

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 11/15/21**

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 11/15/21 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.**

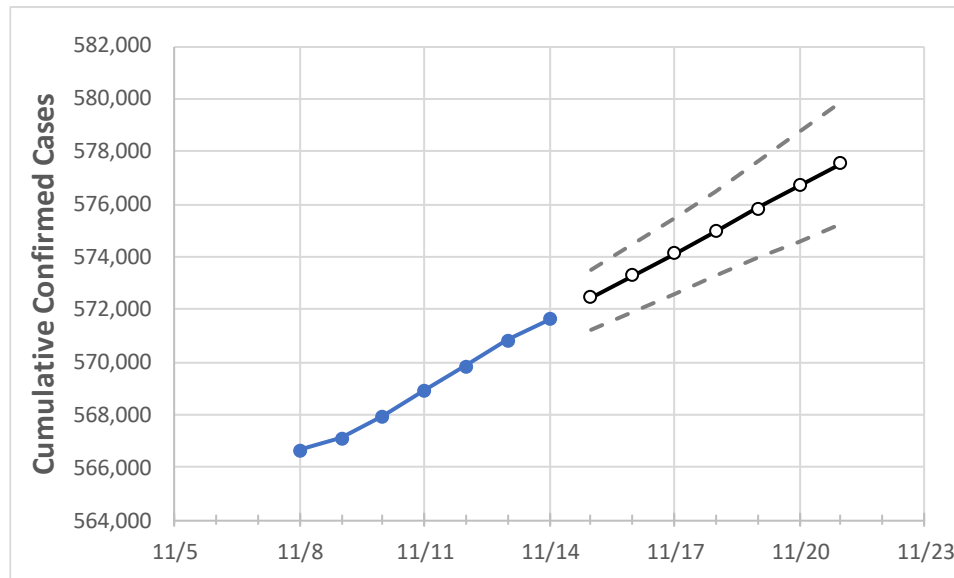
**IEM's Modeling Lead**

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:						
	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21
Maryland	568,914	569,823	570,806	571,625	572,445	573,279	574,122	574,950	575,842	576,706	577,547

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:						
	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21
Anne Arundel	53,863	53,939	54,022	54,107	54,177	54,247	54,315	54,385	54,457	54,528	54,598
Baltimore City	62,456	62,567	62,697	62,814	62,917	63,021	63,126	63,234	63,342	63,455	63,573
Baltimore County	77,891	78,023	78,143	78,253	78,361	78,472	78,586	78,696	78,814	78,932	79,050
Charles	14,701	14,715	14,721	14,731	14,743	14,756	14,768	14,781	14,792	14,804	14,817
Frederick	24,868	24,919	24,977	25,019	25,071	25,124	25,178	25,233	25,291	25,348	25,406
Harford	21,217	21,268	21,318	21,359	21,403	21,447	21,493	21,538	21,586	21,633	21,681
Howard	22,960	23,000	23,037	23,063	23,094	23,126	23,156	23,189	23,224	23,257	23,292
Montgomery	83,445	83,548	83,638	83,700	83,789	83,877	83,969	84,059	84,150	84,247	84,340
Prince George's	100,694	100,763	100,824	100,885	100,955	101,025	101,094	101,165	101,234	101,305	101,376

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:											
	11/11	11/12	11/13	11/14	11/16				11/18				11/20			
Anne Arundel	53,863	53,939	54,022	54,107	54,247	(10,849)	[2,604]	{1,302}	54,385	(10,877)	[2,610]	{1,305}	54,528	(10,906)	[2,617]	{1,309}
Baltimore City	62,456	62,567	62,697	62,814	63,021	(12,604)	[3,025]	{1,513}	63,234	(12,647)	[3,035]	{1,518}	63,455	(12,691)	[3,046]	{1,523}
Baltimore County	77,891	78,023	78,143	78,253	78,472	(15,694)	[3,767]	{1,883}	78,696	(15,739)	[3,777]	{1,889}	78,932	(15,786)	[3,789]	{1,894}
Charles	14,701	14,715	14,721	14,731	14,756	(2,951)	[708]	{354}	14,781	(2,956)	[709]	{355}	14,804	(2,961)	[711]	{355}
Frederick	24,868	24,919	24,977	25,019	25,124	(5,025)	[1,206]	{603}	25,233	(5,047)	[1,211]	{606}	25,348	(5,070)	[1,217]	{608}
Harford	21,217	21,268	21,318	21,359	21,447	(4,289)	[1,029]	{515}	21,538	(4,308)	[1,034]	{517}	21,633	(4,327)	[1,038]	{519}
Howard	22,960	23,000	23,037	23,063	23,126	(4,625)	[1,110]	{555}	23,189	(4,638)	[1,113]	{557}	23,257	(4,651)	[1,116]	{558}
Montgomery	83,445	83,548	83,638	83,700	83,877	(16,775)	[4,026]	{2,013}	84,059	(16,812)	[4,035]	{2,017}	84,247	(16,849)	[4,044]	{2,022}
Prince George's	100,694	100,763	100,824	100,885	101,025	(20,205)	[4,849]	{2,425}	101,165	(20,233)	[4,856]	{2,428}	101,305	(20,261)	[4,863]	{2,431}

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.