

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

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 3/19/21 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.**

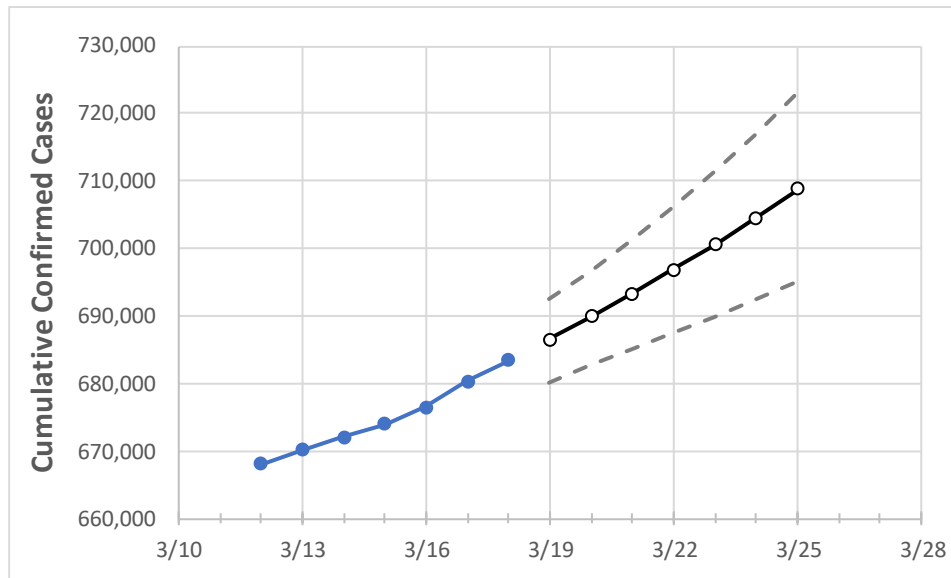
**IEM's Modeling Lead**

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Michigan	673,916	676,494	680,279	683,398	686,564	689,875	693,288	696,845	700,620	704,623	708,786

*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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Genesee	26,979	27,117	27,257	27,421	27,573	27,734	27,899	28,072	28,252	28,445	28,645
Ingham	17,251	17,332	17,422	17,518	17,612	17,711	17,813	17,919	18,035	18,157	18,286
Kent	53,179	53,258	53,446	53,585	53,713	53,847	53,983	54,123	54,267	54,419	54,569
Livingston	10,922	10,958	11,030	11,090	11,152	11,217	11,284	11,355	11,431	11,507	11,589
Macomb	62,272	62,607	63,091	63,448	63,848	64,264	64,710	65,177	65,679	66,209	66,755
Monroe	10,379	10,440	10,539	10,595	10,660	10,726	10,796	10,868	10,943	11,021	11,103
Oakland	78,091	78,465	78,978	79,397	79,835	80,300	80,804	81,336	81,900	82,502	83,154
Washtenaw	19,337	19,402	19,463	19,524	19,577	19,631	19,685	19,740	19,796	19,852	19,910
Wayne	106,587	106,994	107,579	107,988	108,474	108,989	109,527	110,068	110,633	111,238	111,856

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:											
	3/15	3/16	3/17	3/18	3/20				3/22				3/24			
Genesee	26,979	27,117	27,257	27,421	27,734	(5,547)	[1,331]	{666}	28,072	(5,614)	[1,347]	{674}	28,445	(5,689)	[1,365]	{683}
Ingham	17,251	17,332	17,422	17,518	17,711	(3,542)	[850]	{425}	17,919	(3,584)	[860]	{430}	18,157	(3,631)	[872]	{436}
Kent	53,179	53,258	53,446	53,585	53,847	(10,769)	[2,585]	{1,292}	54,123	(10,825)	[2,598]	{1,299}	54,419	(10,884)	[2,612]	{1,306}
Livingston	10,922	10,958	11,030	11,090	11,217	(2,243)	[538]	{269}	11,355	(2,271)	[545]	{273}	11,507	(2,301)	[552]	{276}
Macomb	62,272	62,607	63,091	63,448	64,264	(12,853)	[3,085]	{1,542}	65,177	(13,035)	[3,129]	{1,564}	66,209	(13,242)	[3,178]	{1,589}
Monroe	10,379	10,440	10,539	10,595	10,726	(2,145)	[515]	{257}	10,868	(2,174)	[522]	{261}	11,021	(2,204)	[529]	{265}
Oakland	78,091	78,465	78,978	79,397	80,300	(16,060)	[3,854]	{1,927}	81,336	(16,267)	[3,904]	{1,952}	82,502	(16,500)	[3,960]	{1,980}
Washtenaw	19,337	19,402	19,463	19,524	19,631	(3,926)	[942]	{471}	19,740	(3,948)	[948]	{474}	19,852	(3,970)	[953]	{476}
Wayne	106,587	106,994	107,579	107,988	108,989	(21,798)	[5,231]	{2,616}	110,068	(22,014)	[5,283]	{2,642}	111,238	(22,248)	[5,339]	{2,670}

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.