

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

Date: 2/17/21

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 2/17/21 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.**

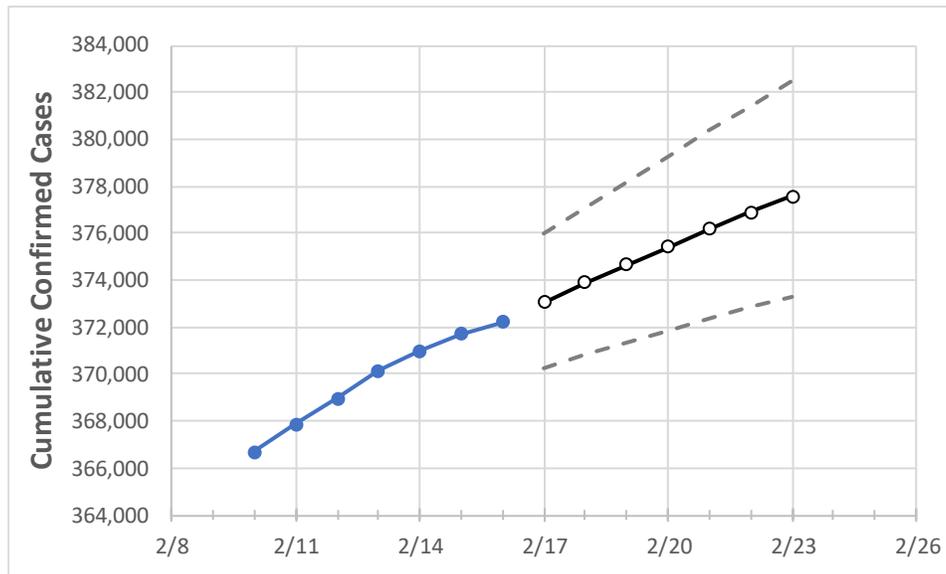
### IEM's Modeling Lead

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:						
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23
Maryland	370,136	370,983	371,705	372,221	373,073	373,884	374,682	375,438	376,183	376,887	377,575

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:						
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23
Anne Arundel	34,448	34,526	34,602	34,645	34,723	34,803	34,878	34,953	35,022	35,090	35,153
Baltimore City	39,345	39,424	39,497	39,552	39,637	39,721	39,803	39,882	39,960	40,037	40,110
Baltimore County	49,233	49,353	49,444	49,497	49,599	49,696	49,794	49,883	49,971	50,058	50,139
Charles	8,553	8,578	8,597	8,626	8,650	8,673	8,695	8,715	8,735	8,754	8,772
Frederick	16,409	16,448	16,481	16,511	16,548	16,585	16,622	16,656	16,690	16,722	16,751
Harford	12,004	12,040	12,080	12,095	12,134	12,172	12,209	12,247	12,282	12,318	12,352
Howard	15,238	15,284	15,316	15,342	15,382	15,420	15,458	15,494	15,530	15,565	15,599
Montgomery	61,643	61,744	61,835	61,942	62,051	62,156	62,254	62,345	62,431	62,514	62,592
Prince George’s	70,980	71,118	71,216	71,402	71,550	71,693	71,829	71,960	72,086	72,206	72,319

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:											
	2/13	2/14	2/15	2/16	2/18		2/20		2/22							
Anne Arundel	34,448	34,526	34,602	34,645	34,803	(6,961)	[1,671]	{835}	34,953	(6,991)	[1,678]	{839}	35,090	(7,018)	[1,684]	{842}
Baltimore City	39,345	39,424	39,497	39,552	39,721	(7,944)	[1,907]	{953}	39,882	(7,976)	[1,914]	{957}	40,037	(8,007)	[1,922]	{961}
Baltimore County	49,233	49,353	49,444	49,497	49,696	(9,939)	[2,385]	{1,193}	49,883	(9,977)	[2,394]	{1,197}	50,058	(10,012)	[2,403]	{1,201}
Charles	8,553	8,578	8,597	8,626	8,673	(1,735)	[416]	{208}	8,715	(1,743)	[418]	{209}	8,754	(1,751)	[420]	{210}
Frederick	16,409	16,448	16,481	16,511	16,585	(3,317)	[796]	{398}	16,656	(3,331)	[799]	{400}	16,722	(3,344)	[803]	{401}
Harford	12,004	12,040	12,080	12,095	12,172	(2,434)	[584]	{292}	12,247	(2,449)	[588]	{294}	12,318	(2,464)	[591]	{296}
Howard	15,238	15,284	15,316	15,342	15,420	(3,084)	[740]	{370}	15,494	(3,099)	[744]	{372}	15,565	(3,113)	[747]	{374}
Montgomery	61,643	61,744	61,835	61,942	62,156	(12,431)	[2,984]	{1,492}	62,345	(12,469)	[2,993]	{1,496}	62,514	(12,503)	[3,001]	{1,500}
Prince George's	70,980	71,118	71,216	71,402	71,693	(14,339)	[3,441]	{1,721}	71,960	(14,392)	[3,454]	{1,727}	72,206	(14,441)	[3,466]	{1,733}

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.