

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

Date: 10/29/21

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 10/29/21 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.

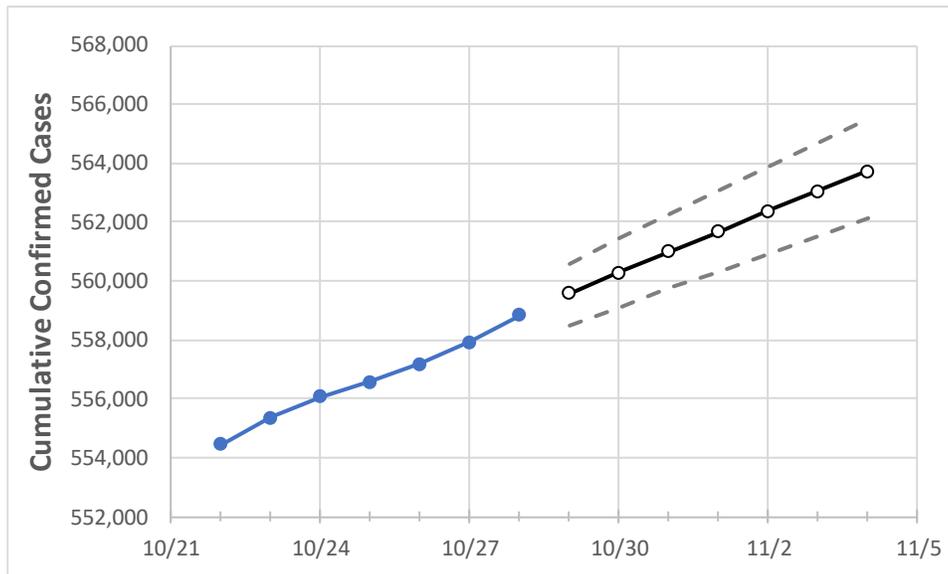
IEM's Modeling Lead

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Maryland	556,595	557,192	557,923	558,852	559,573	560,283	560,991	561,680	562,370	563,050	563,733

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Anne Arundel	52,697	52,748	52,832	52,948	53,024	53,097	53,171	53,246	53,319	53,397	53,467
Baltimore City	61,353	61,389	61,414	61,478	61,543	61,607	61,668	61,731	61,792	61,852	61,913
Baltimore County	76,362	76,414	76,496	76,602	76,682	76,763	76,841	76,917	76,998	77,075	77,151
Charles	14,447	14,458	14,481	14,504	14,525	14,545	14,565	14,586	14,606	14,626	14,645
Frederick	24,140	24,172	24,224	24,268	24,310	24,351	24,393	24,434	24,476	24,519	24,561
Harford	20,587	20,635	20,669	20,709	20,750	20,791	20,832	20,872	20,913	20,953	20,993
Howard	22,570	22,591	22,614	22,628	22,647	22,666	22,685	22,704	22,722	22,741	22,759
Montgomery	82,095	82,162	82,270	82,365	82,439	82,512	82,586	82,660	82,734	82,808	82,882
Prince George’s	99,406	99,501	99,599	99,689	99,763	99,835	99,906	99,977	100,048	100,119	100,187

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:											
	10/25	10/26	10/27	10/28	10/30			11/1			11/3					
Anne Arundel	52,697	52,748	52,832	52,948	53,097	(10,619)	[2,549]	{1,274}	53,246	(10,649)	[2,556]	{1,278}	53,397	(10,679)	[2,563]	{1,282}
Baltimore City	61,353	61,389	61,414	61,478	61,607	(12,321)	[2,957]	{1,479}	61,731	(12,346)	[2,963]	{1,482}	61,852	(12,370)	[2,969]	{1,484}
Baltimore County	76,362	76,414	76,496	76,602	76,763	(15,353)	[3,685]	{1,842}	76,917	(15,383)	[3,692]	{1,846}	77,075	(15,415)	[3,700]	{1,850}
Charles	14,447	14,458	14,481	14,504	14,545	(2,909)	[698]	{349}	14,586	(2,917)	[700]	{350}	14,626	(2,925)	[702]	{351}
Frederick	24,140	24,172	24,224	24,268	24,351	(4,870)	[1,169]	{584}	24,434	(4,887)	[1,173]	{586}	24,519	(4,904)	[1,177]	{588}
Harford	20,587	20,635	20,669	20,709	20,791	(4,158)	[998]	{499}	20,872	(4,174)	[1,002]	{501}	20,953	(4,191)	[1,006]	{503}
Howard	22,570	22,591	22,614	22,628	22,666	(4,533)	[1,088]	{544}	22,704	(4,541)	[1,090]	{545}	22,741	(4,548)	[1,092]	{546}
Montgomery	82,095	82,162	82,270	82,365	82,512	(16,502)	[3,961]	{1,980}	82,660	(16,532)	[3,968]	{1,984}	82,808	(16,562)	[3,975]	{1,987}
Prince George's	99,406	99,501	99,599	99,689	99,835	(19,967)	[4,792]	{2,396}	99,977	(19,995)	[4,799]	{2,399}	100,119	(20,024)	[4,806]	{2,403}

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.