

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

**Date: 3/4/22**

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 3/4/22 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.**

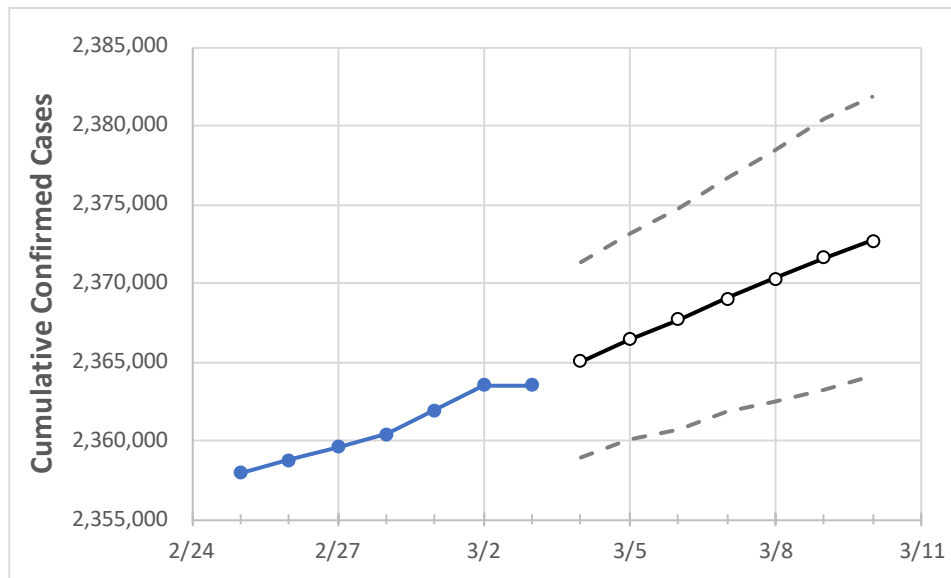
### **IEM's Modeling Lead**

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:							
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10	
Michigan	2,360,399	2,361,959	2,363,519	2,363,519	2,365,036	2,366,463	2,367,725	2,369,020	2,370,316	2,371,619	2,372,728	

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Genesee	100,036	100,127	100,218	100,218	100,256	100,294	100,332	100,360	100,392	100,424	100,454
Ingham	63,083	63,120	63,156	63,156	63,196	63,234	63,270	63,304	63,339	63,372	63,402
Kent	164,941	165,010	165,079	165,079	165,198	165,294	165,382	165,472	165,559	165,673	165,745
Livingston	45,321	45,338	45,354	45,354	45,377	45,400	45,421	45,440	45,458	45,480	45,499
Macomb	224,669	224,862	225,055	225,055	225,208	225,365	225,509	225,658	225,802	225,952	226,086
Monroe	37,544	37,560	37,575	37,575	37,586	37,597	37,607	37,616	37,625	37,634	37,642
Oakland	282,079	282,259	282,438	282,438	282,574	282,685	282,800	282,914	283,033	283,124	283,231
Washtenaw	72,915	73,007	73,098	73,098	73,184	73,271	73,349	73,435	73,507	73,588	73,669
Wayne	392,673	392,903	393,133	393,133	393,320	393,507	393,671	393,870	394,030	394,189	394,361

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:											
	2/28	3/1	3/2	3/3	3/5			3/7			3/9					
Genesee	100,036	100,127	100,218	100,218	100,294	(20,059)	[4,814]	{2,407}	100,360	(20,072)	[4,817]	{2,409}	100,424	(20,085)	[4,820]	{2,410}
Ingham	63,083	63,120	63,156	63,156	63,234	(12,647)	[3,035]	{1,518}	63,304	(12,661)	[3,039]	{1,519}	63,372	(12,674)	[3,042]	{1,521}
Kent	164,941	165,010	165,079	165,079	165,294	(33,059)	[7,934]	{3,967}	165,472	(33,094)	[7,943]	{3,971}	165,673	(33,135)	[7,952]	{3,976}
Livingston	45,321	45,338	45,354	45,354	45,400	(9,080)	[2,179]	{1,090}	45,440	(9,088)	[2,181]	{1,091}	45,480	(9,096)	[2,183]	{1,092}
Macomb	224,669	224,862	225,055	225,055	225,365	(45,073)	[10,817]	{5,409}	225,658	(45,132)	[10,832]	{5,416}	225,952	(45,190)	[10,846]	{5,423}
Monroe	37,544	37,560	37,575	37,575	37,597	(7,519)	[1,805]	{902}	37,616	(7,523)	[1,806]	{903}	37,634	(7,527)	[1,806]	{903}
Oakland	282,079	282,259	282,438	282,438	282,685	(56,537)	[13,569]	{6,784}	282,914	(56,583)	[13,580]	{6,790}	283,124	(56,625)	[13,590]	{6,795}
Washtenaw	72,915	73,007	73,098	73,098	73,271	(14,654)	[3,517]	{1,758}	73,435	(14,687)	[3,525]	{1,762}	73,588	(14,718)	[3,532]	{1,766}
Wayne	392,673	392,903	393,133	393,133	393,507	(78,701)	[18,888]	{9,444}	393,870	(78,774)	[18,906]	{9,453}	394,189	(78,838)	[18,921]	{9,461}

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.