

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 10/8/21**

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 10/8/21 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.**

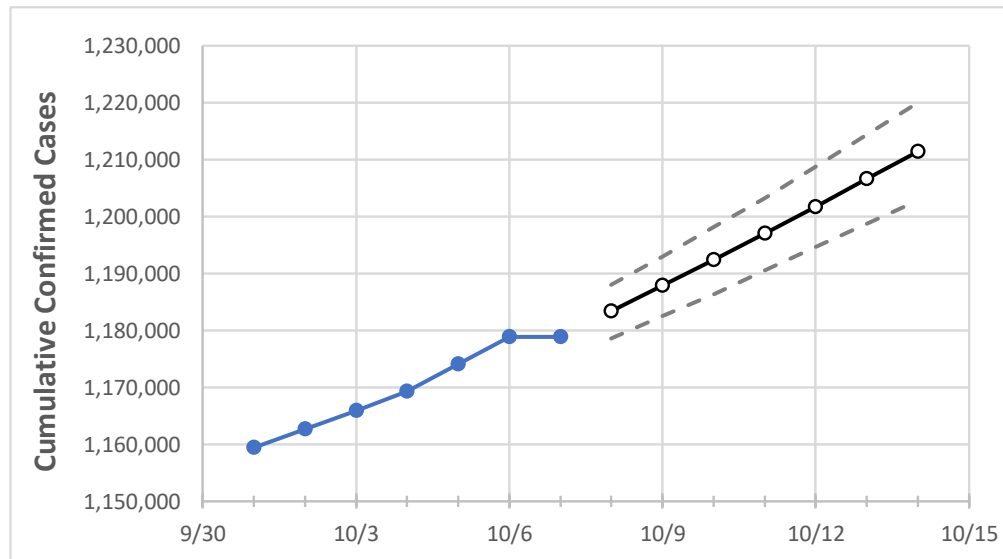
**IEM's Modeling Lead**

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Michigan	1,169,238	1,174,073	1,178,908	1,178,908	1,183,362	1,187,844	1,192,437	1,197,031	1,201,729	1,206,628	1,211,423

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Genesee	48,009	48,181	48,353	48,353	48,509	48,668	48,826	48,989	49,155	49,324	49,495
Ingham	28,963	29,065	29,166	29,166	29,260	29,354	29,450	29,548	29,647	29,748	29,849
Kent	86,401	86,728	87,054	87,054	87,355	87,660	87,972	88,285	88,603	88,918	89,242
Livingston	20,704	20,832	20,960	20,960	21,078	21,198	21,322	21,450	21,580	21,712	21,849
Macomb	113,933	114,287	114,641	114,641	114,996	115,357	115,718	116,082	116,468	116,850	117,236
Monroe	18,492	18,594	18,696	18,696	18,798	18,903	19,007	19,117	19,226	19,340	19,456
Oakland	137,205	137,673	138,141	138,141	138,561	138,985	139,417	139,853	140,298	140,759	141,216
Washtenaw	31,091	31,216	31,341	31,341	31,455	31,570	31,690	31,811	31,937	32,062	32,190
Wayne	188,328	188,865	189,401	189,401	189,895	190,402	190,914	191,442	191,967	192,515	193,061

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:											
	10/4	10/5	10/6	10/7	10/9				10/11				10/13			
Genesee	48,009	48,181	48,353	48,353	48,668	(9,734)	[2,336]	{1,168}	48,989	(9,798)	[2,351]	{1,176}	49,324	(9,865)	[2,368]	{1,184}
Ingham	28,963	29,065	29,166	29,166	29,354	(5,871)	[1,409]	{705}	29,548	(5,910)	[1,418]	{709}	29,748	(5,950)	[1,428]	{714}
Kent	86,401	86,728	87,054	87,054	87,660	(17,532)	[4,208]	{2,104}	88,285	(17,657)	[4,238]	{2,119}	88,918	(17,784)	[4,268]	{2,134}
Livingston	20,704	20,832	20,960	20,960	21,198	(4,240)	[1,017]	{509}	21,450	(4,290)	[1,030]	{515}	21,712	(4,342)	[1,042]	{521}
Macomb	113,933	114,287	114,641	114,641	115,357	(23,071)	[5,537]	{2,769}	116,082	(23,216)	[5,572]	{2,786}	116,850	(23,370)	[5,609]	{2,804}
Monroe	18,492	18,594	18,696	18,696	18,903	(3,781)	[907]	{454}	19,117	(3,823)	[918]	{459}	19,340	(3,868)	[928]	{464}
Oakland	137,205	137,673	138,141	138,141	138,985	(27,797)	[6,671]	{3,336}	139,853	(27,971)	[6,713]	{3,356}	140,759	(28,152)	[6,756]	{3,378}
Washtenaw	31,091	31,216	31,341	31,341	31,570	(6,314)	[1,515]	{758}	31,811	(6,362)	[1,527]	{763}	32,062	(6,412)	[1,539]	{769}
Wayne	188,328	188,865	189,401	189,401	190,402	(38,080)	[9,139]	{4,570}	191,442	(38,288)	[9,189]	{4,595}	192,515	(38,503)	[9,241]	{4,620}

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.