

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

Date: 9/3/21

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 9/3/21 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.**

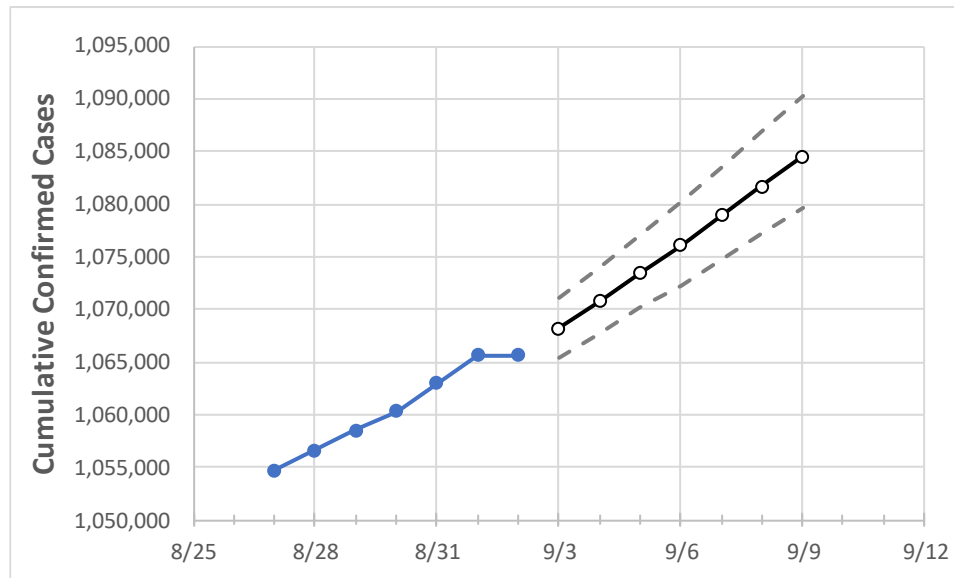
### IEM's Modeling Lead

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:						
	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9
Michigan	1,060,343	1,063,007	1,065,671	1,065,671	1,068,195	1,070,786	1,073,405	1,076,080	1,078,883	1,081,727	1,084,537

*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:							
	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9	
Genesee	44,044	44,195	44,345	44,345	44,465	44,586	44,714	44,842	44,976	45,119	45,261	
Ingham	26,420	26,473	26,526	26,526	26,577	26,630	26,683	26,737	26,792	26,848	26,905	
Kent	77,828	78,044	78,260	78,260	78,477	78,700	78,931	79,166	79,412	79,666	79,928	
Livingston	18,253	18,324	18,394	18,394	18,468	18,544	18,620	18,701	18,783	18,869	18,957	
Macomb	105,364	105,587	105,809	105,809	106,020	106,239	106,456	106,690	106,917	107,159	107,409	
Monroe	16,368	16,404	16,440	16,440	16,478	16,518	16,556	16,598	16,640	16,682	16,725	
Oakland	126,572	126,876	127,180	127,180	127,455	127,740	128,024	128,309	128,607	128,906	129,210	
Washtenaw	28,267	28,375	28,482	28,482	28,556	28,630	28,706	28,785	28,864	28,945	29,025	
Wayne	175,797	176,127	176,456	176,456	176,790	177,124	177,464	177,807	178,158	178,519	178,881	

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:											
	8/30	8/31	9/1	9/2	9/4				9/6				9/8			
Genesee	44,044	44,195	44,345	44,345	44,586	(8,917)	[2,140]	{1,070}	44,842	(8,968)	[2,152]	{1,076}	45,119	(9,024)	[2,166]	{1,083}
Ingham	26,420	26,473	26,526	26,526	26,630	(5,326)	[1,278]	{639}	26,737	(5,347)	[1,283]	{642}	26,848	(5,370)	[1,289]	{644}
Kent	77,828	78,044	78,260	78,260	78,700	(15,740)	[3,778]	{1,889}	79,166	(15,833)	[3,800]	{1,900}	79,666	(15,933)	[3,824]	{1,912}
Livingston	18,253	18,324	18,394	18,394	18,544	(3,709)	[890]	{445}	18,701	(3,740)	[898]	{449}	18,869	(3,774)	[906]	{453}
Macomb	105,364	105,587	105,809	105,809	106,239	(21,248)	[5,099]	{2,550}	106,690	(21,338)	[5,121]	{2,561}	107,159	(21,432)	[5,144]	{2,572}
Monroe	16,368	16,404	16,440	16,440	16,518	(3,304)	[793]	{396}	16,598	(3,320)	[797]	{398}	16,682	(3,336)	[801]	{400}
Oakland	126,572	126,876	127,180	127,180	127,740	(25,548)	[6,132]	{3,066}	128,309	(25,662)	[6,159]	{3,079}	128,906	(25,781)	[6,187]	{3,094}
Washtenaw	28,267	28,375	28,482	28,482	28,630	(5,726)	[1,374]	{687}	28,785	(5,757)	[1,382]	{691}	28,945	(5,789)	[1,389]	{695}
Wayne	175,797	176,127	176,456	176,456	177,124	(35,425)	[8,502]	{4,251}	177,807	(35,561)	[8,535]	{4,267}	178,519	(35,704)	[8,569]	{4,284}

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.