

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

Date: 3/4/22

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 3/4/22 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.

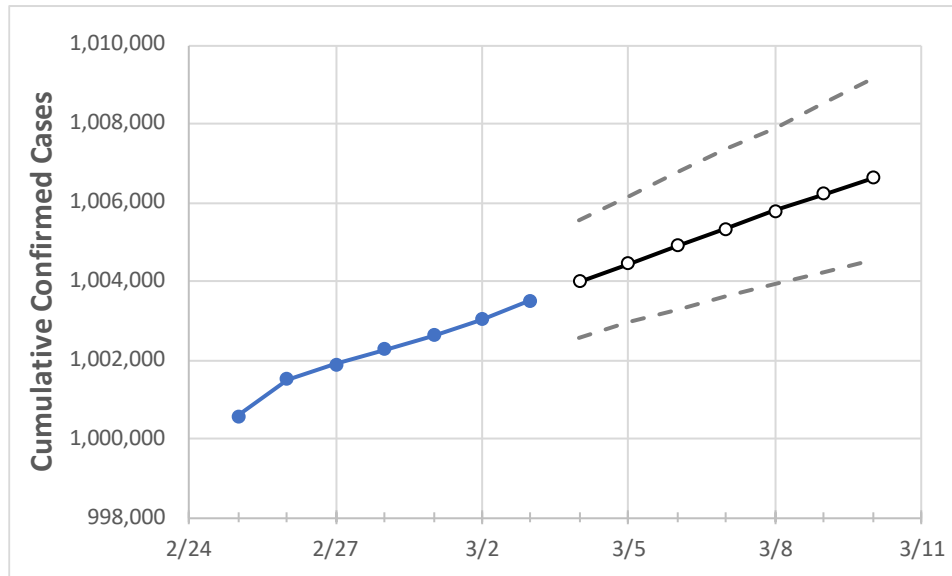
IEM's Modeling Lead

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	1,002,279	1,002,634	1,003,039	1,003,510	1,003,991	1,004,447	1,004,901	1,005,339	1,005,786	1,006,217	1,006,634

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	88,171	88,210	88,264	88,333	88,374	88,414	88,452	88,491	88,529	88,564	88,599
Baltimore City	110,491	110,506	110,528	110,565	110,618	110,671	110,722	110,764	110,816	110,865	110,906
Baltimore County	130,542	130,584	130,630	130,680	130,724	130,762	130,802	130,842	130,874	130,910	130,943
Charles	27,587	27,598	27,609	27,616	27,623	27,630	27,637	27,645	27,650	27,656	27,662
Frederick	45,067	45,091	45,126	45,158	45,178	45,195	45,211	45,229	45,246	45,264	45,277
Harford	37,722	37,748	37,764	37,784	37,799	37,814	37,827	37,841	37,854	37,866	37,879
Howard	43,006	43,022	43,054	43,079	43,106	43,133	43,156	43,181	43,204	43,227	43,251
Montgomery	165,229	165,297	165,383	165,445	165,505	165,561	165,616	165,671	165,724	165,774	165,822
Prince George's	168,933	168,972	168,993	169,032	169,074	169,112	169,150	169,186	169,220	169,256	169,292

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	88,171	88,210	88,264	88,333	88,414	(17,683)	[4,244]	{2,122}	88,491	(17,698)	[4,248]	{2,124}	88,564	(17,713)	[4,251]	{2,126}
Baltimore City	110,491	110,506	110,528	110,565	110,671	(22,134)	[5,312]	{2,656}	110,764	(22,153)	[5,317]	{2,658}	110,865	(22,173)	[5,322]	{2,661}
Baltimore County	130,542	130,584	130,630	130,680	130,762	(26,152)	[6,277]	{3,138}	130,842	(26,168)	[6,280]	{3,140}	130,910	(26,182)	[6,284]	{3,142}
Charles	27,587	27,598	27,609	27,616	27,630	(5,526)	[1,326]	{663}	27,645	(5,529)	[1,327]	{663}	27,656	(5,531)	[1,328]	{664}
Frederick	45,067	45,091	45,126	45,158	45,195	(9,039)	[2,169]	{1,085}	45,229	(9,046)	[2,171]	{1,085}	45,264	(9,053)	[2,173]	{1,086}
Harford	37,722	37,748	37,764	37,784	37,814	(7,563)	[1,815]	{908}	37,841	(7,568)	[1,816]	{908}	37,866	(7,573)	[1,818]	{909}
Howard	43,006	43,022	43,054	43,079	43,133	(8,627)	[2,070]	{1,035}	43,181	(8,636)	[2,073]	{1,036}	43,227	(8,645)	[2,075]	{1,037}
Montgomery	165,229	165,297	165,383	165,445	165,561	(33,112)	[7,947]	{3,973}	165,671	(33,134)	[7,952]	{3,976}	165,774	(33,155)	[7,957]	{3,979}
Prince George's	168,933	168,972	168,993	169,032	169,112	(33,822)	[8,117]	{4,059}	169,186	(33,837)	[8,121]	{4,060}	169,256	(33,851)	[8,124]	{4,062}

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.