

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

Date: 3/5/21

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 3/5/21 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.

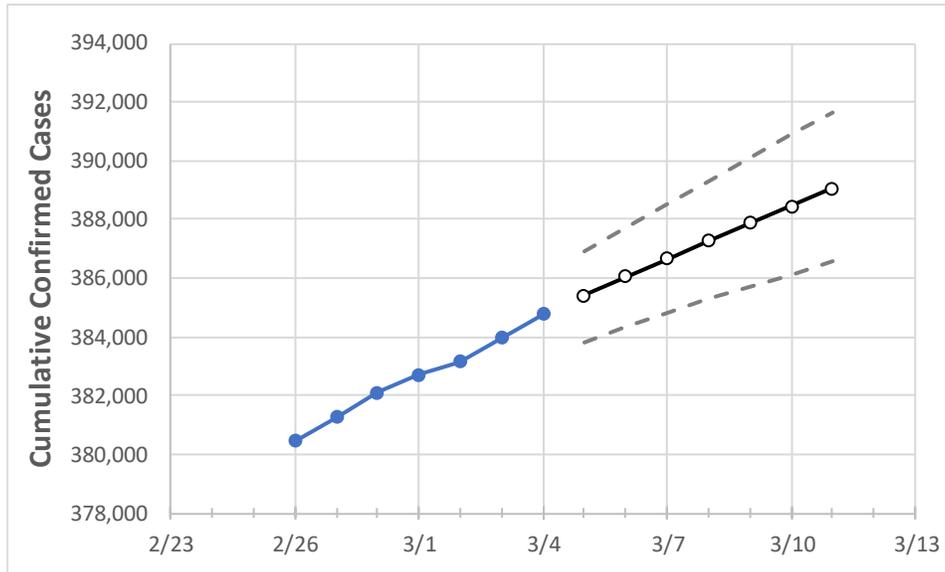
IEM's Modeling Lead

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:						
	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11
Maryland	382,702	383,170	383,956	384,765	385,402	386,050	386,667	387,276	387,879	388,467	389,052

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:						
	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11
Anne Arundel	35,772	35,827	35,963	36,084	36,165	36,246	36,329	36,409	36,491	36,571	36,654
Baltimore City	40,474	40,481	40,540	40,608	40,665	40,723	40,779	40,833	40,885	40,937	40,992
Baltimore County	50,972	51,062	51,183	51,318	51,422	51,526	51,629	51,728	51,830	51,933	52,034
Charles	8,929	8,963	8,994	9,033	9,054	9,075	9,096	9,116	9,136	9,156	9,176
Frederick	17,003	17,035	17,095	17,141	17,176	17,211	17,246	17,281	17,316	17,351	17,385
Harford	12,515	12,529	12,567	12,592	12,616	12,638	12,660	12,682	12,704	12,725	12,745
Howard	15,827	15,831	15,868	15,893	15,920	15,945	15,971	15,996	16,019	16,043	16,067
Montgomery	63,499	63,595	63,702	63,796	63,895	63,992	64,088	64,182	64,276	64,369	64,460
Prince George’s	73,509	73,685	73,834	73,994	74,130	74,263	74,394	74,525	74,649	74,772	74,897

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:											
	3/1	3/2	3/3	3/4	3/6			3/8			3/10					
Anne Arundel	35,772	35,827	35,963	36,084	36,246	(7,249)	[1,740]	{870}	36,409	(7,282)	[1,748]	{874}	36,571	(7,314)	[1,755]	{878}
Baltimore City	40,474	40,481	40,540	40,608	40,723	(8,145)	[1,955]	{977}	40,833	(8,167)	[1,960]	{980}	40,937	(8,187)	[1,965]	{982}
Baltimore County	50,972	51,062	51,183	51,318	51,526	(10,305)	[2,473]	{1,237}	51,728	(10,346)	[2,483]	{1,241}	51,933	(10,387)	[2,493]	{1,246}
Charles	8,929	8,963	8,994	9,033	9,075	(1,815)	[436]	{218}	9,116	(1,823)	[438]	{219}	9,156	(1,831)	[439]	{220}
Frederick	17,003	17,035	17,095	17,141	17,211	(3,442)	[826]	{413}	17,281	(3,456)	[829]	{415}	17,351	(3,470)	[833]	{416}
Harford	12,515	12,529	12,567	12,592	12,638	(2,528)	[607]	{303}	12,682	(2,536)	[609]	{304}	12,725	(2,545)	[611]	{305}
Howard	15,827	15,831	15,868	15,893	15,945	(3,189)	[765]	{383}	15,996	(3,199)	[768]	{384}	16,043	(3,209)	[770]	{385}
Montgomery	63,499	63,595	63,702	63,796	63,992	(12,798)	[3,072]	{1,536}	64,182	(12,836)	[3,081]	{1,540}	64,369	(12,874)	[3,090]	{1,545}
Prince George's	73,509	73,685	73,834	73,994	74,263	(14,853)	[3,565]	{1,782}	74,525	(14,905)	[3,577]	{1,789}	74,772	(14,954)	[3,589]	{1,795}

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.