ingham	18,445	18,644	18,753	18,753	19,136	(3,827)	[919]	{459}	19,563	(3,913)	[939]	{470}	20,036	(4,007)	[962]	{481}
Kent	54,835	55,160	55,430	55,430	56,111	(11,222)	[2,693]	{1,347}	56,895	(11,379)	[2,731]	{1,365}	57,818	(11,564)	[2,775]	{1,388}
Livingston	11,661	11,747	11,860	11,860	12,106	(2,421)	[581]	{291}	12,384	(2,477)	[594]	{297}	12,695	(2,539)	[609]	{305}
Macomb	67,441	68,315	69,100	69,100	71,129	(14,226)	[3,414]	{1,707}	73,506	(14,701)	[3,528]	{1,764}	76,282	(15,256)	[3,662]	{1,831}
Monroe	10,977	11,144	11,197	11,197	11,370	(2,274)	[546]	{273}	11,552	(2,310)	[555]	{277}	11,754	(2,351)	[564]	{282}
Oakland	83,444	84,210	84,984	84,984	86,923	(17,385)	[4,172]	{2,086}	89,150	(17,830)	[4,279]	{2,140}	91,735	(18,347)	[4,403]	{2,202}
Washtenaw	20,126	20,295	20,434	20,434	20,658	(4,132)	[992]	{496}	20,911	(4,182)	[1,004]	{502}	21,182	(4,236)	[1,017]	{508}
Wayne	112,946	113,931	114,811	114,811	117,120	(23,424)	[5,622]	{2,811}	119,815	(23,963)	[5,751]	{2,876}	122,912	(24,582)	[5,900]	{2,950}

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.