

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

Date: 10/22/21

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 10/22/21 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.

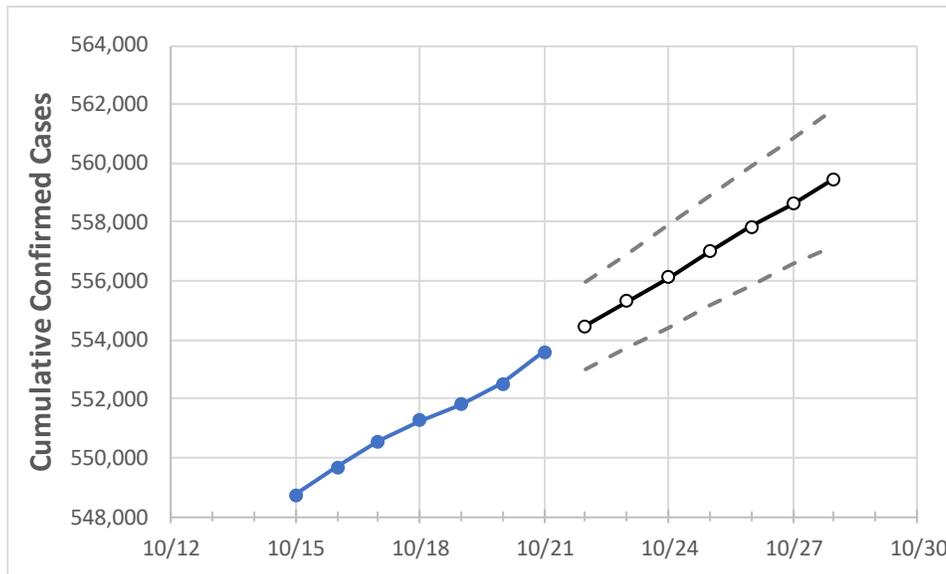
IEM's Modeling Lead

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:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
Maryland	551,264	551,807	552,524	553,593	554,460	555,323	556,141	556,989	557,834	558,634	559,456

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:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
Anne Arundel	52,143	52,207	52,290	52,401	52,480	52,558	52,637	52,712	52,786	52,867	52,939
Baltimore City	60,923	60,903	60,951	61,003	61,082	61,165	61,242	61,325	61,407	61,485	61,564
Baltimore County	75,718	75,812	75,906	76,039	76,146	76,247	76,350	76,453	76,551	76,653	76,756
Charles	14,287	14,308	14,336	14,363	14,387	14,409	14,431	14,453	14,475	14,498	14,520
Frederick	23,852	23,886	23,944	23,976	24,016	24,055	24,095	24,134	24,173	24,212	24,251
Harford	20,280	20,328	20,369	20,426	20,479	20,532	20,584	20,639	20,691	20,748	20,801
Howard	22,420	22,437	22,466	22,478	22,499	22,519	22,539	22,560	22,580	22,599	22,618
Montgomery	81,618	81,691	81,768	81,833	81,907	81,980	82,053	82,123	82,195	82,262	82,332
Prince George’s	98,912	98,991	99,077	99,161	99,259	99,357	99,451	99,553	99,647	99,747	99,842

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:											
	10/18	10/19	10/20	10/21	10/23			10/25			10/27					
Anne Arundel	52,143	52,207	52,290	52,401	52,558	(10,512)	[2,523]	{1,261}	52,712	(10,542)	[2,530]	{1,265}	52,867	(10,573)	[2,538]	{1,269}
Baltimore City	60,923	60,903	60,951	61,003	61,165	(12,233)	[2,936]	{1,468}	61,325	(12,265)	[2,944]	{1,472}	61,485	(12,297)	[2,951]	{1,476}
Baltimore County	75,718	75,812	75,906	76,039	76,247	(15,249)	[3,660]	{1,830}	76,453	(15,291)	[3,670]	{1,835}	76,653	(15,331)	[3,679]	{1,840}
Charles	14,287	14,308	14,336	14,363	14,409	(2,882)	[692]	{346}	14,453	(2,891)	[694]	{347}	14,498	(2,900)	[696]	{348}
Frederick	23,852	23,886	23,944	23,976	24,055	(4,811)	[1,155]	{577}	24,134	(4,827)	[1,158]	{579}	24,212	(4,842)	[1,162]	{581}
Harford	20,280	20,328	20,369	20,426	20,532	(4,106)	[986]	{493}	20,639	(4,128)	[991]	{495}	20,748	(4,150)	[996]	{498}
Howard	22,420	22,437	22,466	22,478	22,519	(4,504)	[1,081]	{540}	22,560	(4,512)	[1,083]	{541}	22,599	(4,520)	[1,085]	{542}
Montgomery	81,618	81,691	81,768	81,833	81,980	(16,396)	[3,935]	{1,968}	82,123	(16,425)	[3,942]	{1,971}	82,262	(16,452)	[3,949]	{1,974}
Prince George's	98,912	98,991	99,077	99,161	99,357	(19,871)	[4,769]	{2,385}	99,553	(19,911)	[4,779]	{2,389}	99,747	(19,949)	[4,788]	{2,394}

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.