

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

Date: 12/1/21

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 12/1/21 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.**

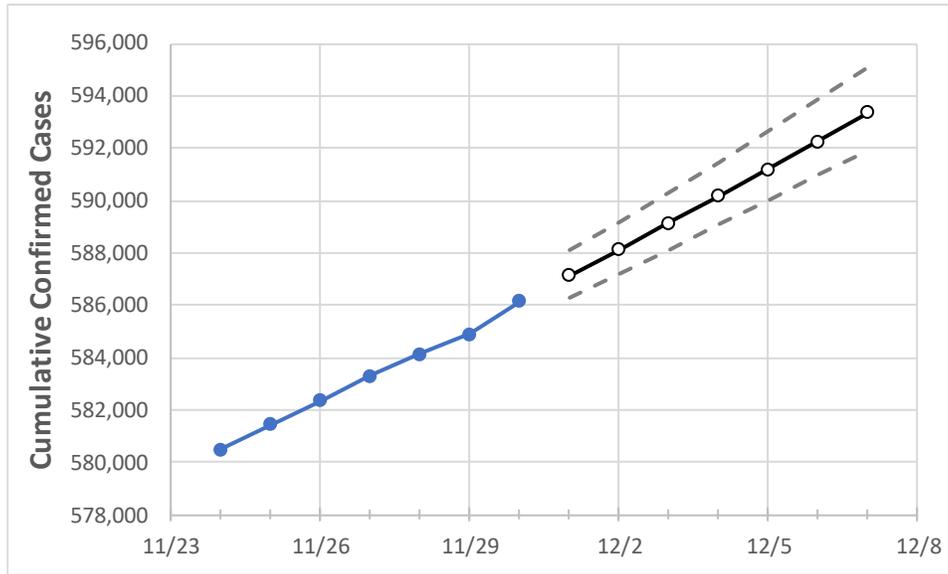
### IEM's Modeling Lead

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
Maryland	583,299	584,137	584,899	586,143	587,135	588,146	589,161	590,186	591,218	592,274	593,351

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:						
	11/27	11/28	11/29	11/30	12/1	12/2	12/3	12/4	12/5	12/6	12/7
Anne Arundel	55,228	55,275	55,356	55,481	55,576	55,673	55,770	55,868	55,970	56,072	56,177
Baltimore City	64,001	64,083	64,173	64,328	64,436	64,545	64,652	64,762	64,873	64,989	65,106
Baltimore County	79,848	79,944	80,057	80,262	80,409	80,554	80,703	80,855	81,009	81,169	81,324
Charles	14,927	14,938	14,962	14,977	14,994	15,011	15,028	15,045	15,062	15,080	15,097
Frederick	25,705	25,749	25,836	25,907	25,968	26,031	26,093	26,157	26,223	26,289	26,354
Harford	22,038	22,100	22,151	22,253	22,324	22,399	22,474	22,550	22,630	22,710	22,795
Howard	23,521	23,563	23,587	23,624	23,661	23,700	23,737	23,777	23,815	23,855	23,896
Montgomery	85,088	85,170	85,310	85,430	85,550	85,673	85,796	85,923	86,051	86,184	86,313
Prince George’s	101,907	101,976	102,081	102,189	102,276	102,364	102,452	102,541	102,631	102,722	102,815

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:											
	11/27	11/28	11/29	11/30	12/2			12/4			12/6					
Anne Arundel	55,228	55,275	55,356	55,481	55,673	(11,135)	[2,672]	{1,336}	55,868	(11,174)	[2,682]	{1,341}	56,072	(11,214)	[2,691]	{1,346}
Baltimore City	64,001	64,083	64,173	64,328	64,545	(12,909)	[3,098]	{1,549}	64,762	(12,952)	[3,109]	{1,554}	64,989	(12,998)	[3,119]	{1,560}
Baltimore County	79,848	79,944	80,057	80,262	80,554	(16,111)	[3,867]	{1,933}	80,855	(16,171)	[3,881]	{1,941}	81,169	(16,234)	[3,896]	{1,948}
Charles	14,927	14,938	14,962	14,977	15,011	(3,002)	[721]	{360}	15,045	(3,009)	[722]	{361}	15,080	(3,016)	[724]	{362}
Frederick	25,705	25,749	25,836	25,907	26,031	(5,206)	[1,250]	{625}	26,157	(5,231)	[1,256]	{628}	26,289	(5,258)	[1,262]	{631}
Harford	22,038	22,100	22,151	22,253	22,399	(4,480)	[1,075]	{538}	22,550	(4,510)	[1,082]	{541}	22,710	(4,542)	[1,090]	{545}
Howard	23,521	23,563	23,587	23,624	23,700	(4,740)	[1,138]	{569}	23,777	(4,755)	[1,141]	{571}	23,855	(4,771)	[1,145]	{573}
Montgomery	85,088	85,170	85,310	85,430	85,673	(17,135)	[4,112]	{2,056}	85,923	(17,185)	[4,124]	{2,062}	86,184	(17,237)	[4,137]	{2,068}
Prince George's	101,907	101,976	102,081	102,189	102,364	(20,473)	[4,913]	{2,457}	102,541	(20,508)	[4,922]	{2,461}	102,722	(20,544)	[4,931]	{2,465}

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.