

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

Date: 9/27/21

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 9/27/21 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.**

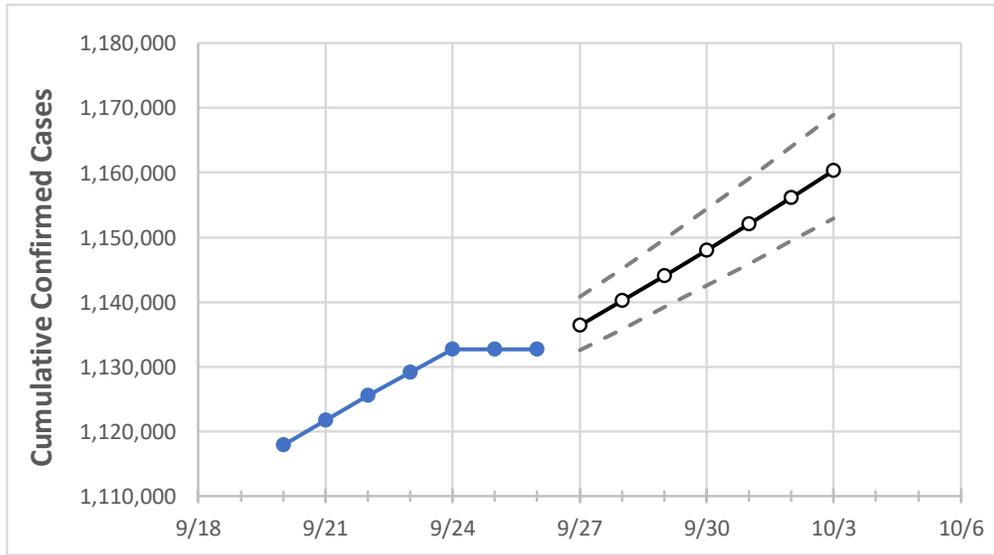
### IEM's Modeling Lead

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Michigan	1,129,108	1,132,651	1,132,651	1,132,651	1,136,419	1,140,222	1,144,049	1,148,017	1,152,025	1,156,110	1,160,278

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Genesee	46,643	46,752	46,752	46,752	46,863	46,971	47,077	47,187	47,297	47,407	47,514
Ingham	28,072	28,140	28,140	28,140	28,231	28,321	28,414	28,508	28,604	28,701	28,801
Kent	83,427	83,729	83,729	83,729	84,024	84,324	84,625	84,931	85,247	85,564	85,885
Livingston	19,720	19,803	19,803	19,803	19,880	19,956	20,036	20,114	20,195	20,278	20,360
Macomb	110,649	110,905	110,905	110,905	111,190	111,479	111,771	112,073	112,375	112,685	112,998
Monroe	17,587	17,673	17,673	17,673	17,751	17,834	17,916	18,002	18,092	18,182	18,275
Oakland	133,374	133,724	133,724	133,724	134,076	134,435	134,795	135,166	135,539	135,915	136,292
Washtenaw	30,148	30,237	30,237	30,237	30,324	30,412	30,499	30,588	30,677	30,769	30,861
Wayne	183,852	184,244	184,244	184,244	184,641	185,030	185,424	185,831	186,236	186,640	187,048

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:											
	9/23	9/24	9/25	9/26	9/28				9/30				10/2			
Genesee	46,643	46,752	46,752	46,752	46,971	(9,394)	[2,255]	{1,127}	47,187	(9,437)	[2,265]	{1,132}	47,407	(9,481)	[2,276]	{1,138}
Ingham	28,072	28,140	28,140	28,140	28,321	(5,664)	[1,359]	{680}	28,508	(5,702)	[1,368]	{684}	28,701	(5,740)	[1,378]	{689}
Kent	83,427	83,729	83,729	83,729	84,324	(16,865)	[4,048]	{2,024}	84,931	(16,986)	[4,077]	{2,038}	85,564	(17,113)	[4,107]	{2,054}
Livingston	19,720	19,803	19,803	19,803	19,956	(3,991)	[958]	{479}	20,114	(4,023)	[965]	{483}	20,278	(4,056)	[973]	{487}
Macomb	110,649	110,905	110,905	110,905	111,479	(22,296)	[5,351]	{2,676}	112,073	(22,415)	[5,379]	{2,690}	112,685	(22,537)	[5,409]	{2,704}
Monroe	17,587	17,673	17,673	17,673	17,834	(3,567)	[856]	{428}	18,002	(3,600)	[864]	{432}	18,182	(3,636)	[873]	{436}
Oakland	133,374	133,724	133,724	133,724	134,435	(26,887)	[6,453]	{3,226}	135,166	(27,033)	[6,488]	{3,244}	135,915	(27,183)	[6,524]	{3,262}
Washtenaw	30,148	30,237	30,237	30,237	30,412	(6,082)	[1,460]	{730}	30,588	(6,118)	[1,468]	{734}	30,769	(6,154)	[1,477]	{738}
Wayne	183,852	184,244	184,244	184,244	185,030	(37,006)	[8,881]	{4,441}	185,831	(37,166)	[8,920]	{4,460}	186,640	(37,328)	[8,959]	{4,479}

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.