

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

Date: 8/25/21

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 8/25/21 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.

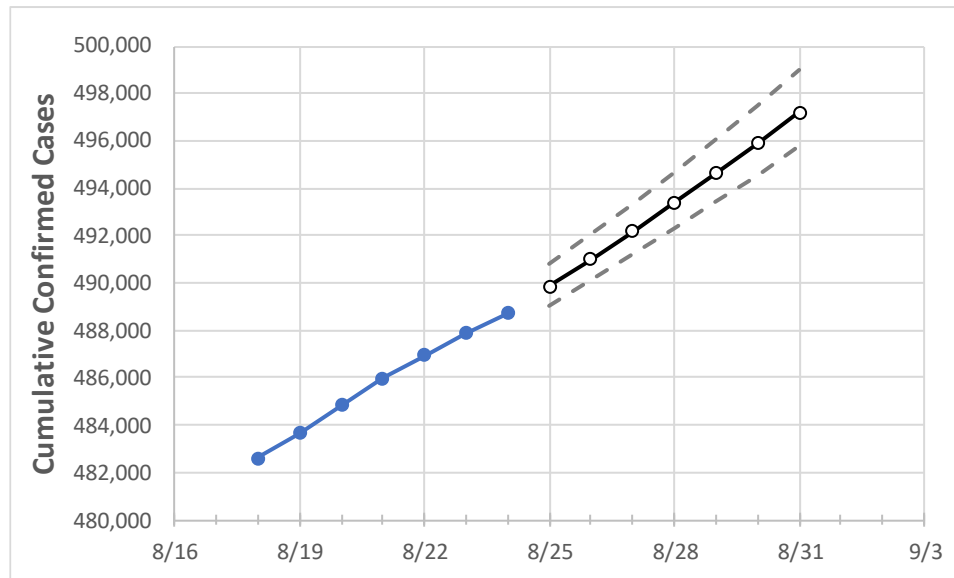
IEM's Modeling Lead

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
Maryland	485,978	486,968	487,893	488,740	489,868	491,012	492,191	493,395	494,635	495,899	497,213

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:						
	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31
Anne Arundel	46,168	46,334	46,389	46,470	46,570	46,674	46,781	46,890	47,000	47,112	47,230
Baltimore City	55,156	55,244	55,312	55,368	55,458	55,549	55,643	55,737	55,833	55,930	56,033
Baltimore County	68,696	68,788	68,889	68,984	69,113	69,244	69,379	69,516	69,655	69,801	69,947
Charles	11,975	12,023	12,053	12,100	12,149	12,201	12,252	12,304	12,359	12,416	12,472
Frederick	21,053	21,122	21,151	21,213	21,281	21,352	21,424	21,499	21,576	21,657	21,742
Harford	17,551	17,586	17,623	17,654	17,695	17,738	17,781	17,825	17,870	17,917	17,965
Howard	20,196	20,233	20,267	20,295	20,335	20,375	20,416	20,459	20,502	20,547	20,593
Montgomery	74,662	74,807	74,912	75,053	75,200	75,352	75,505	75,660	75,820	75,984	76,157
Prince George's	90,148	90,304	90,454	90,683	90,880	91,082	91,284	91,492	91,705	91,921	92,139

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:											
	8/21	8/22	8/23	8/24	8/26				8/28				8/30			
Anne Arundel	46,168	46,334	46,389	46,470	46,674	(9,335)	[2,240]	{1,120}	46,890	(9,378)	[2,251]	{1,125}	47,112	(9,422)	[2,261]	{1,131}
Baltimore City	55,156	55,244	55,312	55,368	55,549	(11,110)	[2,666]	{1,333}	55,737	(11,147)	[2,675]	{1,338}	55,930	(11,186)	[2,685]	{1,342}
Baltimore County	68,696	68,788	68,889	68,984	69,244	(13,849)	[3,324]	{1,662}	69,516	(13,903)	[3,337]	{1,668}	69,801	(13,960)	[3,350]	{1,675}
Charles	11,975	12,023	12,053	12,100	12,201	(2,440)	[586]	{293}	12,304	(2,461)	[591]	{295}	12,416	(2,483)	[596]	{298}
Frederick	21,053	21,122	21,151	21,213	21,352	(4,270)	[1,025]	{512}	21,499	(4,300)	[1,032]	{516}	21,657	(4,331)	[1,040]	{520}
Harford	17,551	17,586	17,623	17,654	17,738	(3,548)	[851]	{426}	17,825	(3,565)	[856]	{428}	17,917	(3,583)	[860]	{430}
Howard	20,196	20,233	20,267	20,295	20,375	(4,075)	[978]	{489}	20,459	(4,092)	[982]	{491}	20,547	(4,109)	[986]	{493}
Montgomery	74,662	74,807	74,912	75,053	75,352	(15,070)	[3,617]	{1,808}	75,660	(15,132)	[3,632]	{1,816}	75,984	(15,197)	[3,647]	{1,824}
Prince George's	90,148	90,304	90,454	90,683	91,082	(18,216)	[4,372]	{2,186}	91,492	(18,298)	[4,392]	{2,196}	91,921	(18,384)	[4,412]	{2,206}

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.