

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

Date: 4/8/21

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 4/8/21 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.

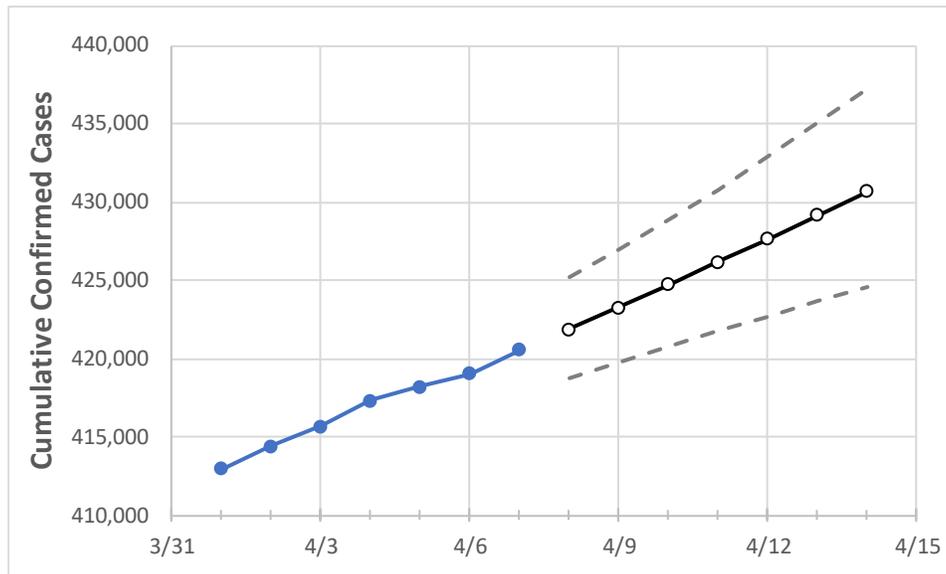
IEM's Modeling Lead

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Maryland	417,329	418,188	419,055	420,526	421,901	423,297	424,726	426,192	427,655	429,180	430,691

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:						
	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	4/13	4/14
Anne Arundel	39,483	39,578	39,658	39,773	39,894	40,011	40,129	40,247	40,362	40,482	40,595
Baltimore City	45,660	45,825	45,967	46,254	46,514	46,773	47,051	47,325	47,609	47,900	48,196
Baltimore County	57,083	57,222	57,383	57,709	58,003	58,300	58,611	58,921	59,245	59,566	59,903
Charles	9,895	9,906	9,937	9,965	9,993	10,022	10,050	10,079	10,108	10,137	10,166
Frederick	18,425	18,479	18,507	18,575	18,624	18,674	18,723	18,773	18,822	18,873	18,924
Harford	14,437	14,490	14,553	14,652	14,747	14,846	14,945	15,047	15,151	15,260	15,369
Howard	17,567	17,605	17,641	17,718	17,790	17,865	17,942	18,022	18,103	18,186	18,272
Montgomery	67,303	67,375	67,505	67,613	67,724	67,835	67,943	68,050	68,158	68,266	68,375
Prince George’s	78,948	79,087	79,286	79,453	79,631	79,811	79,990	80,170	80,348	80,529	80,714

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:											
	4/4	4/5	4/6	4/7	4/9			4/11			4/13					
Anne Arundel	39,483	39,578	39,658	39,773	40,011	(8,002)	[1,921]	{960}	40,247	(8,049)	[1,932]	{966}	40,482	(8,096)	[1,943]	{972}
Baltimore City	45,660	45,825	45,967	46,254	46,773	(9,355)	[2,245]	{1,123}	47,325	(9,465)	[2,272]	{1,136}	47,900	(9,580)	[2,299]	{1,150}
Baltimore County	57,083	57,222	57,383	57,709	58,300	(11,660)	[2,798]	{1,399}	58,921	(11,784)	[2,828]	{1,414}	59,566	(11,913)	[2,859]	{1,430}
Charles	9,895	9,906	9,937	9,965	10,022	(2,004)	[481]	{241}	10,079	(2,016)	[484]	{242}	10,137	(2,027)	[487]	{243}
Frederick	18,425	18,479	18,507	18,575	18,674	(3,735)	[896]	{448}	18,773	(3,755)	[901]	{451}	18,873	(3,775)	[906]	{453}
Harford	14,437	14,490	14,553	14,652	14,846	(2,969)	[713]	{356}	15,047	(3,009)	[722]	{361}	15,260	(3,052)	[732]	{366}
Howard	17,567	17,605	17,641	17,718	17,865	(3,573)	[858]	{429}	18,022	(3,604)	[865]	{433}	18,186	(3,637)	[873]	{436}
Montgomery	67,303	67,375	67,505	67,613	67,835	(13,567)	[3,256]	{1,628}	68,050	(13,610)	[3,266]	{1,633}	68,266	(13,653)	[3,277]	{1,638}
Prince George's	78,948	79,087	79,286	79,453	79,811	(15,962)	[3,831]	{1,915}	80,170	(16,034)	[3,848]	{1,924}	80,529	(16,106)	[3,865]	{1,933}

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.