

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 7/16/21**

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 7/16/21 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.

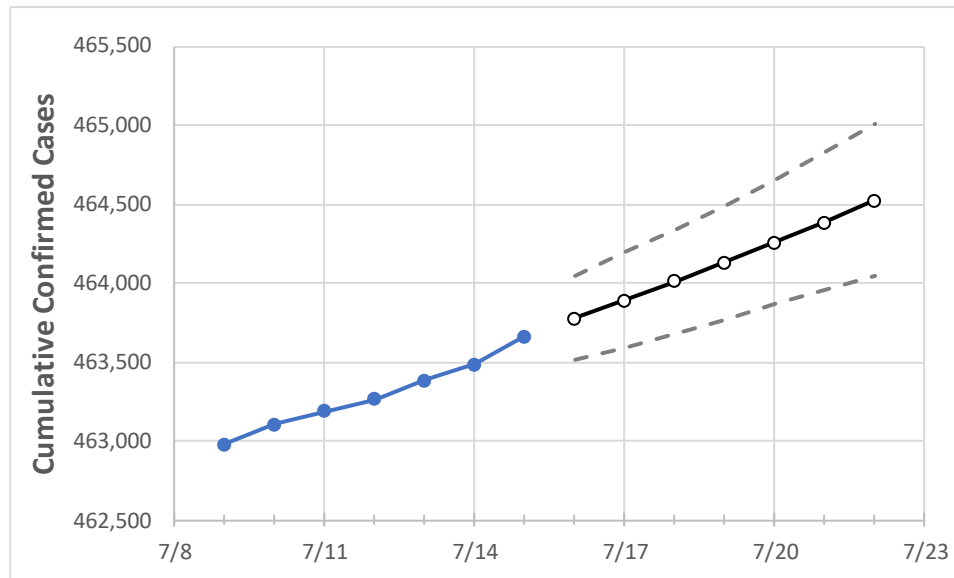
IEM's Modeling Lead

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:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Maryland	463,265	463,383	463,487	463,665	463,776	463,891	464,009	464,131	464,256	464,387	464,523

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:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Anne Arundel	44,065	44,074	44,082	44,107	44,119	44,131	44,144	44,157	44,171	44,186	44,201
Baltimore City	53,232	53,237	53,242	53,247	53,254	53,261	53,269	53,276	53,283	53,291	53,298
Baltimore County	66,069	66,074	66,088	66,112	66,123	66,135	66,147	66,159	66,171	66,184	66,197
Charles	10,998	11,004	11,005	11,015	11,019	11,023	11,027	11,031	11,036	11,041	11,045
Frederick	19,877	19,882	19,889	19,897	19,903	19,909	19,915	19,921	19,929	19,936	19,944
Harford	16,691	16,694	16,696	16,699	16,702	16,705	16,708	16,711	16,714	16,717	16,720
Howard	19,380	19,385	19,390	19,399	19,405	19,412	19,419	19,425	19,433	19,441	19,448
Montgomery	71,354	71,369	71,396	71,432	71,455	71,479	71,505	71,532	71,561	71,591	71,623
Prince George's	85,760	85,781	85,836	85,875	85,905	85,936	85,969	86,004	86,041	86,080	86,120

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:											
	7/12	7/13	7/14	7/15	7/17				7/19				7/21			
Anne Arundel	44,065	44,074	44,082	44,107	44,131	(8,826)	[2,118]	{1,059}	44,157	(8,831)	[2,120]	{1,060}	44,186	(8,837)	[2,121]	{1,060}
Baltimore City	53,232	53,237	53,242	53,247	53,261	(10,652)	[2,557]	{1,278}	53,276	(10,655)	[2,557]	{1,279}	53,291	(10,658)	[2,558]	{1,279}
Baltimore County	66,069	66,074	66,088	66,112	66,135	(13,227)	[3,174]	{1,587}	66,159	(13,232)	[3,176]	{1,588}	66,184	(13,237)	[3,177]	{1,588}
Charles	10,998	11,004	11,005	11,015	11,023	(2,205)	[529]	{265}	11,031	(2,206)	[530]	{265}	11,041	(2,208)	[530]	{265}
Frederick	19,877	19,882	19,889	19,897	19,909	(3,982)	[956]	{478}	19,921	(3,984)	[956]	{478}	19,936	(3,987)	[957]	{478}
Harford	16,691	16,694	16,696	16,699	16,705	(3,341)	[802]	{401}	16,711	(3,342)	[802]	{401}	16,717	(3,343)	[802]	{401}
Howard	19,380	19,385	19,390	19,399	19,412	(3,882)	[932]	{466}	19,425	(3,885)	[932]	{466}	19,441	(3,888)	[933]	{467}
Montgomery	71,354	71,369	71,396	71,432	71,479	(14,296)	[3,431]	{1,716}	71,532	(14,306)	[3,434]	{1,717}	71,591	(14,318)	[3,436]	{1,718}
Prince George's	85,760	85,781	85,836	85,875	85,936	(17,187)	[4,125]	{2,062}	86,004	(17,201)	[4,128]	{2,064}	86,080	(17,216)	[4,132]	{2,066}

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.