

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

Date: 9/15/21

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 9/15/21 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.

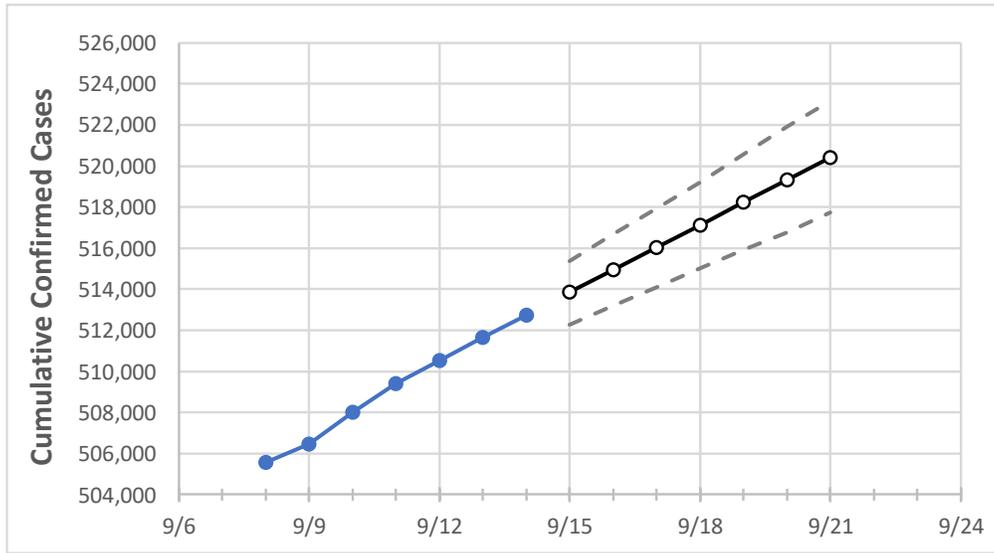
IEM's Modeling Lead

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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21
Maryland	509,393	510,543	511,646	512,740	513,848	514,926	516,041	517,120	518,226	519,322	520,426

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:						
	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21
Anne Arundel	48,437	48,548	48,651	48,733	48,834	48,937	49,038	49,139	49,238	49,341	49,441
Baltimore City	56,990	57,113	57,211	57,295	57,385	57,476	57,567	57,659	57,748	57,843	57,936
Baltimore County	71,133	71,241	71,366	71,444	71,545	71,645	71,749	71,849	71,945	72,048	72,148
Charles	12,997	13,042	13,082	13,123	13,165	13,205	13,245	13,287	13,327	13,368	13,407
Frederick	22,149	22,191	22,247	22,309	22,363	22,416	22,469	22,522	22,579	22,635	22,692
Harford	18,488	18,540	18,587	18,621	18,668	18,716	18,762	18,809	18,856	18,904	18,953
Howard	21,123	21,164	21,198	21,236	21,277	21,320	21,357	21,396	21,436	21,478	21,518
Montgomery	77,522	77,696	77,870	77,967	78,088	78,207	78,332	78,450	78,572	78,693	78,816
Prince George's	93,865	94,015	94,179	94,379	94,548	94,717	94,885	95,052	95,224	95,392	95,566

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:											
	9/11	9/12	9/13	9/14	9/16			9/18			9/20					
Anne Arundel	48,437	48,548	48,651	48,733	48,937	(9,787)	[2,349]	{1,174}	49,139	(9,828)	[2,359]	{1,179}	49,341	(9,868)	[2,368]	{1,184}
Baltimore City	56,990	57,113	57,211	57,295	57,476	(11,495)	[2,759]	{1,379}	57,659	(11,532)	[2,768]	{1,384}	57,843	(11,569)	[2,776]	{1,388}
Baltimore County	71,133	71,241	71,366	71,444	71,645	(14,329)	[3,439]	{1,719}	71,849	(14,370)	[3,449]	{1,724}	72,048	(14,410)	[3,458]	{1,729}
Charles	12,997	13,042	13,082	13,123	13,205	(2,641)	[634]	{317}	13,287	(2,657)	[638]	{319}	13,368	(2,674)	[642]	{321}
Frederick	22,149	22,191	22,247	22,309	22,416	(4,483)	[1,076]	{538}	22,522	(4,504)	[1,081]	{541}	22,635	(4,527)	[1,086]	{543}
Harford	18,488	18,540	18,587	18,621	18,716	(3,743)	[898]	{449}	18,809	(3,762)	[903]	{451}	18,904	(3,781)	[907]	{454}
Howard	21,123	21,164	21,198	21,236	21,320	(4,264)	[1,023]	{512}	21,396	(4,279)	[1,027]	{514}	21,478	(4,296)	[1,031]	{515}
Montgomery	77,522	77,696	77,870	77,967	78,207	(15,641)	[3,754]	{1,877}	78,450	(15,690)	[3,766]	{1,883}	78,693	(15,739)	[3,777]	{1,889}
Prince George's	93,865	94,015	94,179	94,379	94,717	(18,943)	[4,546]	{2,273}	95,052	(19,010)	[4,563]	{2,281}	95,392	(19,078)	[4,579]	{2,289}

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.