

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 9/10/21**

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 9/10/21 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.**

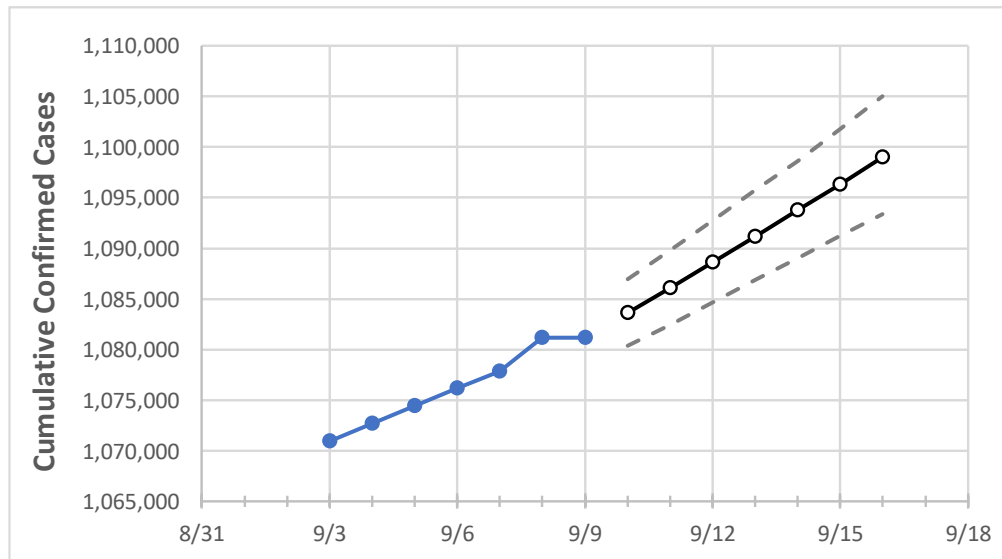
**IEM's Modeling Lead**

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:						
	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16
Michigan	1,076,144	1,077,871	1,081,179	1,081,179	1,083,612	1,086,090	1,088,603	1,091,130	1,093,737	1,096,342	1,099,036

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:							
	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	
Genesee	44,746	44,813	45,000	45,000	45,109	45,224	45,334	45,451	45,574	45,696	45,810	
Ingham	26,764	26,806	26,885	26,885	26,942	27,002	27,059	27,120	27,181	27,243	27,305	
Kent	79,197	79,359	79,603	79,603	79,821	80,042	80,274	80,504	80,746	80,991	81,233	
Livingston	18,634	18,670	18,728	18,728	18,785	18,842	18,897	18,955	19,013	19,071	19,129	
Macomb	106,677	106,828	107,056	107,056	107,259	107,462	107,670	107,876	108,092	108,310	108,531	
Monroe	16,616	16,639	16,749	16,749	16,794	16,839	16,887	16,934	16,986	17,036	17,086	
Oakland	128,279	128,466	128,837	128,837	129,096	129,362	129,620	129,887	130,155	130,429	130,700	
Washtenaw	28,818	28,871	28,946	28,946	29,019	29,094	29,169	29,246	29,323	29,404	29,480	
Wayne	177,775	177,996	178,417	178,417	178,708	179,002	179,299	179,589	179,891	180,197	180,501	

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:											
	9/6	9/7	9/8	9/9	9/11				9/13				9/15			
Genesee	44,746	44,813	45,000	45,000	45,224	(9,045)	[2,171]	{1,085}	45,451	(9,090)	[2,182]	{1,091}	45,696	(9,139)	[2,193]	{1,097}
Ingham	26,764	26,806	26,885	26,885	27,002	(5,400)	[1,296]	{648}	27,120	(5,424)	[1,302]	{651}	27,243	(5,449)	[1,308]	{654}
Kent	79,197	79,359	79,603	79,603	80,042	(16,008)	[3,842]	{1,921}	80,504	(16,101)	[3,864]	{1,932}	80,991	(16,198)	[3,888]	{1,944}
Livingston	18,634	18,670	18,728	18,728	18,842	(3,768)	[904]	{452}	18,955	(3,791)	[910]	{455}	19,071	(3,814)	[915]	{458}
Macomb	106,677	106,828	107,056	107,056	107,462	(21,492)	[5,158]	{2,579}	107,876	(21,575)	[5,178]	{2,589}	108,310	(21,662)	[5,199]	{2,599}
Monroe	16,616	16,639	16,749	16,749	16,839	(3,368)	[808]	{404}	16,934	(3,387)	[813]	{406}	17,036	(3,407)	[818]	{409}
Oakland	128,279	128,466	128,837	128,837	129,362	(25,872)	[6,209]	{3,105}	129,887	(25,977)	[6,235]	{3,117}	130,429	(26,086)	[6,261]	{3,130}
Washtenaw	28,818	28,871	28,946	28,946	29,094	(5,819)	[1,397]	{698}	29,246	(5,849)	[1,404]	{702}	29,404	(5,881)	[1,411]	{706}
Wayne	177,775	177,996	178,417	178,417	179,002	(35,800)	[8,592]	{4,296}	179,589	(35,918)	[8,620]	{4,310}	180,197	(36,039)	[8,649]	{4,325}

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.