

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

Date: 2/25/22

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 2/25/22 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.

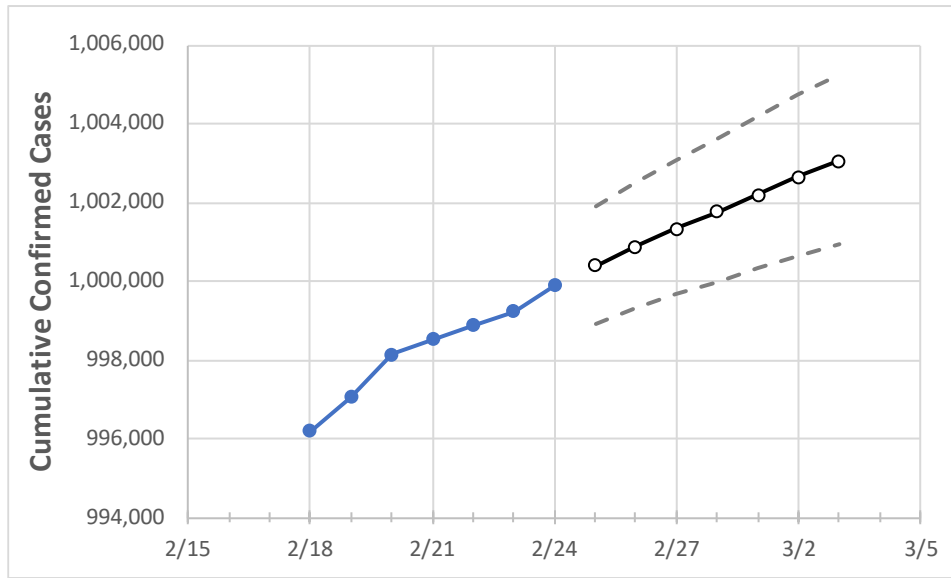
IEM's Modeling Lead

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Maryland	998,512	998,888	999,229	999,890	1,000,400	1,000,871	1,001,327	1,001,770	1,002,197	1,002,649	1,003,047

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Anne Arundel	87,842	87,878	87,913	87,972	88,140	88,309	88,402	88,538	88,668	88,829	88,959
Baltimore City	110,156	110,187	110,222	110,282	110,583	110,837	111,115	111,313	111,631	111,880	112,119
Baltimore County	130,170	130,211	130,249	130,303	130,607	130,832	131,080	131,301	131,475	131,793	132,025
Charles	27,503	27,511	27,522	27,531	27,586	27,632	27,667	27,704	27,754	27,790	27,833
Frederick	44,873	44,903	44,934	44,964	45,041	45,136	45,190	45,276	45,362	45,446	45,521
Harford	37,589	37,602	37,620	37,648	37,717	37,788	37,838	37,907	37,960	38,033	38,086
Howard	42,744	42,768	42,775	42,832	42,914	42,997	43,074	43,143	43,214	43,304	43,380
Montgomery	164,603	164,655	164,763	164,893	165,220	165,479	165,808	166,020	166,264	166,665	166,941
Prince George’s	168,453	168,491	168,555	168,622	169,038	169,355	169,603	169,944	170,322	170,682	170,937

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:											
	2/21	2/22	2/23	2/24	2/26		2/28		3/2							
Anne Arundel	87,842	87,878	87,913	87,972	88,309	(17,662)	[4,239]	{2,119}	88,538	(17,708)	[4,250]	{2,125}	88,829	(17,766)	[4,264]	{2,132}
Baltimore City	110,156	110,187	110,222	110,282	110,837	(22,167)	[5,320]	{2,660}	111,313	(22,263)	[5,343]	{2,672}	111,880	(22,376)	[5,370]	{2,685}
Baltimore County	130,170	130,211	130,249	130,303	130,832	(26,166)	[6,280]	{3,140}	131,301	(26,260)	[6,302]	{3,151}	131,793	(26,359)	[6,326]	{3,163}
Charles	27,503	27,511	27,522	27,531	27,632	(5,526)	[1,326]	{663}	27,704	(5,541)	[1,330]	{665}	27,790	(5,558)	[1,334]	{667}
Frederick	44,873	44,903	44,934	44,964	45,136	(9,027)	[2,167]	{1,083}	45,276	(9,055)	[2,173]	{1,087}	45,446	(9,089)	[2,181]	{1,091}
Harford	37,589	37,602	37,620	37,648	37,788	(7,558)	[1,814]	{907}	37,907	(7,581)	[1,820]	{910}	38,033	(7,607)	[1,826]	{913}
Howard	42,744	42,768	42,775	42,832	42,997	(8,599)	[2,064]	{1,032}	43,143	(8,629)	[2,071]	{1,035}	43,304	(8,661)	[2,079]	{1,039}
Montgomery	164,603	164,655	164,763	164,893	165,479	(33,096)	[7,943]	{3,971}	166,020	(33,204)	[7,969]	{3,984}	166,665	(33,333)	[8,000]	{4,000}
Prince George's	168,453	168,491	168,555	168,622	169,355	(33,871)	[8,129]	{4,065}	169,944	(33,989)	[8,157]	{4,079}	170,682	(34,136)	[8,193]	{4,096}

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.