

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

Date: 6/21/21

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 6/21/21 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.

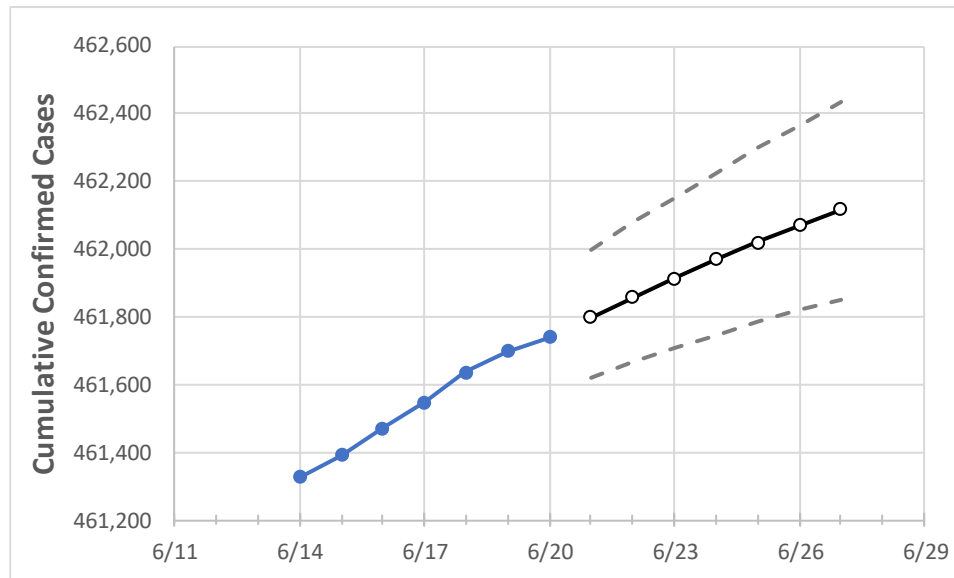
IEM's Modeling Lead

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:						
	6/17	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Maryland	461,549	461,635	461,697	461,739	461,800	461,859	461,915	461,970	462,022	462,072	462,119

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:						
	6/17	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Anne Arundel	43,910	43,917	43,924	43,927	43,931	43,936	43,939	43,943	43,947	43,950	43,954
Baltimore City	53,048	53,065	53,074	53,085	53,092	53,099	53,106	53,113	53,119	53,125	53,131
Baltimore County	65,853	65,860	65,872	65,880	65,889	65,897	65,905	65,913	65,920	65,927	65,934
Charles	10,946	10,951	10,953	10,953	10,957	10,960	10,963	10,967	10,970	10,973	10,976
Frederick	19,822	19,823	19,823	19,823	19,825	19,826	19,828	19,829	19,831	19,832	19,833
Harford	16,626	16,628	16,630	16,631	16,633	16,635	16,636	16,638	16,639	16,641	16,642
Howard	19,288	19,295	19,297	19,299	19,302	19,304	19,307	19,309	19,312	19,314	19,316
Montgomery	71,089	71,097	71,105	71,110	71,116	71,121	71,126	71,131	71,136	71,140	71,144
Prince George's	85,408	85,411	85,414	85,420	85,431	85,441	85,451	85,461	85,470	85,478	85,486

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:											
	6/17	6/18	6/19	6/20	6/22				6/24				6/26			
Anne Arundel	43,910	43,917	43,924	43,927	43,936	(8,787)	[2,109]	{1,054}	43,943	(8,789)	[2,109]	{1,055}	43,950	(8,790)	[2,110]	{1,055}
Baltimore City	53,048	53,065	53,074	53,085	53,099	(10,620)	[2,549]	{1,274}	53,113	(10,623)	[2,549]	{1,275}	53,125	(10,625)	[2,550]	{1,275}
Baltimore County	65,853	65,860	65,872	65,880	65,897	(13,179)	[3,163]	{1,582}	65,913	(13,183)	[3,164]	{1,582}	65,927	(13,185)	[3,165]	{1,582}
Charles	10,946	10,951	10,953	10,953	10,960	(2,192)	[526]	{263}	10,967	(2,193)	[526]	{263}	10,973	(2,195)	[527]	{263}
Frederick	19,822	19,823	19,823	19,823	19,826	(3,965)	[952]	{476}	19,829	(3,966)	[952]	{476}	19,832	(3,966)	[952]	{476}
Harford	16,626	16,628	16,630	16,631	16,635	(3,327)	[798]	{399}	16,638	(3,328)	[799]	{399}	16,641	(3,328)	[799]	{399}
Howard	19,288	19,295	19,297	19,299	19,304	(3,861)	[927]	{463}	19,309	(3,862)	[927]	{463}	19,314	(3,863)	[927]	{464}
Montgomery	71,089	71,097	71,105	71,110	71,121	(14,224)	[3,414]	{1,707}	71,131	(14,226)	[3,414]	{1,707}	71,140	(14,228)	[3,415]	{1,707}
Prince George's	85,408	85,411	85,414	85,420	85,441	(17,088)	[4,101]	{2,051}	85,461	(17,092)	[4,102]	{2,051}	85,478	(17,096)	[4,103]	{2,051}

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.