

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

**Date: 7/12/21**

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 7/12/21 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.**

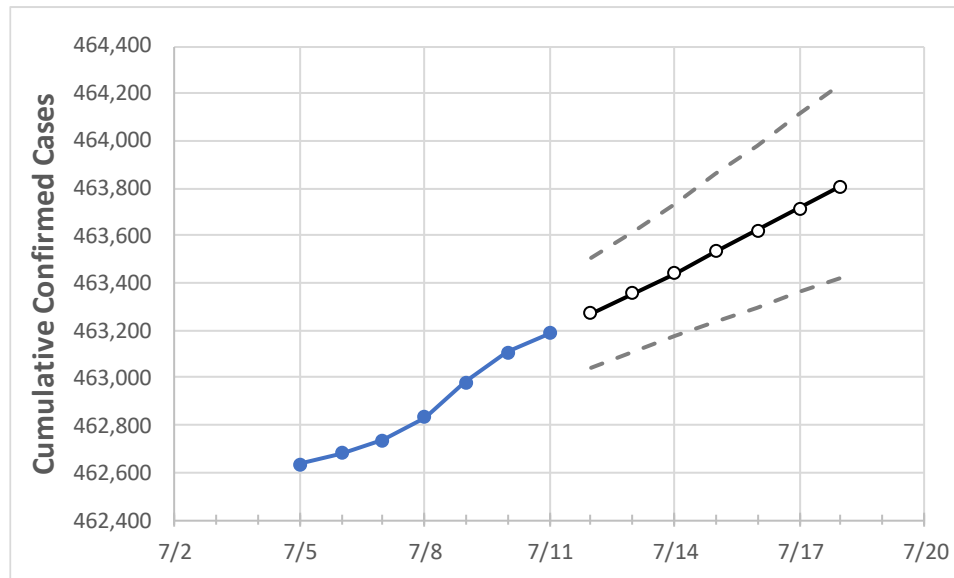
### **IEM's Modeling Lead**

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:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
Maryland	462,835	462,980	463,107	463,186	463,271	463,356	463,442	463,532	463,622	463,714	463,809

*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:						
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18
Anne Arundel	44,022	44,032	44,045	44,056	44,064	44,072	44,080	44,088	44,097	44,105	44,114
Baltimore City	53,185	53,210	53,217	53,228	53,237	53,247	53,257	53,267	53,277	53,287	53,297
Baltimore County	66,018	66,030	66,048	66,059	66,070	66,080	66,091	66,102	66,113	66,124	66,136
Charles	10,984	10,988	10,989	10,992	10,994	10,995	10,997	10,999	11,000	11,002	11,004
Frederick	19,860	19,863	19,865	19,872	19,875	19,879	19,883	19,886	19,890	19,894	19,899
Harford	16,675	16,681	16,687	16,689	16,692	16,695	16,698	16,702	16,705	16,708	16,712
Howard	19,360	19,370	19,376	19,378	19,385	19,391	19,398	19,405	19,413	19,421	19,429
Montgomery	71,296	71,311	71,321	71,334	71,349	71,364	71,380	71,396	71,413	71,430	71,447
Prince George's	85,660	85,687	85,701	85,718	85,735	85,751	85,768	85,786	85,805	85,823	85,842

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:											
	7/8	7/9	7/10	7/11	7/13				7/15				7/17			
Anne Arundel	44,022	44,032	44,045	44,056	44,072	(8,814)	[2,115]	{1,058}	44,088	(8,818)	[2,116]	{1,058}	44,105	(8,821)	[2,117]	{1,059}
Baltimore City	53,185	53,210	53,217	53,228	53,247	(10,649)	[2,556]	{1,278}	53,267	(10,653)	[2,557]	{1,278}	53,287	(10,657)	[2,558]	{1,279}
Baltimore County	66,018	66,030	66,048	66,059	66,080	(13,216)	[3,172]	{1,586}	66,102	(13,220)	[3,173]	{1,586}	66,124	(13,225)	[3,174]	{1,587}
Charles	10,984	10,988	10,989	10,992	10,995	(2,199)	[528]	{264}	10,999	(2,200)	[528]	{264}	11,002	(2,200)	[528]	{264}
Frederick	19,860	19,863	19,865	19,872	19,879	(3,976)	[954]	{477}	19,886	(3,977)	[955]	{477}	19,894	(3,979)	[955]	{477}
Harford	16,675	16,681	16,687	16,689	16,695	(3,339)	[801]	{401}	16,702	(3,340)	[802]	{401}	16,708	(3,342)	[802]	{401}
Howard	19,360	19,370	19,376	19,378	19,391	(3,878)	[931]	{465}	19,405	(3,881)	[931]	{466}	19,421	(3,884)	[932]	{466}
Montgomery	71,296	71,311	71,321	71,334	71,364	(14,273)	[3,425]	{1,713}	71,396	(14,279)	[3,427]	{1,714}	71,430	(14,286)	[3,429]	{1,714}
Prince George's	85,660	85,687	85,701	85,718	85,751	(17,150)	[4,116]	{2,058}	85,786	(17,157)	[4,118]	{2,059}	85,823	(17,165)	[4,120]	{2,060}

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.