

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

Date: 5/4/21

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 5/4/21 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.

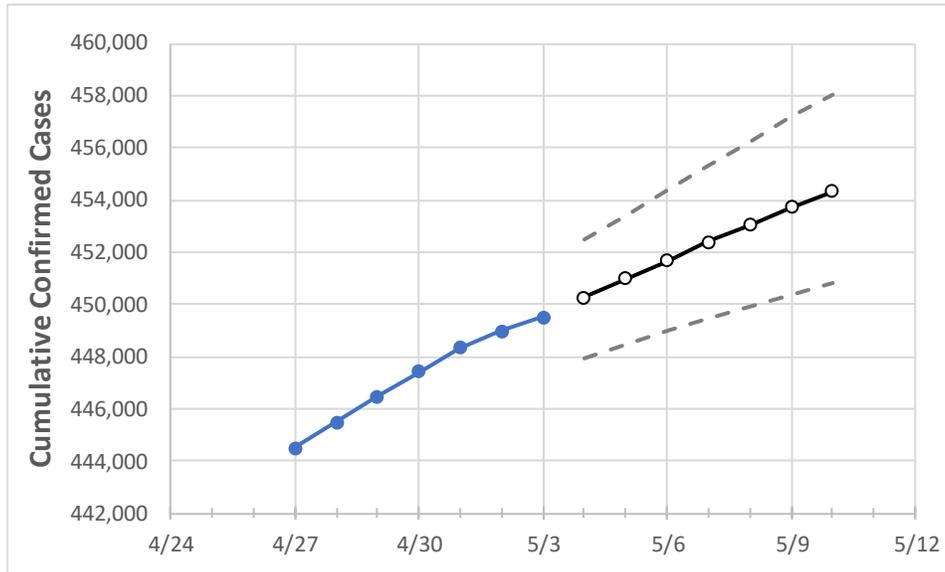
IEM's Modeling Lead

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:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Maryland	447,401	448,340	448,989	449,509	450,271	450,984	451,689	452,387	453,046	453,708	454,342

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:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Anne Arundel	42,512	42,598	42,661	42,709	42,787	42,863	42,941	43,012	43,086	43,157	43,225
Baltimore City	50,930	51,085	51,206	51,306	51,422	51,532	51,638	51,742	51,842	51,938	52,031
Baltimore County	63,446	63,631	63,739	63,835	63,990	64,142	64,294	64,435	64,572	64,704	64,831
Charles	10,546	10,567	10,578	10,593	10,611	10,628	10,646	10,662	10,679	10,695	10,711
Frederick	19,444	19,466	19,478	19,481	19,497	19,513	19,527	19,541	19,554	19,567	19,579
Harford	16,070	16,104	16,133	16,151	16,179	16,207	16,234	16,258	16,284	16,307	16,330
Howard	18,862	18,886	18,907	18,922	18,951	18,978	19,005	19,031	19,056	19,081	19,104
Montgomery	69,873	69,922	69,964	70,006	70,067	70,125	70,180	70,235	70,288	70,340	70,388
Prince George’s	83,102	83,218	83,310	83,410	83,521	83,629	83,734	83,839	83,940	84,040	84,135

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:											
	4/30	5/1	5/2	5/3	5/5			5/7			5/9					
Anne Arundel	42,512	42,598	42,661	42,709	42,863	(8,573)	[2,057]	{1,029}	43,012	(8,602)	[2,065]	{1,032}	43,157	(8,631)	[2,072]	{1,036}
Baltimore City	50,930	51,085	51,206	51,306	51,532	(10,306)	[2,474]	{1,237}	51,742	(10,348)	[2,484]	{1,242}	51,938	(10,388)	[2,493]	{1,247}
Baltimore County	63,446	63,631	63,739	63,835	64,142	(12,828)	[3,079]	{1,539}	64,435	(12,887)	[3,093]	{1,546}	64,704	(12,941)	[3,106]	{1,553}
Charles	10,546	10,567	10,578	10,593	10,628	(2,126)	[510]	{255}	10,662	(2,132)	[512]	{256}	10,695	(2,139)	[513]	{257}
Frederick	19,444	19,466	19,478	19,481	19,513	(3,903)	[937]	{468}	19,541	(3,908)	[938]	{469}	19,567	(3,913)	[939]	{470}
Harford	16,070	16,104	16,133	16,151	16,207	(3,241)	[778]	{389}	16,258	(3,252)	[780]	{390}	16,307	(3,261)	[783]	{391}
Howard	18,862	18,886	18,907	18,922	18,978	(3,796)	[911]	{455}	19,031	(3,806)	[914]	{457}	19,081	(3,816)	[916]	{458}
Montgomery	69,873	69,922	69,964	70,006	70,125	(14,025)	[3,366]	{1,683}	70,235	(14,047)	[3,371]	{1,686}	70,340	(14,068)	[3,376]	{1,688}
Prince George's	83,102	83,218	83,310	83,410	83,629	(16,726)	[4,014]	{2,007}	83,839	(16,768)	[4,024]	{2,012}	84,040	(16,808)	[4,034]	{2,017}

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.