

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/29/21**

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 9/29/21 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.

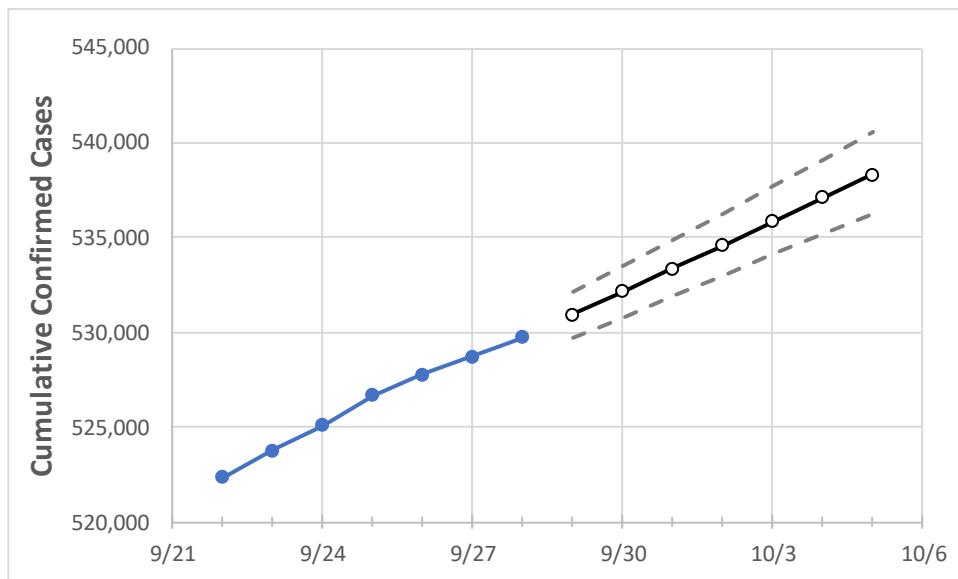
IEM's Modeling Lead

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
Maryland	526,690	527,804	528,764	529,736	530,975	532,187	533,389	534,619	535,859	537,110	538,340

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
Anne Arundel	49,974	50,074	50,169	50,220	50,325	50,429	50,532	50,632	50,737	50,840	50,946
Baltimore City	58,445	58,576	58,677	58,792	58,910	59,031	59,153	59,279	59,402	59,533	59,664
Baltimore County	72,942	73,061	73,169	73,254	73,386	73,517	73,646	73,779	73,909	74,043	74,179
Charles	13,581	13,612	13,635	13,670	13,705	13,739	13,773	13,807	13,839	13,873	13,906
Frederick	22,825	22,865	22,908	22,974	23,021	23,068	23,112	23,159	23,206	23,252	23,296
Harford	19,117	19,164	19,202	19,242	19,285	19,329	19,371	19,415	19,457	19,501	19,544
Howard	21,671	21,719	21,764	21,795	21,835	21,875	21,916	21,956	21,997	22,038	22,079
Montgomery	79,373	79,452	79,555	79,650	79,766	79,881	79,993	80,104	80,213	80,327	80,439
Prince George's	96,140	96,246	96,373	96,496	96,641	96,784	96,928	97,068	97,210	97,355	97,494

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:			
	9/25	9/26	9/27	9/28	9/30	10/2	10/4	
Anne Arundel	49,974	50,074	50,169	50,220	50,429 (10,086) [2,421] {1,210}	50,632 (10,126) [2,430] {1,215}	50,840 (10,168) [2,440] {1,220}	
Baltimore City	58,445	58,576	58,677	58,792	59,031 (11,806) [2,834] {1,417}	59,279 (11,856) [2,845] {1,423}	59,533 (11,907) [2,858] {1,429}	
Baltimore County	72,942	73,061	73,169	73,254	73,517 (14,703) [3,529] {1,764}	73,779 (14,756) [3,541] {1,771}	74,043 (14,809) [3,554] {1,777}	
Charles	13,581	13,612	13,635	13,670	13,739 (2,748) [659] {330}	13,807 (2,761) [663] {331}	13,873 (2,775) [666] {333}	
Frederick	22,825	22,865	22,908	22,974	23,068 (4,614) [1,107] {554}	23,159 (4,632) [1,112] {556}	23,252 (4,650) [1,116] {558}	
Harford	19,117	19,164	19,202	19,242	19,329 (3,866) [928] {464}	19,415 (3,883) [932] {466}	19,501 (3,900) [936] {468}	
Howard	21,671	21,719	21,764	21,795	21,875 (4,375) [1,050] {525}	21,956 (4,391) [1,054] {527}	22,038 (4,408) [1,058] {529}	
Montgomery	79,373	79,452	79,555	79,650	79,881 (15,976) [3,834] {1,917}	80,104 (16,021) [3,845] {1,922}	80,327 (16,065) [3,856] {1,928}	
Prince George's	96,140	96,246	96,373	96,496	96,784 (19,357) [4,646] {2,323}	97,068 (19,414) [4,659] {2,330}	97,355 (19,471) [4,673] {2,337}	

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.