

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 9/13/21**

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 9/13/21 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.**

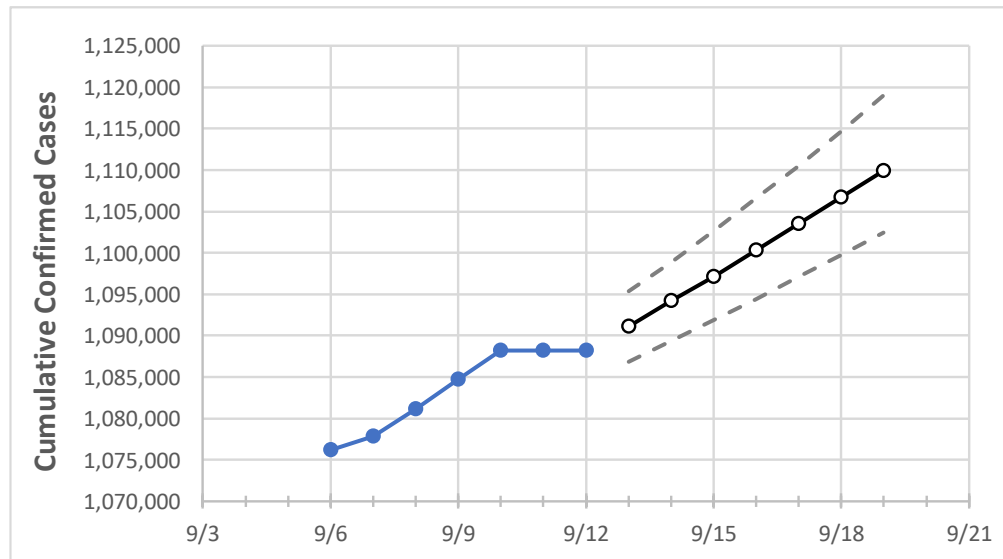
**IEM's Modeling Lead**

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Michigan	1,084,690	1,088,201	1,088,201	1,088,201	1,091,150	1,094,165	1,097,152	1,100,295	1,103,508	1,106,738	1,109,939

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Genesee	45,139	45,277	45,277	45,277	45,401	45,533	45,664	45,801	45,938	46,082	46,222
Ingham	26,959	27,032	27,032	27,032	27,100	27,167	27,236	27,307	27,380	27,456	27,530
Kent	79,906	80,208	80,208	80,208	80,477	80,752	81,037	81,322	81,623	81,930	82,247
Livingston	18,808	18,887	18,887	18,887	18,950	19,013	19,077	19,141	19,205	19,272	19,336
Macomb	107,336	107,615	107,615	107,615	107,854	108,099	108,346	108,597	108,857	109,117	109,387
Monroe	16,796	16,843	16,843	16,843	16,893	16,943	16,997	17,050	17,104	17,161	17,218
Oakland	129,190	129,543	129,543	129,543	129,844	130,151	130,463	130,773	131,086	131,418	131,743
Washtenaw	29,051	29,155	29,155	29,155	29,242	29,330	29,417	29,505	29,600	29,696	29,789
Wayne	178,880	179,343	179,343	179,343	179,707	180,062	180,437	180,804	181,179	181,558	181,944

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:											
	9/9	9/10	9/11	9/12	9/14				9/16				9/18			
Genesee	45,139	45,277	45,277	45,277	45,533	(9,107)	[2,186]	{1,093}	45,801	(9,160)	[2,198]	{1,099}	46,082	(9,216)	[2,212]	{1,106}
Ingham	26,959	27,032	27,032	27,032	27,167	(5,433)	[1,304]	{652}	27,307	(5,461)	[1,311]	{655}	27,456	(5,491)	[1,318]	{659}
Kent	79,906	80,208	80,208	80,208	80,752	(16,150)	[3,876]	{1,938}	81,322	(16,264)	[3,903]	{1,952}	81,930	(16,386)	[3,933]	{1,966}
Livingston	18,808	18,887	18,887	18,887	19,013	(3,803)	[913]	{456}	19,141	(3,828)	[919]	{459}	19,272	(3,854)	[925]	{463}
Macomb	107,336	107,615	107,615	107,615	108,099	(21,620)	[5,189]	{2,594}	108,597	(21,719)	[5,213]	{2,606}	109,117	(21,823)	[5,238]	{2,619}
Monroe	16,796	16,843	16,843	16,843	16,943	(3,389)	[813]	{407}	17,050	(3,410)	[818]	{409}	17,161	(3,432)	[824]	{412}
Oakland	129,190	129,543	129,543	129,543	130,151	(26,030)	[6,247]	{3,124}	130,773	(26,155)	[6,277]	{3,139}	131,418	(26,284)	[6,308]	{3,154}
Washtenaw	29,051	29,155	29,155	29,155	29,330	(5,866)	[1,408]	{704}	29,505	(5,901)	[1,416]	{708}	29,696	(5,939)	[1,425]	{713}
Wayne	178,880	179,343	179,343	179,343	180,062	(36,012)	[8,643]	{4,321}	180,804	(36,161)	[8,679]	{4,339}	181,558	(36,312)	[8,715]	{4,357}

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.