

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

Date: 5/3/21

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 5/3/21 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.**

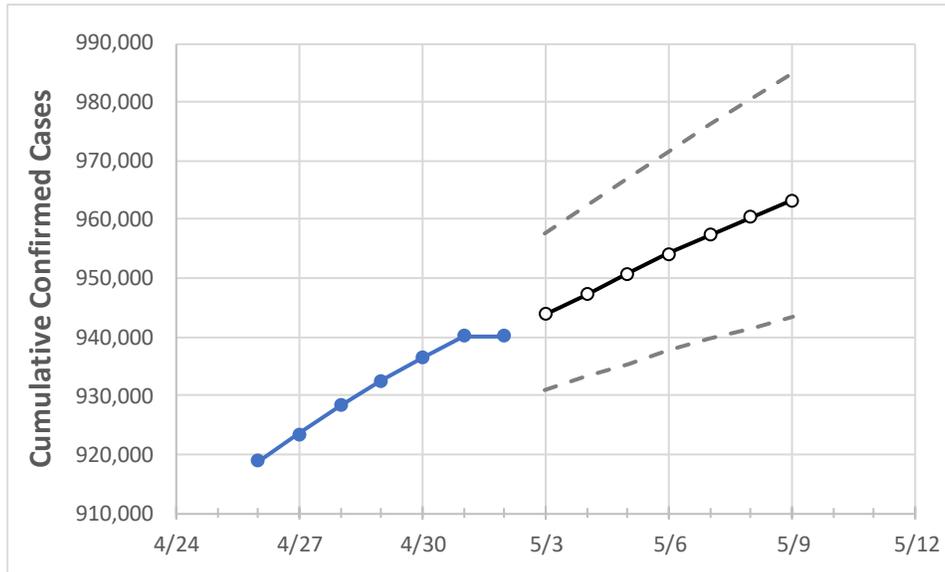
### IEM's Modeling Lead

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:					
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Michigan	932,604	936,467	940,175	940,175	943,792	947,305	950,751	954,122	957,337	960,391	963,323

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Genesee	39,394	39,590	39,733	39,733	39,904	40,069	40,227	40,383	40,532	40,673	40,809
Ingham	23,595	23,640	23,709	23,709	23,773	23,835	23,893	23,949	24,005	24,057	24,107
Kent	67,857	68,100	68,438	68,438	68,729	69,016	69,290	69,564	69,838	70,110	70,374
Livingston	15,738	15,806	15,876	15,876	15,942	16,004	16,065	16,126	16,183	16,240	16,295
Macomb	94,218	94,581	94,975	94,975	95,332	95,660	95,977	96,275	96,570	96,836	97,098
Monroe	14,469	14,540	14,574	14,574	14,621	14,667	14,711	14,754	14,794	14,831	14,869
Oakland	110,431	110,917	111,429	111,429	111,852	112,269	112,654	113,045	113,430	113,797	114,151
Washtenaw	25,296	25,372	25,449	25,449	25,509	25,569	25,624	25,673	25,721	25,768	25,812
Wayne	154,040	154,782	155,417	155,417	156,047	156,652	157,243	157,795	158,344	158,867	159,386

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:											
	4/29	4/30	5/1	5/2	5/4				5/6				5/8			
Genesee	39,394	39,590	39,733	39,733	40,069	(8,014)	[1,923]	{962}	40,383	(8,077)	[1,938]	{969}	40,673	(8,135)	[1,952]	{976}
Ingham	23,595	23,640	23,709	23,709	23,835	(4,767)	[1,144]	{572}	23,949	(4,790)	[1,150]	{575}	24,057	(4,811)	[1,155]	{577}
Kent	67,857	68,100	68,438	68,438	69,016	(13,803)	[3,313]	{1,656}	69,564	(13,913)	[3,339]	{1,670}	70,110	(14,022)	[3,365]	{1,683}
Livingston	15,738	15,806	15,876	15,876	16,004	(3,201)	[768]	{384}	16,126	(3,225)	[774]	{387}	16,240	(3,248)	[780]	{390}
Macomb	94,218	94,581	94,975	94,975	95,660	(19,132)	[4,592]	{2,296}	96,275	(19,255)	[4,621]	{2,311}	96,836	(19,367)	[4,648]	{2,324}
Monroe	14,469	14,540	14,574	14,574	14,667	(2,933)	[704]	{352}	14,754	(2,951)	[708]	{354}	14,831	(2,966)	[712]	{356}
Oakland	110,431	110,917	111,429	111,429	112,269	(22,454)	[5,389]	{2,694}	113,045	(22,609)	[5,426]	{2,713}	113,797	(22,759)	[5,462]	{2,731}
Washtenaw	25,296	25,372	25,449	25,449	25,569	(5,114)	[1,227]	{614}	25,673	(5,135)	[1,232]	{616}	25,768	(5,154)	[1,237]	{618}
Wayne	154,040	154,782	155,417	155,417	156,652	(31,330)	[7,519]	{3,760}	157,795	(31,559)	[7,574]	{3,787}	158,867	(31,773)	[7,626]	{3,813}

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.