

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

Date: 3/3/21

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 3/3/21 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.**

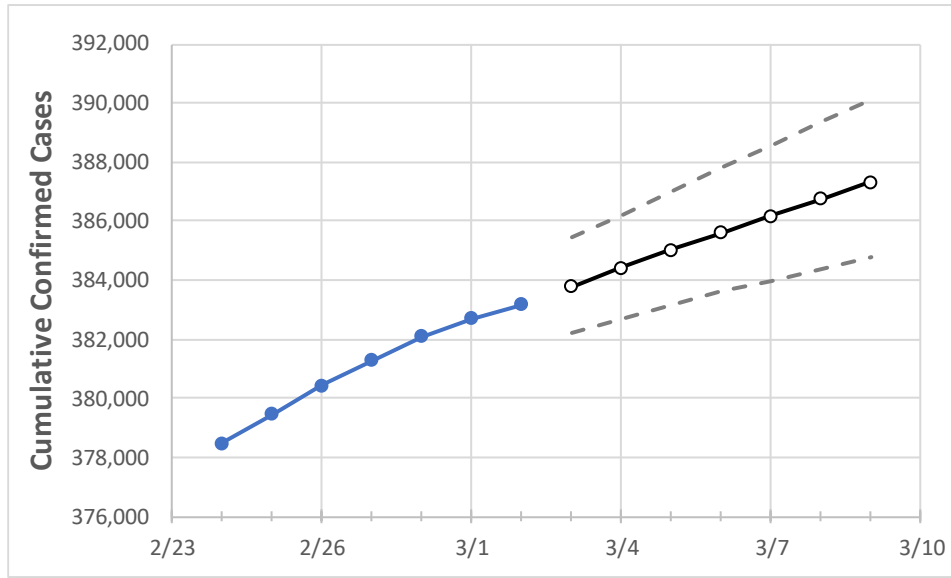
### IEM's Modeling Lead

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:					
	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	
Maryland	381,272	382,099	382,702	383,170	383,801	384,413	385,025	385,624	386,201	386,768	387,329	

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:					
	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9
Anne Arundel	35,604	35,712	35,772	35,827	35,900	35,970	36,039	36,109	36,174	36,243	36,308
Baltimore City	40,303	40,401	40,474	40,481	40,537	40,593	40,649	40,703	40,756	40,807	40,859
Baltimore County	50,779	50,891	50,972	51,062	51,159	51,252	51,346	51,436	51,526	51,612	51,703
Charles	8,899	8,921	8,929	8,963	8,981	8,998	9,015	9,032	9,048	9,063	9,079
Frederick	16,938	16,969	17,003	17,035	17,065	17,093	17,122	17,150	17,177	17,203	17,229
Harford	12,457	12,483	12,515	12,529	12,552	12,575	12,597	12,617	12,638	12,659	12,679
Howard	15,757	15,798	15,827	15,831	15,859	15,886	15,912	15,938	15,963	15,988	16,012
Montgomery	63,276	63,395	63,499	63,595	63,693	63,792	63,889	63,983	64,076	64,168	64,257
Prince George’s	73,320	73,413	73,509	73,685	73,818	73,953	74,086	74,212	74,337	74,463	74,584

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:											
	2/27	2/28	3/1	3/2	3/4			3/6			3/8					
Anne Arundel	35,604	35,712	35,772	35,827	35,970	(7,194)	[1,727]	{863}	36,109	(7,222)	[1,733]	{867}	36,243	(7,249)	[1,740]	{870}
Baltimore City	40,303	40,401	40,474	40,481	40,593	(8,119)	[1,948]	{974}	40,703	(8,141)	[1,954]	{977}	40,807	(8,161)	[1,959]	{979}
Baltimore County	50,779	50,891	50,972	51,062	51,252	(10,250)	[2,460]	{1,230}	51,436	(10,287)	[2,469]	{1,234}	51,612	(10,322)	[2,477]	{1,239}
Charles	8,899	8,921	8,929	8,963	8,998	(1,800)	[432]	{216}	9,032	(1,806)	[434]	{217}	9,063	(1,813)	[435]	{218}
Frederick	16,938	16,969	17,003	17,035	17,093	(3,419)	[820]	{410}	17,150	(3,430)	[823]	{412}	17,203	(3,441)	[826]	{413}
Harford	12,457	12,483	12,515	12,529	12,575	(2,515)	[604]	{302}	12,617	(2,523)	[606]	{303}	12,659	(2,532)	[608]	{304}
Howard	15,757	15,798	15,827	15,831	15,886	(3,177)	[763]	{381}	15,938	(3,188)	[765]	{383}	15,988	(3,198)	[767]	{384}
Montgomery	63,276	63,395	63,499	63,595	63,792	(12,758)	[3,062]	{1,531}	63,983	(12,797)	[3,071]	{1,536}	64,168	(12,834)	[3,080]	{1,540}
Prince George's	73,320	73,413	73,509	73,685	73,953	(14,791)	[3,550]	{1,775}	74,212	(14,842)	[3,562]	{1,781}	74,463	(14,893)	[3,574]	{1,787}

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.