

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

Date: 3/4/21

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 3/4/21 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.

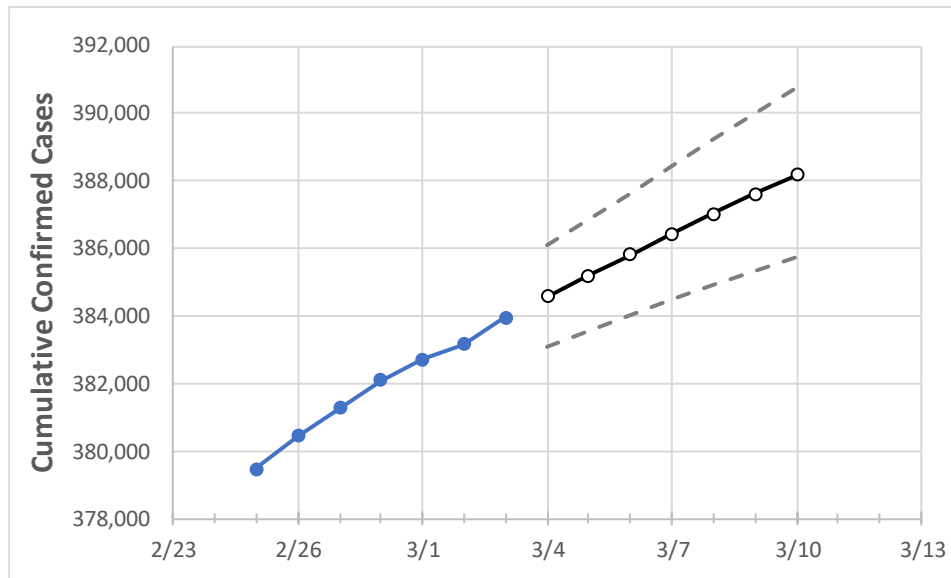
IEM's Modeling Lead

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Maryland	382,099	382,702	383,170	383,956	384,587	385,204	385,829	386,437	387,024	387,606	388,179

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:						
	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	3/10
Anne Arundel	35,712	35,772	35,827	35,963	36,039	36,116	36,190	36,264	36,338	36,410	36,481
Baltimore City	40,401	40,474	40,481	40,540	40,598	40,653	40,709	40,761	40,815	40,868	40,919
Baltimore County	50,891	50,972	51,062	51,183	51,284	51,385	51,486	51,588	51,689	51,785	51,882
Charles	8,921	8,929	8,963	8,994	9,013	9,033	9,052	9,070	9,088	9,105	9,122
Frederick	16,969	17,003	17,035	17,095	17,126	17,156	17,186	17,215	17,244	17,273	17,301
Harford	12,483	12,515	12,529	12,567	12,592	12,615	12,638	12,661	12,682	12,703	12,725
Howard	15,798	15,827	15,831	15,868	15,897	15,924	15,951	15,978	16,002	16,027	16,052
Montgomery	63,395	63,499	63,595	63,702	63,802	63,900	63,997	64,092	64,186	64,279	64,370
Prince George's	73,413	73,509	73,685	73,834	73,973	74,106	74,238	74,372	74,496	74,620	74,747

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:											
	2/28	3/1	3/2	3/3	3/5			3/7			3/9					
Anne Arundel	35,712	35,772	35,827	35,963	36,116	(7,223)	[1,734]	{867}	36,264	(7,253)	[1,741]	{870}	36,410	(7,282)	[1,748]	{874}
Baltimore City	40,401	40,474	40,481	40,540	40,653	(8,131)	[1,951]	{976}	40,761	(8,152)	[1,957]	{978}	40,868	(8,174)	[1,962]	{981}
Baltimore County	50,891	50,972	51,062	51,183	51,385	(10,277)	[2,466]	{1,233}	51,588	(10,318)	[2,476]	{1,238}	51,785	(10,357)	[2,486]	{1,243}
Charles	8,921	8,929	8,963	8,994	9,033	(1,807)	[434]	{217}	9,070	(1,814)	[435]	{218}	9,105	(1,821)	[437]	{219}
Frederick	16,969	17,003	17,035	17,095	17,156	(3,431)	[823]	{412}	17,215	(3,443)	[826]	{413}	17,273	(3,455)	[829]	{415}
Harford	12,483	12,515	12,529	12,567	12,615	(2,523)	[606]	{303}	12,661	(2,532)	[608]	{304}	12,703	(2,541)	[610]	{305}
Howard	15,798	15,827	15,831	15,868	15,924	(3,185)	[764]	{382}	15,978	(3,196)	[767]	{383}	16,027	(3,205)	[769]	{385}
Montgomery	63,395	63,499	63,595	63,702	63,900	(12,780)	[3,067]	{1,534}	64,092	(12,818)	[3,076]	{1,538}	64,279	(12,856)	[3,085]	{1,543}
Prince George's	73,413	73,509	73,685	73,834	74,106	(14,821)	[3,557]	{1,779}	74,372	(14,874)	[3,570]	{1,785}	74,620	(14,924)	[3,582]	{1,791}

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.