

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

**Date: 2/24/21**

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 2/24/21 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.**

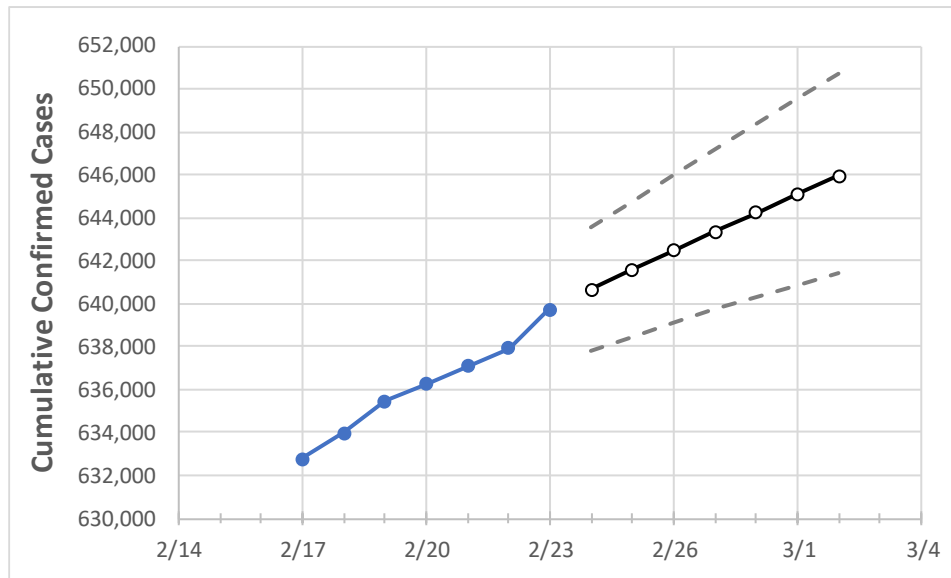
### **IEM's Modeling Lead**

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:							
	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	
Michigan	636,269	637,099	637,928	639,712	640,656	641,572	642,465	643,357	644,235	645,095	645,948	

*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:						
	2/20	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2
Genesee	25,129	25,153	25,177	25,272	25,307	25,343	25,379	25,414	25,450	25,485	25,522
Ingham	16,090	16,114	16,138	16,215	16,248	16,280	16,312	16,342	16,373	16,403	16,433
Kent	51,149	51,205	51,260	51,381	51,454	51,523	51,594	51,663	51,730	51,797	51,863
Livingston	10,113	10,131	10,148	10,182	10,199	10,215	10,232	10,248	10,264	10,279	10,294
Macomb	58,002	58,087	58,172	58,347	58,437	58,525	58,614	58,698	58,785	58,872	58,958
Monroe	9,614	9,627	9,639	9,664	9,678	9,691	9,705	9,718	9,730	9,741	9,753
Oakland	73,744	73,833	73,922	74,155	74,266	74,375	74,486	74,591	74,696	74,798	74,896
Washtenaw	18,279	18,320	18,361	18,424	18,476	18,525	18,573	18,622	18,666	18,711	18,755
Wayne	100,372	100,507	100,642	100,878	101,019	101,157	101,295	101,427	101,556	101,684	101,813

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:											
	2/20	2/21	2/22	2/23	2/25				2/27				3/1			
Genesee	25,129	25,153	25,177	25,272	25,343	(5,069)	[1,216]	{608}	25,414	(5,083)	[1,220]	{610}	25,485	(5,097)	[1,223]	{612}
Ingham	16,090	16,114	16,138	16,215	16,280	(3,256)	[781]	{391}	16,342	(3,268)	[784]	{392}	16,403	(3,281)	[787]	{394}
Kent	51,149	51,205	51,260	51,381	51,523	(10,305)	[2,473]	{1,237}	51,663	(10,333)	[2,480]	{1,240}	51,797	(10,359)	[2,486]	{1,243}
Livingston	10,113	10,131	10,148	10,182	10,215	(2,043)	[490]	{245}	10,248	(2,050)	[492]	{246}	10,279	(2,056)	[493]	{247}
Macomb	58,002	58,087	58,172	58,347	58,525	(11,705)	[2,809]	{1,405}	58,698	(11,740)	[2,818]	{1,409}	58,872	(11,774)	[2,826]	{1,413}
Monroe	9,614	9,627	9,639	9,664	9,691	(1,938)	[465]	{233}	9,718	(1,944)	[466]	{233}	9,741	(1,948)	[468]	{234}
Oakland	73,744	73,833	73,922	74,155	74,375	(14,875)	[3,570]	{1,785}	74,591	(14,918)	[3,580]	{1,790}	74,798	(14,960)	[3,590]	{1,795}
Washtenaw	18,279	18,320	18,361	18,424	18,525	(3,705)	[889]	{445}	18,622	(3,724)	[894]	{447}	18,711	(3,742)	[898]	{449}
Wayne	100,372	100,507	100,642	100,878	101,157	(20,231)	[4,856]	{2,428}	101,427	(20,285)	[4,869]	{2,434}	101,684	(20,337)	[4,881]	{2,440}

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.