

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

Date: 5/3/21

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 5/3/21 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.

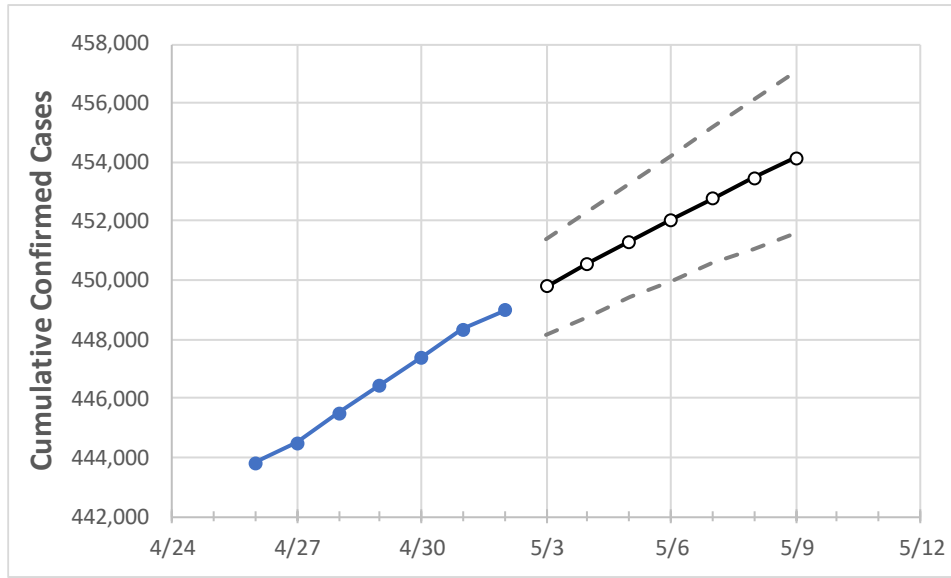
IEM's Modeling Lead

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Maryland	446,459	447,401	448,340	448,989	449,788	450,558	451,313	452,055	452,761	453,461	454,146

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Anne Arundel	42,421	42,512	42,598	42,661	42,742	42,823	42,900	42,975	43,048	43,119	43,190
Baltimore City	50,772	50,930	51,085	51,206	51,326	51,442	51,555	51,665	51,773	51,877	51,978
Baltimore County	63,252	63,446	63,631	63,739	63,906	64,066	64,226	64,377	64,527	64,675	64,818
Charles	10,524	10,546	10,567	10,578	10,597	10,614	10,632	10,649	10,667	10,683	10,701
Frederick	19,428	19,444	19,466	19,478	19,497	19,514	19,530	19,546	19,560	19,575	19,589
Harford	16,036	16,070	16,104	16,133	16,164	16,193	16,223	16,249	16,276	16,301	16,326
Howard	18,815	18,862	18,886	18,907	18,937	18,966	18,995	19,023	19,050	19,076	19,102
Montgomery	69,805	69,873	69,922	69,964	70,026	70,086	70,142	70,201	70,257	70,310	70,363
Prince George’s	82,965	83,102	83,218	83,310	83,425	83,534	83,642	83,747	83,847	83,944	84,042

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:											
	4/29	4/30	5/1	5/2	5/4			5/6			5/8					
Anne Arundel	42,421	42,512	42,598	42,661	42,823	(8,565)	[2,056]	{1,028}	42,975	(8,595)	[2,063]	{1,031}	43,119	(8,624)	[2,070]	{1,035}
Baltimore City	50,772	50,930	51,085	51,206	51,442	(10,288)	[2,469]	{1,235}	51,665	(10,333)	[2,480]	{1,240}	51,877	(10,375)	[2,490]	{1,245}
Baltimore County	63,252	63,446	63,631	63,739	64,066	(12,813)	[3,075]	{1,538}	64,377	(12,875)	[3,090]	{1,545}	64,675	(12,935)	[3,104]	{1,552}
Charles	10,524	10,546	10,567	10,578	10,614	(2,123)	[509]	{255}	10,649	(2,130)	[511]	{256}	10,683	(2,137)	[513]	{256}
Frederick	19,428	19,444	19,466	19,478	19,514	(3,903)	[937]	{468}	19,546	(3,909)	[938]	{469}	19,575	(3,915)	[940]	{470}
Harford	16,036	16,070	16,104	16,133	16,193	(3,239)	[777]	{389}	16,249	(3,250)	[780]	{390}	16,301	(3,260)	[782]	{391}
Howard	18,815	18,862	18,886	18,907	18,966	(3,793)	[910]	{455}	19,023	(3,805)	[913]	{457}	19,076	(3,815)	[916]	{458}
Montgomery	69,805	69,873	69,922	69,964	70,086	(14,017)	[3,364]	{1,682}	70,201	(14,040)	[3,370]	{1,685}	70,310	(14,062)	[3,375]	{1,687}
Prince George's	82,965	83,102	83,218	83,310	83,534	(16,707)	[4,010]	{2,005}	83,747	(16,749)	[4,020]	{2,010}	83,944	(16,789)	[4,029]	{2,015}

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.