

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

Date: 2/3/21

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 2/3/21 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.**

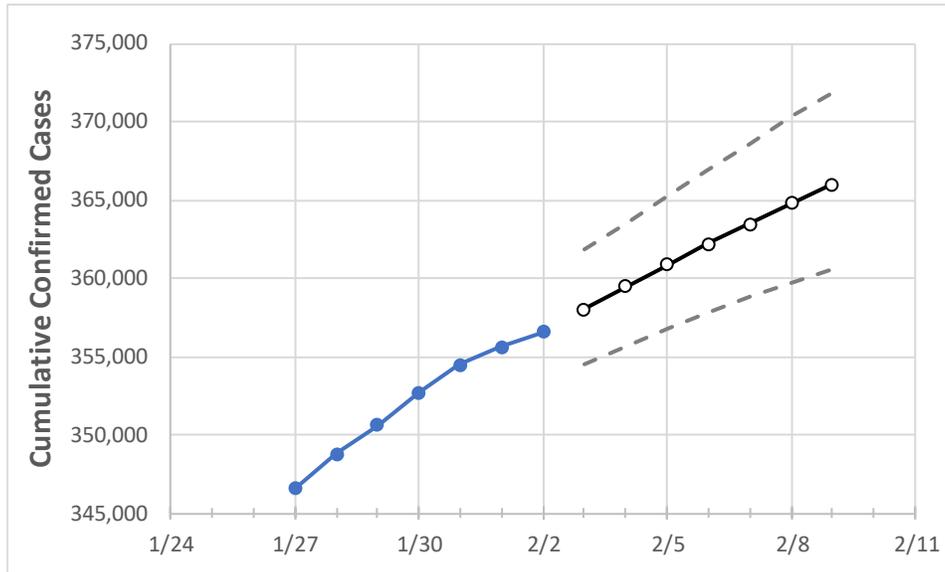
### IEM's Modeling Lead

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:							
	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	
Maryland	352,726	354,473	355,636	356,541	358,029	359,458	360,855	362,195	363,468	364,763	366,006	

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:							
	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	
Anne Arundel	32,737	32,906	33,044	33,111	33,259	33,398	33,537	33,669	33,796	33,920	34,039	
Baltimore City	37,771	37,951	38,024	38,120	38,247	38,371	38,490	38,605	38,718	38,826	38,933	
Baltimore County	47,111	47,341	47,502	47,608	47,797	47,989	48,176	48,361	48,539	48,716	48,889	
Charles	8,022	8,060	8,087	8,126	8,176	8,227	8,277	8,326	8,376	8,424	8,472	
Frederick	15,615	15,646	15,722	15,759	15,826	15,889	15,949	16,005	16,061	16,117	16,171	
Harford	11,287	11,368	11,411	11,450	11,516	11,582	11,644	11,706	11,767	11,827	11,886	
Howard	14,496	14,572	14,631	14,656	14,715	14,772	14,828	14,883	14,938	14,991	15,041	
Montgomery	58,965	59,155	59,292	59,439	59,697	59,957	60,198	60,443	60,677	60,896	61,115	
Prince George’s	67,883	68,102	68,295	68,490	68,755	69,003	69,245	69,480	69,711	69,932	70,146	

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:											
	1/30	1/31	2/1	2/2	2/4		2/6		2/8							
Anne Arundel	32,737	32,906	33,044	33,111	33,398	(6,680)	[1,603]	{802}	33,669	(6,734)	[1,616]	{808}	33,920	(6,784)	[1,628]	{814}
Baltimore City	37,771	37,951	38,024	38,120	38,371	(7,674)	[1,842]	{921}	38,605	(7,721)	[1,853]	{927}	38,826	(7,765)	[1,864]	{932}
Baltimore County	47,111	47,341	47,502	47,608	47,989	(9,598)	[2,303]	{1,152}	48,361	(9,672)	[2,321]	{1,161}	48,716	(9,743)	[2,338]	{1,169}
Charles	8,022	8,060	8,087	8,126	8,227	(1,645)	[395]	{197}	8,326	(1,665)	[400]	{200}	8,424	(1,685)	[404]	{202}
Frederick	15,615	15,646	15,722	15,759	15,889	(3,178)	[763]	{381}	16,005	(3,201)	[768]	{384}	16,117	(3,223)	[774]	{387}
Harford	11,287	11,368	11,411	11,450	11,582	(2,316)	[556]	{278}	11,706	(2,341)	[562]	{281}	11,827	(2,365)	[568]	{284}
Howard	14,496	14,572	14,631	14,656	14,772	(2,954)	[709]	{355}	14,883	(2,977)	[714]	{357}	14,991	(2,998)	[720]	{360}
Montgomery	58,965	59,155	59,292	59,439	59,957	(11,991)	[2,878]	{1,439}	60,443	(12,089)	[2,901]	{1,451}	60,896	(12,179)	[2,923]	{1,462}
Prince George's	67,883	68,102	68,295	68,490	69,003	(13,801)	[3,312]	{1,656}	69,480	(13,896)	[3,335]	{1,668}	69,932	(13,986)	[3,357]	{1,678}

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.