

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

Date: 6/11/21

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 6/11/21 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.**

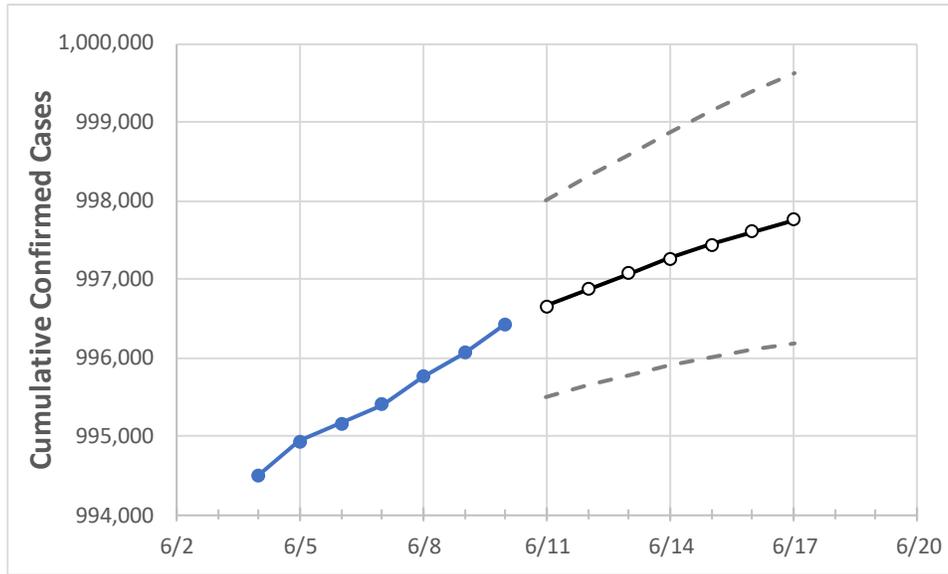
### IEM's Modeling Lead

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Michigan	995,397	995,759	996,065	996,427	996,653	996,870	997,071	997,261	997,441	997,605	997,761

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Genesee	41,655	41,665	41,670	41,671	41,676	41,680	41,684	41,688	41,691	41,693	41,696
Ingham	24,808	24,814	24,828	24,842	24,849	24,855	24,862	24,867	24,873	24,878	24,884
Kent	73,016	73,035	73,037	73,112	73,132	73,151	73,168	73,184	73,199	73,213	73,227
Livingston	16,676	16,682	16,685	16,694	16,698	16,702	16,706	16,709	16,713	16,716	16,719
Macomb	99,864	99,902	99,928	99,949	99,967	99,983	100,000	100,014	100,026	100,038	100,050
Monroe	15,369	15,374	15,377	15,385	15,388	15,391	15,394	15,397	15,399	15,402	15,404
Oakland	118,221	118,257	118,291	118,320	118,351	118,379	118,406	118,430	118,453	118,475	118,496
Washtenaw	26,412	26,419	26,420	26,428	26,430	26,433	26,435	26,437	26,438	26,440	26,441
Wayne	164,860	164,937	165,000	165,056	165,103	165,148	165,191	165,231	165,265	165,299	165,333

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:											
	6/7	6/8	6/9	6/10	6/12			6/14			6/16					
Genesee	41,655	41,665	41,670	41,671	41,680	(8,336)	[2,001]	{1,000}	41,688	(8,338)	[2,001]	{1,001}	41,693	(8,339)	[2,001]	{1,001}
Ingham	24,808	24,814	24,828	24,842	24,855	(4,971)	[1,193]	{597}	24,867	(4,973)	[1,194]	{597}	24,878	(4,976)	[1,194]	{597}
Kent	73,016	73,035	73,037	73,112	73,151	(14,630)	[3,511]	{1,756}	73,184	(14,637)	[3,513]	{1,756}	73,213	(14,643)	[3,514]	{1,757}
Livingston	16,676	16,682	16,685	16,694	16,702	(3,340)	[802]	{401}	16,709	(3,342)	[802]	{401}	16,716	(3,343)	[802]	{401}
Macomb	99,864	99,902	99,928	99,949	99,983	(19,997)	[4,799]	{2,400}	100,014	(20,003)	[4,801]	{2,400}	100,038	(20,008)	[4,802]	{2,401}
Monroe	15,369	15,374	15,377	15,385	15,391	(3,078)	[739]	{369}	15,397	(3,079)	[739]	{370}	15,402	(3,080)	[739]	{370}
Oakland	118,221	118,257	118,291	118,320	118,379	(23,676)	[5,682]	{2,841}	118,430	(23,686)	[5,685]	{2,842}	118,475	(23,695)	[5,687]	{2,843}
Washtenaw	26,412	26,419	26,420	26,428	26,433	(5,287)	[1,269]	{634}	26,437	(5,287)	[1,269]	{634}	26,440	(5,288)	[1,269]	{635}
Wayne	164,860	164,937	165,000	165,056	165,148	(33,030)	[7,927]	{3,964}	165,231	(33,046)	[7,931]	{3,966}	165,299	(33,060)	[7,934]	{3,967}

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.