

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 6/10/21**

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 6/10/21 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.

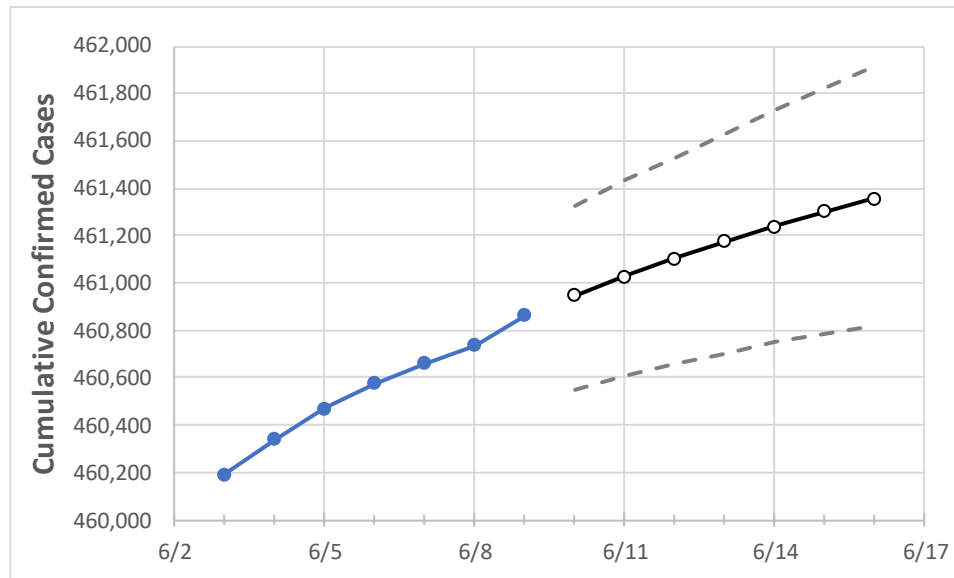
IEM's Modeling Lead

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:						
	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16
Maryland	460,575	460,659	460,737	460,863	460,947	461,027	461,104	461,174	461,240	461,303	461,358

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:						
	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16
Anne Arundel	43,832	43,841	43,848	43,862	43,870	43,877	43,884	43,890	43,896	43,902	43,907
Baltimore City	52,940	52,952	52,955	52,967	52,977	52,986	52,995	53,003	53,011	53,018	53,025
Baltimore County	65,726	65,735	65,753	65,771	65,783	65,793	65,803	65,812	65,821	65,830	65,838
Charles	10,892	10,898	10,899	10,906	10,909	10,912	10,915	10,918	10,921	10,923	10,926
Frederick	19,792	19,794	19,795	19,800	19,802	19,805	19,807	19,809	19,811	19,813	19,814
Harford	16,593	16,597	16,599	16,602	16,605	16,609	16,611	16,614	16,617	16,619	16,621
Howard	19,246	19,250	19,253	19,259	19,263	19,267	19,271	19,274	19,278	19,281	19,284
Montgomery	70,985	70,995	71,010	71,024	71,036	71,047	71,058	71,068	71,077	71,087	71,095
Prince George's	85,204	85,226	85,240	85,264	85,281	85,296	85,312	85,327	85,340	85,352	85,365

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:											
	6/6	6/7	6/8	6/9	6/11			6/13			6/15					
Anne Arundel	43,832	43,841	43,848	43,862	43,877	(8,775)	[2,106]	{1,053}	43,890	(8,778)	[2,107]	{1,053}	43,902	(8,780)	[2,107]	{1,054}
Baltimore City	52,940	52,952	52,955	52,967	52,986	(10,597)	[2,543]	{1,272}	53,003	(10,601)	[2,544]	{1,272}	53,018	(10,604)	[2,545]	{1,272}
Baltimore County	65,726	65,735	65,753	65,771	65,793	(13,159)	[3,158]	{1,579}	65,812	(13,162)	[3,159]	{1,579}	65,830	(13,166)	[3,160]	{1,580}
Charles	10,892	10,898	10,899	10,906	10,912	(2,182)	[524]	{262}	10,918	(2,184)	[524]	{262}	10,923	(2,185)	[524]	{262}
Frederick	19,792	19,794	19,795	19,800	19,805	(3,961)	[951]	{475}	19,809	(3,962)	[951]	{475}	19,813	(3,963)	[951]	{476}
Harford	16,593	16,597	16,599	16,602	16,609	(3,322)	[797]	{399}	16,614	(3,323)	[797]	{399}	16,619	(3,324)	[798]	{399}
Howard	19,246	19,250	19,253	19,259	19,267	(3,853)	[925]	{462}	19,274	(3,855)	[925]	{463}	19,281	(3,856)	[925]	{463}
Montgomery	70,985	70,995	71,010	71,024	71,047	(14,209)	[3,410]	{1,705}	71,068	(14,214)	[3,411]	{1,706}	71,087	(14,217)	[3,412]	{1,706}
Prince George's	85,204	85,226	85,240	85,264	85,296	(17,059)	[4,094]	{2,047}	85,327	(17,065)	[4,096]	{2,048}	85,352	(17,070)	[4,097]	{2,048}

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.