

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

Date: 6/24/21

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 6/24/21 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.

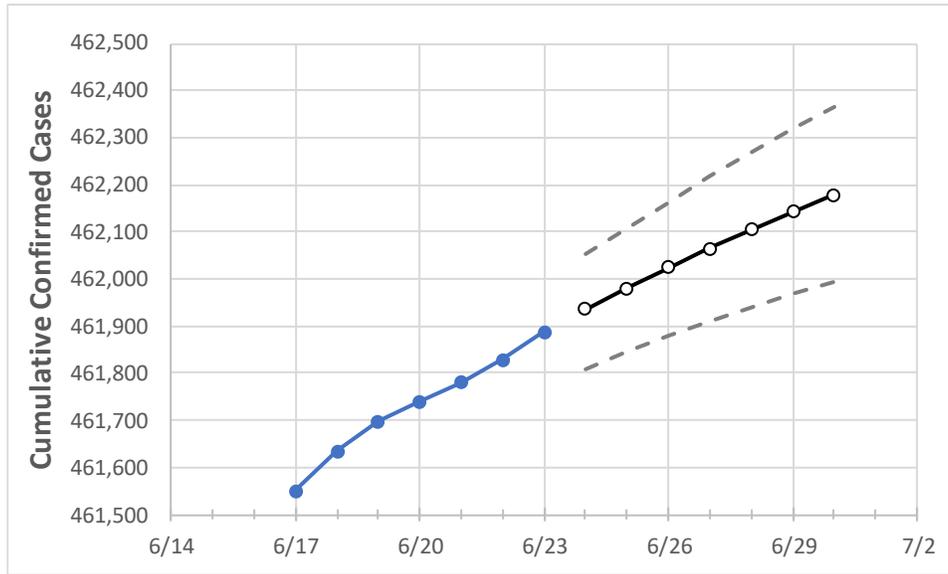
IEM's Modeling Lead

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:							
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	
Maryland	461,739	461,779	461,828	461,887	461,935	461,981	462,025	462,065	462,105	462,144	462,180	

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:							
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	
Anne Arundel	43,927	43,930	43,934	43,940	43,944	43,947	43,951	43,954	43,957	43,960	43,962	
Baltimore City	53,085	53,091	53,098	53,097	53,103	53,110	53,116	53,122	53,128	53,133	53,138	
Baltimore County	65,880	65,884	65,888	65,902	65,909	65,916	65,923	65,930	65,936	65,942	65,948	
Charles	10,954	10,955	10,957	10,958	10,960	10,963	10,965	10,967	10,969	10,971	10,973	
Frederick	19,825	19,826	19,828	19,829	19,830	19,832	19,833	19,835	19,836	19,837	19,838	
Harford	16,631	16,632	16,632	16,635	16,637	16,638	16,640	16,641	16,642	16,643	16,645	
Howard	19,299	19,302	19,305	19,307	19,310	19,312	19,314	19,317	19,319	19,321	19,323	
Montgomery	71,110	71,113	71,119	71,121	71,126	71,130	71,134	71,138	71,141	71,144	71,148	
Prince George’s	85,420	85,442	85,451	85,459	85,468	85,477	85,486	85,494	85,502	85,510	85,516	

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:											
	6/20	6/21	6/22	6/23	6/25			6/27			6/29					
Anne Arundel	43,927	43,930	43,934	43,940	43,947	(8,789)	[2,109]	{1,055}	43,954	(8,791)	[2,110]	{1,055}	43,960	(8,792)	[2,110]	{1,055}
Baltimore City	53,085	53,091	53,098	53,097	53,110	(10,622)	[2,549]	{1,275}	53,122	(10,624)	[2,550]	{1,275}	53,133	(10,627)	[2,550]	{1,275}
Baltimore County	65,880	65,884	65,888	65,902	65,916	(13,183)	[3,164]	{1,582}	65,930	(13,186)	[3,165]	{1,582}	65,942	(13,188)	[3,165]	{1,583}
Charles	10,954	10,955	10,957	10,958	10,963	(2,193)	[526]	{263}	10,967	(2,193)	[526]	{263}	10,971	(2,194)	[527]	{263}
Frederick	19,825	19,826	19,828	19,829	19,832	(3,966)	[952]	{476}	19,835	(3,967)	[952]	{476}	19,837	(3,967)	[952]	{476}
Harford	16,631	16,632	16,632	16,635	16,638	(3,328)	[799]	{399}	16,641	(3,328)	[799]	{399}	16,643	(3,329)	[799]	{399}
Howard	19,299	19,302	19,305	19,307	19,312	(3,862)	[927]	{463}	19,317	(3,863)	[927]	{464}	19,321	(3,864)	[927]	{464}
Montgomery	71,110	71,113	71,119	71,121	71,130	(14,226)	[3,414]	{1,707}	71,138	(14,228)	[3,415]	{1,707}	71,144	(14,229)	[3,415]	{1,707}
Prince George's	85,420	85,442	85,451	85,459	85,477	(17,095)	[4,103]	{2,051}	85,494	(17,099)	[4,104]	{2,052}	85,510	(17,102)	[4,104]	{2,052}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.