

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

Date: 3/25/21

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 3/25/21 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.**

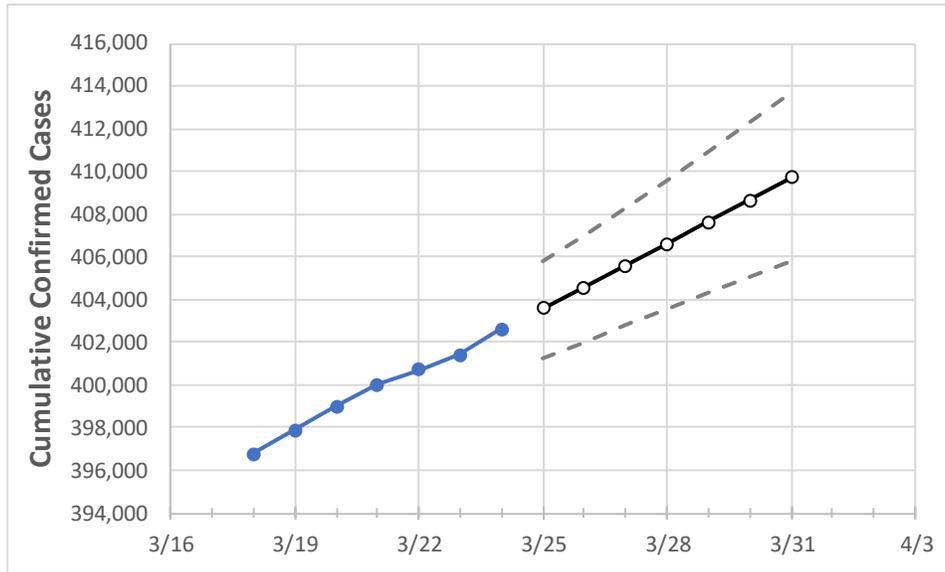
### IEM's Modeling Lead

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Maryland	400,023	400,705	401,427	402,600	403,585	404,565	405,566	406,589	407,613	408,670	409,725

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Anne Arundel	37,722	37,799	37,879	38,011	38,119	38,227	38,339	38,450	38,567	38,681	38,795
Baltimore City	42,736	42,839	42,970	43,156	43,330	43,513	43,705	43,900	44,100	44,308	44,525
Baltimore County	53,801	53,914	54,031	54,243	54,408	54,575	54,744	54,919	55,094	55,271	55,452
Charles	9,465	9,484	9,531	9,556	9,585	9,613	9,642	9,671	9,700	9,729	9,759
Frederick	17,772	17,788	17,838	17,893	17,933	17,974	18,016	18,058	18,099	18,142	18,184
Harford	13,350	13,376	13,415	13,472	13,524	13,578	13,632	13,688	13,743	13,801	13,859
Howard	16,741	16,776	16,798	16,848	16,887	16,925	16,963	17,001	17,040	17,077	17,115
Montgomery	65,596	65,686	65,825	65,986	66,103	66,221	66,339	66,458	66,578	66,695	66,819
Prince George’s	76,481	76,587	76,750	76,950	77,099	77,250	77,401	77,551	77,701	77,849	77,998

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:											
	3/21	3/22	3/23	3/24	3/26			3/28			3/30					
Anne Arundel	37,722	37,799	37,879	38,011	38,227	(7,645)	[1,835]	{917}	38,450	(7,690)	[1,846]	{923}	38,681	(7,736)	[1,857]	{928}
Baltimore City	42,736	42,839	42,970	43,156	43,513	(8,703)	[2,089]	{1,044}	43,900	(8,780)	[2,107]	{1,054}	44,308	(8,862)	[2,127]	{1,063}
Baltimore County	53,801	53,914	54,031	54,243	54,575	(10,915)	[2,620]	{1,310}	54,919	(10,984)	[2,636]	{1,318}	55,271	(11,054)	[2,653]	{1,327}
Charles	9,465	9,484	9,531	9,556	9,613	(1,923)	[461]	{231}	9,671	(1,934)	[464]	{232}	9,729	(1,946)	[467]	{233}
Frederick	17,772	17,788	17,838	17,893	17,974	(3,595)	[863]	{431}	18,058	(3,612)	[867]	{433}	18,142	(3,628)	[871]	{435}
Harford	13,350	13,376	13,415	13,472	13,578	(2,716)	[652]	{326}	13,688	(2,738)	[657]	{329}	13,801	(2,760)	[662]	{331}
Howard	16,741	16,776	16,798	16,848	16,925	(3,385)	[812]	{406}	17,001	(3,400)	[816]	{408}	17,077	(3,415)	[820]	{410}
Montgomery	65,596	65,686	65,825	65,986	66,221	(13,244)	[3,179]	{1,589}	66,458	(13,292)	[3,190]	{1,595}	66,695	(13,339)	[3,201]	{1,601}
Prince George's	76,481	76,587	76,750	76,950	77,250	(15,450)	[3,708]	{1,854}	77,551	(15,510)	[3,722]	{1,861}	77,849	(15,570)	[3,737]	{1,868}

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.