

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

Date: 1/29/21

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 1/29/21 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.**

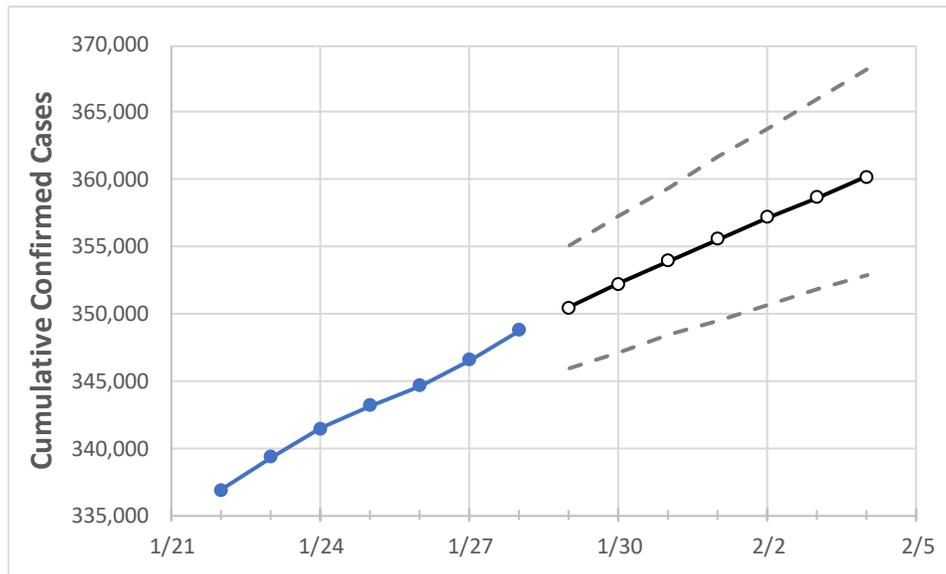
### IEM's Modeling Lead

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Maryland	343,138	344,620	346,559	348,749	350,494	352,241	353,933	355,574	357,176	358,683	360,201

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Anne Arundel	31,764	31,909	32,093	32,362	32,550	32,731	32,911	33,082	33,248	33,409	33,571
Baltimore City	37,023	37,087	37,281	37,464	37,614	37,756	37,895	38,030	38,161	38,294	38,417
Baltimore County	45,847	46,027	46,254	46,618	46,827	47,044	47,247	47,451	47,657	47,851	48,043
Charles	7,719	7,786	7,833	7,909	7,972	8,035	8,099	8,163	8,225	8,288	8,352
Frederick	15,216	15,239	15,342	15,447	15,517	15,583	15,651	15,715	15,775	15,835	15,891
Harford	10,896	10,957	11,039	11,127	11,203	11,276	11,351	11,424	11,498	11,570	11,642
Howard	14,077	14,138	14,250	14,330	14,400	14,470	14,535	14,596	14,657	14,717	14,774
Montgomery	57,326	57,685	58,011	58,308	58,627	58,945	59,264	59,580	59,893	60,202	60,513
Prince George’s	66,159	66,535	66,888	67,262	67,554	67,844	68,118	68,395	68,669	68,933	69,196

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:											
	1/25	1/26	1/27	1/28	1/30				2/1				2/3			
Anne Arundel	31,764	31,909	32,093	32,362	32,731	(6,546)	[1,571]	{786}	33,082	(6,616)	[1,588]	{794}	33,409	(6,682)	[1,604]	{802}
Baltimore City	37,023	37,087	37,281	37,464	37,756	(7,551)	[1,812]	{906}	38,030	(7,606)	[1,825]	{913}	38,294	(7,659)	[1,838]	{919}
Baltimore County	45,847	46,027	46,254	46,618	47,044	(9,409)	[2,258]	{1,129}	47,451	(9,490)	[2,278]	{1,139}	47,851	(9,570)	[2,297]	{1,148}
Charles	7,719	7,786	7,833	7,909	8,035	(1,607)	[386]	{193}	8,163	(1,633)	[392]	{196}	8,288	(1,658)	[398]	{199}
Frederick	15,216	15,239	15,342	15,447	15,583	(3,117)	[748]	{374}	15,715	(3,143)	[754]	{377}	15,835	(3,167)	[760]	{380}
Harford	10,896	10,957	11,039	11,127	11,276	(2,255)	[541]	{271}	11,424	(2,285)	[548]	{274}	11,570	(2,314)	[555]	{278}
Howard	14,077	14,138	14,250	14,330	14,470	(2,894)	[695]	{347}	14,596	(2,919)	[701]	{350}	14,717	(2,943)	[706]	{353}
Montgomery	57,326	57,685	58,011	58,308	58,945	(11,789)	[2,829]	{1,415}	59,580	(11,916)	[2,860]	{1,430}	60,202	(12,040)	[2,890]	{1,445}
Prince George's	66,159	66,535	66,888	67,262	67,844	(13,569)	[3,257]	{1,628}	68,395	(13,679)	[3,283]	{1,641}	68,933	(13,787)	[3,309]	{1,654}

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.