

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

Date: 2/14/22

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 2/14/22 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.

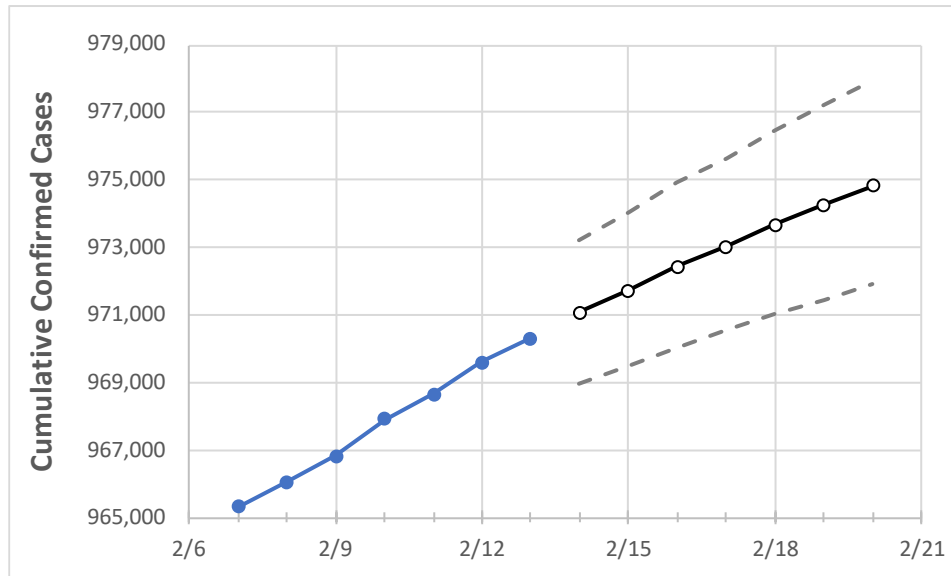
IEM's Modeling Lead

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:						
	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20
Maryland	967,917	968,648	969,589	970,307	971,084	971,736	972,437	973,035	973,681	974,262	974,829

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:						
	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20
Anne Arundel	85,493	85,639	85,717	85,784	85,859	85,927	85,991	86,055	86,116	86,180	86,230
Baltimore City	106,067	106,339	106,420	106,470	106,529	106,592	106,653	106,702	106,759	106,815	106,863
Baltimore County	126,169	126,338	126,425	126,515	126,600	126,681	126,757	126,832	126,899	126,974	127,036
Charles	26,725	26,760	26,774	26,800	26,827	26,852	26,876	26,899	26,921	26,941	26,963
Frederick	43,516	43,584	43,640	43,656	43,706	43,749	43,791	43,834	43,873	43,914	43,949
Harford	36,527	36,611	36,663	36,680	36,717	36,751	36,783	36,816	36,846	36,875	36,903
Howard	41,499	41,577	41,621	41,646	41,701	41,758	41,806	41,860	41,905	41,955	41,998
Montgomery	159,763	159,922	160,040	160,109	160,232	160,349	160,459	160,573	160,669	160,769	160,864
Prince George's	163,371	163,441	163,516	163,555	163,639	163,720	163,795	163,866	163,944	164,010	164,078

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:											
	2/10	2/11	2/12	2/13	2/15			2/17			2/19					
Anne Arundel	85,493	85,639	85,717	85,784	85,927	(17,185)	[4,124]	{2,062}	86,055	(17,211)	[4,131]	{2,065}	86,180	(17,236)	[4,137]	{2,068}
Baltimore City	106,067	106,339	106,420	106,470	106,592	(21,318)	[5,116]	{2,558}	106,702	(21,340)	[5,122]	{2,561}	106,815	(21,363)	[5,127]	{2,564}
Baltimore County	126,169	126,338	126,425	126,515	126,681	(25,336)	[6,081]	{3,040}	126,832	(25,366)	[6,088]	{3,044}	126,974	(25,395)	[6,095]	{3,047}
Charles	26,725	26,760	26,774	26,800	26,852	(5,370)	[1,289]	{644}	26,899	(5,380)	[1,291]	{646}	26,941	(5,388)	[1,293]	{647}
Frederick	43,516	43,584	43,640	43,656	43,749	(8,750)	[2,100]	{1,050}	43,834	(8,767)	[2,104]	{1,052}	43,914	(8,783)	[2,108]	{1,054}
Harford	36,527	36,611	36,663	36,680	36,751	(7,350)	[1,764]	{882}	36,816	(7,363)	[1,767]	{884}	36,875	(7,375)	[1,770]	{885}
Howard	41,499	41,577	41,621	41,646	41,758	(8,352)	[2,004]	{1,002}	41,860	(8,372)	[2,009]	{1,005}	41,955	(8,391)	[2,014]	{1,007}
Montgomery	159,763	159,922	160,040	160,109	160,349	(32,070)	[7,697]	{3,848}	160,573	(32,115)	[7,708]	{3,854}	160,769	(32,154)	[7,717]	{3,858}
Prince George's	163,371	163,441	163,516	163,555	163,720	(32,744)	[7,859]	{3,929}	163,866	(32,773)	[7,866]	{3,933}	164,010	(32,802)	[7,872]	{3,936}

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.