

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

Date: 3/1/21

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 3/1/21 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.

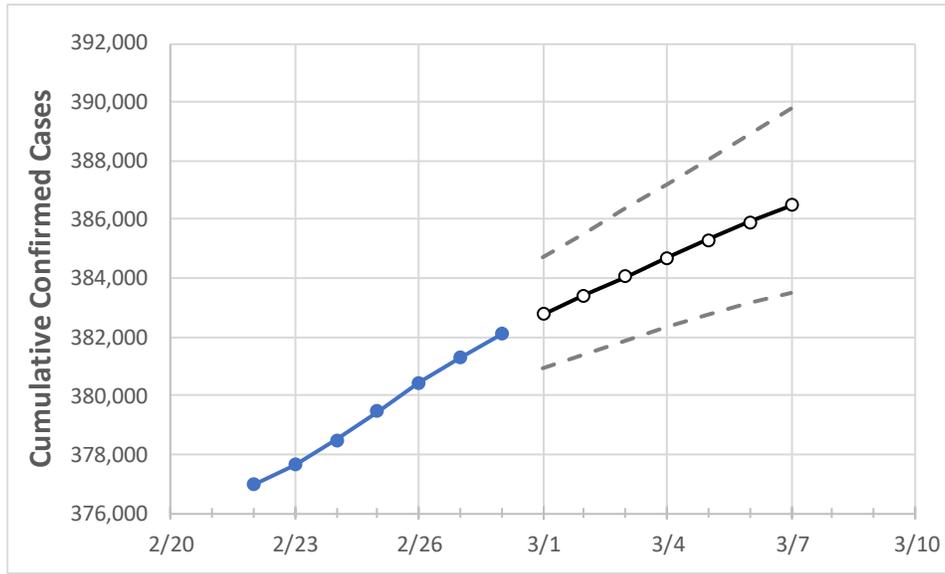
IEM's Modeling Lead

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:						
	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7
Maryland	379,466	380,436	381,272	382,099	382,764	383,423	384,071	384,692	385,303	385,908	386,494

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:						
	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7
Anne Arundel	35,410	35,510	35,604	35,712	35,788	35,864	35,938	36,008	36,082	36,156	36,229
Baltimore City	40,141	40,186	40,303	40,401	40,459	40,516	40,573	40,627	40,683	40,735	40,786
Baltimore County	50,482	50,669	50,779	50,891	50,990	51,089	51,193	51,293	51,393	51,489	51,583
Charles	8,864	8,885	8,899	8,921	8,941	8,960	8,979	8,998	9,016	9,033	9,051
Frederick	16,869	16,910	16,938	16,969	17,000	17,030	17,060	17,090	17,118	17,147	17,174
Harford	12,403	12,432	12,457	12,483	12,507	12,531	12,554	12,577	12,599	12,620	12,641
Howard	15,682	15,724	15,757	15,798	15,833	15,868	15,901	15,936	15,969	16,002	16,035
Montgomery	63,039	63,166	63,276	63,395	63,494	63,591	63,687	63,780	63,871	63,962	64,053
Prince George’s	72,990	73,149	73,320	73,413	73,552	73,689	73,825	73,960	74,091	74,225	74,350

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:											
	2/25	2/26	2/27	2/28	3/2			3/4			3/6					
Anne Arundel	35,410	35,510	35,604	35,712	35,864	(7,173)	[1,721]	{861}	36,008	(7,202)	[1,728]	{864}	36,156	(7,231)	[1,735]	{868}
Baltimore City	40,141	40,186	40,303	40,401	40,516	(8,103)	[1,945]	{972}	40,627	(8,125)	[1,950]	{975}	40,735	(8,147)	[1,955]	{978}
Baltimore County	50,482	50,669	50,779	50,891	51,089	(10,218)	[2,452]	{1,226}	51,293	(10,259)	[2,462]	{1,231}	51,489	(10,298)	[2,471]	{1,236}
Charles	8,864	8,885	8,899	8,921	8,960	(1,792)	[430]	{215}	8,998	(1,800)	[432]	{216}	9,033	(1,807)	[434]	{217}
Frederick	16,869	16,910	16,938	16,969	17,030	(3,406)	[817]	{409}	17,090	(3,418)	[820]	{410}	17,147	(3,429)	[823]	{412}
Harford	12,403	12,432	12,457	12,483	12,531	(2,506)	[601]	{301}	12,577	(2,515)	[604]	{302}	12,620	(2,524)	[606]	{303}
Howard	15,682	15,724	15,757	15,798	15,868	(3,174)	[762]	{381}	15,936	(3,187)	[765]	{382}	16,002	(3,200)	[768]	{384}
Montgomery	63,039	63,166	63,276	63,395	63,591	(12,718)	[3,052]	{1,526}	63,780	(12,756)	[3,061]	{1,531}	63,962	(12,792)	[3,070]	{1,535}
Prince George's	72,990	73,149	73,320	73,413	73,689	(14,738)	[3,537]	{1,769}	73,960	(14,792)	[3,550]	{1,775}	74,225	(14,845)	[3,563]	{1,781}

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.