

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

**Date: 1/21/22**

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 1/21/22 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.**

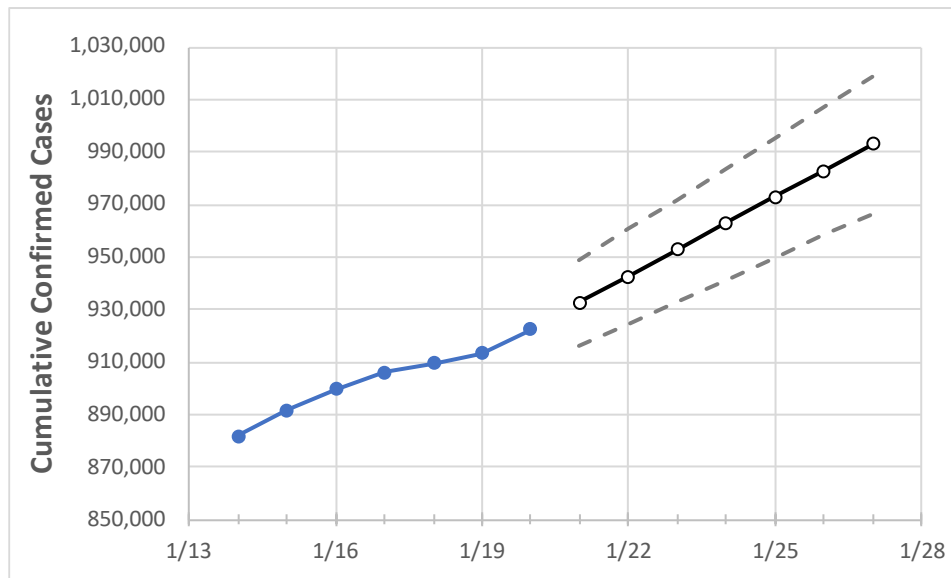
### **IEM's Modeling Lead**

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.

## Maryland State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27
Maryland	906,209	909,424	913,464	922,361	932,624	942,673	952,757	962,982	972,967	982,927	992,945

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.

## Maryland Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27
Anne Arundel	80,141	80,440	80,734	81,501	82,226	82,957	83,658	84,377	85,081	85,791	86,475
Baltimore City	101,412	101,764	102,074	102,671	103,651	104,600	105,525	106,453	107,350	108,279	109,156
Baltimore County	119,863	120,242	120,637	121,589	122,710	123,791	124,867	125,937	126,993	128,054	129,103
Charles	24,674	24,857	25,159	25,343	25,595	25,848	26,095	26,346	26,589	26,834	27,067
Frederick	40,545	40,760	41,095	41,304	41,792	42,267	42,742	43,228	43,692	44,184	44,649
Harford	34,132	34,275	34,447	34,725	35,121	35,502	35,875	36,265	36,651	37,057	37,438
Howard	38,341	38,450	38,603	39,102	39,537	39,984	40,416	40,859	41,273	41,723	42,137
Montgomery	148,911	149,856	152,015	152,742	154,889	157,083	159,234	161,280	163,437	165,618	167,675
Prince George's	156,258	156,723	158,280	158,871	160,116	161,333	162,502	163,661	164,813	165,980	167,110

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.

### Maryland Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	1/17	1/18	1/19	1/20	1/22			1/24			1/26					
Anne Arundel	80,141	80,440	80,734	81,501	82,957	(16,591)	[3,982]	{1,991}	84,377	(16,875)	[4,050]	{2,025}	85,791	(17,158)	[4,118]	{2,059}
Baltimore City	101,412	101,764	102,074	102,671	104,600	(20,920)	[5,021]	{2,510}	106,453	(21,291)	[5,110]	{2,555}	108,279	(21,656)	[5,197]	{2,599}
Baltimore County	119,863	120,242	120,637	121,589	123,791	(24,758)	[5,942]	{2,971}	125,937	(25,187)	[6,045]	{3,022}	128,054	(25,611)	[6,147]	{3,073}
Charles	24,674	24,857	25,159	25,343	25,848	(5,170)	[1,241]	{620}	26,346	(5,269)	[1,265]	{632}	26,834	(5,367)	[1,288]	{644}
Frederick	40,545	40,760	41,095	41,304	42,267	(8,453)	[2,029]	{1,014}	43,228	(8,646)	[2,075]	{1,037}	44,184	(8,837)	[2,121]	{1,060}
Harford	34,132	34,275	34,447	34,725	35,502	(7,100)	[1,704]	{852}	36,265	(7,253)	[1,741]	{870}	37,057	(7,411)	[1,779]	{889}
Howard	38,341	38,450	38,603	39,102	39,984	(7,997)	[1,919]	{960}	40,859	(8,172)	[1,961]	{981}	41,723	(8,345)	[2,003]	{1,001}
Montgomery	148,911	149,856	152,015	152,742	157,083	(31,417)	[7,540]	{3,770}	161,280	(32,256)	[7,741]	{3,871}	165,618	(33,124)	[7,950]	{3,975}
Prince George's	156,258	156,723	158,280	158,871	161,333	(32,267)	[7,744]	{3,872}	163,661	(32,732)	[7,856]	{3,928}	165,980	(33,196)	[7,967]	{3,984}

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.