

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

**Date: 3/29/21**

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 3/29/21 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.**

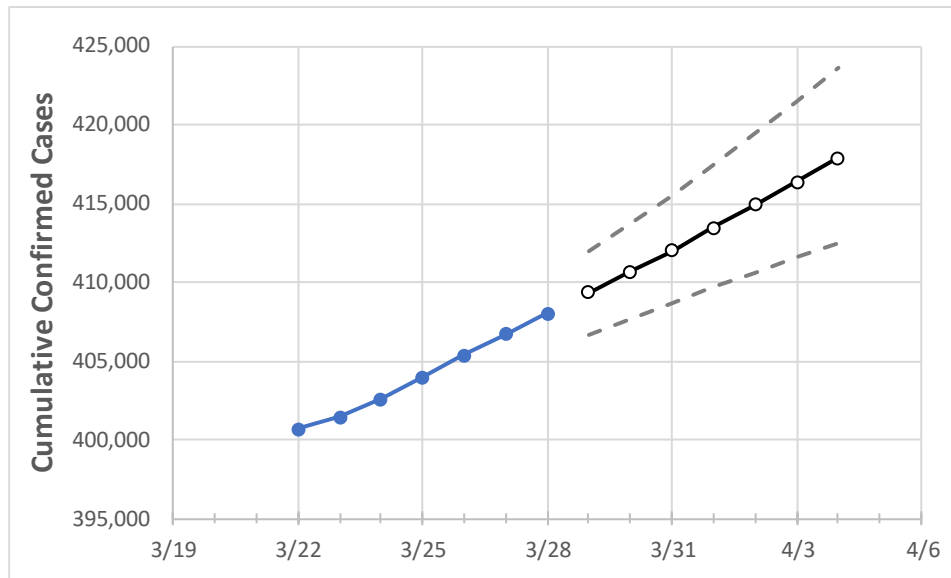
### **IEM's Modeling Lead**

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Maryland	403,982	405,343	406,709	408,044	409,341	410,685	412,037	413,433	414,887	416,355	417,871

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Anne Arundel	38,186	38,308	38,446	38,572	38,716	38,866	39,016	39,172	39,335	39,502	39,674
Baltimore City	43,351	43,578	43,782	44,016	44,243	44,481	44,730	44,989	45,255	45,537	45,833
Baltimore County	54,484	54,740	55,000	55,245	55,484	55,737	55,994	56,262	56,544	56,830	57,133
Charles	9,596	9,620	9,648	9,676	9,707	9,738	9,769	9,801	9,833	9,865	9,898
Frederick	17,961	18,003	18,053	18,097	18,148	18,199	18,252	18,306	18,360	18,415	18,471
Harford	13,550	13,634	13,742	13,826	13,906	13,991	14,079	14,168	14,263	14,362	14,467
Howard	16,915	16,959	17,044	17,106	17,164	17,223	17,284	17,348	17,413	17,479	17,549
Montgomery	66,113	66,250	66,392	66,491	66,622	66,757	66,889	67,026	67,167	67,308	67,453
Prince George's	77,153	77,370	77,573	77,701	77,883	78,069	78,259	78,453	78,652	78,849	79,050

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:											
	3/25	3/26	3/27	3/28	3/30			4/1			4/3					
Anne Arundel	38,186	38,308	38,446	38,572	38,866	(7,773)	[1,866]	{933}	39,172	(7,834)	[1,880]	{940}	39,502	(7,900)	[1,896]	{948}
Baltimore City	43,351	43,578	43,782	44,016	44,481	(8,896)	[2,135]	{1,068}	44,989	(8,998)	[2,159]	{1,080}	45,537	(9,107)	[2,186]	{1,093}
Baltimore County	54,484	54,740	55,000	55,245	55,737	(11,147)	[2,675]	{1,338}	56,262	(11,252)	[2,701]	{1,350}	56,830	(11,366)	[2,728]	{1,364}
Charles	9,596	9,620	9,648	9,676	9,738	(1,948)	[467]	{234}	9,801	(1,960)	[470]	{235}	9,865	(1,973)	[474]	{237}
Frederick	17,961	18,003	18,053	18,097	18,199	(3,640)	[874]	{437}	18,306	(3,661)	[879]	{439}	18,415	(3,683)	[884]	{442}
Harford	13,550	13,634	13,742	13,826	13,991	(2,798)	[672]	{336}	14,168	(2,834)	[680]	{340}	14,362	(2,872)	[689]	{345}
Howard	16,915	16,959	17,044	17,106	17,223	(3,445)	[827]	{413}	17,348	(3,470)	[833]	{416}	17,479	(3,496)	[839]	{419}
Montgomery	66,113	66,250	66,392	66,491	66,757	(13,351)	[3,204]	{1,602}	67,026	(13,405)	[3,217]	{1,609}	67,308	(13,462)	[3,231]	{1,615}
Prince George's	77,153	77,370	77,573	77,701	78,069	(15,614)	[3,747]	{1,874}	78,453	(15,691)	[3,766]	{1,883}	78,849	(15,770)	[3,785]	{1,892}

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.