

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

Date: 11/22/21

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 11/22/21 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.**

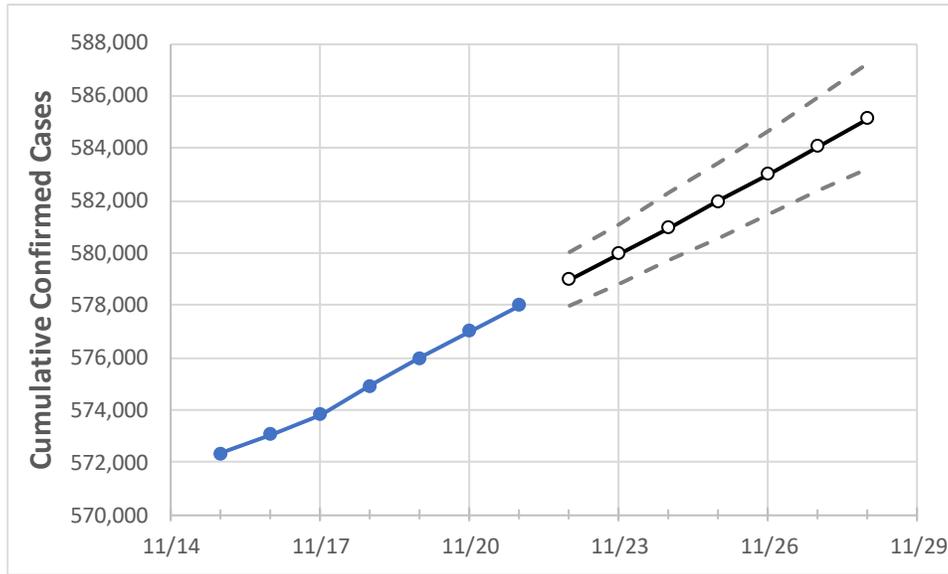
### IEM's Modeling Lead

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:						
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28
Maryland	574,914	575,996	577,013	578,019	578,983	579,967	580,964	581,986	583,023	584,060	585,123

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:						
	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28
Anne Arundel	54,427	54,537	54,641	54,751	54,853	54,960	55,069	55,181	55,296	55,412	55,531
Baltimore City	63,109	63,235	63,371	63,506	63,616	63,725	63,838	63,953	64,072	64,191	64,316
Baltimore County	78,751	78,897	79,002	79,128	79,260	79,393	79,526	79,664	79,805	79,947	80,088
Charles	14,781	14,800	14,818	14,840	14,854	14,868	14,882	14,896	14,910	14,924	14,938
Frederick	25,223	25,279	25,321	25,381	25,437	25,493	25,549	25,606	25,665	25,725	25,783
Harford	21,525	21,576	21,638	21,691	21,741	21,793	21,846	21,899	21,953	22,008	22,064
Howard	23,210	23,253	23,289	23,348	23,392	23,436	23,482	23,529	23,578	23,630	23,681
Montgomery	84,110	84,233	84,350	84,443	84,554	84,667	84,780	84,898	85,015	85,137	85,259
Prince George’s	101,218	101,284	101,389	101,468	101,550	101,634	101,718	101,803	101,888	101,977	102,064

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:											
	11/18	11/19	11/20	11/21	11/23			11/25			11/27					
Anne Arundel	54,427	54,537	54,641	54,751	54,960	(10,992)	[2,638]	{1,319}	55,181	(11,036)	[2,649]	{1,324}	55,412	(11,082)	[2,660]	{1,330}
Baltimore City	63,109	63,235	63,371	63,506	63,725	(12,745)	[3,059]	{1,529}	63,953	(12,791)	[3,070]	{1,535}	64,191	(12,838)	[3,081]	{1,541}
Baltimore County	78,751	78,897	79,002	79,128	79,393	(15,879)	[3,811]	{1,905}	79,664	(15,933)	[3,824]	{1,912}	79,947	(15,989)	[3,837]	{1,919}
Charles	14,781	14,800	14,818	14,840	14,868	(2,974)	[714]	{357}	14,896	(2,979)	[715]	{358}	14,924	(2,985)	[716]	{358}
Frederick	25,223	25,279	25,321	25,381	25,493	(5,099)	[1,224]	{612}	25,606	(5,121)	[1,229]	{615}	25,725	(5,145)	[1,235]	{617}
Harford	21,525	21,576	21,638	21,691	21,793	(4,359)	[1,046]	{523}	21,899	(4,380)	[1,051]	{526}	22,008	(4,402)	[1,056]	{528}
Howard	23,210	23,253	23,289	23,348	23,436	(4,687)	[1,125]	{562}	23,529	(4,706)	[1,129]	{565}	23,630	(4,726)	[1,134]	{567}
Montgomery	84,110	84,233	84,350	84,443	84,667	(16,933)	[4,064]	{2,032}	84,898	(16,980)	[4,075]	{2,038}	85,137	(17,027)	[4,087]	{2,043}
Prince George's	101,218	101,284	101,389	101,468	101,634	(20,327)	[4,878]	{2,439}	101,803	(20,361)	[4,887]	{2,443}	101,977	(20,395)	[4,895]	{2,447}

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.