

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 11/22/21**

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 11/22/21 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.**

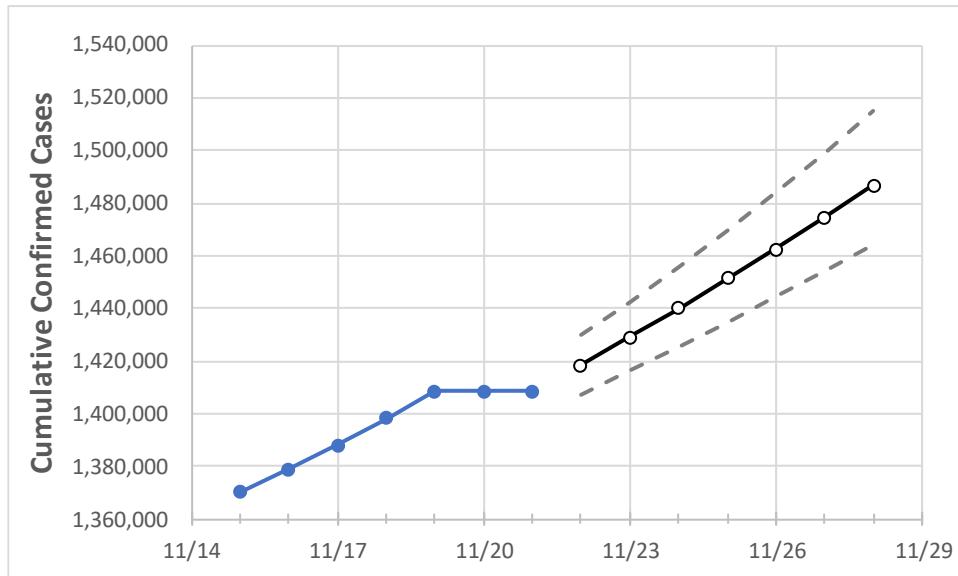
**IEM's Modeling Lead**

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:							
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	
Michigan	1,398,179	1,408,419	1,408,419	1,408,419	1,418,480	1,429,041	1,439,864	1,451,212	1,462,559	1,474,438	1,486,623	

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:							
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	
Genesee	57,786	58,231	58,231	58,231	58,743	59,289	59,864	60,466	61,101	61,762	62,451	
Ingham	34,626	34,852	34,852	34,852	35,131	35,415	35,713	36,018	36,332	36,662	36,997	
Kent	103,560	104,450	104,450	104,450	105,201	106,010	106,814	107,638	108,498	109,407	110,297	
Livingston	26,591	26,824	26,824	26,824	27,084	27,351	27,624	27,905	28,197	28,494	28,805	
Macomb	132,698	133,501	133,501	133,501	134,313	135,155	135,999	136,904	137,797	138,729	139,677	
Monroe	22,759	22,881	22,881	22,881	23,026	23,175	23,327	23,483	23,642	23,806	23,973	
Oakland	159,293	160,301	160,301	160,301	161,348	162,427	163,541	164,699	165,888	167,121	168,391	
Washtenaw	36,603	36,852	36,852	36,852	37,109	37,382	37,656	37,945	38,236	38,544	38,866	
Wayne	216,714	218,079	218,079	218,079	219,491	220,967	222,464	224,052	225,695	227,379	229,128	

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:				11/23	Projected Cases (Hospitalized) [ICU] {Ventilator} For:					
	11/18	11/19	11/20	11/21		11/25	11/27	11/25	11/27	11/25	11/27
Genesee	57,786	58,231	58,231	58,231	59,289 (11,858) [2,846] {1,423}	60,466 (12,093) [2,902] {1,451}	61,762 (12,352) [2,965] {1,482}				
Ingham	34,626	34,852	34,852	34,852	35,415 (7,083) [1,700] {850}	36,018 (7,204) [1,729] {864}	36,662 (7,332) [1,760] {880}				
Kent	103,560	104,450	104,450	104,450	106,010 (21,202) [5,088] {2,544}	107,638 (21,528) [5,167] {2,583}	109,407 (21,881) [5,252] {2,626}				
Livingston	26,591	26,824	26,824	26,824	27,351 (5,470) [1,313] {656}	27,905 (5,581) [1,339] {670}	28,494 (5,699) [1,368] {684}				
Macomb	132,698	133,501	133,501	133,501	135,155 (27,031) [6,487] {3,244}	136,904 (27,381) [6,571] {3,286}	138,729 (27,746) [6,659] {3,329}				
Monroe	22,759	22,881	22,881	22,881	23,175 (4,635) [1,112] {556}	23,483 (4,697) [1,127] {564}	23,806 (4,761) [1,143] {571}				
Oakland	159,293	160,301	160,301	160,301	162,427 (32,485) [7,796] {3,898}	164,699 (32,940) [7,906] {3,953}	167,121 (33,424) [8,022] {4,011}				
Washtenaw	36,603	36,852	36,852	36,852	37,382 (7,476) [1,794] {897}	37,945 (7,589) [1,821] {911}	38,544 (7,709) [1,850] {925}				
Wayne	216,714	218,079	218,079	218,079	220,967 (44,193) [10,606] {5,303}	224,052 (44,810) [10,754] {5,377}	227,379 (45,476) [10,914] {5,457}				

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.