

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

Date: 8/16/21

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 8/16/21 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.

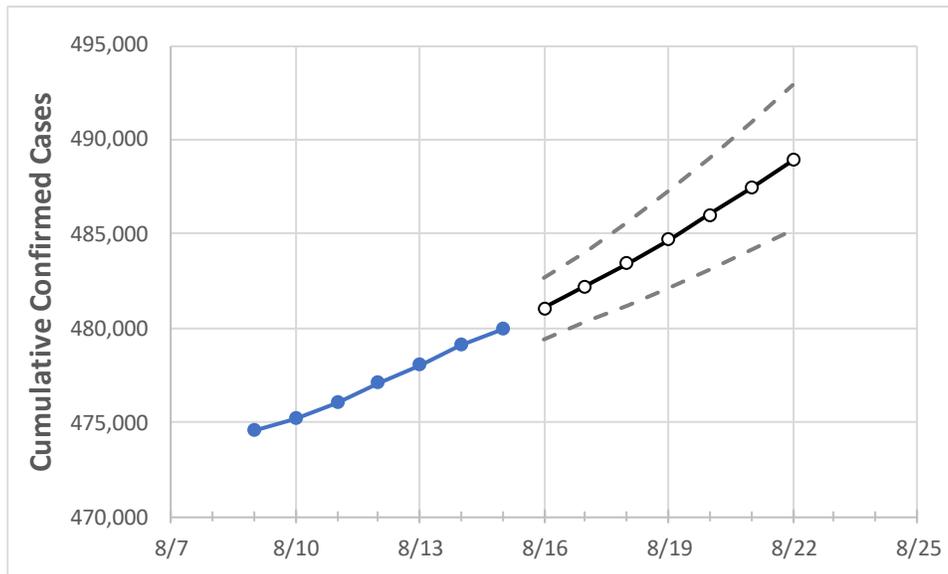
IEM's Modeling Lead

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Maryland	477,117	478,067	479,083	479,952	481,047	482,203	483,428	484,690	486,010	487,428	488,893

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Anne Arundel	45,436	45,523	45,595	45,671	45,760	45,852	45,949	46,049	46,156	46,262	46,372
Baltimore City	54,469	54,537	54,641	54,726	54,829	54,936	55,046	55,167	55,292	55,424	55,563
Baltimore County	67,627	67,750	67,869	67,977	68,101	68,230	68,365	68,510	68,657	68,818	68,989
Charles	11,621	11,647	11,680	11,720	11,768	11,818	11,871	11,926	11,984	12,044	12,109
Frederick	20,546	20,598	20,625	20,665	20,713	20,763	20,815	20,868	20,924	20,980	21,039
Harford	17,223	17,263	17,291	17,320	17,357	17,396	17,435	17,476	17,519	17,564	17,610
Howard	19,882	19,910	19,952	19,988	20,023	20,060	20,100	20,141	20,184	20,231	20,281
Montgomery	73,535	73,645	73,761	73,842	73,971	74,106	74,243	74,383	74,530	74,680	74,833
Prince George’s	88,619	88,816	88,991	89,131	89,329	89,537	89,748	89,968	90,193	90,430	90,671

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:											
	8/12	8/13	8/14	8/15	8/17			8/19			8/21					
Anne Arundel	45,436	45,523	45,595	45,671	45,852	(9,170)	[2,201]	{1,100}	46,049	(9,210)	[2,210]	{1,105}	46,262	(9,252)	[2,221]	{1,110}
Baltimore City	54,469	54,537	54,641	54,726	54,936	(10,987)	[2,637]	{1,318}	55,167	(11,033)	[2,648]	{1,324}	55,424	(11,085)	[2,660]	{1,330}
Baltimore County	67,627	67,750	67,869	67,977	68,230	(13,646)	[3,275]	{1,638}	68,510	(13,702)	[3,288]	{1,644}	68,818	(13,764)	[3,303]	{1,652}
Charles	11,621	11,647	11,680	11,720	11,818	(2,364)	[567]	{284}	11,926	(2,385)	[572]	{286}	12,044	(2,409)	[578]	{289}
Frederick	20,546	20,598	20,625	20,665	20,763	(4,153)	[997]	{498}	20,868	(4,174)	[1,002]	{501}	20,980	(4,196)	[1,007]	{504}
Harford	17,223	17,263	17,291	17,320	17,396	(3,479)	[835]	{417}	17,476	(3,495)	[839]	{419}	17,564	(3,513)	[843]	{422}
Howard	19,882	19,910	19,952	19,988	20,060	(4,012)	[963]	{481}	20,141	(4,028)	[967]	{483}	20,231	(4,046)	[971]	{486}
Montgomery	73,535	73,645	73,761	73,842	74,106	(14,821)	[3,557]	{1,779}	74,383	(14,877)	[3,570]	{1,785}	74,680	(14,936)	[3,585]	{1,792}
Prince George's	88,619	88,816	88,991	89,131	89,537	(17,907)	[4,298]	{2,149}	89,968	(17,994)	[4,318]	{2,159}	90,430	(18,086)	[4,341]	{2,170}

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.