

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

Date: 9/27/21

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 9/27/21 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.

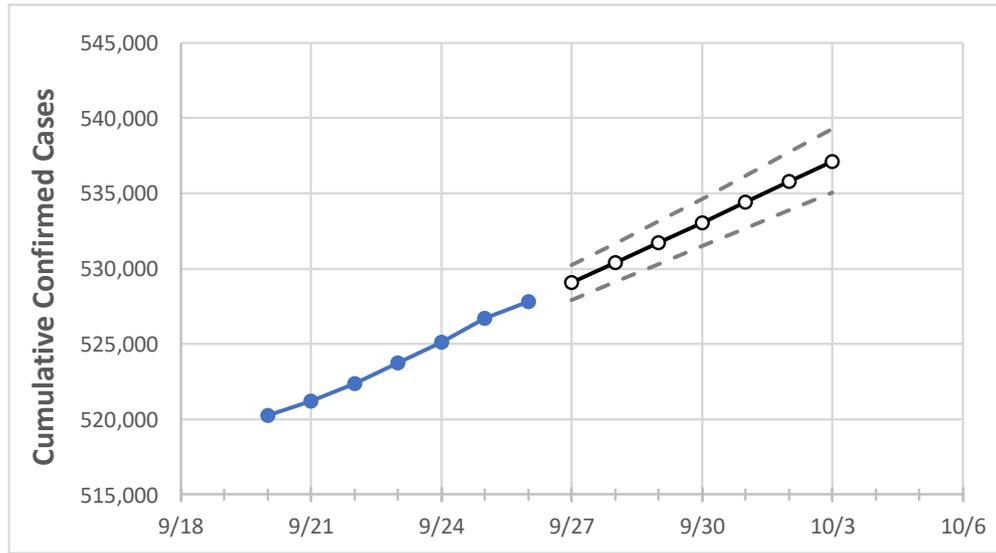
IEM's Modeling Lead

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	
Maryland	523,760	525,123	526,690	527,804	529,101	530,401	531,726	533,046	534,407	535,774	537,123	

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Anne Arundel	49,719	49,843	49,974	50,074	50,188	50,304	50,420	50,533	50,654	50,772	50,890
Baltimore City	58,209	58,311	58,445	58,576	58,696	58,820	58,942	59,067	59,196	59,327	59,459
Baltimore County	72,635	72,781	72,942	73,061	73,202	73,344	73,486	73,630	73,777	73,924	74,074
Charles	13,522	13,559	13,581	13,612	13,650	13,687	13,724	13,761	13,797	13,834	13,870
Frederick	22,737	22,777	22,825	22,865	22,908	22,951	22,993	23,035	23,076	23,118	23,159
Harford	19,046	19,080	19,117	19,164	19,208	19,254	19,298	19,344	19,389	19,435	19,481
Howard	21,600	21,634	21,671	21,719	21,760	21,800	21,841	21,883	21,924	21,966	22,008
Montgomery	79,097	79,270	79,373	79,452	79,571	79,694	79,812	79,933	80,053	80,174	80,292
Prince George's	95,797	96,009	96,140	96,246	96,400	96,553	96,708	96,860	97,015	97,169	97,318

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:											
	9/23	9/24	9/25	9/26	9/28		9/30		10/2							
Anne Arundel	49,719	49,843	49,974	50,074	50,304	(10,061)	[2,415]	{1,207}	50,533	(10,107)	[2,426]	{1,213}	50,772	(10,154)	[2,437]	{1,219}
Baltimore City	58,209	58,311	58,445	58,576	58,820	(11,764)	[2,823]	{1,412}	59,067	(11,813)	[2,835]	{1,418}	59,327	(11,865)	[2,848]	{1,424}
Baltimore County	72,635	72,781	72,942	73,061	73,344	(14,669)	[3,521]	{1,760}	73,630	(14,726)	[3,534]	{1,767}	73,924	(14,785)	[3,548]	{1,774}
Charles	13,522	13,559	13,581	13,612	13,687	(2,737)	[657]	{328}	13,761	(2,752)	[661]	{330}	13,834	(2,767)	[664]	{332}
Frederick	22,737	22,777	22,825	22,865	22,951	(4,590)	[1,102]	{551}	23,035	(4,607)	[1,106]	{553}	23,118	(4,624)	[1,110]	{555}
Harford	19,046	19,080	19,117	19,164	19,254	(3,851)	[924]	{462}	19,344	(3,869)	[928]	{464}	19,435	(3,887)	[933]	{466}
Howard	21,600	21,634	21,671	21,719	21,800	(4,360)	[1,046]	{523}	21,883	(4,377)	[1,050]	{525}	21,966	(4,393)	[1,054]	{527}
Montgomery	79,097	79,270	79,373	79,452	79,694	(15,939)	[3,825]	{1,913}	79,933	(15,987)	[3,837]	{1,918}	80,174	(16,035)	[3,848]	{1,924}
Prince George's	95,797	96,009	96,140	96,246	96,553	(19,311)	[4,635]	{2,317}	96,860	(19,372)	[4,649]	{2,325}	97,169	(19,434)	[4,664]	{2,332}

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.