

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

Date: 11/19/20

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 11/19/20 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.**

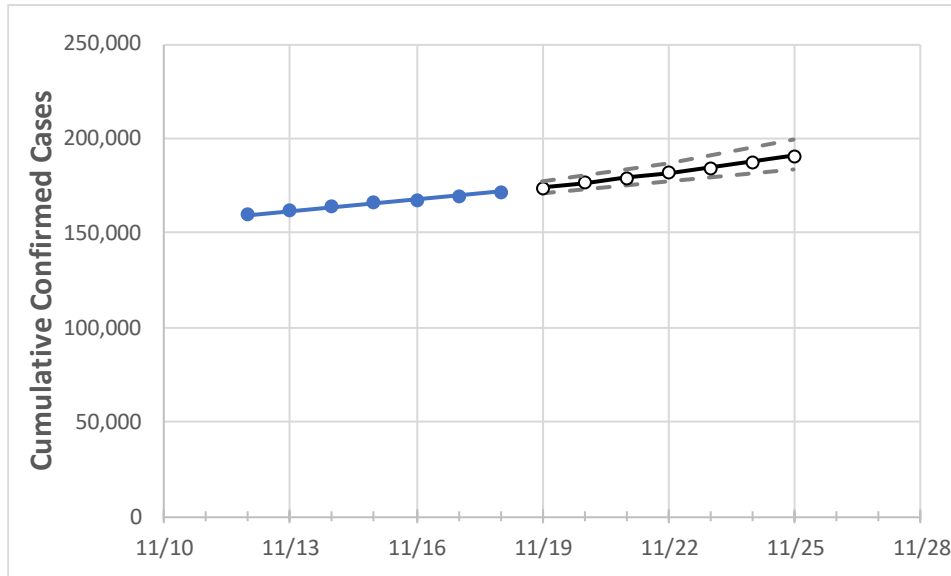
### IEM's Modeling Lead

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Maryland	165,930	167,656	169,805	171,823	174,119	176,532	179,066	181,729	184,525	187,461	190,544

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 20%, and are often within 10%, of actual confirmed cases.

### Maryland Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Anne Arundel	14,129	14,307	14,480	14,660	14,860	15,070	15,288	15,517	15,755	16,004	16,264
Baltimore City	20,737	21,010	21,186	21,409	21,684	21,971	22,270	22,581	22,905	23,242	23,593
Baltimore County	24,285	24,594	24,897	25,253	25,628	26,024	26,442	26,882	27,346	27,836	28,353
Charles	3,738	3,790	3,831	3,880	3,926	3,974	4,023	4,074	4,126	4,181	4,237
Frederick	5,616	5,703	5,778	5,859	5,944	6,033	6,127	6,225	6,329	6,439	6,554
Harford	4,616	4,749	4,828	4,959	5,086	5,223	5,369	5,526	5,695	5,875	6,068
Howard	6,791	6,843	6,945	7,005	7,097	7,194	7,297	7,404	7,518	7,637	7,763
Montgomery	29,205	29,571	29,833	30,298	30,640	30,998	31,374	31,768	32,181	32,614	33,068
Prince George's	36,531	36,746	37,168	37,440	37,778	38,132	38,504	38,895	39,305	39,735	40,187

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:											
	11/15	11/16	11/17	11/18	11/20				11/22				11/24			
Anne Arundel	14,129	14,307	14,480	14,660	15,070	(3,014)	[723]	{362}	15,517	(3,103)	[745]	{372}	16,004	(3,201)	[768]	{384}
Baltimore City	20,737	21,010	21,186	21,409	21,971	(4,394)	[1,055]	{527}	22,581	(4,516)	[1,084]	{542}	23,242	(4,648)	[1,116]	{558}
Baltimore County	24,285	24,594	24,897	25,253	26,024	(5,205)	[1,249]	{625}	26,882	(5,376)	[1,290]	{645}	27,836	(5,567)	[1,336]	{668}
Charles	3,738	3,790	3,831	3,880	3,974	(795)	[191]	{95}	4,074	(815)	[196]	{98}	4,181	(836)	[201]	{100}
Frederick	5,616	5,703	5,778	5,859	6,033	(1,207)	[290]	{145}	6,225	(1,245)	[299]	{149}	6,439	(1,288)	[309]	{155}
Harford	4,616	4,749	4,828	4,959	5,223	(1,045)	[251]	{125}	5,526	(1,105)	[265]	{133}	5,875	(1,175)	[282]	{141}
Howard	6,791	6,843	6,945	7,005	7,194	(1,439)	[345]	{173}	7,404	(1,481)	[355]	{178}	7,637	(1,527)	[367]	{183}
Montgomery	29,205	29,571	29,833	30,298	30,998	(6,200)	[1,488]	{744}	31,768	(6,354)	[1,525]	{762}	32,614	(6,523)	[1,565]	{783}
Prince George's	36,531	36,746	37,168	37,440	38,132	(7,626)	[1,830]	{915}	38,895	(7,779)	[1,867]	{933}	39,735	(7,947)	[1,907]	{954}

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.