

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 8/11/21**

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 8/11/21 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.**

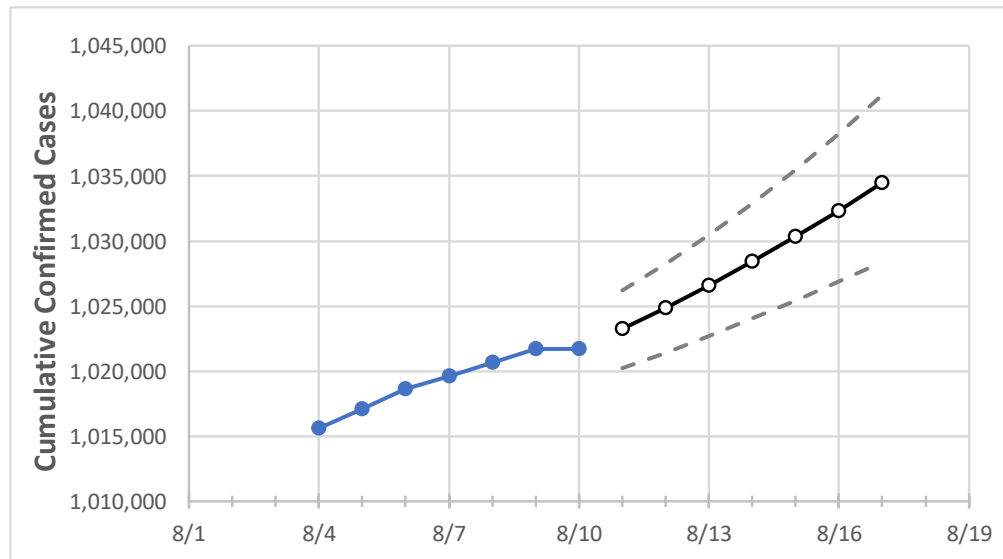
**IEM's Modeling Lead**

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Michigan	1,019,628	1,020,654	1,021,681	1,021,681	1,023,219	1,024,844	1,026,564	1,028,404	1,030,314	1,032,335	1,034,482

*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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Genesee	42,379	42,414	42,448	42,448	42,496	42,546	42,600	42,656	42,715	42,777	42,843
Ingham	25,478	25,512	25,547	25,547	25,592	25,640	25,690	25,742	25,797	25,856	25,916
Kent	74,884	74,937	74,991	74,991	75,061	75,135	75,212	75,295	75,382	75,473	75,570
Livingston	17,167	17,194	17,220	17,220	17,256	17,294	17,335	17,378	17,425	17,474	17,526
Macomb	101,996	102,083	102,169	102,169	102,309	102,455	102,607	102,770	102,943	103,123	103,314
Monroe	15,733	15,751	15,768	15,768	15,790	15,814	15,839	15,865	15,893	15,922	15,952
Oakland	121,545	121,678	121,812	121,812	122,020	122,241	122,472	122,714	122,977	123,254	123,544
Washtenaw	27,093	27,126	27,159	27,159	27,203	27,249	27,298	27,348	27,401	27,458	27,517
Wayne	169,612	169,794	169,976	169,976	170,249	170,542	170,845	171,165	171,505	171,871	172,258

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:											
	8/7	8/8	8/9	8/10	8/12				8/14				8/16			
Genesee	42,379	42,414	42,448	42,448	42,546	(8,509)	[2,042]	{1,021}	42,656	(8,531)	[2,048]	{1,024}	42,777	(8,555)	[2,053]	{1,027}
Ingham	25,478	25,512	25,547	25,547	25,640	(5,128)	[1,231]	{615}	25,742	(5,148)	[1,236]	{618}	25,856	(5,171)	[1,241]	{621}
Kent	74,884	74,937	74,991	74,991	75,135	(15,027)	[3,607]	{1,803}	75,295	(15,059)	[3,614]	{1,807}	75,473	(15,095)	[3,623]	{1,811}
Livingston	17,167	17,194	17,220	17,220	17,294	(3,459)	[830]	{415}	17,378	(3,476)	[834]	{417}	17,474	(3,495)	[839]	{419}
Macomb	101,996	102,083	102,169	102,169	102,455	(20,491)	[4,918]	{2,459}	102,770	(20,554)	[4,933]	{2,466}	103,123	(20,625)	[4,950]	{2,475}
Monroe	15,733	15,751	15,768	15,768	15,814	(3,163)	[759]	{380}	15,865	(3,173)	[762]	{381}	15,922	(3,184)	[764]	{382}
Oakland	121,545	121,678	121,812	121,812	122,241	(24,448)	[5,868]	{2,934}	122,714	(24,543)	[5,890]	{2,945}	123,254	(24,651)	[5,916]	{2,958}
Washtenaw	27,093	27,126	27,159	27,159	27,249	(5,450)	[1,308]	{654}	27,348	(5,470)	[1,313]	{656}	27,458	(5,492)	[1,318]	{659}
Wayne	169,612	169,794	169,976	169,976	170,542	(34,108)	[8,186]	{4,093}	171,165	(34,233)	[8,216]	{4,108}	171,871	(34,374)	[8,250]	{4,125}

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.