

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

Date: 10/11/21

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 10/11/21 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.**

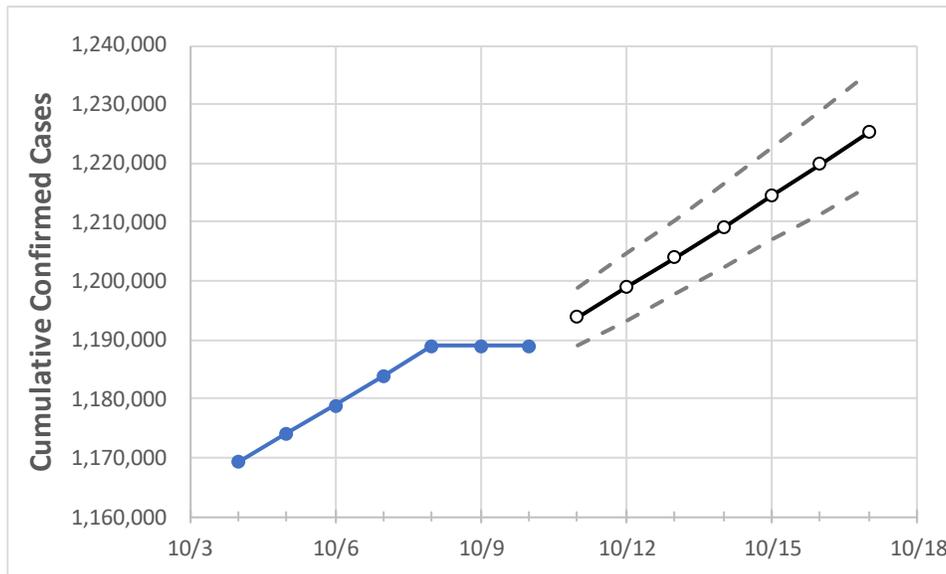
### IEM's Modeling Lead

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:					
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	
Michigan	1,183,969	1,189,030	1,189,030	1,189,030	1,193,914	1,198,913	1,204,008	1,209,119	1,214,460	1,219,866	1,225,319	

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:						
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	
Genesee	48,562	48,770	48,770	48,770	48,952	49,133	49,326	49,518	49,716	49,928	50,133	
Ingham	29,289	29,411	29,411	29,411	29,523	29,638	29,753	29,873	29,993	30,117	30,241	
Kent	87,421	87,787	87,787	87,787	88,122	88,465	88,815	89,170	89,525	89,884	90,254	
Livingston	21,095	21,229	21,229	21,229	21,364	21,501	21,644	21,792	21,942	22,096	22,254	
Macomb	115,010	115,379	115,379	115,379	115,760	116,138	116,524	116,914	117,316	117,727	118,136	
Monroe	18,817	18,938	18,938	18,938	19,050	19,166	19,284	19,404	19,529	19,657	19,785	
Oakland	138,626	139,111	139,111	139,111	139,581	140,054	140,540	141,029	141,533	142,037	142,555	
Washtenaw	31,453	31,564	31,564	31,564	31,683	31,807	31,930	32,059	32,187	32,320	32,454	
Wayne	189,882	190,362	190,362	190,362	190,878	191,406	191,933	192,472	193,025	193,577	194,146	

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:											
	10/7	10/8	10/9	10/10	10/12			10/14			10/16					
Genesee	48,562	48,770	48,770	48,770	49,133	(9,827)	[2,358]	{1,179}	49,518	(9,904)	[2,377]	{1,188}	49,928	(9,986)	[2,397]	{1,198}
Ingham	29,289	29,411	29,411	29,411	29,638	(5,928)	[1,423]	{711}	29,873	(5,975)	[1,434]	{717}	30,117	(6,023)	[1,446]	{723}
Kent	87,421	87,787	87,787	87,787	88,465	(17,693)	[4,246]	{2,123}	89,170	(17,834)	[4,280]	{2,140}	89,884	(17,977)	[4,314]	{2,157}
Livingston	21,095	21,229	21,229	21,229	21,501	(4,300)	[1,032]	{516}	21,792	(4,358)	[1,046]	{523}	22,096	(4,419)	[1,061]	{530}
Macomb	115,010	115,379	115,379	115,379	116,138	(23,228)	[5,575]	{2,787}	116,914	(23,383)	[5,612]	{2,806}	117,727	(23,545)	[5,651]	{2,825}
Monroe	18,817	18,938	18,938	18,938	19,166	(3,833)	[920]	{460}	19,404	(3,881)	[931]	{466}	19,657	(3,931)	[944]	{472}
Oakland	138,626	139,111	139,111	139,111	140,054	(28,011)	[6,723]	{3,361}	141,029	(28,206)	[6,769]	{3,385}	142,037	(28,407)	[6,818]	{3,409}
Washtenaw	31,453	31,564	31,564	31,564	31,807	(6,361)	[1,527]	{763}	32,059	(6,412)	[1,539]	{769}	32,320	(6,464)	[1,551]	{776}
Wayne	189,882	190,362	190,362	190,362	191,406	(38,281)	[9,188]	{4,594}	192,472	(38,494)	[9,239]	{4,619}	193,577	(38,715)	[9,292]	{4,646}

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.