

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/25/21**

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 10/25/21 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.

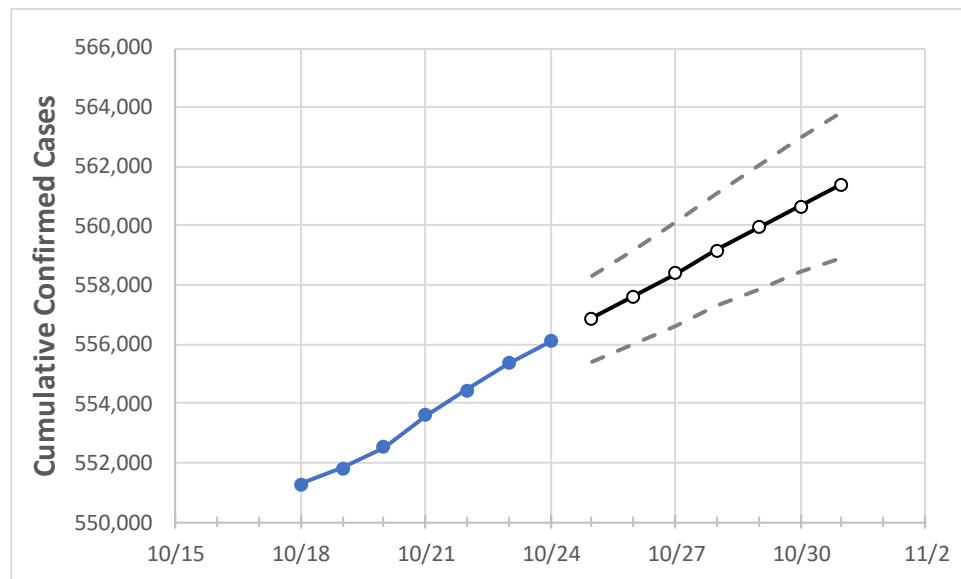
IEM's Modeling Lead

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:							
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	
Maryland	553,593	554,456	555,366	556,083	556,867	557,620	558,398	559,156	559,932	560,643	561,415	

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:							
	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	
Anne Arundel	52,401	52,471	52,585	52,648	52,724	52,799	52,872	52,944	53,022	53,094	53,167	
Baltimore City	61,003	61,101	61,181	61,275	61,354	61,432	61,507	61,583	61,658	61,733	61,807	
Baltimore County	76,039	76,132	76,246	76,319	76,417	76,511	76,605	76,695	76,787	76,882	76,971	
Charles	14,363	14,398	14,418	14,434	14,459	14,482	14,505	14,529	14,553	14,577	14,601	
Frederick	23,976	24,030	24,063	24,094	24,135	24,175	24,215	24,256	24,296	24,337	24,378	
Harford	20,426	20,480	20,525	20,563	20,611	20,658	20,704	20,751	20,798	20,844	20,893	
Howard	22,478	22,501	22,522	22,547	22,567	22,586	22,606	22,624	22,644	22,664	22,681	
Montgomery	81,833	81,913	81,988	82,037	82,104	82,170	82,234	82,297	82,363	82,426	82,487	
Prince George's	99,161	99,223	99,293	99,338	99,407	99,475	99,542	99,607	99,670	99,734	99,795	

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:			
	10/21	10/22	10/23	10/24	10/26	10/28	10/30	
Anne Arundel	52,401	52,471	52,585	52,648	52,799 (10,560) [2,534] {1,267}	52,944 (10,589) [2,541] {1,271}	53,094 (10,619) [2,548] {1,274}	
Baltimore City	61,003	61,101	61,181	61,275	61,432 (12,286) [2,949] {1,474}	61,583 (12,317) [2,956] {1,478}	61,733 (12,347) [2,963] {1,482}	
Baltimore County	76,039	76,132	76,246	76,319	76,511 (15,302) [3,673] {1,836}	76,695 (15,339) [3,681] {1,841}	76,882 (15,376) [3,690] {1,845}	
Charles	14,363	14,398	14,418	14,434	14,482 (2,896) [695] {348}	14,529 (2,906) [697] {349}	14,577 (2,915) [700] {350}	
Frederick	23,976	24,030	24,063	24,094	24,175 (4,835) [1,160] {580}	24,256 (4,851) [1,164] {582}	24,337 (4,867) [1,168] {584}	
Harford	20,426	20,480	20,525	20,563	20,658 (4,132) [992] {496}	20,751 (4,150) [996] {498}	20,844 (4,169) [1,001] {500}	
Howard	22,478	22,501	22,522	22,547	22,586 (4,517) [1,084] {542}	22,624 (4,525) [1,086] {543}	22,664 (4,533) [1,088] {544}	
Montgomery	81,833	81,913	81,988	82,037	82,170 (16,434) [3,944] {1,972}	82,297 (16,459) [3,950] {1,975}	82,426 (16,485) [3,956] {1,978}	
Prince George's	99,161	99,223	99,293	99,338	99,475 (19,895) [4,775] {2,387}	99,607 (19,921) [4,781] {2,391}	99,734 (19,947) [4,787] {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.