

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

Date: 7/30/21

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 7/30/21 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.

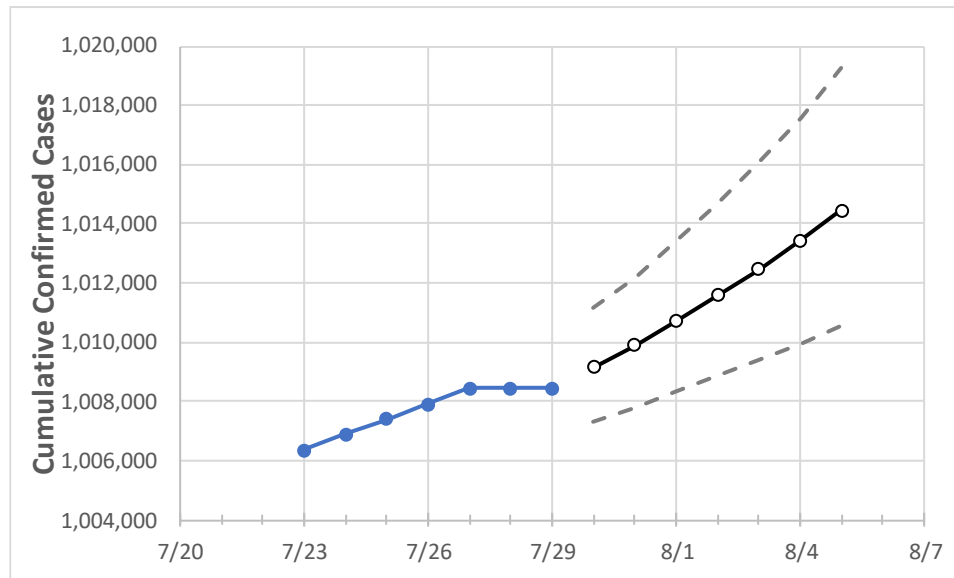
IEM's Modeling Lead

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:						
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5
Michigan	1,007,912	1,008,429	1,008,429	1,008,429	1,009,140	1,009,910	1,010,720	1,011,568	1,012,475	1,013,432	1,014,438

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:						
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5
Genesee	42,006	42,026	42,026	42,026	42,055	42,086	42,119	42,156	42,194	42,235	42,279
Ingham	25,110	25,127	25,127	25,127	25,151	25,178	25,207	25,239	25,273	25,310	25,351
Kent	74,270	74,292	74,292	74,292	74,321	74,349	74,378	74,408	74,439	74,470	74,502
Livingston	16,909	16,922	16,922	16,922	16,939	16,956	16,976	16,998	17,020	17,044	17,071
Macomb	100,917	100,973	100,973	100,973	101,056	101,149	101,248	101,356	101,475	101,603	101,742
Monroe	15,557	15,566	15,566	15,566	15,577	15,590	15,603	15,617	15,631	15,647	15,663
Oakland	119,900	119,978	119,978	119,978	120,092	120,213	120,343	120,484	120,629	120,791	120,960
Washtenaw	26,742	26,761	26,761	26,761	26,786	26,813	26,841	26,872	26,905	26,940	26,978
Wayne	167,508	167,594	167,594	167,594	167,705	167,819	167,940	168,067	168,198	168,337	168,481

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:											
	7/26	7/27	7/28	7/29	7/31				8/2				8/4			
Genesee	42,006	42,026	42,026	42,026	42,086	(8,417)	[2,020]	{1,010}	42,156	(8,431)	[2,023]	{1,012}	42,235	(8,447)	[2,027]	{1,014}
Ingham	25,110	25,127	25,127	25,127	25,178	(5,036)	[1,209]	{604}	25,239	(5,048)	[1,211]	{606}	25,310	(5,062)	[1,215]	{607}
Kent	74,270	74,292	74,292	74,292	74,349	(14,870)	[3,569]	{1,784}	74,408	(14,882)	[3,572]	{1,786}	74,470	(14,894)	[3,575]	{1,787}
Livingston	16,909	16,922	16,922	16,922	16,956	(3,391)	[814]	{407}	16,998	(3,400)	[816]	{408}	17,044	(3,409)	[818]	{409}
Macomb	100,917	100,973	100,973	100,973	101,149	(20,230)	[4,855]	{2,428}	101,356	(20,271)	[4,865]	{2,433}	101,603	(20,321)	[4,877]	{2,438}
Monroe	15,557	15,566	15,566	15,566	15,590	(3,118)	[748]	{374}	15,617	(3,123)	[750]	{375}	15,647	(3,129)	[751]	{376}
Oakland	119,900	119,978	119,978	119,978	120,213	(24,043)	[5,770]	{2,885}	120,484	(24,097)	[5,783]	{2,892}	120,791	(24,158)	[5,798]	{2,899}
Washtenaw	26,742	26,761	26,761	26,761	26,813	(5,363)	[1,287]	{644}	26,872	(5,374)	[1,290]	{645}	26,940	(5,388)	[1,293]	{647}
Wayne	167,508	167,594	167,594	167,594	167,819	(33,564)	[8,055]	{4,028}	168,067	(33,613)	[8,067]	{4,034}	168,337	(33,667)	[8,080]	{4,040}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.