

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

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 11/19/21 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.**

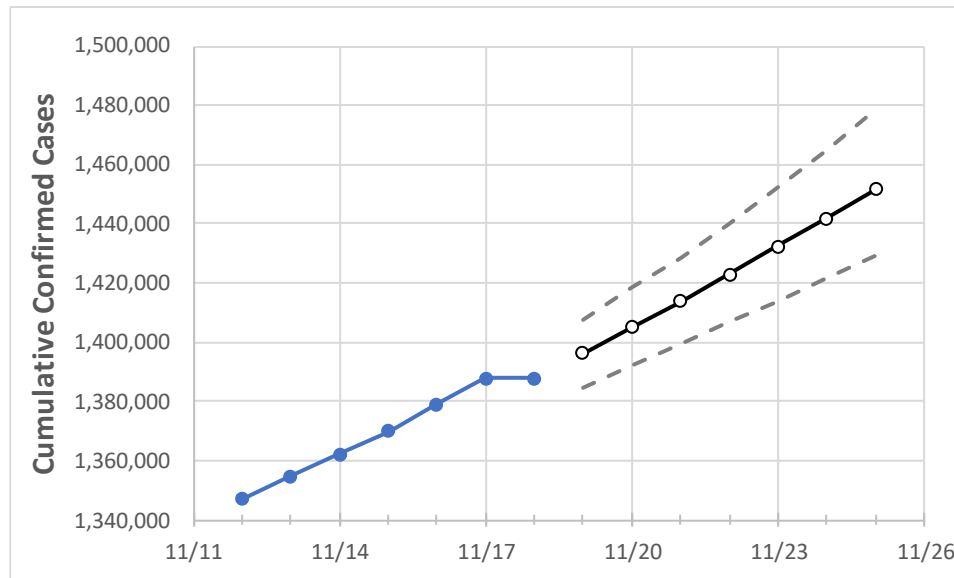
**IEM's Modeling Lead**

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Michigan	1,370,035	1,378,987	1,387,938	1,387,938	1,396,294	1,404,919	1,413,860	1,422,850	1,432,286	1,441,842	1,451,530

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Genesee	56,558	56,949	57,340	57,340	57,707	58,092	58,488	58,904	59,319	59,753	60,199
Ingham	33,899	34,150	34,400	34,400	34,667	34,945	35,233	35,530	35,843	36,165	36,506
Kent	101,340	102,005	102,669	102,669	103,267	103,894	104,491	105,146	105,824	106,529	107,225
Livingston	25,879	26,119	26,358	26,358	26,588	26,833	27,079	27,338	27,603	27,884	28,168
Macomb	130,309	131,102	131,895	131,895	132,570	133,263	133,983	134,712	135,465	136,231	137,024
Monroe	22,373	22,505	22,636	22,636	22,777	22,923	23,072	23,225	23,381	23,544	23,710
Oakland	156,443	157,364	158,285	158,285	159,146	160,032	160,920	161,857	162,817	163,820	164,833
Washtenaw	35,961	36,157	36,353	36,353	36,572	36,796	37,024	37,263	37,513	37,765	38,029
Wayne	212,627	213,988	215,348	215,348	216,528	217,711	218,962	220,211	221,568	222,928	224,297

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:											
	11/15	11/16	11/17	11/18	11/20			11/22			11/24					
Genesee	56,558	56,949	57,340	57,340	58,092	(11,618)	[2,788]	{1,394}	58,904	(11,781)	[2,827]	{1,414}	59,753	(11,951)	[2,868]	{1,434}
Ingham	33,899	34,150	34,400	34,400	34,945	(6,989)	[1,677]	{839}	35,530	(7,106)	[1,705]	{853}	36,165	(7,233)	[1,736]	{868}
Kent	101,340	102,005	102,669	102,669	103,894	(20,779)	[4,987]	{2,493}	105,146	(21,029)	[5,047]	{2,524}	106,529	(21,306)	[5,113]	{2,557}
Livingston	25,879	26,119	26,358	26,358	26,833	(5,367)	[1,288]	{644}	27,338	(5,468)	[1,312]	{656}	27,884	(5,577)	[1,338]	{669}
Macomb	130,309	131,102	131,895	131,895	133,263	(26,653)	[6,397]	{3,198}	134,712	(26,942)	[6,466]	{3,233}	136,231	(27,246)	[6,539]	{3,270}
Monroe	22,373	22,505	22,636	22,636	22,923	(4,585)	[1,100]	{550}	23,225	(4,645)	[1,115]	{557}	23,544	(4,709)	[1,130]	{565}
Oakland	156,443	157,364	158,285	158,285	160,032	(32,006)	[7,682]	{3,841}	161,857	(32,371)	[7,769]	{3,885}	163,820	(32,764)	[7,863]	{3,932}
Washtenaw	35,961	36,157	36,353	36,353	36,796	(7,359)	[1,766]	{883}	37,263	(7,453)	[1,789]	{894}	37,765	(7,553)	[1,813]	{906}
Wayne	212,627	213,988	215,348	215,348	217,711	(43,542)	[10,450]	{5,225}	220,211	(44,042)	[10,570]	{5,285}	222,928	(44,586)	[10,701]	{5,350}

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.