

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

**Date: 2/26/21**

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 2/26/21 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.**

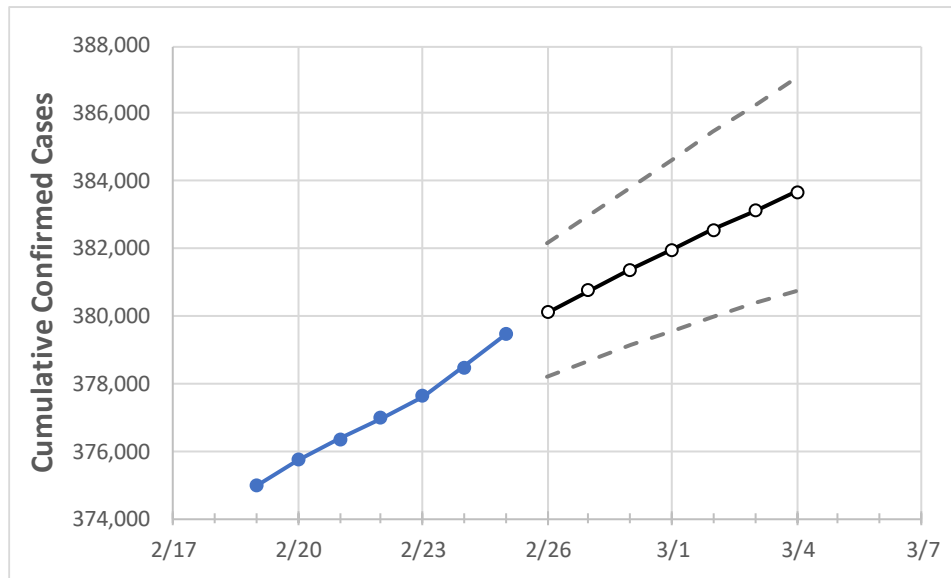
### **IEM's Modeling Lead**

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.

## Maryland State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Maryland	376,966	377,628	378,490	379,466	380,114	380,754	381,377	381,980	382,565	383,132	383,693

*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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4
Anne Arundel	35,166	35,218	35,297	35,410	35,478	35,544	35,609	35,674	35,737	35,796	35,853
Baltimore City	39,899	39,980	40,037	40,141	40,200	40,259	40,316	40,371	40,425	40,477	40,528
Baltimore County	50,132	50,194	50,351	50,482	50,568	50,652	50,733	50,812	50,886	50,958	51,030
Charles	8,771	8,801	8,830	8,830	8,850	8,869	8,887	8,906	8,923	8,940	8,956
Frederick	16,747	16,778	16,826	16,826	16,857	16,887	16,915	16,943	16,971	16,997	17,022
Harford	12,309	12,336	12,373	12,403	12,431	12,459	12,486	12,512	12,538	12,563	12,586
Howard	15,568	15,603	15,647	15,682	15,716	15,748	15,780	15,811	15,840	15,870	15,900
Montgomery	62,626	62,767	62,896	62,896	62,985	63,070	63,154	63,235	63,312	63,389	63,462
Prince George's	72,416	72,609	72,788	72,788	72,918	73,042	73,162	73,282	73,399	73,518	73,628

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:											
	2/22	2/23	2/24	2/25	2/27			3/1			3/3					
Anne Arundel	35,166	35,218	35,297	35,410	35,544	(7,109)	[1,706]	{853}	35,674	(7,135)	[1,712]	{856}	35,796	(7,159)	[1,718]	{859}
Baltimore City	39,899	39,980	40,037	40,141	40,259	(8,052)	[1,932]	{966}	40,371	(8,074)	[1,938]	{969}	40,477	(8,095)	[1,943]	{971}
Baltimore County	50,132	50,194	50,351	50,482	50,652	(10,130)	[2,431]	{1,216}	50,812	(10,162)	[2,439]	{1,219}	50,958	(10,192)	[2,446]	{1,223}
Charles	8,771	8,801	8,830	8,830	8,869	(1,774)	[426]	{213}	8,906	(1,781)	[427]	{214}	8,940	(1,788)	[429]	{215}
Frederick	16,747	16,778	16,826	16,826	16,887	(3,377)	[811]	{405}	16,943	(3,389)	[813]	{407}	16,997	(3,399)	[816]	{408}
Harford	12,309	12,336	12,373	12,403	12,459	(2,492)	[598]	{299}	12,512	(2,502)	[601]	{300}	12,563	(2,513)	[603]	{302}
Howard	15,568	15,603	15,647	15,682	15,748	(3,150)	[756]	{378}	15,811	(3,162)	[759]	{379}	15,870	(3,174)	[762]	{381}
Montgomery	62,626	62,767	62,896	62,896	63,070	(12,614)	[3,027]	{1,514}	63,235	(12,647)	[3,035]	{1,518}	63,389	(12,678)	[3,043]	{1,521}
Prince George's	72,416	72,609	72,788	72,788	73,042	(14,608)	[3,506]	{1,753}	73,282	(14,656)	[3,518]	{1,759}	73,518	(14,704)	[3,529]	{1,764}

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.