

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

Date: 2/11/21

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 2/11/21 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.**

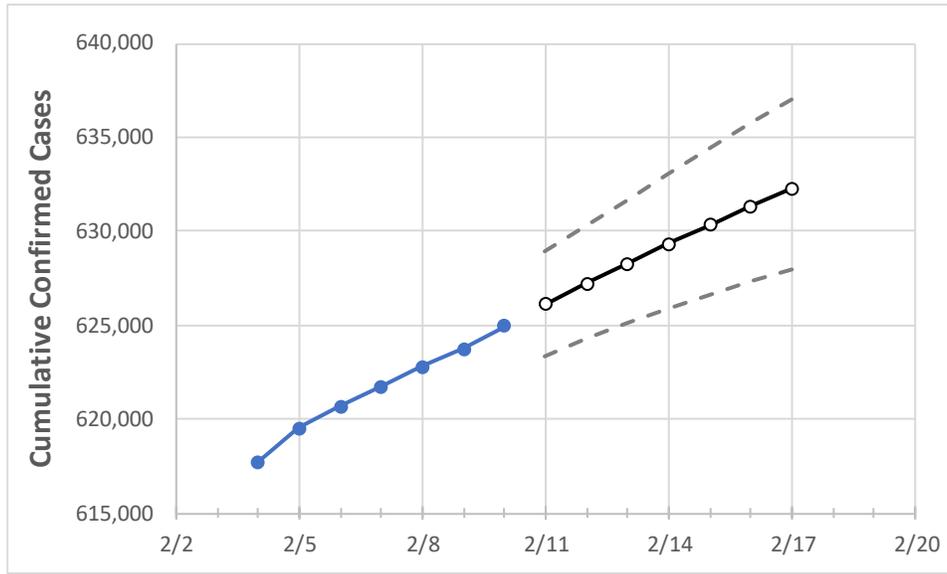
### IEM's Modeling Lead

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:							
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	
Michigan	621,749	622,813	623,731	624,970	626,131	627,231	628,301	629,343	630,347	631,313	632,263	

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:							
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	
Genesee	24,686	24,720	24,732	24,776	24,805	24,833	24,860	24,887	24,912	24,937	24,960	
Ingham	15,532	15,588	15,616	15,684	15,741	15,799	15,856	15,911	15,968	16,024	16,079	
Kent	50,035	50,094	50,158	50,273	50,351	50,428	50,502	50,575	50,643	50,710	50,775	
Livingston	9,851	9,874	9,892	9,918	9,943	9,967	9,990	10,013	10,035	10,057	10,078	
Macomb	56,801	56,893	56,964	57,089	57,184	57,276	57,365	57,451	57,536	57,618	57,697	
Monroe	9,365	9,384	9,405	9,423	9,441	9,459	9,476	9,491	9,506	9,520	9,534	
Oakland	71,944	72,077	72,246	72,411	72,570	72,726	72,878	73,031	73,177	73,321	73,460	
Washtenaw	17,391	17,439	17,526	17,581	17,661	17,739	17,818	17,895	17,970	18,045	18,119	
Wayne	98,327	98,524	98,632	98,783	98,943	99,098	99,247	99,393	99,533	99,670	99,800	

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:											
	2/7	2/8	2/9	2/10	2/12				2/14				2/16			
Genesee	24,686	24,720	24,732	24,776	24,833	(4,967)	[1,192]	{596}	24,887	(4,977)	[1,195]	{597}	24,937	(4,987)	[1,197]	{598}
Ingham	15,532	15,588	15,616	15,684	15,799	(3,160)	[758]	{379}	15,911	(3,182)	[764]	{382}	16,024	(3,205)	[769]	{385}
Kent	50,035	50,094	50,158	50,273	50,428	(10,086)	[2,421]	{1,210}	50,575	(10,115)	[2,428]	{1,214}	50,710	(10,142)	[2,434]	{1,217}
Livingston	9,851	9,874	9,892	9,918	9,967	(1,993)	[478]	{239}	10,013	(2,003)	[481]	{240}	10,057	(2,011)	[483]	{241}
Macomb	56,801	56,893	56,964	57,089	57,276	(11,455)	[2,749]	{1,375}	57,451	(11,490)	[2,758]	{1,379}	57,618	(11,524)	[2,766]	{1,383}
Monroe	9,365	9,384	9,405	9,423	9,459	(1,892)	[454]	{227}	9,491	(1,898)	[456]	{228}	9,520	(1,904)	[457]	{228}
Oakland	71,944	72,077	72,246	72,411	72,726	(14,545)	[3,491]	{1,745}	73,031	(14,606)	[3,505]	{1,753}	73,321	(14,664)	[3,519]	{1,760}
Washtenaw	17,391	17,439	17,526	17,581	17,739	(3,548)	[851]	{426}	17,895	(3,579)	[859]	{429}	18,045	(3,609)	[866]	{433}
Wayne	98,327	98,524	98,632	98,783	99,098	(19,820)	[4,757]	{2,378}	99,393	(19,879)	[4,771]	{2,385}	99,670	(19,934)	[4,784]	{2,392}

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.