

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/10/21**

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 5/10/21 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.

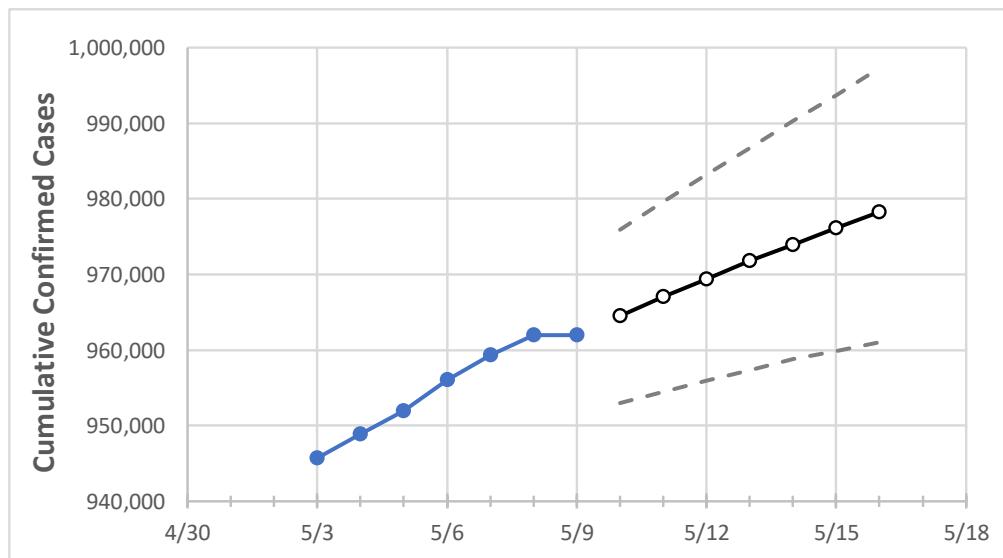
IEM's Modeling Lead

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:							
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	
Michigan	956,012	959,379	961,956	961,956	964,527	967,042	969,411	971,787	973,915	976,115	978,237	

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:							
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	
Genesee	40,376	40,480	40,639	40,639	40,746	40,848	40,942	41,031	41,118	41,200	41,280	
Ingham	23,989	24,058	24,100	24,100	24,142	24,182	24,218	24,254	24,289	24,322	24,353	
Kent	69,629	69,854	70,012	70,012	70,218	70,418	70,609	70,800	70,979	71,158	71,332	
Livingston	16,116	16,145	16,194	16,194	16,236	16,275	16,313	16,348	16,384	16,417	16,448	
Macomb	96,540	96,822	97,068	97,068	97,304	97,538	97,757	97,973	98,181	98,378	98,558	
Monroe	14,826	14,878	14,912	14,912	14,953	14,994	15,033	15,068	15,104	15,139	15,172	
Oakland	113,204	113,840	114,310	114,310	114,600	114,876	115,140	115,391	115,640	115,873	116,098	
Washtenaw	25,739	25,790	25,836	25,836	25,882	25,926	25,967	26,007	26,045	26,082	26,116	
Wayne	158,230	158,792	159,167	159,167	159,609	160,019	160,412	160,802	161,162	161,518	161,853	

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:	5/15
	5/6	5/7	5/8	5/9	5/11	5/13	5/15	5/15	5/15	5/15	5/15	
Genesee	40,376	40,480	40,639	40,639	40,848 (8,170) [1,961] {980}	41,031 (8,206) [1,969] {985}	41,200 (8,240) [1,978] {989}					
Ingham	23,989	24,058	24,100	24,100	24,182 (4,836) [1,161] {580}	24,254 (4,851) [1,164] {582}	24,322 (4,864) [1,167] {584}					
Kent	69,629	69,854	70,012	70,012	70,418 (14,084) [3,380] {1,690}	70,800 (14,160) [3,398] {1,699}	71,158 (14,232) [3,416] {1,708}					
Livingston	16,116	16,145	16,194	16,194	16,275 (3,255) [781] {391}	16,348 (3,270) [785] {392}	16,417 (3,283) [788] {394}					
Macomb	96,540	96,822	97,068	97,068	97,538 (19,508) [4,682] {2,341}	97,973 (19,595) [4,703] {2,351}	98,378 (19,676) [4,722] {2,361}					
Monroe	14,826	14,878	14,912	14,912	14,994 (2,999) [720] {360}	15,068 (3,014) [723] {362}	15,139 (3,028) [727] {363}					
Oakland	113,204	113,840	114,310	114,310	114,876 (22,975) [5,514] {2,757}	115,391 (23,078) [5,539] {2,769}	115,873 (23,175) [5,562] {2,781}					
Washtenaw	25,739	25,790	25,836	25,836	25,926 (5,185) [1,244] {622}	26,007 (5,201) [1,248] {624}	26,082 (5,216) [1,252] {626}					
Wayne	158,230	158,792	159,167	159,167	160,019 (32,004) [7,681] {3,840}	160,802 (32,160) [7,718] {3,859}	161,518 (32,304) [7,753] {3,876}					

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.