

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/13/21**

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 8/13/21 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.

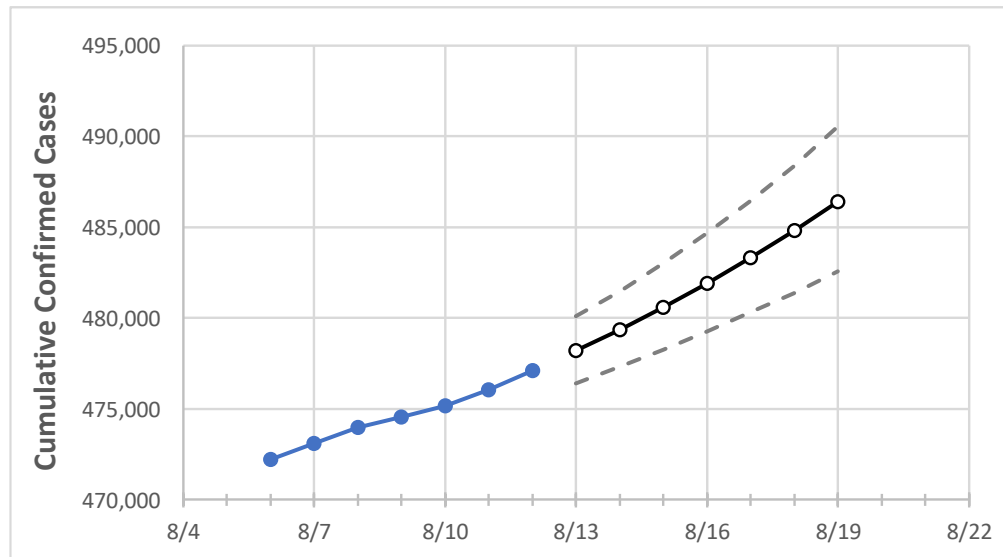
IEM's Modeling Lead

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Maryland	474,555	475,184	476,070	477,117	478,200	479,346	480,584	481,897	483,298	484,800	486,392

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Anne Arundel	45,203	45,259	45,342	45,436	45,529	45,629	45,737	45,852	45,972	46,098	46,236
Baltimore City	54,235	54,282	54,371	54,469	54,571	54,681	54,801	54,927	55,061	55,211	55,368
Baltimore County	67,361	67,407	67,524	67,627	67,748	67,878	68,015	68,163	68,319	68,483	68,658
Charles	11,479	11,510	11,563	11,621	11,676	11,737	11,802	11,873	11,950	12,034	12,123
Frederick	20,423	20,458	20,506	20,546	20,602	20,661	20,725	20,794	20,866	20,946	21,028
Harford	17,122	17,152	17,185	17,223	17,261	17,302	17,344	17,390	17,438	17,489	17,542
Howard	19,820	19,829	19,858	19,882	19,911	19,942	19,974	20,009	20,044	20,081	20,120
Montgomery	73,178	73,308	73,452	73,535	73,687	73,844	74,012	74,191	74,377	74,576	74,784
Prince George's	88,102	88,268	88,457	88,619	88,827	89,053	89,288	89,541	89,810	90,091	90,391

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:											
	8/9	8/10	8/11	8/12	8/14				8/16				8/18			
Anne Arundel	45,203	45,259	45,342	45,436	45,629	(9,126)	[2,190]	{1,095}	45,852	(9,170)	[2,201]	{1,100}	46,098	(9,220)	[2,213]	{1,106}
Baltimore City	54,235	54,282	54,371	54,469	54,681	(10,936)	[2,625]	{1,312}	54,927	(10,985)	[2,637]	{1,318}	55,211	(11,042)	[2,650]	{1,325}
Baltimore County	67,361	67,407	67,524	67,627	67,878	(13,576)	[3,258]	{1,629}	68,163	(13,633)	[3,272]	{1,636}	68,483	(13,697)	[3,287]	{1,644}
Charles	11,479	11,510	11,563	11,621	11,737	(2,347)	[563]	{282}	11,873	(2,375)	[570]	{285}	12,034	(2,407)	[578]	{289}
Frederick	20,423	20,458	20,506	20,546	20,661	(4,132)	[992]	{496}	20,794	(4,159)	[998]	{499}	20,946	(4,189)	[1,005]	{503}
Harford	17,122	17,152	17,185	17,223	17,302	(3,460)	[830]	{415}	17,390	(3,478)	[835]	{417}	17,489	(3,498)	[839]	{420}
Howard	19,820	19,829	19,858	19,882	19,942	(3,988)	[957]	{479}	20,009	(4,002)	[960]	{480}	20,081	(4,016)	[964]	{482}
Montgomery	73,178	73,308	73,452	73,535	73,844	(14,769)	[3,544]	{1,772}	74,191	(14,838)	[3,561]	{1,781}	74,576	(14,915)	[3,580]	{1,790}
Prince George's	88,102	88,268	88,457	88,619	89,053	(17,811)	[4,275]	{2,137}	89,541	(17,908)	[4,298]	{2,149}	90,091	(18,018)	[4,324]	{2,162}

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.