

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 3/10/21**

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 3/10/21 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.**

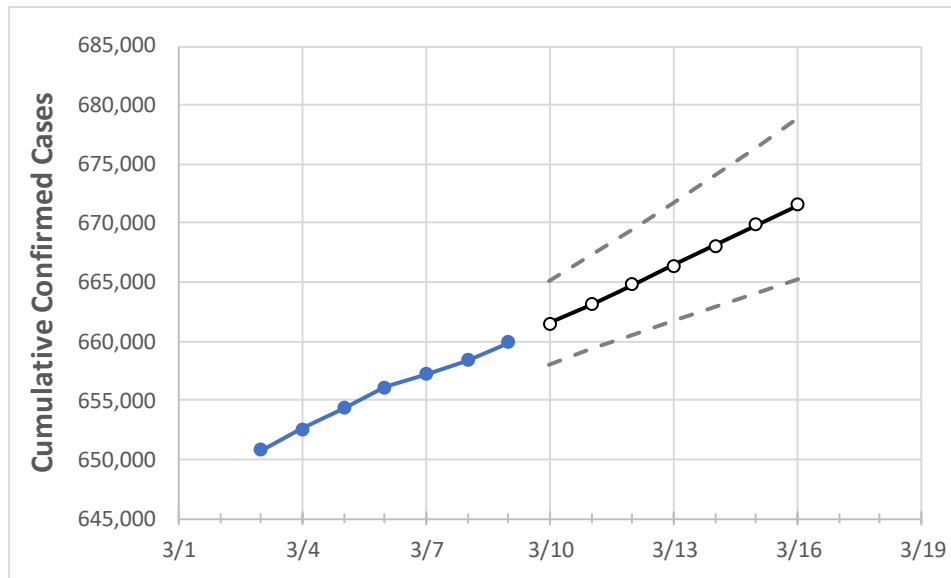
**IEM's Modeling Lead**

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:						
	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16
Michigan	656,072	657,214	658,355	659,890	661,502	663,157	664,796	666,432	668,120	669,849	671,595

*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:						
	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	3/15	3/16
Genesee	26,111	26,158	26,204	26,276	26,363	26,453	26,545	26,642	26,741	26,842	26,945
Ingham	16,689	16,725	16,761	16,798	16,840	16,884	16,927	16,971	17,016	17,061	17,106
Kent	52,304	52,364	52,424	52,468	52,540	52,611	52,681	52,749	52,818	52,886	52,954
Livingston	10,537	10,562	10,586	10,605	10,639	10,675	10,710	10,748	10,786	10,825	10,864
Macomb	60,150	60,261	60,372	60,567	60,767	60,969	61,185	61,402	61,628	61,863	62,101
Monroe	10,008	10,038	10,067	10,125	10,170	10,216	10,267	10,318	10,373	10,429	10,487
Oakland	75,863	75,991	76,119	76,359	76,538	76,720	76,907	77,095	77,286	77,482	77,682
Washtenaw	18,951	18,979	19,006	19,047	19,080	19,113	19,145	19,174	19,204	19,232	19,258
Wayne	103,560	103,792	104,024	104,229	104,512	104,804	105,101	105,404	105,713	106,033	106,362

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:											
	3/6	3/7	3/8	3/9	3/11				3/13				3/15			
Genesee	26,111	26,158	26,204	26,276	26,453	(5,291)	[1,270]	{635}	26,642	(5,328)	[1,279]	{639}	26,842	(5,368)	[1,288]	{644}
Ingham	16,689	16,725	16,761	16,798	16,884	(3,377)	[810]	{405}	16,971	(3,394)	[815]	{407}	17,061	(3,412)	[819]	{409}
Kent	52,304	52,364	52,424	52,468	52,611	(10,522)	[2,525]	{1,263}	52,749	(10,550)	[2,532]	{1,266}	52,886	(10,577)	[2,539]	{1,269}
Livingston	10,537	10,562	10,586	10,605	10,675	(2,135)	[512]	{256}	10,748	(2,150)	[516]	{258}	10,825	(2,165)	[520]	{260}
Macomb	60,150	60,261	60,372	60,567	60,969	(12,194)	[2,927]	{1,463}	61,402	(12,280)	[2,947]	{1,474}	61,863	(12,373)	[2,969]	{1,485}
Monroe	10,008	10,038	10,067	10,125	10,216	(2,043)	[490]	{245}	10,318	(2,064)	[495]	{248}	10,429	(2,086)	[501]	{250}
Oakland	75,863	75,991	76,119	76,359	76,720	(15,344)	[3,683]	{1,841}	77,095	(15,419)	[3,701]	{1,850}	77,482	(15,496)	[3,719]	{1,860}
Washtenaw	18,951	18,979	19,006	19,047	19,113	(3,823)	[917]	{459}	19,174	(3,835)	[920]	{460}	19,232	(3,846)	[923]	{462}
Wayne	103,560	103,792	104,024	104,229	104,804	(20,961)	[5,031]	{2,515}	105,404	(21,081)	[5,059]	{2,530}	106,033	(21,207)	[5,090]	{2,545}

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.