

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 2/11/22**

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 2/11/22 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.**

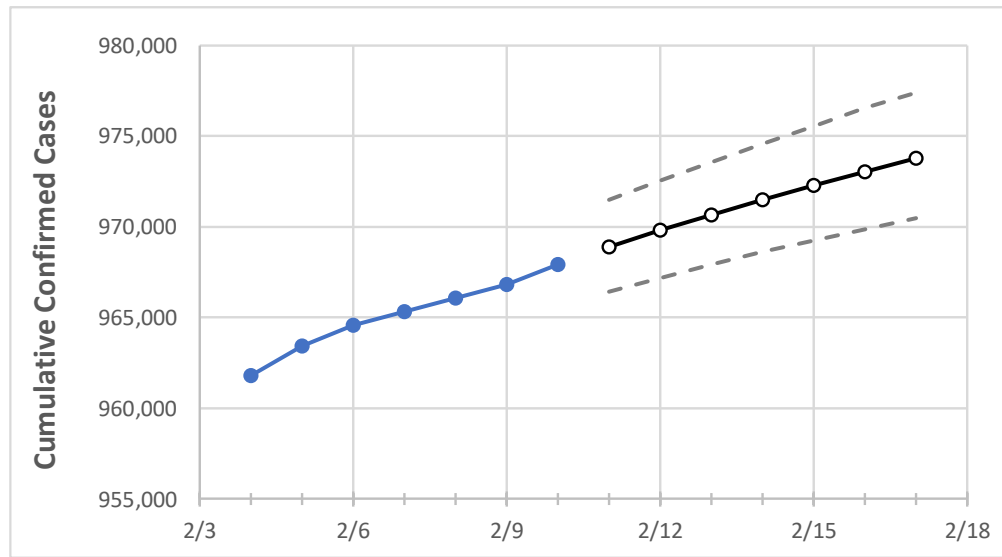
**IEM's Modeling Lead**

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:					
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Maryland	965,328	966,066	966,817	967,917	968,885	969,812	970,663	971,503	972,279	973,051	973,758

*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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Anne Arundel	85,258	85,330	85,414	85,493	85,582	85,663	85,747	85,821	85,894	85,968	86,029
Baltimore City	105,906	105,945	106,002	106,067	106,136	106,198	106,256	106,314	106,369	106,423	106,470
Baltimore County	125,880	125,956	126,051	126,169	126,266	126,357	126,447	126,527	126,605	126,682	126,752
Charles	26,578	26,591	26,649	26,725	26,758	26,787	26,818	26,845	26,871	26,900	26,923
Frederick	43,317	43,359	43,405	43,516	43,572	43,625	43,674	43,726	43,771	43,818	43,862
Harford	36,380	36,423	36,464	36,527	36,570	36,610	36,649	36,684	36,721	36,755	36,788
Howard	41,331	41,390	41,413	41,499	41,563	41,628	41,690	41,753	41,809	41,865	41,919
Montgomery	159,192	159,303	159,429	159,763	159,906	160,045	160,181	160,307	160,421	160,545	160,659
Prince George's	162,868	162,928	163,042	163,371	163,481	163,584	163,667	163,762	163,844	163,922	164,001

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:											
	2/7	2/8	2/9	2/10	2/12				2/14				2/16			
Anne Arundel	85,258	85,330	85,414	85,493	85,663	(17,133)	[4,112]	{2,056}	85,821	(17,164)	[4,119]	{2,060}	85,968	(17,194)	[4,126]	{2,063}
Baltimore City	105,906	105,945	106,002	106,067	106,198	(21,240)	[5,097]	{2,549}	106,314	(21,263)	[5,103]	{2,552}	106,423	(21,285)	[5,108]	{2,554}
Baltimore County	125,880	125,956	126,051	126,169	126,357	(25,271)	[6,065]	{3,033}	126,527	(25,305)	[6,073]	{3,037}	126,682	(25,336)	[6,081]	{3,040}
Charles	26,578	26,591	26,649	26,725	26,787	(5,357)	[1,286]	{643}	26,845	(5,369)	[1,289]	{644}	26,900	(5,380)	[1,291]	{646}
Frederick	43,317	43,359	43,405	43,516	43,625	(8,725)	[2,094]	{1,047}	43,726	(8,745)	[2,099]	{1,049}	43,818	(8,764)	[2,103]	{1,052}
Harford	36,380	36,423	36,464	36,527	36,610	(7,322)	[1,757]	{879}	36,684	(7,337)	[1,761]	{880}	36,755	(7,351)	[1,764]	{882}
Howard	41,331	41,390	41,413	41,499	41,628	(8,326)	[1,998]	{999}	41,753	(8,351)	[2,004]	{1,002}	41,865	(8,373)	[2,010]	{1,005}
Montgomery	159,192	159,303	159,429	159,763	160,045	(32,009)	[7,682]	{3,841}	160,307	(32,061)	[7,695]	{3,847}	160,545	(32,109)	[7,706]	{3,853}
Prince George's	162,868	162,928	163,042	163,371	163,584	(32,717)	[7,852]	{3,926}	163,762	(32,752)	[7,861]	{3,930}	163,922	(32,784)	[7,868]	{3,934}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.