

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

Date: 4/29/21

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 4/29/21 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.

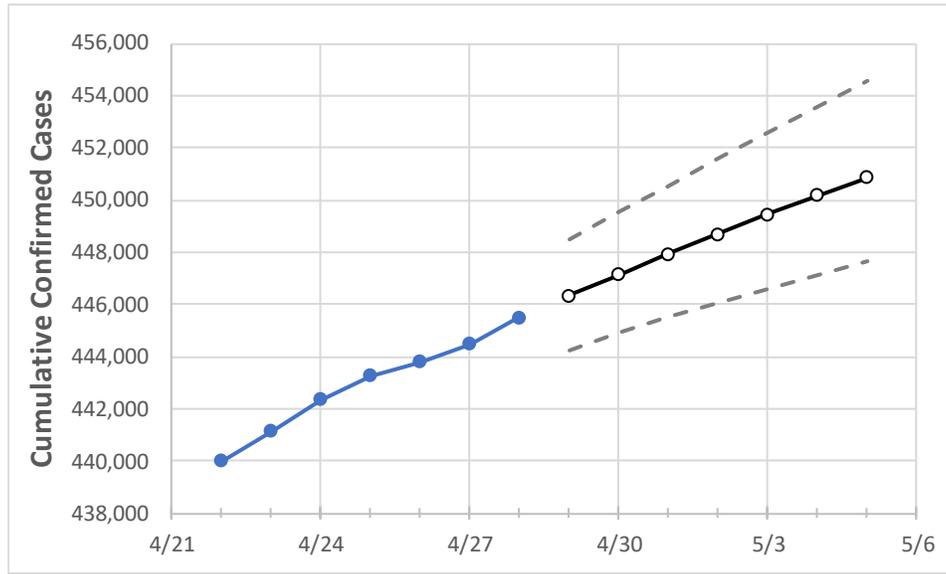
IEM's Modeling Lead

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:						
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5
Maryland	443,257	443,814	444,491	445,493	446,330	447,140	447,936	448,706	449,447	450,177	450,881

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:						
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5
Anne Arundel	42,103	42,150	42,219	42,325	42,419	42,512	42,605	42,699	42,790	42,880	42,970
Baltimore City	50,311	50,423	50,499	50,633	50,767	50,895	51,023	51,145	51,261	51,372	51,483
Baltimore County	62,566	62,652	62,832	63,042	63,243	63,445	63,644	63,836	64,027	64,215	64,395
Charles	10,435	10,455	10,473	10,498	10,517	10,535	10,554	10,571	10,588	10,605	10,621
Frederick	19,323	19,342	19,376	19,411	19,434	19,456	19,478	19,499	19,518	19,538	19,557
Harford	15,913	15,936	15,956	16,000	16,037	16,072	16,106	16,137	16,166	16,195	16,224
Howard	18,683	18,709	18,736	18,785	18,819	18,853	18,887	18,920	18,950	18,979	19,009
Montgomery	69,476	69,528	69,624	69,735	69,809	69,881	69,952	70,023	70,094	70,160	70,224
Prince George’s	82,405	82,515	82,663	82,809	82,929	83,047	83,163	83,277	83,387	83,496	83,602

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:											
	4/25	4/26	4/27	4/28	4/30			5/2			5/4					
Anne Arundel	42,103	42,150	42,219	42,325	42,512	(8,502)	[2,041]	{1,020}	42,699	(8,540)	[2,050]	{1,025}	42,880	(8,576)	[2,058]	{1,029}
Baltimore City	50,311	50,423	50,499	50,633	50,895	(10,179)	[2,443]	{1,221}	51,145	(10,229)	[2,455]	{1,227}	51,372	(10,274)	[2,466]	{1,233}
Baltimore County	62,566	62,652	62,832	63,042	63,445	(12,689)	[3,045]	{1,523}	63,836	(12,767)	[3,064]	{1,532}	64,215	(12,843)	[3,082]	{1,541}
Charles	10,435	10,455	10,473	10,498	10,535	(2,107)	[506]	{253}	10,571	(2,114)	[507]	{254}	10,605	(2,121)	[509]	{255}
Frederick	19,323	19,342	19,376	19,411	19,456	(3,891)	[934]	{467}	19,499	(3,900)	[936]	{468}	19,538	(3,908)	[938]	{469}
Harford	15,913	15,936	15,956	16,000	16,072	(3,214)	[771]	{386}	16,137	(3,227)	[775]	{387}	16,195	(3,239)	[777]	{389}
Howard	18,683	18,709	18,736	18,785	18,853	(3,771)	[905]	{452}	18,920	(3,784)	[908]	{454}	18,979	(3,796)	[911]	{456}
Montgomery	69,476	69,528	69,624	69,735	69,881	(13,976)	[3,354]	{1,677}	70,023	(14,005)	[3,361]	{1,681}	70,160	(14,032)	[3,368]	{1,684}
Prince George's	82,405	82,515	82,663	82,809	83,047	(16,609)	[3,986]	{1,993}	83,277	(16,655)	[3,997]	{1,999}	83,496	(16,699)	[4,008]	{2,004}

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.