

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

Date: 3/25/22

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 3/25/22 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.

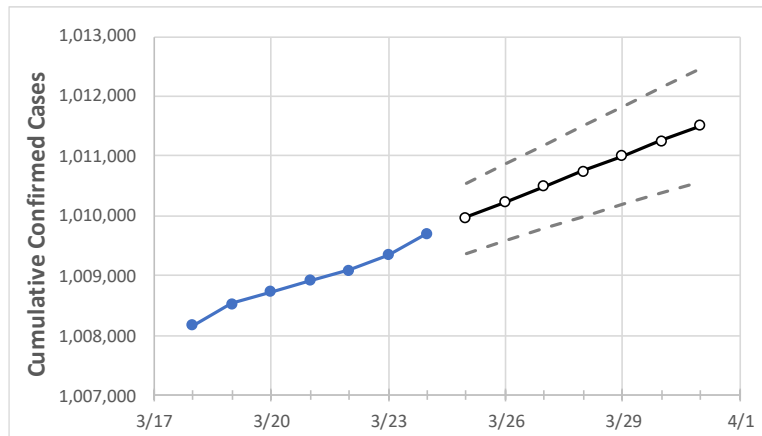
IEM's Modeling Lead

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Maryland	1,008,915	1,009,097	1,009,343	1,009,705	1,009,974	1,010,236	1,010,494	1,010,749	1,011,006	1,011,256	1,011,513

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Anne Arundel	88,879	88,902	88,924	88,955	88,979	89,005	89,029	89,054	89,077	89,101	89,124
Baltimore City	111,139	111,155	111,192	111,231	111,268	111,303	111,339	111,374	111,412	111,449	111,485
Baltimore County	131,274	131,303	131,341	131,376	131,411	131,446	131,481	131,515	131,550	131,585	131,619
Charles	27,778	27,783	27,792	27,792	27,798	27,805	27,812	27,819	27,825	27,832	27,838
Frederick	45,385	45,401	45,426	45,426	45,439	45,452	45,465	45,478	45,491	45,504	45,516
Harford	38,030	38,038	38,039	38,053	38,062	38,071	38,080	38,088	38,096	38,105	38,113
Howard	43,431	43,448	43,458	43,473	43,492	43,510	43,528	43,547	43,566	43,584	43,602
Montgomery	166,436	166,490	166,577	166,577	166,629	166,680	166,731	166,781	166,832	166,884	166,935
Prince George's	169,611	169,641	169,683	169,683	169,711	169,740	169,767	169,795	169,823	169,851	169,878

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:											
	3/21	3/22	3/23	3/24	3/26			3/28			3/30					
Anne Arundel	88,879	88,902	88,924	88,955	89,005	(17,801)	[4,272]	{2,136}	89,054	(17,811)	[4,275]	{2,137}	89,101	(17,820)	[4,277]	{2,138}
Baltimore City	111,139	111,155	111,192	111,231	111,303	(22,261)	[5,343]	{2,671}	111,374	(22,275)	[5,346]	{2,673}	111,449	(22,290)	[5,350]	{2,675}
Baltimore County	131,274	131,303	131,341	131,376	131,446	(26,289)	[6,309]	{3,155}	131,515	(26,303)	[6,313]	{3,156}	131,585	(26,317)	[6,316]	{3,158}
Charles	27,778	27,783	27,792	27,792	27,805	(5,561)	[1,335]	{667}	27,819	(5,564)	[1,335]	{668}	27,832	(5,566)	[1,336]	{668}
Frederick	45,385	45,401	45,426	45,426	45,452	(9,090)	[2,182]	{1,091}	45,478	(9,096)	[2,183]	{1,091}	45,504	(9,101)	[2,184]	{1,092}
Harford	38,030	38,038	38,039	38,053	38,071	(7,614)	[1,827]	{914}	38,088	(7,618)	[1,828]	{914}	38,105	(7,621)	[1,829]	{915}
Howard	43,431	43,448	43,458	43,473	43,510	(8,702)	[2,088]	{1,044}	43,547	(8,709)	[2,090]	{1,045}	43,584	(8,717)	[2,092]	{1,046}
Montgomery	166,436	166,490	166,577	166,577	166,680	(33,336)	[8,001]	{4,000}	166,781	(33,356)	[8,005]	{4,003}	166,884	(33,377)	[8,010]	{4,005}
Prince George's	169,611	169,641	169,683	169,683	169,740	(33,948)	[8,147]	{4,074}	169,795	(33,959)	[8,150]	{4,075}	169,851	(33,970)	[8,153]	{4,076}

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.