

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

**Date: 9/24/21**

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 9/24/21 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.**

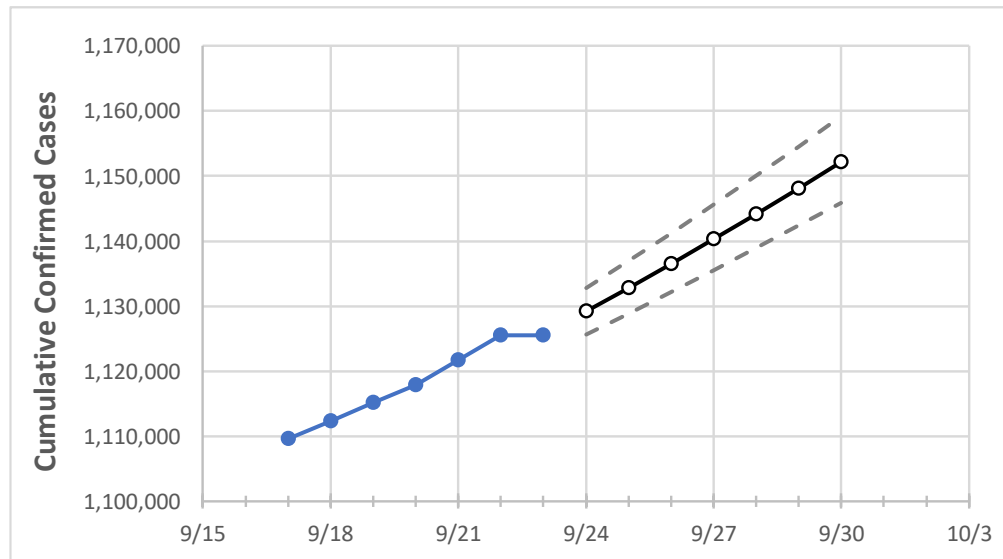
### **IEM's Modeling Lead**

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Michigan	1,117,846	1,121,705	1,125,564	1,125,564	1,129,158	1,132,837	1,136,446	1,140,318	1,144,133	1,148,080	1,152,120

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Genesee	46,330	46,432	46,533	46,533	46,643	46,757	46,865	46,978	47,090	47,207	47,317
Ingham	27,822	27,913	28,003	28,003	28,098	28,195	28,295	28,397	28,501	28,608	28,716
Kent	82,568	82,847	83,125	83,125	83,401	83,684	83,966	84,256	84,551	84,849	85,157
Livingston	19,487	19,562	19,637	19,637	19,703	19,769	19,836	19,904	19,972	20,041	20,111
Macomb	109,774	110,083	110,392	110,392	110,662	110,935	111,213	111,494	111,782	112,075	112,368
Monroe	17,395	17,448	17,501	17,501	17,564	17,630	17,696	17,763	17,832	17,902	17,972
Oakland	132,253	132,639	133,024	133,024	133,345	133,670	134,004	134,333	134,670	135,013	135,357
Washtenaw	29,874	29,967	30,059	30,059	30,141	30,223	30,308	30,391	30,476	30,561	30,647
Wayne	182,613	183,037	183,460	183,460	183,831	184,205	184,586	184,969	185,359	185,746	186,143

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:											
	9/20	9/21	9/22	9/23	9/25				9/27				9/29			
Genesee	46,330	46,432	46,533	46,533	46,757	(9,351)	[2,244]	{1,122}	46,978	(9,396)	[2,255]	{1,127}	47,207	(9,441)	[2,266]	{1,133}
Ingham	27,822	27,913	28,003	28,003	28,195	(5,639)	[1,353]	{677}	28,397	(5,679)	[1,363]	{682}	28,608	(5,722)	[1,373]	{687}
Kent	82,568	82,847	83,125	83,125	83,684	(16,737)	[4,017]	{2,008}	84,256	(16,851)	[4,044]	{2,022}	84,849	(16,970)	[4,073]	{2,036}
Livingston	19,487	19,562	19,637	19,637	19,769	(3,954)	[949]	{474}	19,904	(3,981)	[955]	{478}	20,041	(4,008)	[962]	{481}
Macomb	109,774	110,083	110,392	110,392	110,935	(22,187)	[5,325]	{2,662}	111,494	(22,299)	[5,352]	{2,676}	112,075	(22,415)	[5,380]	{2,690}
Monroe	17,395	17,448	17,501	17,501	17,630	(3,526)	[846]	{423}	17,763	(3,553)	[853]	{426}	17,902	(3,580)	[859]	{430}
Oakland	132,253	132,639	133,024	133,024	133,670	(26,734)	[6,416]	{3,208}	134,333	(26,867)	[6,448]	{3,224}	135,013	(27,003)	[6,481]	{3,240}
Washtenaw	29,874	29,967	30,059	30,059	30,223	(6,045)	[1,451]	{725}	30,391	(6,078)	[1,459]	{729}	30,561	(6,112)	[1,467]	{733}
Wayne	182,613	183,037	183,460	183,460	184,205	(36,841)	[8,842]	{4,421}	184,969	(36,994)	[8,879]	{4,439}	185,746	(37,149)	[8,916]	{4,458}

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.