

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

**Date: 2/18/22**

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 2/18/22 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.**

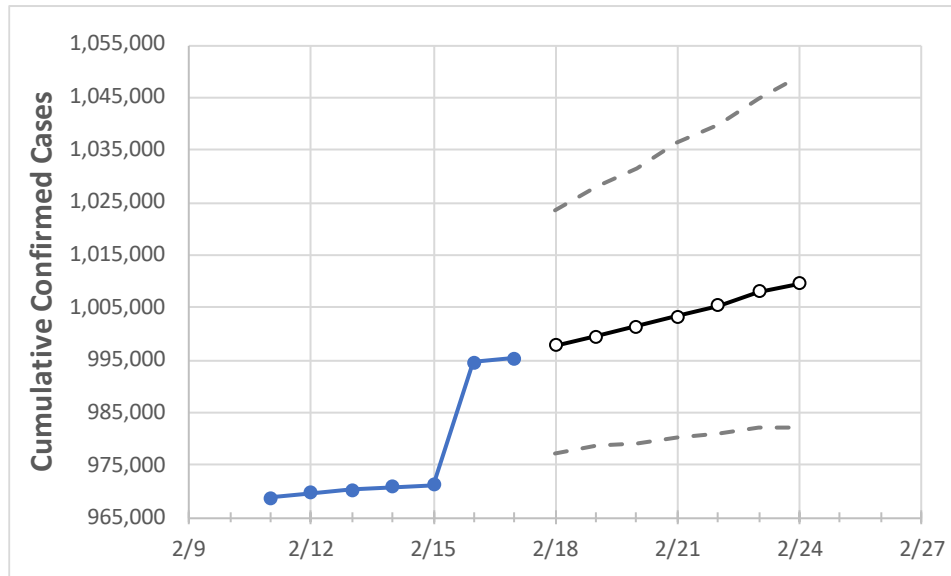
### **IEM's Modeling Lead**

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Maryland	970,732	971,175	994,577	995,328	997,708	999,413	1,001,408	1,003,211	1,005,362	1,007,976	1,009,590

*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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Anne Arundel	85,817	85,878	87,521	87,599	87,792	87,932	88,087	88,227	88,394	88,562	88,703
Baltimore City	106,514	106,520	109,459	109,490	109,786	110,073	110,294	110,556	110,803	111,032	111,228
Baltimore County	126,556	126,607	129,701	129,793	130,152	130,401	130,704	130,986	131,252	131,545	131,783
Charles	26,815	27,393	27,413	27,441	27,500	27,553	27,610	27,663	27,717	27,772	27,828
Frederick	43,675	44,676	44,711	44,767	44,879	44,973	45,064	45,153	45,286	45,376	45,467
Harford	36,704	36,722	37,453	37,485	37,570	37,640	37,725	37,793	37,866	37,941	38,015
Howard	41,664	41,764	42,536	42,583	42,679	42,783	42,866	42,964	43,050	43,150	43,235
Montgomery	160,171	163,917	164,030	164,200	164,597	164,949	165,227	165,616	165,894	166,269	166,591
Prince George's	163,568	168,082	168,162	168,263	168,729	169,067	169,491	169,895	170,238	170,803	171,103

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:											
	2/14	2/15	2/16	2/17	2/19			2/21			2/23					
Anne Arundel	85,817	85,878	87,521	87,599	87,932	(17,586)	[4,221]	{2,110}	88,227	(17,645)	[4,235]	{2,117}	88,562	(17,712)	[4,251]	{2,125}
Baltimore City	106,514	106,520	109,459	109,490	110,073	(22,015)	[5,283]	{2,642}	110,556	(22,111)	[5,307]	{2,653}	111,032	(22,206)	[5,330]	{2,665}
Baltimore County	126,556	126,607	129,701	129,793	130,401	(26,080)	[6,259]	{3,130}	130,986	(26,197)	[6,287]	{3,144}	131,545	(26,309)	[6,314]	{3,157}
Charles	26,815	27,393	27,413	27,441	27,553	(5,511)	[1,323]	{661}	27,663	(5,533)	[1,328]	{664}	27,772	(5,554)	[1,333]	{667}
Frederick	43,675	44,676	44,711	44,767	44,973	(8,995)	[2,159]	{1,079}	45,153	(9,031)	[2,167]	{1,084}	45,376	(9,075)	[2,178]	{1,089}
Harford	36,704	36,722	37,453	37,485	37,640	(7,528)	[1,807]	{903}	37,793	(7,559)	[1,814]	{907}	37,941	(7,588)	[1,821]	{911}
Howard	41,664	41,764	42,536	42,583	42,783	(8,557)	[2,054]	{1,027}	42,964	(8,593)	[2,062]	{1,031}	43,150	(8,630)	[2,071]	{1,036}
Montgomery	160,171	163,917	164,030	164,200	164,949	(32,990)	[7,918]	{3,959}	165,616	(33,123)	[7,950]	{3,975}	166,269	(33,254)	[7,981]	{3,990}
Prince George's	163,568	168,082	168,162	168,263	169,067	(33,813)	[8,115]	{4,058}	169,895	(33,979)	[8,155]	{4,077}	170,803	(34,161)	[8,199]	{4,099}

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.