

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 7/28/21**

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 7/28/21 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.**

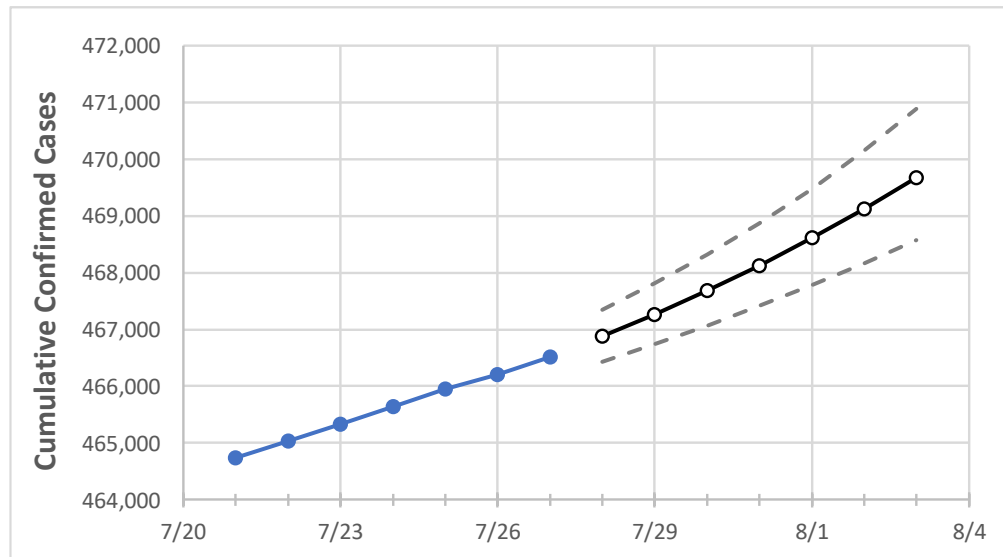
**IEM's Modeling Lead**

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:					
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Maryland	465,643	465,949	466,205	466,514	466,875	467,262	467,679	468,126	468,608	469,122	469,665

*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:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Anne Arundel	44,318	44,343	44,373	44,401	44,437	44,475	44,517	44,564	44,613	44,665	44,722
Baltimore City	53,413	53,455	53,475	53,510	53,543	53,579	53,618	53,660	53,705	53,754	53,809
Baltimore County	66,335	66,370	66,398	66,431	66,471	66,514	66,559	66,609	66,663	66,720	66,782
Charles	11,088	11,100	11,110	11,120	11,134	11,148	11,164	11,180	11,198	11,218	11,239
Frederick	19,978	19,988	20,003	20,014	20,030	20,047	20,065	20,086	20,107	20,131	20,156
Harford	16,775	16,792	16,801	16,811	16,826	16,842	16,860	16,880	16,901	16,924	16,949
Howard	19,487	19,494	19,498	19,541	19,551	19,561	19,572	19,583	19,595	19,607	19,620
Montgomery	71,788	71,842	71,873	71,930	71,993	72,060	72,133	72,213	72,297	72,388	72,487
Prince George's	86,286	86,343	86,404	86,487	86,562	86,641	86,724	86,815	86,912	87,013	87,121

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:											
	7/24	7/25	7/26	7/27	7/29			7/31			8/2					
Anne Arundel	44,318	44,343	44,373	44,401	44,475	(8,895)	[2,135]	{1,067}	44,564	(8,913)	[2,139]	{1,070}	44,665	(8,933)	[2,144]	{1,072}
Baltimore City	53,413	53,455	53,475	53,510	53,579	(10,716)	[2,572]	{1,286}	53,660	(10,732)	[2,576]	{1,288}	53,754	(10,751)	[2,580]	{1,290}
Baltimore County	66,335	66,370	66,398	66,431	66,514	(13,303)	[3,193]	{1,596}	66,609	(13,322)	[3,197]	{1,599}	66,720	(13,344)	[3,203]	{1,601}
Charles	11,088	11,100	11,110	11,120	11,148	(2,230)	[535]	{268}	11,180	(2,236)	[537]	{268}	11,218	(2,244)	[538]	{269}
Frederick	19,978	19,988	20,003	20,014	20,047	(4,009)	[962]	{481}	20,086	(4,017)	[964]	{482}	20,131	(4,026)	[966]	{483}
Harford	16,775	16,792	16,801	16,811	16,842	(3,368)	[808]	{404}	16,880	(3,376)	[810]	{405}	16,924	(3,385)	[812]	{406}
Howard	19,487	19,494	19,498	19,541	19,561	(3,912)	[939]	{469}	19,583	(3,917)	[940]	{470}	19,607	(3,921)	[941]	{471}
Montgomery	71,788	71,842	71,873	71,930	72,060	(14,412)	[3,459]	{1,729}	72,213	(14,443)	[3,466]	{1,733}	72,388	(14,478)	[3,475]	{1,737}
Prince George's	86,286	86,343	86,404	86,487	86,641	(17,328)	[4,159]	{2,079}	86,815	(17,363)	[4,167]	{2,084}	87,013	(17,403)	[4,177]	{2,088}

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.