

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

Date: 3/4/21

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 3/4/21 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.**

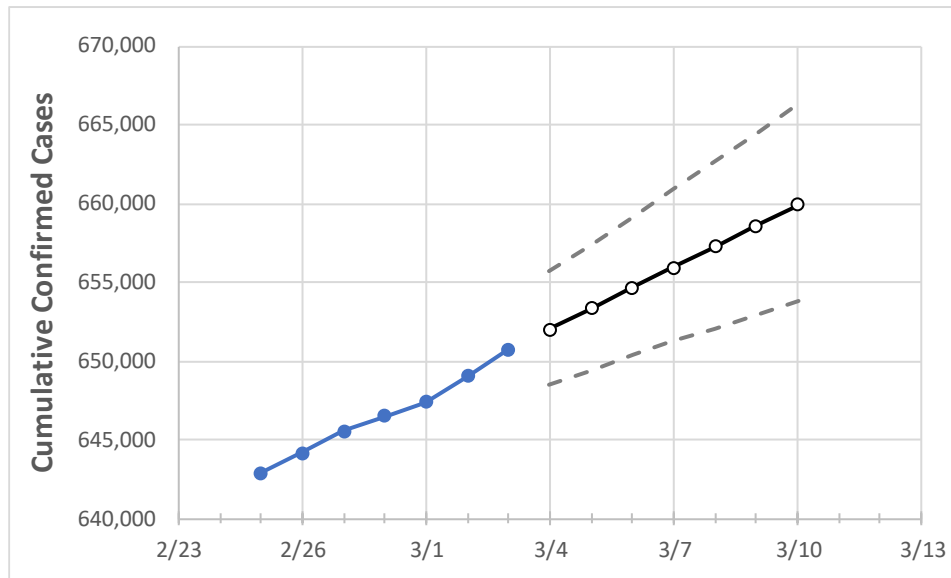
### IEM's Modeling Lead

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Michigan	646,483	647,415	649,057	650,762	652,034	653,333	654,643	655,935	657,263	658,579	659,917

*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	25,601	25,656	25,753	25,834	25,914	25,996	26,082	26,171	26,264	26,359	26,461
Ingham	16,413	16,439	16,482	16,543	16,579	16,614	16,649	16,684	16,719	16,753	16,786
Kent	51,782	51,846	51,949	52,039	52,116	52,193	52,269	52,345	52,423	52,498	52,573
Livingston	10,313	10,336	10,369	10,420	10,447	10,475	10,503	10,531	10,561	10,589	10,620
Macomb	59,027	59,119	59,289	59,489	59,634	59,785	59,935	60,089	60,246	60,411	60,572
Monroe	9,789	9,806	9,854	9,901	9,928	9,957	9,986	10,016	10,046	10,077	10,109
Oakland	74,864	74,973	75,147	75,328	75,471	75,613	75,753	75,897	76,038	76,179	76,319
Washtenaw	18,716	18,748	18,776	18,834	18,878	18,920	18,961	19,000	19,039	19,076	19,112
Wayne	101,950	102,122	102,411	102,694	102,921	103,152	103,386	103,624	103,868	104,115	104,371

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	25,601	25,656	25,753	25,834	25,996	(5,199)	[1,248]	{624}	26,171	(5,234)	[1,256]	{628}	26,359	(5,272)	[1,265]	{633}
Ingham	16,413	16,439	16,482	16,543	16,614	(3,323)	[797]	{399}	16,684	(3,337)	[801]	{400}	16,753	(3,351)	[804]	{402}
Kent	51,782	51,846	51,949	52,039	52,193	(10,439)	[2,505]	{1,253}	52,345	(10,469)	[2,513]	{1,256}	52,498	(10,500)	[2,520]	{1,260}
Livingston	10,313	10,336	10,369	10,420	10,475	(2,095)	[503]	{251}	10,531	(2,106)	[505]	{253}	10,589	(2,118)	[508]	{254}
Macomb	59,027	59,119	59,289	59,489	59,785	(11,957)	[2,870]	{1,435}	60,089	(12,018)	[2,884]	{1,442}	60,411	(12,082)	[2,900]	{1,450}
Monroe	9,789	9,806	9,854	9,901	9,957	(1,991)	[478]	{239}	10,016	(2,003)	[481]	{240}	10,077	(2,015)	[484]	{242}
Oakland	74,864	74,973	75,147	75,328	75,613	(15,123)	[3,629]	{1,815}	75,897	(15,179)	[3,643]	{1,822}	76,179	(15,236)	[3,657]	{1,828}
Washtenaw	18,716	18,748	18,776	18,834	18,920	(3,784)	[908]	{454}	19,000	(3,800)	[912]	{456}	19,076	(3,815)	[916]	{458}
Wayne	101,950	102,122	102,411	102,694	103,152	(20,630)	[4,951]	{2,476}	103,624	(20,725)	[4,974]	{2,487}	104,115	(20,823)	[4,998]	{2,499}

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.