

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

**Date: 4/1/21**

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 4/1/21 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.**

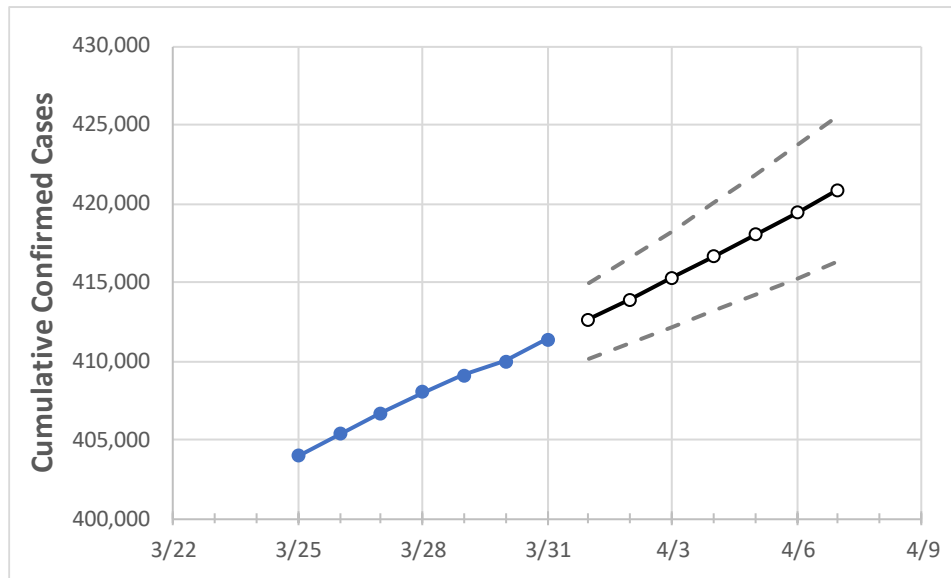
### **IEM's Modeling Lead**

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:						
	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7
Maryland	408,044	409,075	409,978	411,344	412,619	413,932	415,273	416,628	418,025	419,431	420,862

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:						
	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7
Anne Arundel	38,572	38,671	38,776	38,894	39,027	39,161	39,301	39,441	39,584	39,731	39,882
Baltimore City	44,016	44,237	44,390	44,629	44,864	45,106	45,360	45,621	45,888	46,168	46,452
Baltimore County	55,245	55,451	55,611	55,856	56,092	56,330	56,580	56,833	57,098	57,366	57,645
Charles	9,676	9,695	9,724	9,724	9,753	9,782	9,811	9,841	9,870	9,899	9,928
Frederick	18,097	18,133	18,183	18,183	18,230	18,280	18,329	18,379	18,430	18,481	18,534
Harford	13,826	13,898	13,944	14,053	14,137	14,224	14,315	14,408	14,503	14,603	14,709
Howard	17,106	17,148	17,212	17,270	17,329	17,390	17,452	17,515	17,581	17,648	17,716
Montgomery	66,491	66,589	66,704	66,704	66,832	66,960	67,090	67,222	67,355	67,489	67,625
Prince George's	77,701	77,820	78,011	78,011	78,189	78,371	78,554	78,736	78,924	79,109	79,300

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:											
	3/28	3/29	3/30	3/31	4/2			4/4			4/6					
Anne Arundel	38,572	38,671	38,776	38,894	39,161	(7,832)	[1,880]	{940}	39,441	(7,888)	[1,893]	{947}	39,731	(7,946)	[1,907]	{954}
Baltimore City	44,016	44,237	44,390	44,629	45,106	(9,021)	[2,165]	{1,083}	45,621	(9,124)	[2,190]	{1,095}	46,168	(9,234)	[2,216]	{1,108}
Baltimore County	55,245	55,451	55,611	55,856	56,330	(11,266)	[2,704]	{1,352}	56,833	(11,367)	[2,728]	{1,364}	57,366	(11,473)	[2,754]	{1,377}
Charles	9,676	9,695	9,724	9,724	9,782	(1,956)	[470]	{235}	9,841	(1,968)	[472]	{236}	9,899	(1,980)	[475]	{238}
Frederick	18,097	18,133	18,183	18,183	18,280	(3,656)	[877]	{439}	18,379	(3,676)	[882]	{441}	18,481	(3,696)	[887]	{444}
Harford	13,826	13,898	13,944	14,053	14,224	(2,845)	[683]	{341}	14,408	(2,882)	[692]	{346}	14,603	(2,921)	[701]	{350}
Howard	17,106	17,148	17,212	17,270	17,390	(3,478)	[835]	{417}	17,515	(3,503)	[841]	{420}	17,648	(3,530)	[847]	{424}
Montgomery	66,491	66,589	66,704	66,704	66,960	(13,392)	[3,214]	{1,607}	67,222	(13,444)	[3,227]	{1,613}	67,489	(13,498)	[3,239]	{1,620}
Prince George's	77,701	77,820	78,011	78,011	78,371	(15,674)	[3,762]	{1,881}	78,736	(15,747)	[3,779]	{1,890}	79,109	(15,822)	[3,797]	{1,899}

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.